PRELIMINARY DRAINAGE REPORT

FOR

WOODY MOUNTAIN CAMPGROUND

February 5, 2019

COF No. PZ-18-00210

Project Location:

2727 W Route 66
Flagstaff, AZ 86001

Prepared For:

Wanderland Flagstaff LLC
2502 E Camelback Rd No 214
Phoenix, Arizona 85016

Prepared By:

EXPIRES 06-30-2020

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WE Project No. 118044

Preliminary Drainage Report for Woody Mountain Campground

EXPIRES 06-30-2020

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Preliminary Drainage Report

for
Woody Mountain Campground

1. INTRODUCTION

This is the preliminary drainage report for the proposed Woody Mountain Campground (Campground) development on parcels 112-01-007, 102-01-008 and 102-01-701, with an area of 20.53 acres. The current zoning is Rural Residential (RR). The site is located in Section 19, Township 21 N, and Range 07E, located south of Route 66 and east of Woody Mountain Road in the City of Flagstaff. Please note that the northwest corner of the site (the portion of the site in County's jurisdiction) has no proposed improvements. However, it is included in the drainage area (Sub-3B) in the existing condition to account for the flow generated by it.

The site is currently used as a campground with RV sites in the western half of the site. The proposed layout calls for 80 RV sites, 41 park model houses and 42 tent sites with other amenities which include ramadas, bath houses and trash enclosures. Figure 1 shows the parcel map for the subject site. The site will be accessed via a driveway on Route 66 and an emergency access driveway from Woody Mountain Road. Following is the parcel map of the subject site.

Wildwood Hills (WWH) Mobile Home Park (MHP) located east of the subject site is a senior living community and has a history of frequent flooding. The original design and construction of the MHP made little or no allowance for the conveyance of off-site stormwater entering the property from the west. The historic flow pattern of the stormwater enters the MHP around the location of Unit 9 and travels in an east-southeast direction toward Unit 47 and discharging into the Kit Carson RV Park. The flow discharged into the WWH flows through the development with no positive drainage consideration except for some make-shift rock channels built later as an effort to mitigate flooding. Flood walls and flood proofing measures have been attempted by the WWH residents with little success. There are no underground piping facilities to take even a portion of the flow.

Rainfall events are clearly subjecting the WWH residents with unsafe conditions. Flows ripping through and between homes and streets in this nature create massive, forceful momentum that can pick up objects, knock down people and cause significant property damages. It also poses hazardous conditions for not only vehicles but also for pedestrian accessibility.

Woody Mountain Campground project includes a detention basin that mitigates the increased flow due to proposed Campground improvements. The project would like to accommodate some of the offsite flow in the proposed detention basin to provide relief to the flooding on the neighboring development. Since the detention basin is proposed at a natural concentration point, it is a great opportunity to detain and mitigate the flow released into the WWH MHP thereby assisting the senior living community and the City of Flagstaff.

Figure 1: Parcel Map

2. OBJECTIVES AND PROCEDURES

The purpose of this Preliminary Drainage Report is to support the Site Plan submittal and to provide calculations and a description of the proposed stormwater management facilities and disposal outlets.

OBJECTIVES

- To provide Low Impact Development ("LID") Integrated Management Practices ("IMP's") based on the City of Flagstaff (COF or City) Ordinance No. 2009-07. The Runoff Control Volume ("ROCV") is incorporated within the LID basins.
- To provide stormwater detention facilities to mitigate the increase in flowrate from existing to proposed conditions.
- In addition, stormwater mitigation is provided for the increase in flowrate from the future half street improvements of the adjacent Right-of-Way (ROW) off Rte 66 and Woody Mountain Road.
- In addition, the proposed detention basin mitigates about 70% of the offsite flow rate to alleviate the flooding problems of the WWH MHP. The pond serves as a multi- purpose facility by providing detention for onsite and offsite flows and also functions as an amenity to the Campground.

METHODOLOGY

- The proposed improvements include three (3) Bio-Retention Basins (BRB) to address ROCV from the proposed onsite improvements.
- The flow is then directed to the stormwater detention basin to address the flow rate control requirements.

PROCEDURES

- Hydrologic calculations are performed per the of Flagstaff Stormwater Design Manual (SWDM) Chapter 3. United States Army Corps Engineer's (USACE) Hydrologic Engineering Center software (HEC-1), Version 4.1 is used for the runoff computation. Subject site references hydrology from previous drainage studies for Presidio in Pines which used HEC-1 analysis for runoff computation. To reference hydrology from previous studies and to continue with the same hydrologic parameters, subject study also uses HEC-1 analysis.

- Time of Concentration (Tc) calculations are performed per SWDM section 3.1.6.

- Rainfall depths are referenced from the COF SWDM Table 3-2 for a 6-hour storm duration since the watershed area is less than 1 square mile.

- Per SWDM Section 3.2, Curve Numbers for undeveloped forest are referenced from Arizona Department of Water Resources' (ADWR) "Oak Creek Flood Warning System Hydrology Report, TR 90-4, September 1990" (will be referred as Oak Creek Hydrology

Report hereafter). Curve Numbers for other land cover types are referenced from Natural Resources Conservation Services' (NRCS) National Engineering Handbook (NEH) Part 630 Hydrology, Chapter 9 Hydrologic Soil Cover Complexes Tables 9-2 (runoff curve numbers for arid and semiarid rangelands) and Table 9-5 (runoff curve numbers for urban areas). Please note the runoff curve number tables from NEH are same as the runoff curve number tables from the NRCS Technical Release-55 (TR-55).

- The project site lies within Zone X per FEMA FIRM 04005C6804G, 04005C6808G, 04005C6816G and 04005C6812G dated September 3, 2010.

- Federal Emergency Management Agency (FEMA) defines Zone X as areas of moderate flood hazard which are areas outside the Special flood Hazard Area (SFHA) and higher than the elevation of the 0.2% annual-chance flood. Following Figure shows the FEMA's flood zones.

Figure 2: Floodzone Map

3. RUNOFF CONTROL VOLUME (ROCV)

This project proposes three (3) Bio-Retention basins and one (1) detention basin to address the LID and detention needs.

i) Impervious Area Summary

There is an existing building with some paved areas in the northwest corner of the site. The existing impervious area on the site is 2150 SF (excluding the parcel in the County's jurisdiction).

The total impervious area in the proposed condition is 130,101 SF. Thus, the total increase in the impervious area of the site is 127,952 SF. Please see Appendix B for the breakdown of the impervious areas in the proposed condition.

ii) ROCV Calculations

ROCV required $= ((1" \, Rain)/12) \times Area$
$= ((1" \, Rain)/12) \times 127952 \, sq.ft = 10{,}663 \, cu.ft = 0.24 \, ac\text{-}ft$

Where: Area = increase in the impervious area (Roofs, streets, and paved parking areas)

ROCV provided $= 0.29 \, ac.ft$ (Sum of ROCV in LID ponds 1 thru 3)
ROCV provided (0.29 ac.ft) >ROCV required (0.24ac.ft).

iii) LID Basins Summary

There is an existing Following table summarizes the volume of the proposed Bio-Retention basin volumes. Please see Appendix B for elevation volume calculations of the LID basins.

Table 1-Summary of Bio-Retention Basin Volumes

ID	Vol. (CF)
LID-1	5952
LID-2	2962
LID-3	3704
Total	**12618**

Geotechnical exploration was performed for the detention pond and it was found that the soils on the site generally have good infiltration rates (more than 1 inch/hr) due to which no under drain system is proposed to drain the ROCV. Please see Appendix D for the geotechnical report.

4. REFERENCE DRAINAGE STUDIES

The subject site and the contributing offsite watershed areas were included in previous drainage study for Presidio in Pines (Presidio). The hydrologic analysis from the Presidio drainage study has been referenced into the HEC-1 analysis of the current study. Excerpts from the Presidio drainage study are included in Appendix D for reference.

5. HYDROLOGY

City's Stormwater Design Manual (SWDM) guidelines are followed to analyze the runoff generated by the site. Pre-developed and Post developed runoff is computed to design the detention facilities to control the discharge/flow rate.

i) Rainfall

Rainfall depths are referenced from COF SWDM Table 3-2 for 6-hour storm duration since the watershed area is less than 1 square mile.

Table 2-Rainfall Depths

Storm Event	Intensity (inches/hour)	Depth (inches)
10	0.36	2.16
100	0.53	3.18

ii) Time of Concentration (Tc)

Tc calculations were performed per SWDM's section 3.1.6 and are included in Appendix B. Some of the calculated Tc were too low. Thus, a minimum Tc of 15 mins and 10 mins are used for the pre and post developed conditions.

As a guidance to the minimum Tc, ADOT Hydrologic Drainage Design Manual, HDDM Section 2.2.4 has been referenced, the minimum Tc per HDDM is 10 minutes which is more realistic for Improved/Impervious areas. With the ADOT improvements which mostly include paved/impervious areas, the minimum Tc of 10 minutes is used for post developed condition. With this approach, the minimum Tc for pre-developed condition uses a slightly higher Tc of 15 minutes. While the minimum Tc for pre-developed condition could use 10 minutes, it would underestimate the increase in flow rate from pre to post developed condition. Please note that the standard TR-55 Tc calculations do not include a component to account for the time the rain drop takes to traverse from roof top, pass thru roof gutters and then join the surface/overland flow. Thus, it is believed that the Tc of 15 minutes and 10 minutes is apt for the pre and the post developed condition.

iii) Hydrologic Soil Group (HSG)

The soils information is referenced from Natural Resources Conservation Services' (NRCS) Web Soil Survey (WSS). WSS references soil map for Oak Creek-San Francisco Peaks Area which shows the soils on site to be composed of cobbly clay loam and stony clay loam with Hydrologic Soil Group "C" and "D" (HSG C and HSG D). Curve numbers area referenced from Oak Creek Hydrology Report and NRCS curve numbers tables. Composite curve number calculations are performed to account for the landcover/land use and different hydrologic soil groups. (Please see Appendix B for Soils Information and Curve Number tables).

iv) Existing Condition

The offsite watershed area includes both developed and undeveloped areas. The contributing offsite watershed area is comprised of the Vintage 37-acre parcel located west of Woody Mountain

Road, northwest portion of Presidio in Pines and southern tip of Hidden Hollow Manufactured Homes and a portion of Rail Road Springs located north of Rte 66.

The Vintage 37-acre parcel located west of Woody Mountain Road was a part of the 2006 Woody burn area. To reflect the existing condition, current analysis uses curve numbers for the post burn condition.

The Campground site receives offsite flows from the following three locations:

- South perimeter: Offsite flow is released at a point source on southern boundary from the Presidio subdivision via a 30-inch cmp. Majority of Vintage 37-acre parcel (drainage area SUB-1A), most of the Woody Mountain Road (SUB-1B) and portion of Presidio subdivision discharge flow to the 30-inch cmp. The flow from the Vintage parcel and the flow generated by the Woody Mountain Road discharge into a 4'x3' RCBC under Woody Mountain Road that connects into a storm drain system in Presidio. The storm drain system conveys Presidio's onsite flows and eventually discharges into a 30-inch cmp that drains flow into the Campground site. Please note that there is some portion of Timber Sky development Blocks 1 and 2 that historically drains east towards the WWH MHP. Per City's request to Timber Sky development, this area is diverted to flow west to provide relief to the flooding issues on WWH-MHP.
- North perimeter: An existing 24-inch cmp under Rte 66 discharges flow from Hidden Hollow north of Rte 66 (SUB-2) and a portion of Rte 66 (SUB-2A) that discharges into the 24-inch cmp via an existing catch basin in Rte 66. Also flow from Rte 66 flows along the roadside ditch on south side of the road which eventually terminates and discharges into the Campground site.
- West perimeter: An existing 24"x36" arch cmp under Woody Mountain Road discharges flow from minor portion of Vintage 37-acre parcel (SUB-1) and Rte 66 (SUB-2A) which flows in the roadside ditch which eventually terminates and discharges into the Campground site.

Onsite watershed area is divided into two drainage areas Sub-3A and Sub-3B. Drainage area Sub-3A which includes southwest quadrant of the site, flows in southeasterly direction, along the south perimeter wall. This flow eventually combines with the offsite flow released from the Presidio subdivision, the combined flow then continues northeasterly towards the existing pond in the campground site.

Drainage area SUB-3B comprises majority of the site. It traverses through existing swales and eventually continues as ditches at steeper westerly portion of the site.

All the onsite and offsite flow ultimately discharges into a makeshift pond that was roughly excavated to pond flows before the flow continues east into the WWH MHP. Based on the existing pond size, it appears that the pond may detain flows generated by smaller storms only. Once the pond fills up, the flow enters the MHP at the west perimeter of the MHP via two (2) rock/grouted channels located on north and south sides of WWH MHP unit 9. This is the single outlet for the stormwater discharged from the Campground site into the WWH MHP. Following table

summarizes the 10-year and the 100-year storm events flows discharged at the Outlet in existing condition. Please see Exhibit 1 and Exhibit-2 for offsite drainage map and existing condition onsite drainage map included in Appendix A.

Table 3-Existing Condition-Outlet Flow Summary

Storm Event	Flow Rate (cfs)
10-year	96
100-year	197

v) Proposed Condition-Unattenuated

The offsite flow patterns remain same as in proposed condition. However, per COF, the runoff generated by the additional impervious area for future half street improvements of the adjacent ROWs has been included in the post developed hydrologic calculations and in the detention facility design. Curve numbers are revised for the drainage areas SUB-1B and SUB-2A to account for the future street improvements.

The campground intends to maintain the existing grades to the maximum possible extent except for the pond grading and grading for RV pads and roads. For the onsite drainage areas SUB-3A and SUB-3B, the curve numbers area revised to account for the newly added impervious areas. Please refer to the composite curve number calculations included in Appendix B. Post developed runoff calculations are performed to account for the newly added impervious areas and the future half street improvements of adjacent ROWs. Following table summarizes the 10-year and the 100-year storm events flows discharged at the Outlet in post developed unattenuated condition.

Table 4-Proposed Condition Unattenuated-Outlet Flow Summary

Storm Event	Flow Rate (cfs)
10-year	112
100-year	224

vi) Post-Developed Condition-Attenuated

The detention basin is proposed at the downstream end of the site, along the east perimeter of the site. The proposed detention basin serves as a campground amenity by maintaining a body of water year-round and maintain a water level, as the property may need for the activity. The pond does not only provide mitigation to the increased flows due to the proposed Campground improvements, but also mitigates the offsite flows discharged into the WWH MHP by almost 70%. Please see Section 6 of the report for detention basin design description. Following table summarizes the 10-year and the 100-year storm events flows discharged at the Outlet in post developed attenuated condition.

Table 5-Proposed Condition Attenuated-Outlet Flow Summary

Storm Event	Flow Rate (cfs)
10-year	35
100-year	52

6. DETENTION BASIN

The pond will have a 4' of dead storage at the bottom, with 8' live storage above the permanent pool. Due to the existing steep terrain, the pond will have walls (2-3 tiers) on all sides. Safety railing will be proposed around the pond. Please see Appendix B for the detention volume calculations.

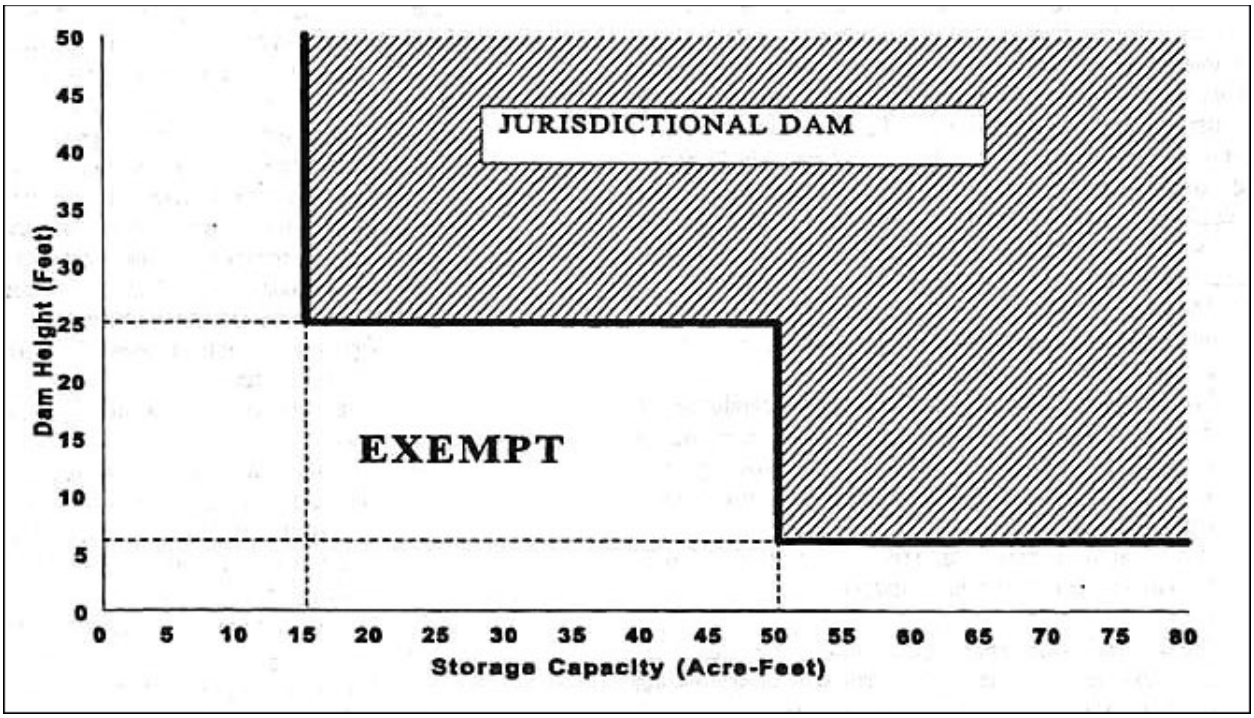
The flow from the proposed improvements will be routed to the LID basins first and then directed to the detention basin. Rock swales/channels are proposed to bring the flow to the detention basin along the existing drainage paths. *Detailed rock channel design will be performed at construction plans phase and will be included in the final drainage report.*

Following table provides a brief summary of pond elevations and volume.

Table 6-Detention Basin Elevation and Volume Summary

Permanent Pool		Detention				Emergency Spillway	Freeboard min. (1 ft)
Bottom	Top	Bottom	Top	Vol. (ac-ft)	100-yr WSE	Elev.	Elev.
6984	6988	6988	6996	8.87	6993.9	6995	1.1

Arizona Department of Water Resources (ADWR) defines "jurisdictional dam" is defined as an artificial barrier for the impounding or diversion of water either 25 feet or more in height or having a storage capacity of more than 50 ac-ft. From the above table, the total height is 12' and the embankment height is 8' and the storage capacity is 8.87 ac-ft. Thus, the proposed detention basin is not categorized as a "jurisdictional dam". Following chart from ADWR's "Jurisdictional dam" criteria shows the height and the volume limits.



i) Outlet Facilities

Two (2) outlet pipes are proposed to discharge the detained volume. Both the outlet pipes, the southern 24-inch pipe or outlet pipe-1 and the northern 18-inch pipe or outlet pipe-2 will have an invert elevation of 6988, above the permanent pool elevation.

Outlet pipe-1 discharges flow into the existing south channel east of the basin. The 100-year discharge from outlet pipe-1 is about 33 cfs. Outlet pipe-2 discharges into the existing north channel east of the basin. The 100-year discharge from outlet pipe-2 is about 19 cfs. Trash racks will be proposed at the inlet and the outlet ends of the pipes to capture debris and also to limit access through the pipes. Please see Appendix C for the outlet flow calculations.

ii) Emergency Spillway

Per COF SWDM Section 8.4.6.1, emergency overflow facilities/spillways are required for instances where the primary outlet structure fails or storm events greater than the design capacity occur. The emergency overflow shall be designed to pass the 100-year peak discharge at a minimum. The design of the emergency overflow/spillway to pass the 100-year flow rate is not feasible due to the limited width of the existing downstream channels. Thus, spillway width will be designed to limit it to the width of the existing rock channel in the WWH MHP. *Detailed spillway design will be performed at construction plans phase.*

iii) Maintenance Road

A 10’ access drive is proposed to provide access into the pond for maintenance.

7. SUMMARY AND CONCLUSIONS

- The proposed Stormwater management facilities satisfies the rate control and the LID/ROCV requirement. Rate control is provided for the increased flows due to proposed improvements. In addition, mitigation is provided for offsite flows to alleviate flooding on WWH MHP.
- Though the proposed flow attenuation facilities do not completely reduce the flows to the capacity of existing drainage/conveyance facilities in WWH MHP, the flows are significantly lower than the existing condition flows (70% reduction).
- All the impervious areas are directed to the proposed LID basins to address the ROCV requirements to the maximum possible extent
- The outlet location and the flow pattern in post developed condition is same as pre-developed condition.
- Post developed flow rate released at the outlets is less than or equal to pre-developed flow rate.
- The drainage areas from the 2006 burn area use an existing burn condition for the curve numbers for the hydrologic analysis. This a conservative approach as the vegetation will eventually be re-established and the curve number will drop significantly.
- To reduce flows from the west of Woody Mountain Road to Wildwood Hills MHP, some areas of Timber Sky that naturally drain east would be routed west as recommended by the City with the Timber Sky improvements.
- The proposed detention based is at the same location as the existing small pond which is a natural concentration point with more than one inflow points. The proposed detention basin maintains the same flow pattern as in existing condition. The permanent pool provides an additional site amenity.
- *Detailed design of the detention basin outlets, spillways and rock channels will be performed at the Construction Plans phase.*

8. REFERENCES

City of Flagstaff Stormwater Management Design Manual, City of Flagstaff Engineering Division, 2000

City of Flagstaff Low Impact Development Manual (January 2009)

Natural Resources Conservation Services' (NRCS) Web Soil Survey

Natural Resources Conservation Services' (NRCS) National Engineering Handbook.

Arizona Department of Water Resources (ADWR) Oak Creek Flood Warning System Hydrology Report, TR 90-4, September 1990

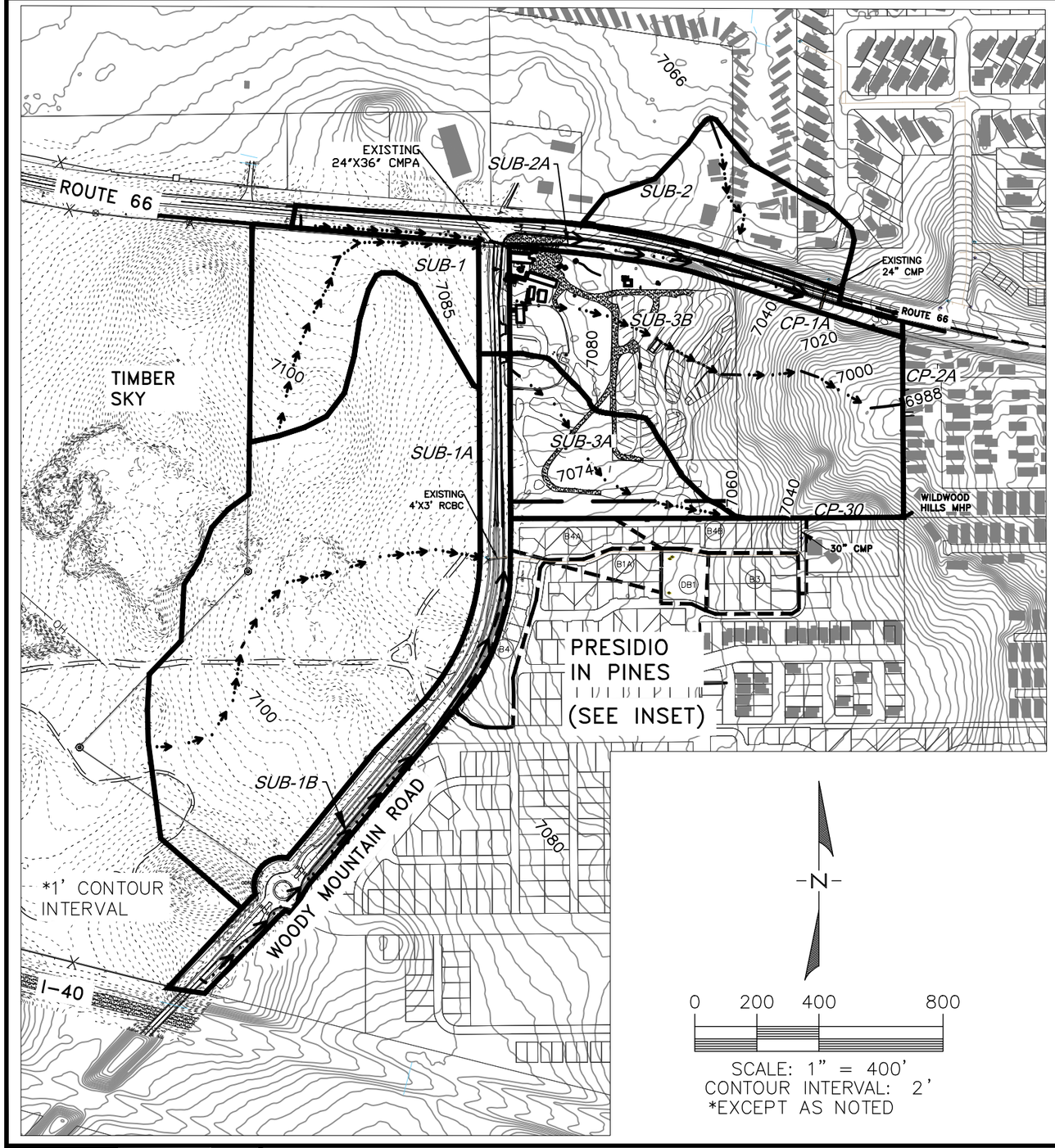
United States Army Corps Engineer's (USACE) Hydrologic Engineering Center software

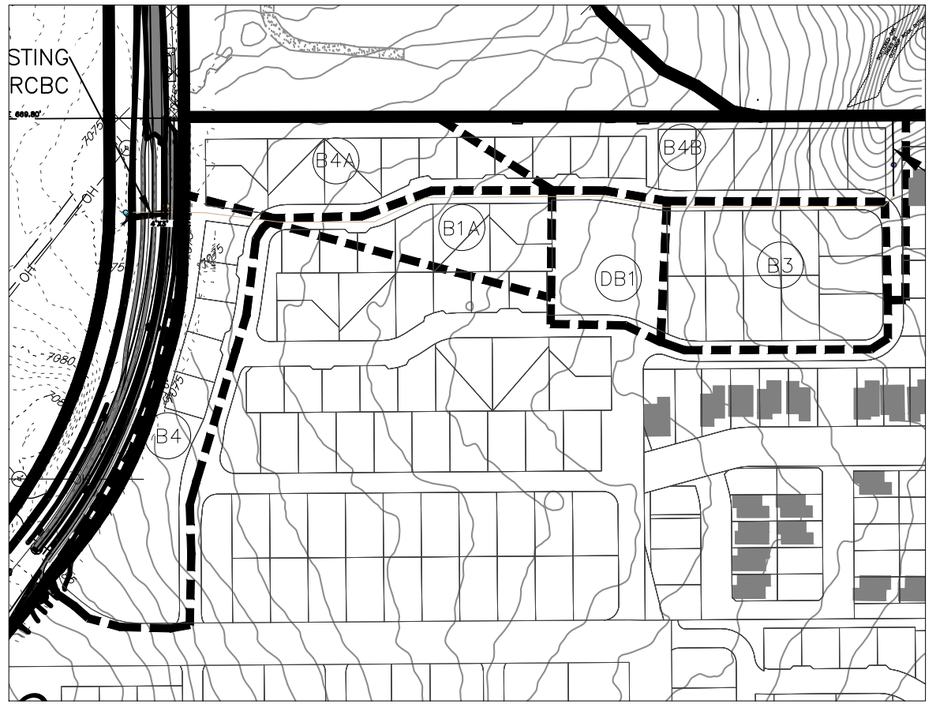
(HEC-1), Version 4.1

Presidio in Pines Drainage Report excerpts (December 2004)

APPENDIX A

Drainage Area Map-Offsite Drainage Areas
Drainage Area Map -Existing Conditions
Drainage Area Map -Proposed Conditions





PRESIDIO IN THE PINES
DRAINAGE AREAS

-N-

0 200 400 800

SCALE: 1" = 400'
CONTOUR INTERVAL: 2'
*EXCEPT AS NOTED

LEGEND

SUB-1	DRAINAGE AREA ID
———	DRAINAGE AREA LIMITS
· · → · · → ·	TRAVEL TIME PATH

DRAFTED BY:	SK
DATE:	2/4/19
PROJ. NO.:	118044
FN:	118044-Drainage

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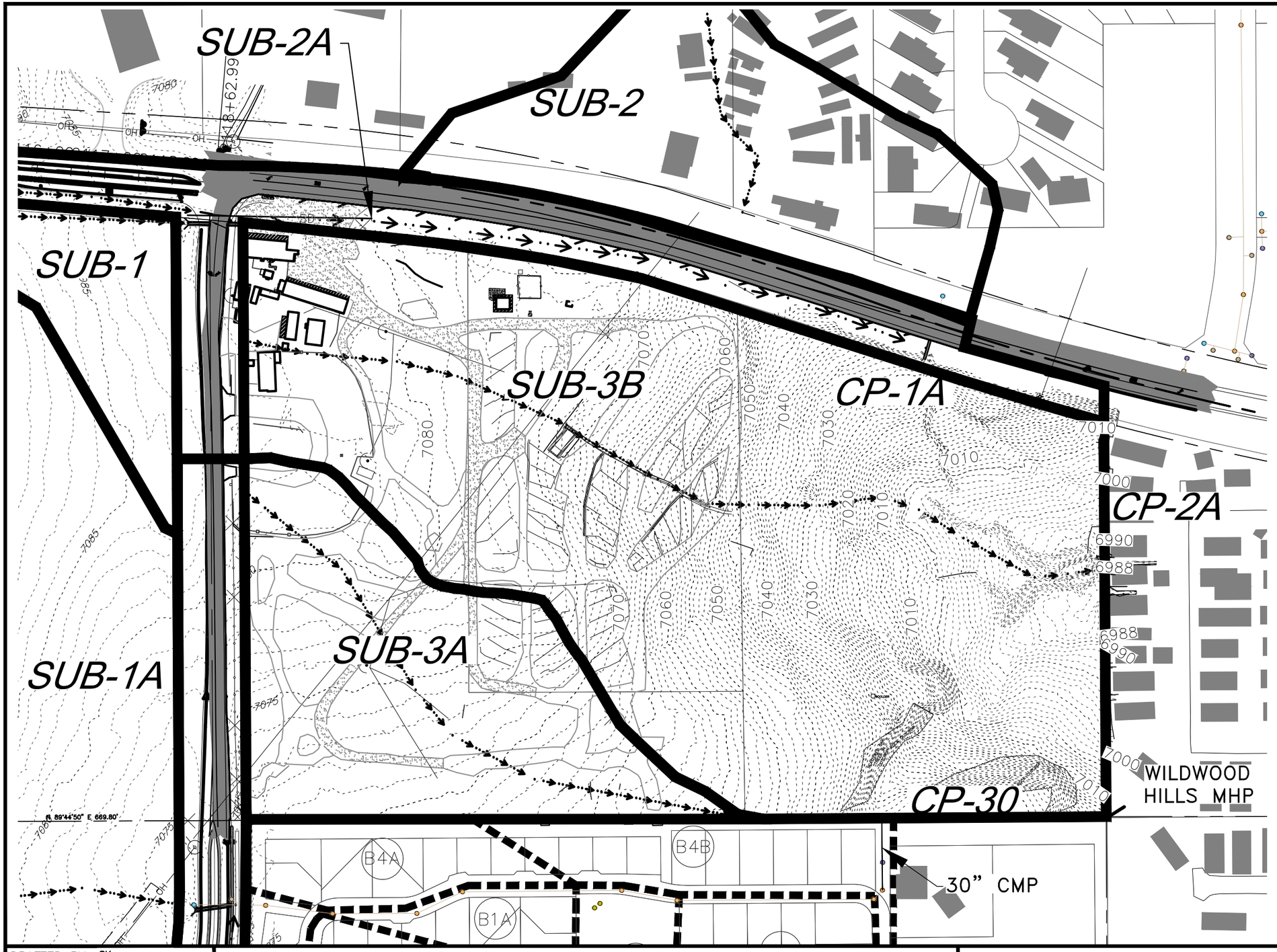
WOODY MOUNTAIN CAMPGROUND
OFFSITE DRAINAGE AREA MAP



LEGEND

SUB1 DRAINAGE AREA ID

DRAINAGE AREA LIMITS

TRAVEL TIME PATH

PLEASE SEE OFFSITE DRAINAGE AREA MAP FOR THE COMPLETE EXTENTS OF THE OFFSITE DRAINAGE AREAS.

N

0 75 150 300

SCALE: 1" = 150'
CONTOUR INTERVAL: 1'

DRAFTED BY:	SK
DATE:	01/24/2019
PROJ. NO.:	118044
FN:	118044 Drainage.dwg

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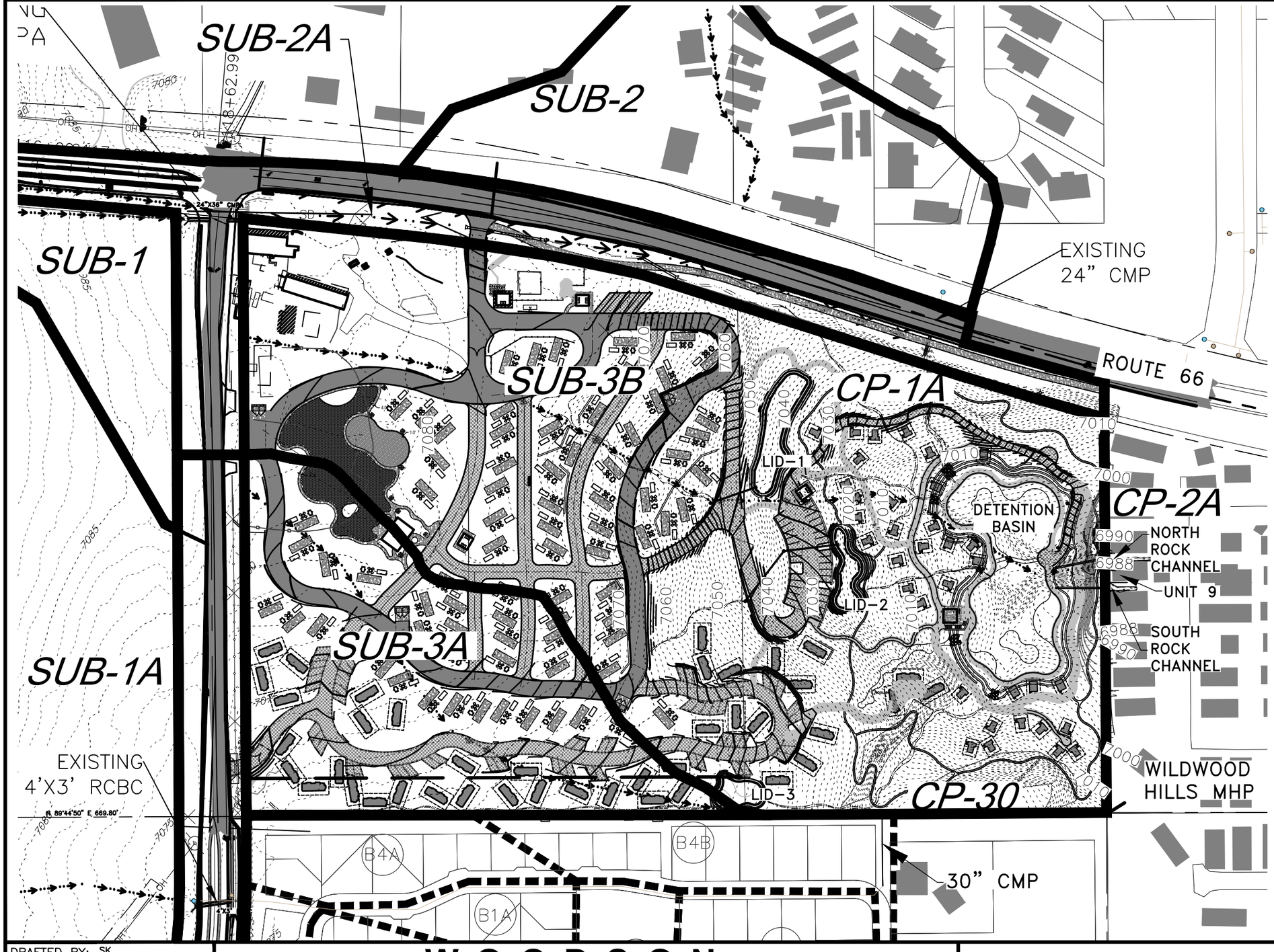
WOODY MOUNTAIN CAMPGROUND
DRAINAGE AREA MAP EXISTING CONDITION



LEGEND

SUB 1 DRAINAGE AREA ID

DRAINAGE AREA LIMITS

TRAVEL TIME PATH

PLEASE SEE OFFSITE DRAINAGE AREA MAP FOR THE COMPLETE EXTENTS OF THE OFFSITE DRAINAGE AREAS.

N

0 75 150 300

SCALE: 1" = 150'
CONTOUR INTERVAL: 1'

DRAFTED BY:	SK
DATE:	12/11/18
PROJ. NO.:	117058
FN:	117058-Drainage Map.dwg

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WOODY MOUNTAIN CAMPGROUND
DRAINAGE AREA MAP PROPOSED CONDITION

APPENDIX B

Soils Information
Composite Curve Number Calculations
Time of Concentration Calculations
Drainage Areas Summary Table
HEC-1 Output-Existing Condition 10-year Storm Event
HEC-1 Output-Existing Condition 100-year Storm Event
HEC-1 Output-Proposed Condition Unattenuated 10-year Storm Event
HEC-1 Output-Proposed Condition Unattenuated 100-year Storm Event
HEC-1 Output-Proposed Condition Attenuated 10-year Storm Event
HEC-1 Output-Proposed Condition Attenuated 100-year Storm Event
Summary of Impervious Area and ROCV Calculations

Search

Map Unit Legend

HSG C

HSG D

Oak Creek-San Francisco Peaks Area, Arizona, Part of Coconino County (AZ693)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
1	Jacques clay loam, 0 to 2 percent slopes	31.7	4.5%
2	Brolliar stony clay loam, 0 to 2 percent slopes	159.2	22.9%
2A	Brolliar stony clay loam, 2 to 8 percent slopes	193.2	27.7%
2B	Brolliar stony clay loam, 8 to 30 percent slopes	16.2	2.3%
12	Brolliar cobbly clay loam, deep variant, 0 to 5 percent slopes	270.0	38.8%
15A	Tortugas-Daze complex, 0 to 15 percent slopes	25.9	3.7%
Totals for Area of Interest		**696.2**	**100.0%**

HSG D

HSG D

HSG C

HSG D

Soil Map

Scale (not to scale)

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

You have zoomed in beyond the scale at which the soil map for this area is intended to be used. Mapping of soils is done at a particular scale. The soil your AOI were mapped at 1:24,000. The design of map units and the level of detail shown in the resulting soil map are dependent on that map 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 areas of contrasting soils that could have been shown at a more detailed scale.

Soil Data Available

Name	Area Symbol	Data Availability	Version
Oak Creek-San Francisco Peaks Area, Arizona, Part of Coconino County	AZ693	Tabular and Spatial, incomplete	Survey Area: Version 5, Sep 14, 2014 Tabular: Version 4, Sep 14, 2014 Spatial: Version 2, Dec 17, 2013

Oak Creek-San Francisco Peaks Area, Arizona, Part of Coconino County

1—Jacques clay loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 1vhjq
Elevation: 6,580 to 7,080 feet
Mean annual precipitation: 18 to 24 inches
Mean annual air temperature: 43 to 49 degrees F
Frost-free period: 90 to 115 days
Farmland classification: Not prime farmland

Map Unit Composition

Jacques and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Jacques

Setting

Landform: Drainageways, valleys
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium

Typical profile

H1 - 0 to 16 inches: clay loam
H2 - 16 to 60 inches: clay

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water storage in profile: High (about 9.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: C

Hydric soil rating: No

Data Source Information

Soil Survey Area: Oak Creek-San Francisco Peaks Area, Arizona, Part of Coconino County
Survey Area Data: Version 5, Sep 14, 2014

Oak Creek-San Francisco Peaks Area, Arizona, Part of Coconino County

2—Brolliar stony clay loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 1vhjr
Elevation: 6,790 to 7,420 feet
Mean annual precipitation: 18 to 24 inches
Mean annual air temperature: 43 to 49 degrees F
Frost-free period: 90 to 115 days
Farmland classification: Not prime farmland

Map Unit Composition

Brolliar and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Brolliar

Setting

Landform: Plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from basalt

Typical profile

H1 - 0 to 3 inches: stony clay loam
H2 - 3 to 30 inches: clay
R - 30 to 40 inches: bedrock

Properties and qualities

Slope: 0 to 2 percent
Percent of area covered with surface fragments: 15.0 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 1 percent
Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5c
Hydrologic Soil Group: D

Hydric soil rating: No

Data Source Information

Soil Survey Area: Oak Creek-San Francisco Peaks Area, Arizona, Part of Coconino County
Survey Area Data: Version 5, Sep 14, 2014

Oak Creek-San Francisco Peaks Area, Arizona, Part of Coconino County

2A—Brolliar stony clay loam, 2 to 8 percent slopes

Map Unit Setting

National map unit symbol: 1vhjs
Elevation: 6,620 to 7,540 feet
Mean annual precipitation: 18 to 24 inches
Mean annual air temperature: 43 to 49 degrees F
Frost-free period: 90 to 115 days
Farmland classification: Not prime farmland

Map Unit Composition

Brolliar and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Brolliar

Setting

Landform: Plains
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from basalt

Typical profile

H1 - 0 to 3 inches: stony clay loam
H2 - 3 to 30 inches: clay
R - 30 to 40 inches: bedrock

Properties and qualities

Slope: 2 to 8 percent
Percent of area covered with surface fragments: 15.0 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 1 percent
Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5c
Hydrologic Soil Group: D

Hydric soil rating: No

Data Source Information

Soil Survey Area: Oak Creek-San Francisco Peaks Area, Arizona, Part of Coconino County
Survey Area Data: Version 5, Sep 14, 2014

Oak Creek-San Francisco Peaks Area, Arizona, Part of Coconino County

2B—Brolliar stony clay loam, 8 to 30 percent slopes

Map Unit Setting

National map unit symbol: 1vhjt
Elevation: 6,760 to 7,550 feet
Mean annual precipitation: 18 to 24 inches
Mean annual air temperature: 43 to 49 degrees F
Frost-free period: 90 to 115 days
Farmland classification: Not prime farmland

Map Unit Composition

Brolliar and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Brolliar

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from basalt

Typical profile

H1 - 0 to 3 inches: stony clay loam
H2 - 3 to 30 inches: clay
R - 30 to 40 inches: bedrock

Properties and qualities

Slope: 8 to 30 percent
Percent of area covered with surface fragments: 20.0 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 1 percent
Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5c
Hydrologic Soil Group: D

Hydric soil rating: No

Data Source Information

Soil Survey Area: Oak Creek-San Francisco Peaks Area, Arizona, Part of Coconino County
Survey Area Data: Version 5, Sep 14, 2014

Oak Creek-San Francisco Peaks Area, Arizona, Part of Coconino County

12—Brolliar cobbly clay loam, deep variant, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: 1vhk4
Elevation: 6,870 to 7,560 feet
Mean annual precipitation: 18 to 24 inches
Mean annual air temperature: 43 to 49 degrees F
Frost-free period: 90 to 115 days
Farmland classification: Not prime farmland

Map Unit Composition

Brolliar, deep, and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Brolliar, Deep

Setting

Landform: Plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from basalt

Typical profile

H1 - 0 to 3 inches: cobbly clay loam
H2 - 3 to 60 inches: clay

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 1 percent
Available water storage in profile: Moderate (about 8.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5c
Hydrologic Soil Group: C

Hydric soil rating: No

Data Source Information

Soil Survey Area: Oak Creek-San Francisco Peaks Area, Arizona, Part of Coconino County
Survey Area Data: Version 5, Sep 14, 2014

Oak Creek-San Francisco Peaks Area, Arizona, Part of Coconino County

15A—Tortugas-Daze complex, 0 to 15 percent slopes

Map Unit Setting

National map unit symbol: 1vhkb
Elevation: 6,670 to 7,090 feet
Mean annual precipitation: 18 to 24 inches
Mean annual air temperature: 43 to 49 degrees F
Frost-free period: 90 to 115 days
Farmland classification: Not prime farmland

Map Unit Composition

Tortugas and similar soils: 55 percent
Daze and similar soils: 45 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tortugas

Setting

Landform: Hills
Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Side slope, interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Alluvium and/or residuum weathered from limestone

Typical profile

H1 - 0 to 3 inches: cobbly loam
H2 - 3 to 14 inches: very cobbly loam
R - 14 to 24 inches: bedrock

Properties and qualities

Slope: 0 to 15 percent
Depth to restrictive feature: 6 to 20 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 50 percent
Available water storage in profile: Very low (about 1.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: D

Hydric soil rating: No

Description of Daze

Setting

Landform: Hills
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from limestone and sandstone

Typical profile

H1 - 0 to 3 inches: fine sandy loam
H2 - 3 to 7 inches: clay loam
H3 - 7 to 18 inches: clay
R - 18 to 28 inches: bedrock

Properties and qualities

Slope: 0 to 15 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: D
Hydric soil rating: No

Data Source Information

Soil Survey Area: Oak Creek-San Francisco Peaks Area, Arizona, Part of Coconino County
Survey Area Data: Version 5, Sep 14, 2014

OAK CREEK FLOOD WARNING SYSTEM

HYDROLOGY REPORT

ARIZONA DEPARTMENT OF WATER RESOURCES

ENGINEERING DIVISION

FLOOD MANAGEMENT SECTION

TR 90 - 4
SEPTEMBER 1990

Table 2

RUNOFF CURVE NUMBERS

Cover Type	Cover Condition	Hydrologic Soil Group	Curve Number
BARE ROCK	NO CONDITION		94
RIVERWASH	NO CONDITION		53
CINDERS/LAVA	POOR 0 - 30%		53
SPRUCE - FIR	GOOD 70 - 100%	B	41
MIXED CONIFER	GOOD 70 - 100%	B	41
MIXED CONIFER	GOOD 70 - 100%	C	51
MIXED CONIFER	FAIR 30 - 70%	A	48
MIXED CONIFER	FAIR 30 - 70%	B	53
MIXED CONIFER	FAIR 30 - 70%	C	65
MIXED CONIFER	FAIR 30 - 70%	D	75
MIXED CONIFER	POOR 0 - 30%	A	60
MIXED CONIFER	POOR 0 - 30%	B	71
MIXED CONIFER	POOR 0 - 30%	C	80
MIXED CONIFER	POOR 0 - 30%	D	87
PONDEROSA PINE	GOOD 70 - 100%	B	41
PONDEROSA PINE	GOOD 70 - 100%	C	51
PONDEROSA PINE	FAIR 30 - 70%	A	48
PONDEROSA PINE	FAIR 30 - 70%	B	53
PONDEROSA PINE	FAIR 30 - 70%	C	65
PONDEROSA PINE	FAIR 30 - 70%	D	75
PONDEROSA PINE	POOR 0 - 30%	B	71
PONDEROSA PINE	POOR 0 - 30%	C	80
PINON - JUNIPER	GOOD 70 - 100%	B	41
PINON - JUNIPER	GOOD 70 - 100%	C	61
PINON - JUNIPER	GOOD 70 - 100%	D	71
PINON - JUNIPER	FAIR 30 - 70%	A	40
PINON - JUNIPER	FAIR 30 - 70%	B	58
PINON - JUNIPER	FAIR 30 - 70%	C	73
PINON - JUNIPER	FAIR 30 - 70%	D	80
PINON - JUNIPER	POOR 0 - 30%	A	62
PINON - JUNIPER	POOR 0 - 30%	B	75
PINON - JUNIPER	POOR 0 - 30%	C	85
PINON - JUNIPER	POOR 0 - 30%	D	89
CHAPARRAL	GOOD 70 - 100%	B	52
CHAPARRAL	GOOD 70 - 100%	C	68
CHAPARRAL	GOOD 70 - 100%	D	78
CHAPARRAL	FAIR 30 - 70%	B	65
CHAPARRAL	FAIR 30 - 70%	C	77
CHAPARRAL	FAIR 30 - 70%	D	85
CHAPARRAL	POOR 0 - 30%	B	78
CHAPARRAL	POOR 0 - 30%	C	86
CHAPARRAL	POOR 0 - 30%	D	91
GRASSLAND	GOOD 70 - 100%	B	48
GRASSLAND	GOOD 70 - 100%	C	60
GRASSLAND	GOOD 70 - 100%	D	70
GRASSLAND	FAIR 30 - 70%	B	61
GRASSLAND	FAIR 30 - 70%	C	72
GRASSLAND	FAIR 30 - 70%	D	80
GRASSLAND	POOR 0 - 30%	B	74
GRASSLAND	POOR 0 - 30%	C	82
GRASSLAND	POOR 0 - 30%	D	89
FOREST PARK	FAIR 30 - 70%	A	55
FOREST PARK	FAIR 30 - 70%	C	69
FOREST PARK	POOR 0 - 30%	B	74
FOREST PARK	POOR 0 - 30%	D	89
DESERT GRASSLAND	GOOD 70 - 100%	B	62
DESERT GRASSLAND	GOOD 70 - 100%	C	74
DESERT GRASSLAND	GOOD 70 - 100%	D	85
DESERT GRASSLAND	FAIR 30 - 70%	B	71
DESERT GRASSLAND	FAIR 30 - 70%	C	81
DESERT GRASSLAND	FAIR 30 - 70%	D	89
DESERT GRASSLAND	POOR 0 - 30%	B	80
DESERT GRASSLAND	POOR 0 - 30%	C	87
DESERT GRASSLAND	POOR 0 - 30%	D	93
SONORA DESERT	GOOD 70 - 100%	A	49
SONORA DESERT	GOOD 70 - 100%	B	68
SONORA DESERT	GOOD 70 - 100%	C	79
SONORA DESERT	GOOD 70 - 100%	D	84
SONORA DESERT	FAIR 30 - 70%	A	55
SONORA DESERT	FAIR 30 - 70%	B	72
SONORA DESERT	FAIR 30 - 70%	C	81
SONORA DESERT	FAIR 30 - 70%	D	86
SONORA DESERT	POOR 0 - 30%	A	63
SONORA DESERT	POOR 0 - 30%	B	77
SONORA DESERT	POOR 0 - 30%	C	85
SONORA DESERT	POOR 0 - 30%	D	88
RIPARIAN	GOOD 70 - 100%	B	57
RIPARIAN	GOOD 70 - 100%	C	63
RIPARIAN	FAIR 30 - 70%	A	55
RIPARIAN	FAIR 30 - 70%	C	68
RIPARIAN SCRUB	FAIR 30 - 70%	A	53
MEADOW	GOOD 70 - 100%	D	70

Table 9–5 Runoff curve numbers for urban areas [1/]

Cover description cover type and hydrologic condition	Average percent impervious area [2/]	-- CN for hydrologic soil group -- A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.) [3/]					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) [4/]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation)		77	86	91	94

1/ Average runoff condition, and $I_a = 0.2S$.

2/ The average percent impervious area shown was used to develop the composite CNs. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition.

3/ CNs shown are equivalent to those of pasture. Composite CNs may be computed for other combinations of open space type.

4/ Composite CNs for natural desert landscaping should be computed using figures 9–3 or 9–4 based on the impervious area percentage (CN=98) and the pervious area CN. The pervious area CNs are assumed equivalent to desert shrub in poor hydrologic condition.

Composite Curve Number (CN) Calculations-Existing Condition

Drainage Area ID	Total Area (ac)	Soil Map Symbol	Hydrologic Soil Group	Cover Type	SCS Curve Number	Area for Individual CN	Composite SCS CN
*1	7.01	2A	D	Open Space (<50% grass cover)	89	1.29	86.55
		12	C	Open Space (<50% grass cover)	86	5.72	
*1A	28.94	2	D	Open Space (<50% grass cover)	89	13.20	87.37
		12	C	Open Space (<50% grass cover)	86	15.74	
Sub-1B	5.84	2	D	Paved Street	98	1.90	93.23
			D	Paved Street w/ Open Ditches	93	1.90	
			D	Dirt (including ROW)	89	2.04	
Sub-2	4.97	2	D	Residential - 1/8 Acre	92	0.85	79.72
		2A	D	Residential - 1/8 Acre	92	1.07	
		12	C	Ponderosa Pine (Fair)	65	1.53	
				Open Space (50% -70% cover)	79	1.53	
Sub-2A	4.53	2A	D	Dirt (including ROW)	89	2.101	91.15
				Paved Street w/ Open Ditches	93	2.43	
Sub-3A	5.14	12	C	Ponderosa Pine (Fair)	65	2.57	72.00
				Open Space (Fair)	79	2.57	
Sub-3B	16.94	2A	D	Ponderosa Pine (Fair)	75	8.97	75.18
		12	C	Ponderosa Pine (Fair)	65	3.88	
				Open Space (Fair)	79	3.88	
		12	C	Roofs	98	0.22	

* Drainage Areas 1 and 1A use the post burn curve numbers - Open Sapce with less than 50% grass cover

Composite Curve Number (CN) Calculations-Proposed Condition

Drainage Area ID	Total Area (ac)	Soil Map Symbol	Hydrologic Soil Group	Cover Type	SCS Curve Number	Area for Individual CN	Composite SCS CN
*1	7.01	2A	D	Open Space (<50% grass cover)	89	1.29	86.55
		12	C	Open Space (<50% grass cover)	86	5.72	
*1A	28.94	2	D	Open Space (<50% grass cover)	89	13.20	87.37
		12	C	Open Space (<50% grass cover)	86	15.74	
Sub-1B	5.84	2	D	Paved Street	98	2.05	93.46
				Paved Street w/ Open Ditches	93	1.90	
				Dirt (including ROW)	89	1.89	
Sub-2	4.97	2	D	Residential - 1/8 Acre	92	0.85	79.72
		2A	D	Residential - 1/8 Acre	92	1.07	
		12	C	Ponderosa Pine (Fair)	65	1.53	
				Open Space (<50% grass cover)	79	1.53	
Sub-2A	4.53	2A	D	Dirt (including ROW)	89	1.387	95.25
				Paved Street	98	3.15	
Sub-3A	5.14	12	C	Ponderosa Pine (Fair)	65	1.75	78.72
				Open space (Fair)	79	1.75	
				Gravel	85	0.62	
				Rooftops/impervious areas	98	1.02	
Sub-3B	16.94	2A	D	Ponderosa Pine (Fair)	75	3.97	82.70
				Open Space (Fair)	84	3.97	
				Permanent Pond	98	1.03	
		12	C	Ponderosa Pine (Fair)	65	2.36	
				Open space (Fair)	79	2.36	
				Gravel	85	1.36	
		12		Rooftops/impervious areas	98	2.19	

* Drainage Areas 1 and 1A use the post burn curve numbers - Open Sapce with less than 50% grass cover

Woody Mountain Campground Drainage Area Summary-Existing Conditions

Drainage Area ID	Area	Area		CN	Tc	Tlag=0.6*Tc
	sq.ft	Acres	sq.miles		min	(hr)
Offsite						
Sub-1	305345	7.01	0.011	86.55	15.5	0.155
Sub-1A	1260517	28.94	0.045	87.37	18.9	0.189
Sub-1B	254229	5.84	0.009	93.23	10.0	0.100
Sub-2	216434	4.97	0.008	79.72	18.1	0.181
Sub-2A	197411	4.53	0.007	91.15	10.0	0.100
Onsite						
Sub-3A	223971	5.14	0.008	72.00	15.0	0.150
Sub-3B	737806	16.94	0.026	75.18	31.7	0.32

Woody Mountain Campground Drainage Area Summary-Proposed Conditions

Drainage Area ID	Area			CN	Tc	Tlag=0.6*Tc
	sq.ft	Acres	sq.miles		min	(hr)
Offsite						
Sub-1	305345	7.01	0.011	86.55	15.5	0.155
Sub-1A	1260517	28.94	0.045	87.37	18.9	0.189
Sub-1B	254229	5.84	0.009	93.46	10.0	0.100
Sub-2	216434	4.97	0.008	79.72	18.1	0.181
Sub-2A	197411	4.53	0.007	95.25	10.0	0.100
Onsite						
Sub-3A	223971	5.14	0.008	78.72	10.0	0.100
Sub-3B	737806	16.94	0.026	82.70	24.2	0.242

Sub-1

Sheet Flow

Input Data		
	Elev Start [ft]	7106
	Elev End [ft]	7105
	Length [ft]	70
	n (Short Grass)	0.15
OUTPUT		
	S [ft/ft]	0.01
	Tt [hr]	0.178

Shallow Concentrated Flow

Unpaved		
	Elev Start [ft]	7105
	Elev End [ft]	7095
	Length [ft]	335
OUTPUT		
	S [ft/ft]	0.0299
	V [ft/s]	2.79
	Tt [min]	2.00
	Tt [hr]	0.033

Open Channel Flow

INPUT DATA:		
	Elev Start [ft]	7095
	Elev End [ft]	7077
	Length [ft]	695
	Manning's n	0.040
	Channel Slope [ft/ft]	0.0259
OUTPUT		
	Area [sf]	23.50
	Wetted Perimeter [ft]	41.06
	Hydraulic Radius	0.57
	Velocity [fps]	4.12
	Tt [min]	2.81
	Tt [hr]	0.047

Tc [hr]	0.258
Tc [min]	15.47
SCS Lag [hr]	0.155

Sub-1A

Sheet Flow

Input Data		
	Elev Start [ft]	7113
	Elev End [ft]	7111
	Length [ft]	98
	n (short grass)	0.15
OUTPUT		
	S [ft/ft]	0.02
	Tt [hr]	0.202

Shallow Concentrated Flow

Unpaved		
	Elev Start [ft]	7111
	Elev End [ft]	7098
	Length [ft]	561
	Output	
	S [ft/ft]	0.0232
	V [ft/s]	2.46
	Tt [min]	3.81
	Tt [hr]	0.063

Open Channel Flow

INPUT DATA:		
	Elev Start [ft]	7098
	Elev End [ft]	7070
	Length [ft]	904
	Manning's n	0.040
	Channel Slope [ft/ft]	0.0310
	Depth [ft]	1.00
OUTPUT DATA:		
	Area [sf]	27.50
	Wetted Perimeter [ft]	40.08
	Hydraulic Radius	0.69
	Velocity [fps]	5.09
	Tt [min]	2.96
	Tt [hr]	0.049

Tc [hr]	0.314
Tc [min]	18.87
SCS Lag [hr]	0.189

Sub-1B

Sheet Flow

Input Data		
	Elev Start [ft]	7131
	Elev End [ft]	7130
	Length [ft]	36
	n (Asphalt)	0.011
OUTPUT		
	S [ft/ft]	0.03
	Tt [hr]	0.010

Shallow Concentrated Flow

Unpaved		
	Elev Start [ft]	7130
	Elev End [ft]	7115
	Length [ft]	490
	Output	
	S [ft/ft]	0.0306
	V [ft/s]	2.82
	Tt [min]	2.89
	Tt [hr]	0.048

Open Channel Flow

INPUT DATA:		
	Elev Start [ft]	7115
	Elev End [ft]	7076
	Length [ft]	1219
	Channel Slope [ft/ft]	0.0320
	Depth [ft]	1.00
OUTPUT DATA:		
	Area [sf]	2.25
	Wetted Perimeter [ft]	4.03
	Hydraulic Radius	0.56
	Velocity [fps]	9.01
	Tt [min]	2.26
	Tt [hr]	0.038

Tc [hr]	0.096	
Tc [min]	10.00	(Min. 10 min)
SCS Lag [hr]	0.100	

Sub-2A

Sheet Flow

Input Data		
	Elev Start [ft]	7088
	Elev End [ft]	7087
	Length [ft]	35
	n (Asphalt)	0.011
OUTPUT		
	S [ft/ft]	0.03
	Tt [hr]	0.010

Shallow Concentrated Flow

Unpaved		
	Elev Start [ft]	7087
	Elev End [ft]	7080
	Length [ft]	674
	Output	
	S [ft/ft]	0.0104
	V [ft/s]	1.64
	Tt [min]	6.83
	Tt [hr]	0.114

Open Channel Flow

INPUT DATA:		
	Elev Start [ft]	7080
	Elev End [ft]	7040
	Length [ft]	945
	Manning's n	0.020
	Channel Slope [ft/ft]	0.0423
	Depth [ft]	1.00
OUTPUT DATA:		
	Area [sf]	16.00
	Wetted Perimeter [ft]	27.09
	Hydraulic Radius	0.59
	Velocity [fps]	10.76
	Tt [min]	1.46
	Tt [hr]	0.024

Tc [hr]	0.148	
Tc [min]	10.00	(Min. 10 min)
SCS Lag [hr]	0.100	

Sub-2

Sheet Flow

Input Data		
	Elev Start [ft]	7072
	Elev End [ft]	7069
	Length [ft]	97
	n (dense grasses)	0.24
OUTPUT		
	S [ft/ft]	0.03
	Tt [hr]	0.247

Shallow Concentrated Flow

Unpaved		
	Elev Start [ft]	7069
	Elev End [ft]	7068
	Length [ft]	203
	Output	
	S [ft/ft]	0.0049
	V [ft/s]	1.13
	Tt [min]	2.99
	Tt [hr]	0.050

Open Channel Flow

INPUT DATA:		
	Elev Start [ft]	7068
	Elev End [ft]	7060
	Length [ft]	125
	Manning's n	0.040
	Channel Slope [ft/ft]	0.0640
	Depth [ft]	1.00
OUTPUT DATA:		
	Area [sf]	7.00
	Wetted Perimeter [ft]	12.20
	Hydraulic Radius	0.57
	Velocity [fps]	6.49
	Tt [min]	0.32
	Tt [hr]	0.005

Tc [hr]	0.302
Tc [min]	18.11
SCS Lag [hr]	0.181

Sub-3A Existing Condition

Sheet Flow

Input Data		
	Elev Start [ft]	7083
	Elev End [ft]	7081
	Length [ft]	42
	n (dense grasses)	0.24
OUTPUT		
	S [ft/ft]	0.05
	Tt [hr]	0.106

Shallow Concentrated Flow

Unpaved		
	Elev Start [ft]	7081
	Elev End [ft]	7050
	Length [ft]	1056
	Output	
	S [ft/ft]	0.0294
	V [ft/s]	2.76
	Tt [min]	6.37
	Tt [hr]	0.106

Tc [hr]	0.212
Tc [min]	12.74
Tc [min] used	15.00
Tc [hr] used	0.25
SCS Lag [hr]	0.150

Sub-3B Existing Condition

Sheet Flow

Input Data		
	Elev Start [ft]	7081
	Elev End [ft]	7080
	Length [ft]	95
	n (Dense Grasses)	0.24
OUTPUT		
	S [ft/ft]	0.01
	Tt [hr]	0.458

Shallow Concentrated Flow

Unpaved		
	Elev Start [ft]	7080.4
	Elev End [ft]	7072
	Length [ft]	400
	Output	
	S [ft/ft]	0.0210
	V [ft/s]	2.34
	Tt [min]	2.85
	Tt [hr]	0.048

Open Channel Flow

INPUT DATA:		
	Elev Start [ft]	7072
	Elev End [ft]	6988
	Length [ft]	912
	Manning's n	0.040
	Channel Slope [ft/ft]	0.0921
	Depth [ft]	2.00
OUTPUT DATA:		
	Area [sf]	90.00
	Wetted Perimeter [ft]	85.10
	Hydraulic Radius	1.06
	Velocity [fps]	11.70
	Tt [min]	1.30
	Tt [hr]	0.022

Tc [hr]	0.527
Tc [min]	31.62
SCS Lag [hr]	0.32

Sub-3A Proposed Condition

Sheet Flow

Input Data		
	Elev Start [ft]	7083
	Elev End [ft]	7081
	Length [ft]	42
	n (short grasses)	0.15
OUTPUT		
	S [ft/ft]	0.05
	Tt [hr]	0.073

Shallow Concentrated Flow

Unpaved		
	Elev Start [ft]	7081
	Elev End [ft]	7050
	Length [ft]	1056
	Output	
	S [ft/ft]	0.0294
	V [ft/s]	2.76
	Tt [min]	6.37
	Tt [hr]	0.106

Tc [hr]	0.179
Tc [min]	10.74
Tc [min] used	10.00
Tc [hr] used	0.17
SCS Lag [hr]	0.100

Sub-3B Proposed Condition

Sheet Flow

Input Data		
	Elev Start [ft]	7081
	Elev End [ft]	7080
	Length [ft]	75
	n (dense grasses)	0.25
OUTPUT		
	S [ft/ft]	0.01
	Tt [hr]	0.345

Shallow Concentrated Flow

Unpaved		
	Elev Start [ft]	7080.35
	Elev End [ft]	7072
	Length [ft]	400
	Output	
	S [ft/ft]	0.0209
	V [ft/s]	2.33
	Tt [min]	2.86
	Tt [hr]	0.048

Open Channel Flow

INPUT DATA:		
	Elev Start [ft]	7072
	Elev End [ft]	7000
	Length [ft]	548
	Manning's n	0.040
	Channel Slope [ft/ft]	0.1314
	Depth [ft]	2.00
OUTPUT DATA:		
	Top Width [ft]	85.00
	Area [sf]	90.00
	Wetted Perimeter [ft]	85.10
	Hydraulic Radius	1.06
	Velocity [fps]	13.98
	Tt [min]	0.65
	Tt [hr]	0.011

Tc [hr]	0.404
Tc [min]	24.21
SCS Lag [hr]	0.24

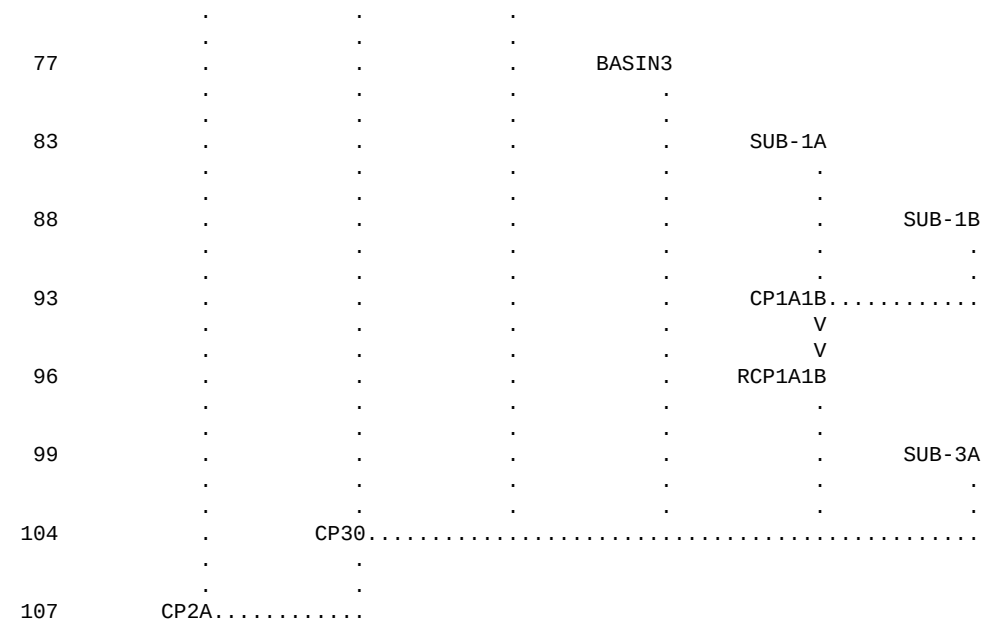
```
1****************************************                 ****************************************
 *                                      *                 *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                 *    U.S. ARMY CORPS OF ENGINEERS      *
 *              JAN   1997              *                 *    HYDROLOGIC ENGINEERING CENTER     *
 *            VERSION 4.1               *                 *          609 SECOND STREET           *
 *                                      *                 *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   02FEB19  TIME  12:30:54  *                 *           (916) 756-1104             *
 *                                      *                 *                                      *
 ****************************************                 ****************************************

                                        X     X  XXXXXXX   XXXXX          X
                                        X     X  X        X     X         XX
                                        X     X  X        X               X
                                        XXXXXXX  XXXX     X        XXXXX  X
                                        X     X  X        X               X
                                        X     X  X        X     X         X
                                        X     X  XXXXXXX   XXXXX         XXX

          THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

          THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
          THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
          NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
          DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
          KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                                  HEC-1 INPUT                                                PAGE  1

          LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 *** FREE ***
                        *DIAGRAM
              1         ID        Woody Mountain Campground
              2         ID        Existing-Conditions HEC-1 Model
              3         ID        10-year, 6-hour Model
              4         ID        Woodson Engineering and Surveying
              5         ID        FEB 2019
              6         ID        EXISTING CONDITION
              7         IT       3       0       0     125
              8         IO       5       0       0
              9         IN       5       0       0
                        *
```

```
  10          KK   SUB-1
  11          BA   0.011
  12          PH      10    0.19    0.48    0.87    1.46    1.70    1.86    2.16
  13          LS       0   86.55
  14          UD   0.155
              *

  15          KK   SUB-2
  16          BA   0.008
  17          LS       0   79.72
  18          UD   0.181
              *

  19          KK  SUB-2A
  20          BA   0.007
  21          LS       0   91.51
  22          UD     0.1
              *

  23          KK    CP1A
  24          KM     COMBINE HYDROGRAPHS FROM SUB-1,SUB-2 & SUB-2A
  25          HC       3
              *

  26          KK  SUB-3B
  27          KM    RUNOFF FROM SUB-3B
  28          BA    .026
  29          LS       0   75.18
  30          UD    0.32
              *

  31          KK     CP2
  32          KM     COMBINE HYDROGRAPHS FROM CP1A & SUB-3B
  33          HC       2
              *

  34          KK  BASIN4
  35          KM    BASIN REFERENCED FROM PRESIDIO IN PINES STUDY
  36          KM    RUNOFF FROM BASIN 4
  37          BA    .002
  38          LS       0   83.56
  39          UD    .086
              *
1                                     HEC-1 INPUT                                          PAGE  2

 LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  40          KK   RCP26
  41          KM    ROUTE CP26 TO CP27
  42          RK     400    0.01   0.016       0      21      10      10
```

```
            *
43          KK BASIN4A
44          KM    BASIN REFERENCED FROM PRESIDIO IN PINES STUDY
45          KM    RUNOFF FROM BASIN 4A
46          BA    .002
47          LS       0    86.0
48          UD    .136
            *
49          KK    CP27
50          KM    COMBINE BASINS RCP26 & BASIN4A
51          HC       2
            *
52          KK BASIN1A
53          KM    BASIN REFERENCED FROM PRESIDIO IN PINES STUDY
54          KM    RUNOFF FROM BASIN 1A
55          BA    .001
56          LS       0    90.4
57          UD    .054
            *
58          KK    CP28
59          KM    COMBINE BASINS BASIN1A & CP27
60          HC       2
            *
61          KK     DB1
62          KM    BASIN REFERENCED FROM PRESIDIO IN PINES STUDY
63          KM    DETENTION BASIN 1
64          RS       1    STOR       0
65          SV     0.0    0.02    0.09    0.15    0.23   0.31          0.39     0.40
66          SE  7052.8  7053.0  7053.5  7054.0  7054.5  7055.0  7055.5      7055.52
67          SQ     0.0    0.21    1.30    3.16    4.14   4.93          5.61     5.63
            *
68          KK    RDB1
69          KM    ROUTE DB1 TO CP30
70          RK     320    0.01   0.013       0    CIRC     0.5
            *
71          KK BASIN4B
72          KM    BASIN REFERENCED FROM PRESIDIO IN PINES STUDY
73          KM    RUNOFF FROM BASIN 4B
74          BA    .002
75          LS       0   87.81
76          UD    .071
            *
```

```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


  77          KK  BASIN3
  78          KM    BASIN REFERENCED FROM PRESIDIO IN PINES STUDY
  79          KM    RUNOFF FROM BASIN 3
  80          BA    .002
  81          LS       0   90.80
  82          UD    .071
              *

  83          KK  SUB-1A
  84          KM    RUNOFF FROM SUB-1A
  85          BA    .045
  86          LS       0   87.37
  87          UD    .189
              *

  88          KK  SUB-1B
  89          KM    RUNOFF FROM SUB-1B
  90          BA    .009
  91          LS       0   93.23
  92          UD     .10
              *

  93          KK  CP1A1B
  94          KM    COMBINE HYDROGRAPHS FROM SUB-1A & SUB-1B
  95          HC       2
              *

  96          KK RCP1A1B
  97          KM    ROUTE CP1A1B TO CP30
  98          RK    1200    0.01   0.013       0    CIRC     2.5
              *

  99          KK  SUB-3A
 100          KM    RUNOFF FROM SUB-3A
 101          BA    .008
 102          LS       0   72.00
 103          UD     .15
              *

 104          KK    CP30
 105          KM    COMBINE BASINS 3, 4B, DB1, & RCP1A1B
 106          HC       5
              *

 107          KK    CP2A
 108          KM     COMBINE HYDROGRAPHS FROM CP30 & CP2
 109          HC       2
              *
```

```
           110          ZZ
1
               SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    10       SUB-1
                .
                .
    15          .       SUB-2
                .           .
                .           .
    19          .           .      SUB-2A
                .           .           .
                .           .           .
    23        CP1A.......................
                .
                .
    26          .      SUB-3B
                .           .
                .           .
    31         CP2............
                .
                .
    34          .      BASIN4
                .           V
                .           V
    40          .       RCP26
                .           .
                .           .
    43          .           .     BASIN4A
                .           .           .
                .           .           .
    49          .        CP27............
                .           .
                .           .
    52          .           .     BASIN1A
                .           .           .
                .           .           .
    58          .        CP28............
                .           V
                .           V
    61          .         DB1
                .           V
                .           V
    68          .        RDB1
                .           .
                .           .
    71          .           .     BASIN4B
```



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *              JAN   1997               *
 *            VERSION 4.1                *
 *                                       *
 *  RUN DATE   02FEB19  TIME  12:30:54   *
 *                                       *
 *****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

Woody Mountain Campground
Existing-Conditions HEC-1 Model
10-year, 6-hour Model
Woodson Engineering and Surveying
FEB 2019
EXISTING CONDITION

```
   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
```

```
 IT          HYDROGRAPH TIME DATA
                   NMIN           3  MINUTES IN COMPUTATION INTERVAL
                  IDATE      1    0  STARTING DATE
                  ITIME        0000  STARTING TIME
                     NQ         125  NUMBER OF HYDROGRAPH ORDINATES
                 NDDATE      1    0  ENDING DATE
                 NDTIME        0612  ENDING TIME
                 ICENT          19  CENTURY MARK

               COMPUTATION INTERVAL     .05 HOURS
                    TOTAL TIME BASE    6.20 HOURS

      ENGLISH UNITS
           DRAINAGE AREA         SQUARE MILES
           PRECIPITATION DEPTH   INCHES
           LENGTH, ELEVATION     FEET
           FLOW                  CUBIC FEET PER SECOND
           STORAGE VOLUME        ACRE-FEET
           SURFACE AREA          ACRES
           TEMPERATURE           DEGREES FAHRENHEIT
1
                                                RUNOFF SUMMARY
                                            FLOW IN CUBIC FEET PER SECOND
                                          TIME IN HOURS,  AREA IN SQUARE MILES

                                    PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
      OPERATION       STATION       FLOW     PEAK                                           AREA      STAGE     MAX STAGE
+                                                      6-HOUR     24-HOUR     72-HOUR

      HYDROGRAPH AT
+                       SUB-1        12.    3.20          1.          1.          1.        .01

      HYDROGRAPH AT
+                       SUB-2         5.    3.25          1.          1.          1.        .01

      HYDROGRAPH AT
+                      SUB-2A        12.    3.15          1.          1.          1.        .01

      3 COMBINED AT
+                        CP1A        27.    3.15          3.          3.          3.        .03

      HYDROGRAPH AT
+                      SUB-3B         8.    3.45          1.          1.          1.        .03

      2 COMBINED AT
+                         CP2        30.    3.20          4.          4.          4.        .05

      HYDROGRAPH AT
+                      BASIN4         2.    3.10          0.          0.          0.        .00
```

	ROUTED TO								
+		RCP26	2.	3.15	0.	0.	0.	.00	
	HYDROGRAPH AT								
+		BASIN4A	2.	3.20	0.	0.	0.	.00	
	2 COMBINED AT								
+		CP27	4.	3.15	0.	0.	0.	.00	
	HYDROGRAPH AT								
+		BASIN1A	2.	3.10	0.	0.	0.	.00	
	2 COMBINED AT								
+		CP28	6.	3.15	1.	0.	0.	.01	
	ROUTED TO								
+		DB1	2.	3.45	0.	0.	0.	.01	
+									7053.69 3.45
	ROUTED TO								
+		RDB1	2.	3.45	0.	0.	0.	.01	
	HYDROGRAPH AT								
+		BASIN4B	3.	3.10	0.	0.	0.	.00	
	HYDROGRAPH AT								
+		BASIN3	4.	3.10	0.	0.	0.	.00	
	HYDROGRAPH AT								
+		SUB-1A	47.	3.25	5.	5.	5.	.05	
	HYDROGRAPH AT								
+		SUB-1B	17.	3.10	1.	1.	1.	.01	
	2 COMBINED AT								
+		CP1A1B	60.	3.20	6.	6.	6.	.05	
	ROUTED TO								
+		RCP1A1B	58.	3.20	6.	6.	6.	.05	
	HYDROGRAPH AT								
+		SUB-3A	2.	3.25	0.	0.	0.	.01	
	5 COMBINED AT								
+		CP30	66.	3.20	8.	7.	7.	.07	
	2 COMBINED AT								
+		CP2A	96.	3.20	12.	11.	11.	.12	

1

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	INTERPOLATED TO COMPUTATION INTERVAL DT	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
RCP26	MANE	.79	2.18	187.57	.82	3.00	2.17	189.00	.82

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8735E-01 EXCESS= .0000E+00 OUTFLOW= .8723E-01 BASIN STORAGE= .1745E-03 PERCENT ERROR= -.1

RDB1	MANE	.40	1.99	207.20	.86	3.00	1.99	207.00	.86

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2303E+00 EXCESS= .0000E+00 OUTFLOW= .2300E+00 BASIN STORAGE= .3864E-03 PERCENT ERROR= .0

RCP1A1B	MANE	.64	59.35	193.37	1.10	3.00	58.41	192.00	1.10

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3177E+01 EXCESS= .0000E+00 OUTFLOW= .3173E+01 BASIN STORAGE= .4051E-02 PERCENT ERROR= .0

*** NORMAL END OF HEC-1 ***

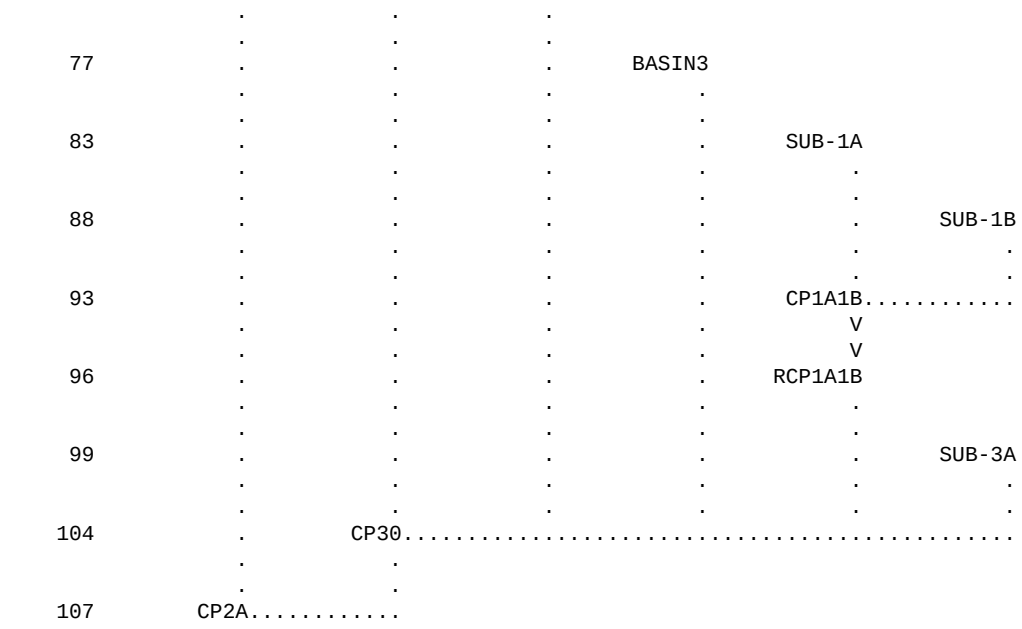
```
1****************************************                 ****************************************
 *                                      *                 *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                 *    U.S. ARMY CORPS OF ENGINEERS      *
 *              JAN   1997              *                 *    HYDROLOGIC ENGINEERING CENTER     *
 *            VERSION 4.1               *                 *          609 SECOND STREET           *
 *                                      *                 *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   02FEB19  TIME  12:39:04  *                 *           (916) 756-1104             *
 *                                      *                 *                                      *
 ****************************************                 ****************************************

                                X     X  XXXXXXX   XXXXX          X
                                X     X  X        X     X         XX
                                X     X  X        X                X
                                XXXXXXX  XXXX     X        XXXXX   X
                                X     X  X        X                X
                                X     X  X        X     X          X
                                X     X  XXXXXXX   XXXXX         XXX

          THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

          THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
          THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
          NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
          DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
          KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                                  HEC-1 INPUT                                                PAGE  1

          LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 *** FREE ***
                        *DIAGRAM
              1         ID        Woody Mountain Campground
              2         ID        Existing-Conditions HEC-1 Model
              3         ID        100-year, 6-hour Model
              4         ID        Woodson Engineering and Surveying
              5         ID        FEB 2019
              6         ID        EXISTING CONDITION
              7         IT       3       0       0     125
              8         IO       5       0       0
              9         IN       5       0       0
                        *
```

```
  10          KK   SUB-1
  11          BA   0.011
  12          PH       1    0.19    0.71    1.37    2.21    2.56    2.76    3.18
  13          LS       0   86.55
  14          UD   0.155
              *

  15          KK   SUB-2
  16          BA   0.008
  17          LS       0   79.72
  18          UD   0.181
              *

  19          KK  SUB-2A
  20          BA   0.007
  21          LS       0   91.51
  22          UD     0.1
              *

  23          KK    CP1A
  24          KM     COMBINE HYDROGRAPHS FROM SUB-1,SUB-2 & SUB-2A
  25          HC       3
              *

  26          KK  SUB-3B
  27          KM    RUNOFF FROM SUB-3B
  28          BA    .026
  29          LS       0   75.18
  30          UD    0.32
              *

  31          KK     CP2
  32          KM     COMBINE HYDROGRAPHS FROM CP1A & SUB-3B
  33          HC       2
              *

  34          KK  BASIN4
  35          KM    BASIN REFERENCED FROM PRESIDIO IN PINES STUDY
  36          KM    RUNOFF FROM BASIN 4
  37          BA    .002
  38          LS       0   83.56
  39          UD    .086
              *
1                                     HEC-1 INPUT                                          PAGE  2

 LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  40          KK   RCP26
  41          KM    ROUTE CP26 TO CP27
  42          RK     400    0.01   0.016       0      21      10      10
```

```
            *
43          KK BASIN4A
44          KM    BASIN REFERENCED FROM PRESIDIO IN PINES STUDY
45          KM    RUNOFF FROM BASIN 4A
46          BA    .002
47          LS       0    86.0
48          UD    .136
            *
49          KK    CP27
50          KM    COMBINE BASINS RCP26 & BASIN4A
51          HC       2
            *
52          KK BASIN1A
53          KM    BASIN REFERENCED FROM PRESIDIO IN PINES STUDY
54          KM    RUNOFF FROM BASIN 1A
55          BA    .001
56          LS       0    90.4
57          UD    .054
            *
58          KK    CP28
59          KM    COMBINE BASINS BASIN1A & CP27
60          HC       2
            *
61          KK     DB1
62          KM    BASIN REFERENCED FROM PRESIDIO IN PINES STUDY
63          KM    DETENTION BASIN 1
64          RS       1    STOR       0
65          SV     0.0    0.02    0.09    0.15    0.23   0.31          0.39    0.40
66          SE  7052.8  7053.0  7053.5  7054.0  7054.5  7055.0  7055.5      7055.52
67          SQ     0.0    0.21    1.30    3.16    4.14   4.93          5.61    5.63
            *
68          KK    RDB1
69          KM    ROUTE DB1 TO CP30
70          RK     320    0.01   0.013       0    CIRC     0.5
            *
71          KK BASIN4B
72          KM    BASIN REFERENCED FROM PRESIDIO IN PINES STUDY
73          KM    RUNOFF FROM BASIN 4B
74          BA    .002
75          LS       0   87.81
76          UD    .071
            *
```

```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


  77          KK  BASIN3
  78          KM    BASIN REFERENCED FROM PRESIDIO IN PINES STUDY
  79          KM    RUNOFF FROM BASIN 3
  80          BA    .002
  81          LS       0   90.80
  82          UD    .071
              *

  83          KK  SUB-1A
  84          KM    RUNOFF FROM SUB-1A
  85          BA    .045
  86          LS       0   87.37
  87          UD    .189
              *

  88          KK  SUB-1B
  89          KM    RUNOFF FROM SUB-1B
  90          BA    .009
  91          LS       0   93.23
  92          UD     .10
              *

  93          KK  CP1A1B
  94          KM    COMBINE HYDROGRAPHS FROM SUB-1A & SUB-1B
  95          HC       2
              *

  96          KK RCP1A1B
  97          KM    ROUTE CP1A1B TO CP30
  98          RK    1200    0.01   0.013       0    CIRC     2.5
              *

  99          KK  SUB-3A
 100          KM    RUNOFF FROM SUB-3A
 101          BA    .008
 102          LS       0   72.00
 103          UD     .15
              *

 104          KK    CP30
 105          KM    COMBINE BASINS 3, 4B, DB1, & RCP1A1B
 106          HC       5
              *

 107          KK    CP2A
 108          KM     COMBINE HYDROGRAPHS FROM CP30 & CP2
 109          HC       2
              *
```

```
           110          ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    10       SUB-1
                .
                .
    15          .       SUB-2
                .           .
                .           .
    19          .           .      SUB-2A
                .           .           .
                .           .           .
    23        CP1A.......................
                .
                .
    26          .      SUB-3B
                .           .
                .           .
    31         CP2............
                .
                .
    34          .      BASIN4
                .           V
                .           V
    40          .       RCP26
                .           .
                .           .
    43          .           .     BASIN4A
                .           .           .
                .           .           .
    49          .        CP27............
                .           .
                .           .
    52          .           .     BASIN1A
                .           .           .
                .           .           .
    58          .        CP28............
                .           V
                .           V
    61          .         DB1
                .           V
                .           V
    68          .        RDB1
                .           .
                .           .
    71          .           .     BASIN4B
```



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *              JAN   1997               *
 *            VERSION 4.1                *
 *                                       *
 *  RUN DATE   02FEB19  TIME  12:39:04   *
 *                                       *
 *****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

Woody Mountain Campground
Existing-Conditions HEC-1 Model
100-year, 6-hour Model
Woodson Engineering and Surveying
FEB 2019
EXISTING CONDITION

```
   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
```

```
 IT          HYDROGRAPH TIME DATA
                   NMIN           3  MINUTES IN COMPUTATION INTERVAL
                  IDATE      1    0  STARTING DATE
                  ITIME        0000  STARTING TIME
                     NQ         125  NUMBER OF HYDROGRAPH ORDINATES
                 NDDATE      1    0  ENDING DATE
                 NDTIME        0612  ENDING TIME
                 ICENT          19  CENTURY MARK

               COMPUTATION INTERVAL     .05 HOURS
                    TOTAL TIME BASE    6.20 HOURS

      ENGLISH UNITS
           DRAINAGE AREA         SQUARE MILES
           PRECIPITATION DEPTH   INCHES
           LENGTH, ELEVATION     FEET
           FLOW                  CUBIC FEET PER SECOND
           STORAGE VOLUME        ACRE-FEET
           SURFACE AREA          ACRES
           TEMPERATURE           DEGREES FAHRENHEIT
1
                                                RUNOFF SUMMARY
                                            FLOW IN CUBIC FEET PER SECOND
                                          TIME IN HOURS,  AREA IN SQUARE MILES

                                    PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
      OPERATION       STATION       FLOW     PEAK                                           AREA      STAGE     MAX STAGE
+                                                      6-HOUR     24-HOUR     72-HOUR

      HYDROGRAPH AT
+                       SUB-1        24.    3.20          2.          2.          2.        .01

      HYDROGRAPH AT
+                       SUB-2        12.    3.25          1.          1.          1.        .01

      HYDROGRAPH AT
+                     SUB-2A         22.    3.15          2.          2.          2.        .01

      3 COMBINED AT
+                       CP1A         54.    3.15          5.          5.          5.        .03

      HYDROGRAPH AT
+                     SUB-3B         21.    3.40          3.          3.          3.        .03

      2 COMBINED AT
+                        CP2         65.    3.20          8.          8.          8.        .05

      HYDROGRAPH AT
+                     BASIN4          5.    3.10          0.          0.          0.        .00
```

	ROUTED TO								
+		RCP26	5.	3.15	0.	0.	0.	.00	
	HYDROGRAPH AT								
+		BASIN4A	4.	3.15	0.	0.	0.	.00	
	2 COMBINED AT								
+		CP27	9.	3.15	1.	1.	1.	.00	
	HYDROGRAPH AT								
+		BASIN1A	3.	3.10	0.	0.	0.	.00	
	2 COMBINED AT								
+		CP28	12.	3.15	1.	1.	1.	.01	
	ROUTED TO								
+		DB1	4.	3.40	1.	1.	1.	.01	
+									7054.42 3.40
	ROUTED TO								
+		RDB1	4.	3.40	1.	1.	1.	.01	
	HYDROGRAPH AT								
+		BASIN4B	6.	3.10	0.	0.	0.	.00	
	HYDROGRAPH AT								
+		BASIN3	7.	3.10	0.	0.	0.	.00	
	HYDROGRAPH AT								
+		SUB-1A	92.	3.25	9.	9.	9.	.05	
	HYDROGRAPH AT								
+		SUB-1B	29.	3.15	2.	2.	2.	.01	
	2 COMBINED AT								
+		CP1A1B	115.	3.20	12.	11.	11.	.05	
	ROUTED TO								
+		RCP1A1B	113.	3.20	12.	11.	11.	.05	
	HYDROGRAPH AT								
+		SUB-3A	8.	3.20	1.	1.	1.	.01	
	5 COMBINED AT								
+		CP30	132.	3.20	14.	14.	14.	.07	
	2 COMBINED AT								
+		CP2A	197.	3.20	22.	22.	22.	.12	

1

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	DT	INTERPOLATED TO COMPUTATION INTERVAL PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
RCP26	MANE	.60	4.66	187.74	1.63	3.00	4.62	189.00	1.63

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1740E+00 EXCESS= .0000E+00 OUTFLOW= .1741E+00 BASIN STORAGE= .2036E-03 PERCENT ERROR= -.2

RDB1	MANE	.44	3.98	204.47	1.68	3.00	3.98	204.00	1.68

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4494E+00 EXCESS= .0000E+00 OUTFLOW= .4489E+00 BASIN STORAGE= .5692E-03 PERCENT ERROR= .0

RCP1A1B	MANE	.43	114.50	192.75	2.00	3.00	112.68	192.00	2.00

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5777E+01 EXCESS= .0000E+00 OUTFLOW= .5773E+01 BASIN STORAGE= .5669E-02 PERCENT ERROR= .0

*** NORMAL END OF HEC-1 ***

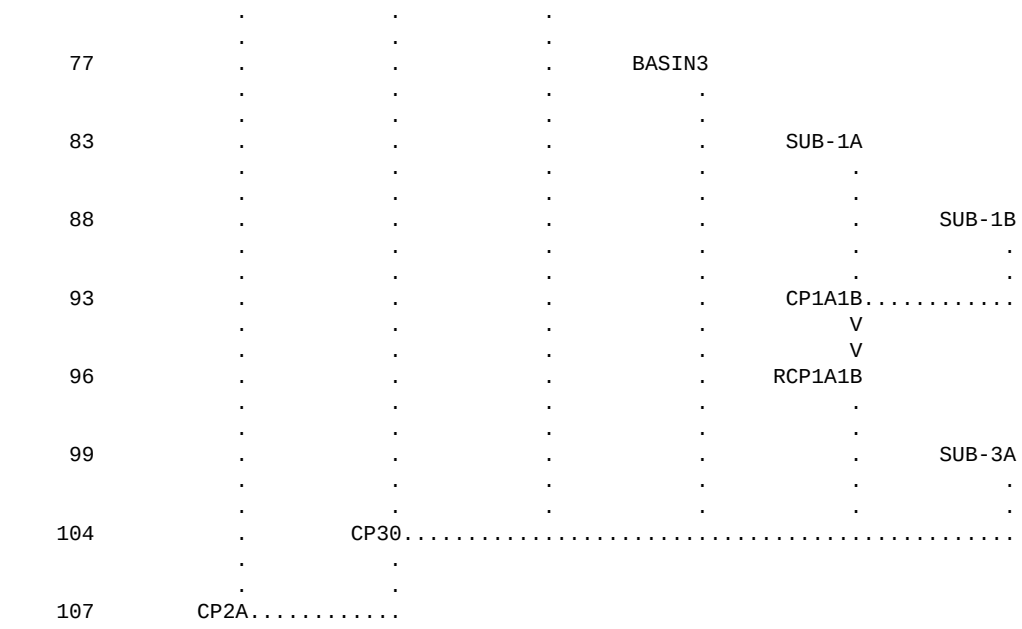
```
1****************************************                 ****************************************
 *                                      *                 *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                 *    U.S. ARMY CORPS OF ENGINEERS      *
 *              JAN   1997              *                 *    HYDROLOGIC ENGINEERING CENTER     *
 *            VERSION 4.1               *                 *          609 SECOND STREET           *
 *                                      *                 *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   02FEB19  TIME  12:46:40  *                 *           (916) 756-1104             *
 *                                      *                 *                                      *
 ****************************************                 ****************************************

                                X     X  XXXXXXX   XXXXX          X
                                X     X  X        X     X         XX
                                X     X  X        X                X
                                XXXXXXX  XXXX     X        XXXXX   X
                                X     X  X        X                X
                                X     X  X        X     X          X
                                X     X  XXXXXXX   XXXXX         XXX

          THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

          THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
          THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
          NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
          DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
          KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                                  HEC-1 INPUT                                                PAGE  1

          LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 *** FREE ***
                        *DIAGRAM
              1         ID        Woody Mountain Campground
              2         ID        Proposed-Conditions without Detention Basin HEC-1 Model
              3         ID        10-year, 6-hour Model
              4         ID        Woodson Engineering and Surveying
              5         ID        Feb 2019
              6         ID        PROPOSED CONDITION (WITHOUT DETENTION BASIN)
              7         IT       3       0       0     125
              8         IO       5       0       0
              9         IN       5       0       0
                        *
```

```
   10          KK   SUB-1
   11          BA   0.011
   12          PH      10    0.19    0.48    0.87    1.46    1.70    1.86    2.16
   13          LS       0   86.55
   14          UD   0.155
               *

   15          KK   SUB-2
   16          BA   0.008
   17          LS       0   79.72
   18          UD   0.181
               *

   19          KK  SUB-2A
   20          BA   0.007
   21          LS       0   95.25
   22          UD     0.1
               *

   23          KK    CP1A
   24          KM     COMBINE HYDROGRAPHS FROM SUB-1,SUB-2 & SUB-2A
   25          HC       3
               *

   26          KK  SUB-3B
   27          KM    RUNOFF FROM SUB-3B
   28          BA    .026
   29          LS       0   82.70
   30          UD     .24
               *

   31          KK     CP2
   32          KM     COMBINE HYDROGRAPHS FROM CP1A & SUB-3B
   33          HC       2
               *

   34          KK  BASIN4
   35          KM    BASIN REFERENCED FROM PRESIDIO IN PINES STUDY
   36          KM    RUNOFF FROM BASIN 4
   37          BA    .002
   38          LS       0   83.56
   39          UD    .086
               *
1                                      HEC-1 INPUT                                      PAGE  2

  LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   40          KK   RCP26
   41          KM    ROUTE CP26 TO CP27
   42          RK     400    0.01   0.016       0      21      10      10
```

```
            *
43          KK BASIN4A
44          KM    BASIN REFERENCED FROM PRESIDIO IN PINES STUDY
45          KM    RUNOFF FROM BASIN 4A
46          BA    .002
47          LS       0    86.0
48          UD    .136
            *
49          KK    CP27
50          KM    COMBINE BASINS RCP26 & BASIN4A
51          HC       2
            *
52          KK BASIN1A
53          KM    BASIN REFERENCED FROM PRESIDIO IN PINES STUDY
54          KM    RUNOFF FROM BASIN 1A
55          BA    .001
56          LS       0    90.4
57          UD    .054
            *
58          KK    CP28
59          KM    COMBINE BASINS BASIN1A & CP27
60          HC       2
            *
61          KK     DB1
62          KM    BASIN REFERENCED FROM PRESIDIO IN PINES STUDY
63          KM    DETENTION BASIN 1
64          RS       1    STOR       0
65          SV     0.0    0.02    0.09    0.15    0.23   0.31          0.39     0.40
66          SE  7052.8  7053.0  7053.5  7054.0  7054.5  7055.0  7055.5      7055.52
67          SQ     0.0    0.21    1.30    3.16    4.14   4.93          5.61     5.63
            *
68          KK    RDB1
69          KM    ROUTE DB1 TO CP30
70          RK     320    0.01   0.013       0    CIRC     0.5
            *
71          KK BASIN4B
72          KM    BASIN REFERENCED FROM PRESIDIO IN PINES STUDY
73          KM    RUNOFF FROM BASIN 4B
74          BA    .002
75          LS       0   87.81
76          UD    .071
            *
```

```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


  77          KK  BASIN3
  78          KM    BASIN REFERENCED FROM PRESIDIO IN PINES STUDY
  79          KM    RUNOFF FROM BASIN 3
  80          BA    .002
  81          LS       0   90.80
  82          UD    .071
              *

  83          KK  SUB-1A
  84          KM    RUNOFF FROM SUB-1A
  85          BA    .045
  86          LS       0   87.37
  87          UD    .189
              *

  88          KK  SUB-1B
  89          KM    RUNOFF FROM SUB-1B
  90          BA    .009
  91          LS       0   93.46
  92          UD     .10
              *

  93          KK  CP1A1B
  94          KM    COMBINE SUB-1A & SUB-1B
  95          HC       2
              *

  96          KK RCP1A1B
  97          KM    ROUTE CP1A1B TO CP30
  98          RK    1200    0.01   0.013       0    CIRC     2.5
              *

  99          KK  SUB-3A
 100          KM    RUNOFF FROM SUB-3A
 101          BA    .008
 102          LS       0   78.72
 103          UD     .10
              *

 104          KK    CP30
 105          KM    COMBINE HYDROGRAPHS FROM BASINS 3, 4B, DB1, SUB-3A& CP1A1B
 106          HC       5
              *

 107          KK    CP2A
 108          KM     COMBINE HYDROGRAPHS FROM CP30 & CP-2
 109          HC       2
              *
```

```
           110          ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    10       SUB-1
                .
                .
    15          .       SUB-2
                .           .
                .           .
    19          .           .      SUB-2A
                .           .           .
                .           .           .
    23        CP1A.......................
                .
                .
    26          .      SUB-3B
                .           .
                .           .
    31         CP2............
                .
                .
    34          .      BASIN4
                .           V
                .           V
    40          .       RCP26
                .           .
                .           .
    43          .           .     BASIN4A
                .           .           .
                .           .           .
    49          .        CP27............
                .           .
                .           .
    52          .           .     BASIN1A
                .           .           .
                .           .           .
    58          .        CP28............
                .           V
                .           V
    61          .         DB1
                .           V
                .           V
    68          .        RDB1
                .           .
                .           .
    71          .           .     BASIN4B
```



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *              JAN   1997               *
 *            VERSION 4.1                *
 *                                       *
 *  RUN DATE   02FEB19  TIME  12:46:40   *
 *                                       *
 *****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

Woody Mountain Campground
Proposed-Conditions without Detention Basin HEC-1 Model
10-year, 6-hour Model
Woodson Engineering and Surveying
Feb 2019
PROPOSED CONDITION (WITHOUT DETENTION BASIN)

```
   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
```

```
 IT          HYDROGRAPH TIME DATA
                   NMIN           3  MINUTES IN COMPUTATION INTERVAL
                  IDATE      1    0  STARTING DATE
                  ITIME        0000  STARTING TIME
                     NQ         125  NUMBER OF HYDROGRAPH ORDINATES
                 NDDATE      1    0  ENDING DATE
                 NDTIME        0612  ENDING TIME
                 ICENT          19  CENTURY MARK

               COMPUTATION INTERVAL     .05 HOURS
                    TOTAL TIME BASE    6.20 HOURS

      ENGLISH UNITS
           DRAINAGE AREA         SQUARE MILES
           PRECIPITATION DEPTH   INCHES
           LENGTH, ELEVATION     FEET
           FLOW                  CUBIC FEET PER SECOND
           STORAGE VOLUME        ACRE-FEET
           SURFACE AREA          ACRES
           TEMPERATURE           DEGREES FAHRENHEIT
1
                                                RUNOFF SUMMARY
                                            FLOW IN CUBIC FEET PER SECOND
                                          TIME IN HOURS,  AREA IN SQUARE MILES

                                    PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
      OPERATION       STATION       FLOW     PEAK                                           AREA      STAGE     MAX STAGE
+                                                      6-HOUR     24-HOUR     72-HOUR

      HYDROGRAPH AT
+                       SUB-1        12.    3.20          1.          1.          1.        .01

      HYDROGRAPH AT
+                       SUB-2         5.    3.25          1.          1.          1.        .01

      HYDROGRAPH AT
+                      SUB-2A        15.    3.10          1.          1.          1.        .01

      3 COMBINED AT
+                        CP1A        29.    3.15          3.          3.          3.        .03

      HYDROGRAPH AT
+                      SUB-3B        17.    3.30          2.          2.          2.        .03

      2 COMBINED AT
+                         CP2        42.    3.20          5.          5.          5.        .05

      HYDROGRAPH AT
+                      BASIN4         2.    3.10          0.          0.          0.        .00
```

	ROUTED TO								
+		RCP26	2.	3.15	0.	0.	0.	.00	
	HYDROGRAPH AT								
+		BASIN4A	2.	3.20	0.	0.	0.	.00	
	2 COMBINED AT								
+		CP27	4.	3.15	0.	0.	0.	.00	
	HYDROGRAPH AT								
+		BASIN1A	2.	3.10	0.	0.	0.	.00	
	2 COMBINED AT								
+		CP28	6.	3.15	1.	0.	0.	.01	
	ROUTED TO								
+		DB1	2.	3.45	0.	0.	0.	.01	
+									7053.69 3.45
	ROUTED TO								
+		RDB1	2.	3.45	0.	0.	0.	.01	
	HYDROGRAPH AT								
+		BASIN4B	3.	3.10	0.	0.	0.	.00	
	HYDROGRAPH AT								
+		BASIN3	4.	3.10	0.	0.	0.	.00	
	HYDROGRAPH AT								
+		SUB-1A	47.	3.25	5.	5.	5.	.05	
	HYDROGRAPH AT								
+		SUB-1B	17.	3.10	1.	1.	1.	.01	
	2 COMBINED AT								
+		CP1A1B	60.	3.20	6.	6.	6.	.05	
	ROUTED TO								
+		RCP1A1B	59.	3.20	6.	6.	6.	.05	
	HYDROGRAPH AT								
+		SUB-3A	6.	3.15	1.	0.	0.	.01	
	5 COMBINED AT								
+		CP30	69.	3.20	8.	8.	8.	.07	
	2 COMBINED AT								
+		CP2A	112.	3.20	13.	13.	13.	.12	

1

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	INTERPOLATED TO COMPUTATION INTERVAL DT	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
RCP26	MANE	.79	2.18	187.57	.82	3.00	2.17	189.00	.82

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8735E-01 EXCESS= .0000E+00 OUTFLOW= .8723E-01 BASIN STORAGE= .1745E-03 PERCENT ERROR= -.1

RDB1	MANE	.40	1.99	207.20	.86	3.00	1.99	207.00	.86

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2303E+00 EXCESS= .0000E+00 OUTFLOW= .2300E+00 BASIN STORAGE= .3864E-03 PERCENT ERROR= .0

RCP1A1B	MANE	.52	59.64	192.98	1.11	3.00	58.58	192.00	1.11

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3186E+01 EXCESS= .0000E+00 OUTFLOW= .3184E+01 BASIN STORAGE= .3936E-02 PERCENT ERROR= -.1

*** NORMAL END OF HEC-1 ***

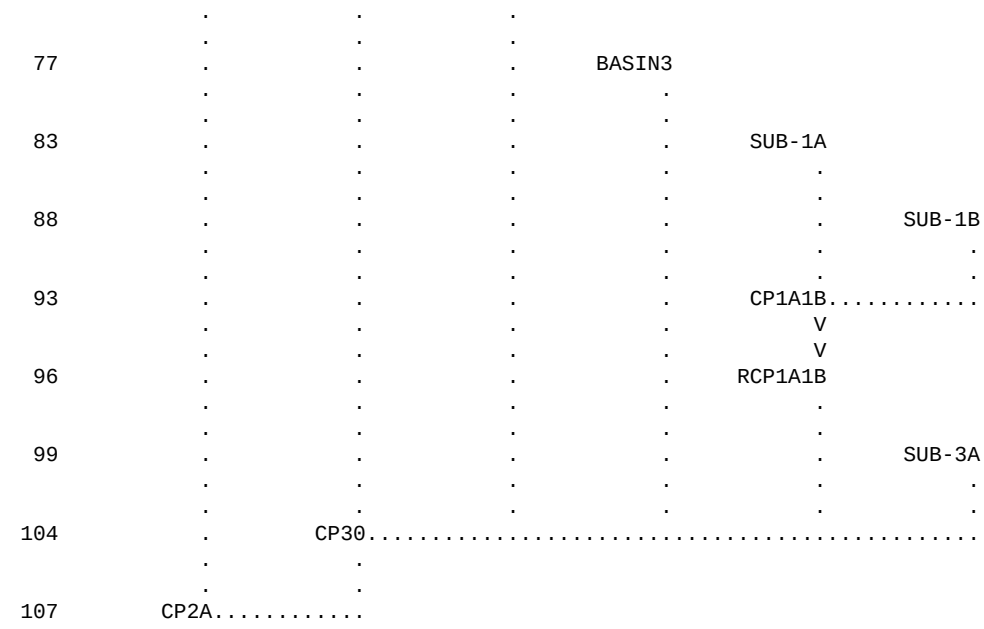
```
1****************************************                 ****************************************
 *                                      *                 *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                 *    U.S. ARMY CORPS OF ENGINEERS      *
 *              JAN   1997              *                 *    HYDROLOGIC ENGINEERING CENTER     *
 *            VERSION 4.1               *                 *          609 SECOND STREET           *
 *                                      *                 *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   02FEB19  TIME  12:46:56  *                 *           (916) 756-1104             *
 *                                      *                 *                                      *
 ****************************************                 ****************************************

                                X     X  XXXXXXX   XXXXX          X
                                X     X  X        X     X         XX
                                X     X  X        X                X
                                XXXXXXX  XXXX     X        XXXXX   X
                                X     X  X        X                X
                                X     X  X        X     X          X
                                X     X  XXXXXXX   XXXXX         XXX

          THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

          THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
          THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
          NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
          DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
          KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                                  HEC-1 INPUT                                                PAGE  1

          LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 *** FREE ***
                        *DIAGRAM
              1         ID        Woody Mountain Campground
              2         ID        Proposed-Conditions without Detention Basin HEC-1 Model
              3         ID        100-year, 6-hour Model
              4         ID        Woodson Engineering and Surveying
              5         ID        Feb 2019
              6         ID        PROPOSED CONDITION (WITHOUT DETENTION BASIN)
              7         IT       3       0       0     125
              8         IO       5       0       0
              9         IN       5       0       0
                        *
```

```
   10          KK   SUB-1
   11          BA   0.011
   12          PH       1    0.19    0.71    1.37    2.21    2.56    2.76    3.18
   13          LS       0   86.55
   14          UD   0.155
               *

   15          KK   SUB-2
   16          BA   0.008
   17          LS       0   79.72
   18          UD   0.181
               *

   19          KK  SUB-2A
   20          BA   0.007
   21          LS       0   95.25
   22          UD     0.1
               *

   23          KK    CP1A
   24          KM     COMBINE HYDROGRAPHS FROM SUB-1,SUB-2 & SUB-2A
   25          HC       3
               *

   26          KK  SUB-3B
   27          KM    RUNOFF FROM SUB-3B
   28          BA    .026
   29          LS       0   82.70
   30          UD     .24
               *

   31          KK     CP2
   32          KM     COMBINE HYDROGRAPHS FROM CP1A & SUB-3B
   33          HC       2
               *

   34          KK  BASIN4
   35          KM    BASIN REFERENCED FROM PRESIDIO IN PINES STUDY
   36          KM    RUNOFF FROM BASIN 4
   37          BA    .002
   38          LS       0   83.56
   39          UD    .086
               *
1                                      HEC-1 INPUT                                      PAGE  2

  LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   40          KK   RCP26
   41          KM    ROUTE CP26 TO CP27
   42          RK     400    0.01   0.016       0      21      10      10
```

```
*
KK BASIN4A
KM    BASIN REFERENCED FROM PRESIDIO IN PINES STUDY
KM    RUNOFF FROM BASIN 4A
BA    .002
LS       0    86.0
UD    .136
*

KK    CP27
KM    COMBINE BASINS RCP26 & BASIN4A
HC       2
*

KK BASIN1A
KM    BASIN REFERENCED FROM PRESIDIO IN PINES STUDY
KM    RUNOFF FROM BASIN 1A
BA    .001
LS       0    90.4
UD    .054
*

KK    CP28
KM    COMBINE BASINS BASIN1A & CP27
HC       2
*

KK     DB1
KM    BASIN REFERENCED FROM PRESIDIO IN PINES STUDY
KM    DETENTION BASIN 1
RS       1    STOR       0
SV     0.0    0.02    0.09    0.15    0.23   0.31          0.39     0.40
SE  7052.8  7053.0  7053.5  7054.0  7054.5  7055.0  7055.5      7055.52
SQ     0.0    0.21    1.30    3.16    4.14   4.93          5.61     5.63
*

KK    RDB1
KM    ROUTE DB1 TO CP30
RK     320    0.01   0.013       0    CIRC     0.5
*

KK BASIN4B
KM    BASIN REFERENCED FROM PRESIDIO IN PINES STUDY
KM    RUNOFF FROM BASIN 4B
BA    .002
LS       0   87.81
UD    .071
*
```

```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


  77          KK  BASIN3
  78          KM    BASIN REFERENCED FROM PRESIDIO IN PINES STUDY
  79          KM    RUNOFF FROM BASIN 3
  80          BA    .002
  81          LS       0   90.80
  82          UD    .071
              *

  83          KK  SUB-1A
  84          KM    RUNOFF FROM SUB-1A
  85          BA    .045
  86          LS       0   87.37
  87          UD    .189
              *

  88          KK  SUB-1B
  89          KM    RUNOFF FROM SUB-1B
  90          BA    .009
  91          LS       0   93.46
  92          UD     .10
              *

  93          KK  CP1A1B
  94          KM    COMBINE SUB-1A & SUB-1B
  95          HC       2
              *

  96          KK RCP1A1B
  97          KM    ROUTE CP1A1B TO CP30
  98          RK    1200    0.01   0.013       0    CIRC     2.5
              *

  99          KK  SUB-3A
 100          KM    RUNOFF FROM SUB-3A
 101          BA    .008
 102          LS       0   78.72
 103          UD     .10
              *

 104          KK    CP30
 105          KM    COMBINE HYDROGRAPHS FROM BASINS 3, 4B, DB1, SUB-3A& CP1A1B
 106          HC       5
              *

 107          KK    CP2A
 108          KM     COMBINE HYDROGRAPHS FROM CP30 & CP-2
 109          HC       2
              *
```

```
           110          ZZ
1
               SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    10       SUB-1
                .
                .
    15          .       SUB-2
                .           .
                .           .
    19          .           .      SUB-2A
                .           .           .
                .           .           .
    23        CP1A.......................
                .
                .
    26          .      SUB-3B
                .           .
                .           .
    31         CP2............
                .
                .
    34          .      BASIN4
                .           V
                .           V
    40          .       RCP26
                .           .
                .           .
    43          .           .     BASIN4A
                .           .           .
                .           .           .
    49          .        CP27............
                .           .
                .           .
    52          .           .     BASIN1A
                .           .           .
                .           .           .
    58          .        CP28............
                .           V
                .           V
    61          .         DB1
                .           V
                .           V
    68          .        RDB1
                .           .
                .           .
    71          .           .     BASIN4B
```



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *               JAN   1997              *
 *            VERSION 4.1                *
 *                                       *
 *  RUN DATE   02FEB19  TIME  12:46:56   *
 *                                       *
 *****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

Woody Mountain Campground
Proposed-Conditions without Detention Basin HEC-1 Model
100-year, 6-hour Model
Woodson Engineering and Surveying
Feb 2019
PROPOSED CONDITION (WITHOUT DETENTION BASIN)

```
   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
```

```
 IT          HYDROGRAPH TIME DATA
                   NMIN           3  MINUTES IN COMPUTATION INTERVAL
                  IDATE      1    0  STARTING DATE
                  ITIME        0000  STARTING TIME
                     NQ         125  NUMBER OF HYDROGRAPH ORDINATES
                 NDDATE      1    0  ENDING DATE
                 NDTIME        0612  ENDING TIME
                 ICENT          19  CENTURY MARK

               COMPUTATION INTERVAL     .05 HOURS
                    TOTAL TIME BASE    6.20 HOURS

      ENGLISH UNITS
           DRAINAGE AREA         SQUARE MILES
           PRECIPITATION DEPTH   INCHES
           LENGTH, ELEVATION     FEET
           FLOW                  CUBIC FEET PER SECOND
           STORAGE VOLUME        ACRE-FEET
           SURFACE AREA          ACRES
           TEMPERATURE           DEGREES FAHRENHEIT
1
                                                RUNOFF SUMMARY
                                            FLOW IN CUBIC FEET PER SECOND
                                          TIME IN HOURS,  AREA IN SQUARE MILES

                                    PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
      OPERATION       STATION       FLOW     PEAK                                           AREA      STAGE     MAX STAGE
+                                                      6-HOUR     24-HOUR     72-HOUR

      HYDROGRAPH AT
+                       SUB-1        24.    3.20          2.          2.          2.        .01

      HYDROGRAPH AT
+                       SUB-2        12.    3.25          1.          1.          1.        .01

      HYDROGRAPH AT
+                      SUB-2A        24.    3.10          2.          2.          2.        .01

      3 COMBINED AT
+                        CP1A        56.    3.15          5.          5.          5.        .03

      HYDROGRAPH AT
+                      SUB-3B        38.    3.30          4.          4.          4.        .03

      2 COMBINED AT
+                         CP2        87.    3.20         10.          9.          9.        .05

      HYDROGRAPH AT
+                      BASIN4         5.    3.10          0.          0.          0.        .00
```

	ROUTED TO								
+		RCP26	5.	3.15	0.	0.	0.	.00	
	HYDROGRAPH AT								
+		BASIN4A	4.	3.15	0.	0.	0.	.00	
	2 COMBINED AT								
+		CP27	9.	3.15	1.	1.	1.	.00	
	HYDROGRAPH AT								
+		BASIN1A	3.	3.10	0.	0.	0.	.00	
	2 COMBINED AT								
+		CP28	12.	3.15	1.	1.	1.	.01	
	ROUTED TO								
+		DB1	4.	3.40	1.	1.	1.	.01	
+									7054.42 3.40
	ROUTED TO								
+		RDB1	4.	3.40	1.	1.	1.	.01	
	HYDROGRAPH AT								
+		BASIN4B	6.	3.10	0.	0.	0.	.00	
	HYDROGRAPH AT								
+		BASIN3	7.	3.10	0.	0.	0.	.00	
	HYDROGRAPH AT								
+		SUB-1A	92.	3.25	9.	9.	9.	.05	
	HYDROGRAPH AT								
+		SUB-1B	29.	3.15	2.	2.	2.	.01	
	2 COMBINED AT								
+		CP1A1B	115.	3.20	12.	11.	11.	.05	
	ROUTED TO								
+		RCP1A1B	113.	3.20	12.	11.	11.	.05	
	HYDROGRAPH AT								
+		SUB-3A	14.	3.15	1.	1.	1.	.01	
	5 COMBINED AT								
+		CP30	137.	3.20	15.	14.	14.	.07	
	2 COMBINED AT								
+		CP2A	224.	3.20	24.	24.	24.	.12	

1

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

						INTERPOLATED TO COMPUTATION INTERVAL			
ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	DT	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
RCP26	MANE	.60	4.66	187.74	1.63	3.00	4.62	189.00	1.63

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1740E+00 EXCESS= .0000E+00 OUTFLOW= .1741E+00 BASIN STORAGE= .2036E-03 PERCENT ERROR= -.2

RDB1	MANE	.44	3.98	204.47	1.68	3.00	3.98	204.00	1.68

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4494E+00 EXCESS= .0000E+00 OUTFLOW= .4489E+00 BASIN STORAGE= .5692E-03 PERCENT ERROR= .0

RCP1A1B	MANE	.46	114.50	193.12	2.01	3.00	112.83	192.00	2.01

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5788E+01 EXCESS= .0000E+00 OUTFLOW= .5784E+01 BASIN STORAGE= .5657E-02 PERCENT ERROR= .0

*** NORMAL END OF HEC-1 ***

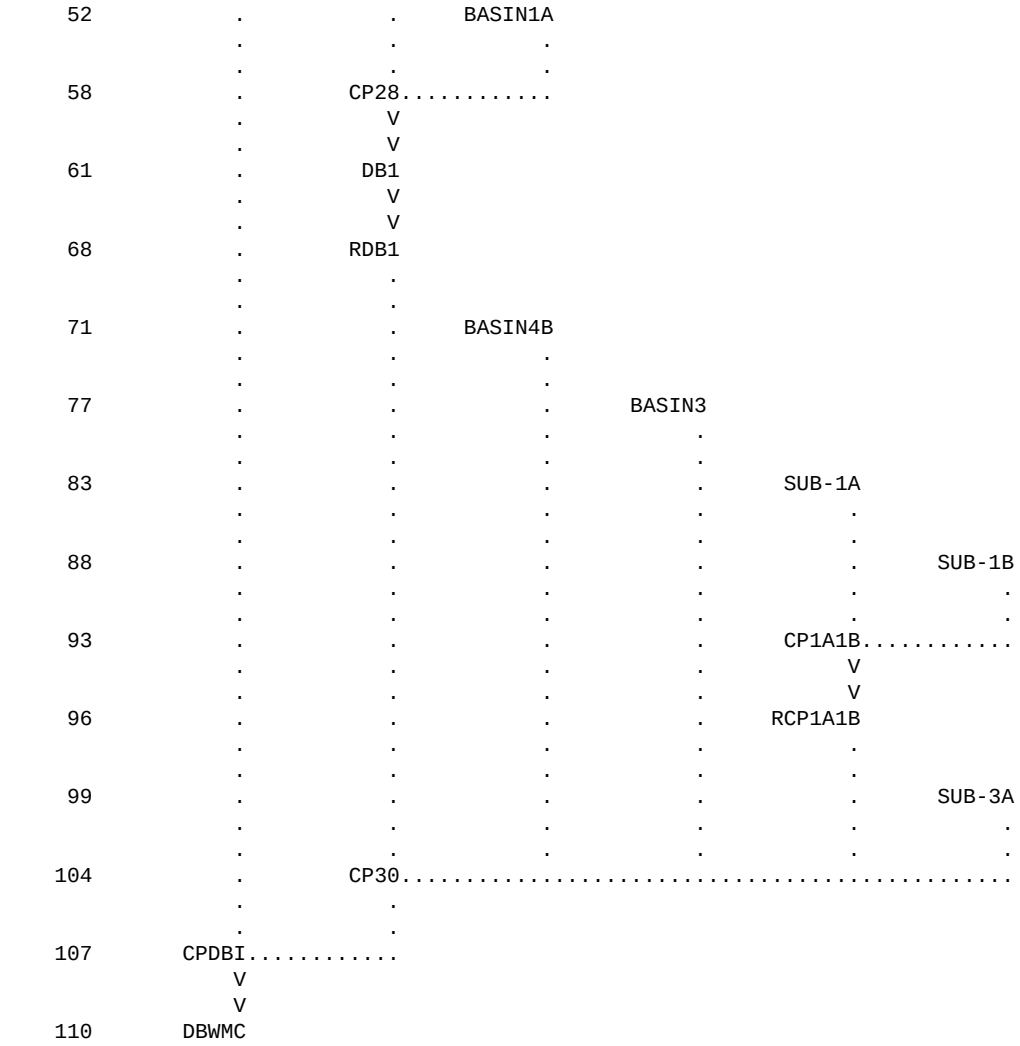
```
1****************************************                 ****************************************
 *                                      *                 *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                 *    U.S. ARMY CORPS OF ENGINEERS      *
 *              JAN   1997              *                 *    HYDROLOGIC ENGINEERING CENTER     *
 *            VERSION 4.1               *                 *          609 SECOND STREET           *
 *                                      *                 *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   02FEB19  TIME  12:51:47  *                 *           (916) 756-1104             *
 *                                      *                 *                                      *
 ****************************************                 ****************************************

                                X     X  XXXXXXX   XXXXX          X
                                X     X  X        X     X         XX
                                X     X  X        X                X
                                XXXXXXX  XXXX     X        XXXXX   X
                                X     X  X        X                X
                                X     X  X        X     X          X
                                X     X  XXXXXXX   XXXXX         XXX

          THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

          THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
          THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
          NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
          DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
          KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                                  HEC-1 INPUT                                                PAGE  1

          LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 *** FREE ***
                        *DIAGRAM
              1         ID        Woody Mountain Campground
              2         ID        Proposed-Conditions with Detention Basin HEC-1 Model
              3         ID        10-year, 6-hour Model
              4         ID        Woodson Engineering and Surveying
              5         ID        Feb 2019
              6         ID        PROPOSED CONDITION (WITH DETENTION BASIN)
              7         IT       3       0       0     125
              8         IO       5       0       0
              9         IN       5       0       0
                        *
```

```
  10          KK   SUB-1
  11          BA   0.011
  12          PH      10    0.19    0.48    0.87    1.46    1.70    1.86    2.16
  13          LS       0   86.55
  14          UD   0.155
              *

  15          KK   SUB-2
  16          BA   0.008
  17          LS       0   79.72
  18          UD   0.181
              *

  19          KK  SUB-2A
  20          BA   0.007
  21          LS       0   95.25
  22          UD     0.1
              *

  23          KK    CP1A
  24          KM     COMBINE HYDROGRAPHS FROM SUB-1,SUB-2 & SUB-2A
  25          HC       3
              *

  26          KK  SUB-3B
  27          KM    RUNOFF FROM SUB-3B
  28          BA    .026
  29          LS       0   82.70
  30          UD     .24
              *

  31          KK     CP2
  32          KM     COMBINE HYDROGRAPHS FROM CP1A & SUB-3B
  33          HC       2
              *

  34          KK  BASIN4
  35          KM    BASIN REFERENCED FROM PRESIDIO IN PINES STUDY
  36          KM    RUNOFF FROM BASIN 4
  37          BA    .002
  38          LS       0   83.56
  39          UD    .086
              *
1                                     HEC-1 INPUT                                          PAGE  2

 LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  40          KK   RCP26
  41          KM    ROUTE CP26 TO CP27
  42          RK     400    0.01   0.016       0      21      10      10
```

```
            *
43          KK BASIN4A
44          KM    BASIN REFERENCED FROM PRESIDIO IN PINES STUDY
45          KM    RUNOFF FROM BASIN 4A
46          BA    .002
47          LS       0    86.0
48          UD    .136
            *
49          KK    CP27
50          KM    COMBINE BASINS RCP26 & BASIN4A
51          HC       2
            *
52          KK BASIN1A
53          KM    BASIN REFERENCED FROM PRESIDIO IN PINES STUDY
54          KM    RUNOFF FROM BASIN 1A
55          BA    .001
56          LS       0    90.4
57          UD    .054
            *
58          KK    CP28
59          KM    COMBINE BASINS BASIN1A & CP27
60          HC       2
            *
61          KK     DB1
62          KM    BASIN REFERENCED FROM PRESIDIO IN PINES STUDY
63          KM    DETENTION BASIN 1
64          RS       1    STOR       0
65          SV     0.0    0.02    0.09    0.15    0.23   0.31          0.39    0.40
66          SE  7052.8  7053.0  7053.5  7054.0  7054.5  7055.0  7055.5      7055.52
67          SQ     0.0    0.21    1.30    3.16    4.14   4.93          5.61    5.63
            *
68          KK    RDB1
69          KM    ROUTE DB1 TO CP30
70          RK     320    0.01   0.013       0    CIRC     0.5
            *
71          KK BASIN4B
72          KM    BASIN REFERENCED FROM PRESIDIO IN PINES STUDY
73          KM    RUNOFF FROM BASIN 4B
74          BA    .002
75          LS       0   87.81
76          UD    .071
            *
```

```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


  77          KK  BASIN3
  78          KM    BASIN REFERENCED FROM PRESIDIO IN PINES STUDY
  79          KM    RUNOFF FROM BASIN 3
  80          BA    .002
  81          LS       0   90.80
  82          UD    .071
              *

  83          KK  SUB-1A
  84          KM    RUNOFF FROM SUB-1A
  85          BA    .045
  86          LS       0   87.37
  87          UD    .189
              *

  88          KK  SUB-1B
  89          KM    RUNOFF FROM SUB-1B
  90          BA    .009
  91          LS       0   93.46
  92          UD     .10
              *

  93          KK  CP1A1B
  94          KM    COMBINE SUB-1A & SUB-1B
  95          HC       2
              *

  96          KK RCP1A1B
  97          KM    ROUTE CP1A1B TO CP30
  98          RK    1200    0.01   0.013       0    CIRC     2.5
              *

  99          KK  SUB-3A
 100          KM    RUNOFF FROM SUB-3A
 101          BA    .008
 102          LS       0   78.72
 103          UD     .10
              *

 104          KK    CP30
 105          KM    COMBINE HYDROGRAPHS FROM BASINS 3, 4B, DB1, SUB-3A& CP1A1B
 106          HC       5
              *

 107          KK   CPDBI
 108          KM     COMBINE ROUTED HYDROGRAPHS FROM CP30 &,CP1A WITH SUB-3B
 109          HC       2
              *
```

```
          LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

           110          KK   DBWMC
           111          KM    DETENTION BASIN WEST OF WILDWOOD HILLS MOBILE HOME PARK
           112          RS       1    STOR       0
           113          SV     0.0    1.03    2.06    3.09    4.12    5.23    6.41    7.60    8.78
           114          SE  6988.0  6989.0  6990.0  6991.0  6992.0  6993.0  6994.0  6995.0  6996.0
           115          SQ     0.0    35.7    24.6    34.1    41.5    47.7    53.2    58.3    62.9
                        *
           116          ZZ
1
               SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    10       SUB-1
                .
                .
    15          .       SUB-2
                .           .
                .           .
    19          .           .      SUB-2A
                .           .           .
                .           .           .
    23        CP1A.......................
                .
                .
    26          .      SUB-3B
                .           .
                .           .
    31         CP2............
                .
                .
    34          .      BASIN4
                .           V
                .           V
    40          .       RCP26
                .           .
                .           .
    43          .           .     BASIN4A
                .           .           .
                .           .           .
    49          .        CP27............
                .           .
                .           .
```



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*************************************
 *                                   *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *               JAN   1997              *
 *            VERSION 4.1                *
 *                                   *
 *  RUN DATE   02FEB19  TIME  12:51:47   *
 *                                   *
 *************************************
```

```
*************************************
*                                   *
*    U.S. ARMY CORPS OF ENGINEERS     *
*    HYDROLOGIC ENGINEERING CENTER    *
*          609 SECOND STREET          *
*       DAVIS, CALIFORNIA 95616       *
*           (916) 756-1104            *
*                                   *
*************************************
```

Woody Mountain Campground
Proposed-Conditions with Detention Basin HEC-1 Model
10-year, 6-hour Model
Woodson Engineering and Surveying
Feb 2019
PROPOSED CONDITION (WITH DETENTION BASIN)

8 IO OUTPUT CONTROL VARIABLES
IPRNT 5 PRINT CONTROL
IPLOT 0 PLOT CONTROL
QSCAL 0. HYDROGRAPH PLOT SCALE

IT HYDROGRAPH TIME DATA
NMIN 3 MINUTES IN COMPUTATION INTERVAL
IDATE 1 0 STARTING DATE
ITIME 0000 STARTING TIME
NQ 125 NUMBER OF HYDROGRAPH ORDINATES
NDDATE 1 0 ENDING DATE
NDTIME 0612 ENDING TIME
ICENT 19 CENTURY MARK

COMPUTATION INTERVAL .05 HOURS
TOTAL TIME BASE 6.20 HOURS

ENGLISH UNITS
DRAINAGE AREA SQUARE MILES
PRECIPITATION DEPTH INCHES
LENGTH, ELEVATION FEET
FLOW CUBIC FEET PER SECOND
STORAGE VOLUME ACRE-FEET
SURFACE AREA ACRES
TEMPERATURE DEGREES FAHRENHEIT

1

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	SUB-1	12.	3.20	1.	1.	1.	.01		
+	HYDROGRAPH AT	SUB-2	5.	3.25	1.	1.	1.	.01		

```
         HYDROGRAPH AT
+                      SUB-2A        15.    3.10          1.          1.          1.        .01
         3 COMBINED AT
+                        CP1A        29.    3.15          3.          3.          3.        .03
         HYDROGRAPH AT
+                      SUB-3B        17.    3.30          2.          2.          2.        .03
         2 COMBINED AT
+                         CP2        42.    3.20          5.          5.          5.        .05
         HYDROGRAPH AT
+                      BASIN4         2.    3.10          0.          0.          0.        .00
         ROUTED TO
+                       RCP26         2.    3.15          0.          0.          0.        .00
         HYDROGRAPH AT
+                     BASIN4A         2.    3.20          0.          0.          0.        .00
         2 COMBINED AT
+                        CP27         4.    3.15          0.          0.          0.        .00
         HYDROGRAPH AT
+                     BASIN1A         2.    3.10          0.          0.          0.        .00
         2 COMBINED AT
+                        CP28         6.    3.15          1.          0.          0.        .01
         ROUTED TO
+                         DB1         2.    3.45          0.          0.          0.        .01
+                                                                                      7053.69        3.45
         ROUTED TO
+                        RDB1         2.    3.45          0.          0.          0.        .01
         HYDROGRAPH AT
+                     BASIN4B         3.    3.10          0.          0.          0.        .00
         HYDROGRAPH AT
+                      BASIN3         4.    3.10          0.          0.          0.        .00
         HYDROGRAPH AT
+                      SUB-1A        47.    3.25          5.          5.          5.        .05
         HYDROGRAPH AT
+                      SUB-1B        17.    3.10          1.          1.          1.        .01
         2 COMBINED AT
```

```
+                        CP1A1B        60.    3.20           6.          6.          6.        .05

         ROUTED TO
+                       RCP1A1B        59.    3.20           6.          6.          6.        .05

         HYDROGRAPH AT
+                        SUB-3A         6.    3.15           1.          0.          0.        .01

         5 COMBINED AT
+                          CP30        69.    3.20           8.          8.          8.        .07

         2 COMBINED AT
+                        CPDBI       112.    3.20          13.         13.         13.        .12

         ROUTED TO
+                        DBWMC        35.    5.00          13.         12.         12.        .12
+                                                                                          6990.71        3.70
1
                                    SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                        (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                 INTERPOLATED TO
                                                                              COMPUTATION INTERVAL
           ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                      PEAK                                    PEAK

                                (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

             RCP26  MANE          .79      2.18    187.57       .82      3.00      2.17    189.00         .82

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .8735E-01 EXCESS= .0000E+00 OUTFLOW= .8723E-01 BASIN STORAGE= .1745E-03 PERCENT ERROR=   -.1

              RDB1  MANE          .40      1.99    207.20       .86      3.00      1.99    207.00         .86

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2303E+00 EXCESS= .0000E+00 OUTFLOW= .2300E+00 BASIN STORAGE= .3864E-03 PERCENT ERROR=    .0

           RCP1A1B  MANE          .52     59.64    192.98      1.11      3.00     58.58    192.00        1.11

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .3186E+01 EXCESS= .0000E+00 OUTFLOW= .3184E+01 BASIN STORAGE= .3936E-02 PERCENT ERROR=   -.1



 *** NORMAL END OF HEC-1 ***
```

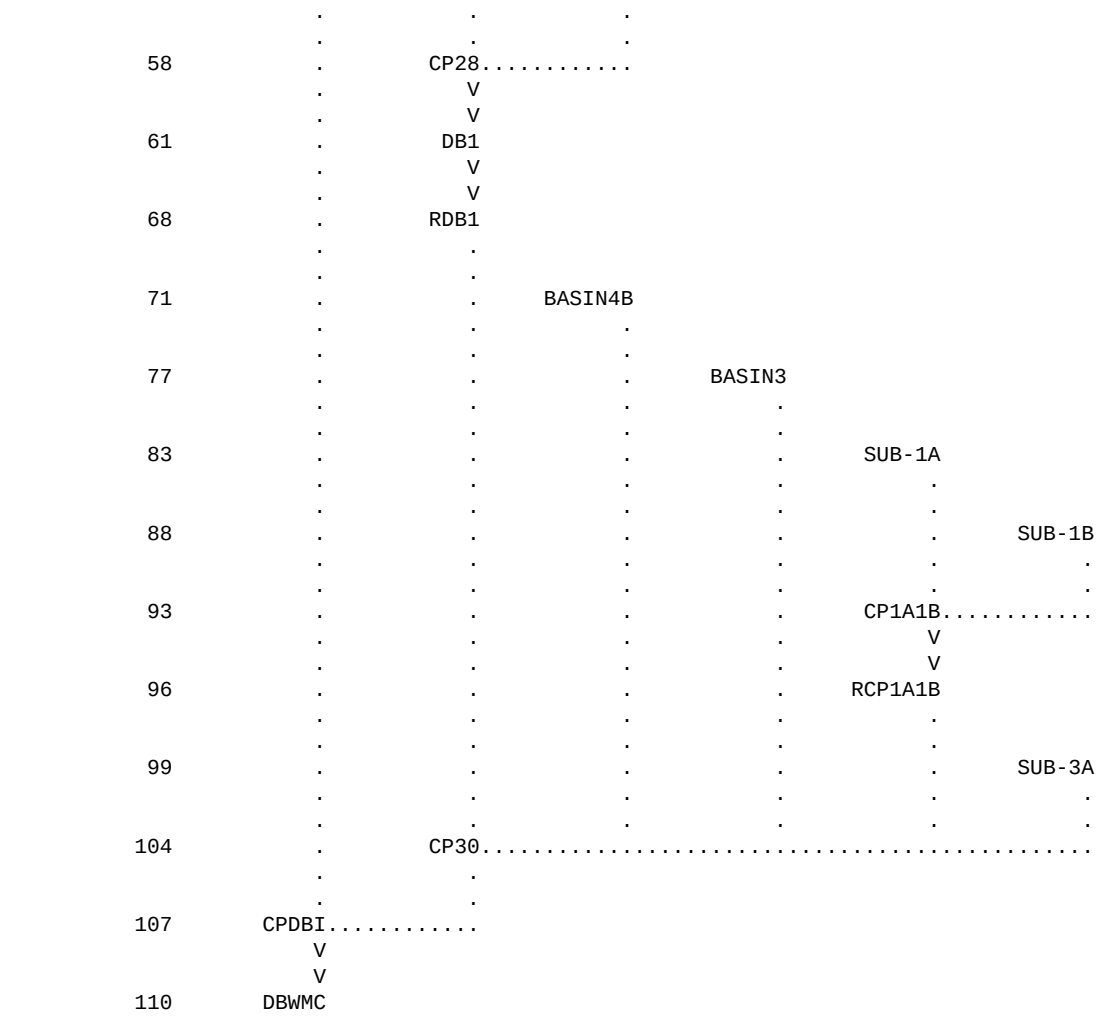
```
1****************************************                 ****************************************
 *                                      *                 *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                 *    U.S. ARMY CORPS OF ENGINEERS      *
 *              JAN   1997              *                 *    HYDROLOGIC ENGINEERING CENTER     *
 *            VERSION 4.1               *                 *          609 SECOND STREET           *
 *                                      *                 *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   02FEB19  TIME  12:52:25  *                 *           (916) 756-1104             *
 *                                      *                 *                                      *
 ****************************************                 ****************************************

                                X     X  XXXXXXX   XXXXX          X
                                X     X  X        X     X         XX
                                X     X  X        X                X
                                XXXXXXX  XXXX     X        XXXXX   X
                                X     X  X        X                X
                                X     X  X        X     X          X
                                X     X  XXXXXXX   XXXXX         XXX

          THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

          THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
          THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
          NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
          DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
          KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                                  HEC-1 INPUT                                                PAGE  1

          LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 *** FREE ***
                        *DIAGRAM
              1         ID        Woody Mountain Campground
              2         ID        Proposed-Conditions with Detention Basin HEC-1 Model
              3         ID        100-year, 6-hour Model
              4         ID        Woodson Engineering and Surveying
              5         ID        Feb 2019
              6         ID        PROPOSED CONDITION (WITH DETENTION BASIN)
              7         IT       3       0       0     125
              8         IO       5       0       0
              9         IN       5       0       0
                        *
```

```
          10          KK   SUB-1
          11          BA   0.011
          12          PH       1    0.19    0.71    1.37    2.21    2.56    2.76    3.18
          13          LS       0   86.55
          14          UD   0.155
                      *

          15          KK   SUB-2
          16          BA   0.008
          17          LS       0   79.72
          18          UD   0.181
                      *

          19          KK  SUB-2A
          20          BA   0.007
          21          LS       0   95.25
          22          UD     0.1
                      *

          23          KK    CP1A
          24          KM     COMBINE HYDROGRAPHS FROM SUB-1,SUB-2 & SUB-2A
          25          HC       3
                      *

          26          KK  SUB-3B
          27          KM    RUNOFF FROM SUB-3B
          28          BA    .026
          29          LS       0   82.70
          30          UD     .24
                      *

          31          KK     CP2
          32          KM     COMBINE HYDROGRAPHS FROM CP1A & SUB-3B
          33          HC       2
                      *

          34          KK  BASIN4
          35          KM    BASIN REFERENCED FROM PRESIDIO IN PINES STUDY
          36          KM    RUNOFF FROM BASIN 4
          37          BA    .002
          38          LS       0   83.56
          39          UD    .086
                      *
1                                        HEC-1 INPUT                                        PAGE  2

     LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


          40          KK   RCP26
          41          KM    ROUTE CP26 TO CP27
          42          RK     400    0.01   0.016       0      21      10      10
```

```
            *
43          KK BASIN4A
44          KM    BASIN REFERENCED FROM PRESIDIO IN PINES STUDY
45          KM    RUNOFF FROM BASIN 4A
46          BA    .002
47          LS       0    86.0
48          UD    .136
            *
49          KK    CP27
50          KM    COMBINE BASINS RCP26 & BASIN4A
51          HC       2
            *
52          KK BASIN1A
53          KM    BASIN REFERENCED FROM PRESIDIO IN PINES STUDY
54          KM    RUNOFF FROM BASIN 1A
55          BA    .001
56          LS       0    90.4
57          UD    .054
            *
58          KK    CP28
59          KM    COMBINE BASINS BASIN1A & CP27
60          HC       2
            *
61          KK     DB1
62          KM    BASIN REFERENCED FROM PRESIDIO IN PINES STUDY
63          KM    DETENTION BASIN 1
64          RS       1    STOR       0
65          SV     0.0    0.02    0.09    0.15    0.23   0.31          0.39    0.40
66          SE  7052.8  7053.0  7053.5  7054.0  7054.5  7055.0  7055.5      7055.52
67          SQ     0.0    0.21    1.30    3.16    4.14   4.93          5.61    5.63
            *
68          KK    RDB1
69          KM    ROUTE DB1 TO CP30
70          RK     320    0.01   0.013       0    CIRC     0.5
            *
71          KK BASIN4B
72          KM    BASIN REFERENCED FROM PRESIDIO IN PINES STUDY
73          KM    RUNOFF FROM BASIN 4B
74          BA    .002
75          LS       0   87.81
76          UD    .071
            *
```

```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


  77          KK  BASIN3
  78          KM    BASIN REFERENCED FROM PRESIDIO IN PINES STUDY
  79          KM    RUNOFF FROM BASIN 3
  80          BA    .002
  81          LS       0   90.80
  82          UD    .071
              *

  83          KK  SUB-1A
  84          KM    RUNOFF FROM SUB-1A
  85          BA    .045
  86          LS       0   87.37
  87          UD    .189
              *

  88          KK  SUB-1B
  89          KM    RUNOFF FROM SUB-1B
  90          BA    .009
  91          LS       0   93.46
  92          UD     .10
              *

  93          KK  CP1A1B
  94          KM    COMBINE SUB-1A & SUB-1B
  95          HC       2
              *

  96          KK RCP1A1B
  97          KM    ROUTE CP1A1B TO CP30
  98          RK    1200    0.01   0.013       0    CIRC     2.5
              *

  99          KK  SUB-3A
 100          KM    RUNOFF FROM SUB-3A
 101          BA    .008
 102          LS       0   78.72
 103          UD     .10
              *

 104          KK    CP30
 105          KM    COMBINE HYDROGRAPHS FROM BASINS 3, 4B, DB1, SUB-3A& CP1A1B
 106          HC       5
              *

 107          KK   CPDBI
 108          KM     COMBINE ROUTED HYDROGRAPHS FROM CP30 &,CP1A WITH SUB-3B
 109          HC       2
              *
```

```
          LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


           110          KK   DBWMC
           111          KM    DETENTION BASIN WEST OF WILDWOOD HILLS MOBILE HOME PARK
           112          RS       1    STOR       0
           113          SV     0.0    1.03    2.06    3.09    4.12    5.23    6.41    7.60    8.78
           114          SE  6988.0  6989.0  6990.0  6991.0  6992.0  6993.0  6994.0  6995.0  6996.0
           115          SQ     0.0    35.7    24.6    34.1    41.5    47.7    53.2    58.3    62.9
                        *
           116          ZZ
1
               SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    10       SUB-1
                .
                .
    15          .       SUB-2
                .           .
                .           .
    19          .           .      SUB-2A
                .           .           .
                .           .           .
    23        CP1A.......................
                .
                .
    26          .      SUB-3B
                .           .
                .           .
    31         CP2............
                .
                .
    34          .      BASIN4
                .           V
                .           V
    40          .       RCP26
                .           .
                .           .
    43          .           .     BASIN4A
                .           .           .
                .           .           .
    49          .        CP27............
                .           .
                .           .
    52          .           .     BASIN1A
```



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *              JAN   1997               *
 *           VERSION 4.1                 *
 *                                       *
 *  RUN DATE   02FEB19  TIME  12:52:25   *
 *                                       *
 *****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

Woody Mountain Campground
Proposed-Conditions with Detention Basin HEC-1 Model
100-year, 6-hour Model
Woodson Engineering and Surveying
Feb 2019
PROPOSED CONDITION (WITH DETENTION BASIN)

8 IO OUTPUT CONTROL VARIABLES
IPRNT 5 PRINT CONTROL
IPLOT 0 PLOT CONTROL
QSCAL 0. HYDROGRAPH PLOT SCALE

IT HYDROGRAPH TIME DATA
NMIN 3 MINUTES IN COMPUTATION INTERVAL
IDATE 1 0 STARTING DATE
ITIME 0000 STARTING TIME
NQ 125 NUMBER OF HYDROGRAPH ORDINATES
NDDATE 1 0 ENDING DATE
NDTIME 0612 ENDING TIME
ICENT 19 CENTURY MARK

COMPUTATION INTERVAL .05 HOURS
TOTAL TIME BASE 6.20 HOURS

ENGLISH UNITS
DRAINAGE AREA SQUARE MILES
PRECIPITATION DEPTH INCHES
LENGTH, ELEVATION FEET
FLOW CUBIC FEET PER SECOND
STORAGE VOLUME ACRE-FEET
SURFACE AREA ACRES
TEMPERATURE DEGREES FAHRENHEIT

1

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	SUB-1	24.	3.20	2.	2.	2.	.01		
+	HYDROGRAPH AT	SUB-2	12.	3.25	1.	1.	1.	.01		

	HYDROGRAPH AT								
+		SUB-2A	24.	3.10	2.	2.	2.	.01	
	3 COMBINED AT								
+		CP1A	56.	3.15	5.	5.	5.	.03	
	HYDROGRAPH AT								
+		SUB-3B	38.	3.30	4.	4.	4.	.03	
	2 COMBINED AT								
+		CP2	87.	3.20	10.	9.	9.	.05	
	HYDROGRAPH AT								
+		BASIN4	5.	3.10	0.	0.	0.	.00	
	ROUTED TO								
+		RCP26	5.	3.15	0.	0.	0.	.00	
	HYDROGRAPH AT								
+		BASIN4A	4.	3.15	0.	0.	0.	.00	
	2 COMBINED AT								
+		CP27	9.	3.15	1.	1.	1.	.00	
	HYDROGRAPH AT								
+		BASIN1A	3.	3.10	0.	0.	0.	.00	
	2 COMBINED AT								
+		CP28	12.	3.15	1.	1.	1.	.01	
	ROUTED TO								
+		DB1	4.	3.40	1.	1.	1.	.01	
+									7054.42 3.40
	ROUTED TO								
+		RDB1	4.	3.40	1.	1.	1.	.01	
	HYDROGRAPH AT								
+		BASIN4B	6.	3.10	0.	0.	0.	.00	
	HYDROGRAPH AT								
+		BASIN3	7.	3.10	0.	0.	0.	.00	
	HYDROGRAPH AT								
+		SUB-1A	92.	3.25	9.	9.	9.	.05	
	HYDROGRAPH AT								
+		SUB-1B	29.	3.15	2.	2.	2.	.01	
	2 COMBINED AT								
+		CP1A1B	115.	3.20	12.	11.	11.	.05	

```
          ROUTED TO
+                        RCP1A1B       113.    3.20          12.         11.         11.        .05

          HYDROGRAPH AT
+                         SUB-3A        14.    3.15           1.          1.          1.        .01

          5 COMBINED AT
+                           CP30       137.    3.20          15.         14.         14.        .07

          2 COMBINED AT
+                          CPDBI       224.    3.20          24.         24.         24.        .12

          ROUTED TO
+                          DBWMC        52.    3.70          21.         21.         21.        .12
+                                                                                          6993.79        3.70
1
                                      SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                          (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                  INTERPOLATED TO
                                                                                COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                      PEAK                                    PEAK

                                 (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

              RCP26  MANE          .60      4.66    187.74      1.63      3.00      4.62    189.00        1.63

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1740E+00 EXCESS= .0000E+00 OUTFLOW= .1741E+00 BASIN STORAGE= .2036E-03 PERCENT ERROR=   -.2

               RDB1  MANE          .44      3.98    204.47      1.68      3.00      3.98    204.00        1.68

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .4494E+00 EXCESS= .0000E+00 OUTFLOW= .4489E+00 BASIN STORAGE= .5692E-03 PERCENT ERROR=    .0

            RCP1A1B  MANE          .46    114.50    193.12      2.01      3.00    112.83    192.00        2.01

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .5788E+01 EXCESS= .0000E+00 OUTFLOW= .5784E+01 BASIN STORAGE= .5657E-02 PERCENT ERROR=    .0



 *** NORMAL END OF HEC-1 ***
```

Summary of Impervious Areas

Description	Area (sf)
RV Sites	33600
Park Model	16154
Tent Sites	6132
Asphalt	63389
Site Amenities	4188
Ramada	1200
Trash Enclosures	1708
Bath House	1842
Impervious Road	1888
Total	**130101**

Summary of ROCV Calculations

Total ROCV (for 1")= 10842 CF

Impervious area in Drainage area Sub-3A (SF)= 44300
ROCV required (Sub-3A) (CF)= 3692

ROCV provided in LID basin 3 (CF)= 3704

Thus, ROCV provided for SUB-3A (3704 CF) > ROCV required for SUB-3A (3692 CF)

Impervious area in Drainage area Sub-3B (SF)= 85801
ROCV required (Sub-3B) (CF)= 7150

ROCV provided in LID basins 1 & 2 (CF)= 8914

Thus, ROCV provided for SUB-3B (8914 CF) > ROCV required for SUB-3A (7150 CF)

LID Basin -1: Elevation Volume Summary

Elev.	Area		Increase in Depth	Incremental Area	Incremental Volume	Cumulative Volume		
	(sq.ft)	(ac)	(ft)	(sq.ft)	(cu.ft)	(cu.ft)	(ac-ft)	
7036.5	5324	0.12	0	0	0	0	0.00	
7037	5947	0.14	0.5	5636	2818	2818	0.06	
7037.5	6591	0.15	0.5	6269	3135	*5952*	0.14	ROCV
7038	7235	0.17	0.5	6913	3457	9409	0.22	

LID Basin -2: Elevation Volume Summary

Elev.	Area		Increase in Depth	Incremental Area	Incremental Volume	Cumulative Volume		
	(sq.ft)	(ac)	(ft)	(sq.ft)	(cu.ft)	(cu.ft)	(ac-ft)	
7020.5	1866	0.04	0	0	0	0	0.00	
7021	2291	0.05	0.5	2079	1039	1039	0.02	
7021.5	2738	0.06	0.5	2515	1257	*2297*	0.05	ROCV
7022	3185	0.07	1	2962	2962	4001	0.09	

LID Basin -3: Elevation Volume Summary

Elev.	Area		Increase in Depth	Incremental Area	Incremental Volume	Cumulative Volume		
	(sq.ft)	(ac)	(ft)	(sq.ft)	(cu.ft)	(cu.ft)	(ac-ft)	
7055.5	2033	0.05	0	0	0	0	0.00	
7056	2314	0.05	0.5	2174	1087	1087	0.02	
7056.5	2617	0.06	0.5	2466	1233	*2320*	0.05	
7057	2920	0.07	0.5	2769	1384	3704	0.09	ROCV

APPENDIX C

Detention Basin Stage Volume Calculations
Detention Basin Outlet Pipes Calculations

Elev.	Area		Increase in Depth	Incremental Area	Incremental Volume	Cumulative Volume	
	(sq.ft)	(ac)	(ft)	(sq.ft)	(cu.ft)	(cu.ft)	(ac-ft)
6988	44896.34	1.03	0	0	0	0	0.00
6989	44896.34	1.03	1	44896	44896	44896	1.03
6990	44896.34	1.03	1	44896	44896	89793	2.06
6991	44896.34	1.03	1	44896	44896	134689	3.09
6992	44896.34	1.03	1	44896	44896	179585	4.12
6993	51560.53	1.18	1	48228	48228	227814	5.23
6994	51560.53	1.18	1	51561	51561	279374	6.41
6995	51560.53	1.18	1	51561	51561	330935	7.60
6996	51560.53	1.18	1	51561	51561	382495	8.78

Detention Basin Outlet-Flow Calculations

Outlet-1

Orifice Dia.	24	in
Orifice Dia.	2	ft
Orifice area	3.14	sq.ft
No. of openings	1	
Elev-Inv. In	6988.00	
Elev-Inv. Out	6985.5	
Length=	65	
Slope=	0.0385	
Centroid	6989	
Orifice-top	6990	
Orifice Co-eff	0.6	
G (gravity)	32.2	ft/s
Outlet-1 Flow		
Elev.	**Flow (cfs)**	**Flow Type**
6988	0	Pipe Flow
6989	22	Pipe Flow
6990	15.1	Orifice
6991	21.38	Orifice
6992	26.19	Orifice
6993	30.24	Orifice
6994	33.81	Orifice
6995	37.03	Orifice
6996	40.00	Orifice

Outlet-2

Orifice Dia.	18	in
Orifice Dia.	1.5	ft
Orifice area	1.76625	sq.ft
No. of openings	1	
Elev-Inv. In	6988	
Elev-Inv. Out	6987.5	
Length=	51	
Slope=	0.0098	
Centroid	6988.75	
Orifice-top	6989.5	
Orifice Co-eff	0.6	
G (gravity)	32.2	ft/s
Outlet-2 Flow		
Elev.	**Flow (cfs)**	**Flow Type**
6988	0	Pipe Flow
6989	13.7	Pipe Flow
6990	9.51	Orifice
6991	12.76	Orifice
6992	15.33	Orifice
6993	17.53	Orifice
6994	19.49	Orifice
6995	21.26	Orifice
6996	22.90	Orifice

Total outflow=Outlet-1+Outlet-2

Elev.	**Flow (cfs)**
6988	0.00
6989	35.70
6990	24.61
6991	34.14
6992	41.52
6993	47.77
6994	53.29
6995	58.30
6996	62.90

APPENDIX D

Geotechnical Report by Western Technologies
Excerpts from Presidio in Pines Drainage Report

Western Technologies Inc.
The Quality People
Since 1955

2400 East Huntington Drive
Flagstaff, Arizona 86004-8934
(928) 774-8700 • fax 774-6469

September 26, 2018

Woodson Engineering
124 North Elden Street, Suite 100
Flagstaff, Arizona 86001

Attn: Ms. Sirisha Kalluri, PE, CFM

Re: COF WWH Detention Basin
West Route 66 and Northwestern Street
Flagstaff, Arizona

Job No. 2528JW053

In accordance with our Proposal No. 2527PW137 dated August 9, 2017, we have completed some field exploration, laboratory testing, and field infiltration testing services for the above referenced project. Attached are the test pit location diagram, test pit logs and laboratory test results. Field infiltration testing was performed in each test pit. The following results were obtained:

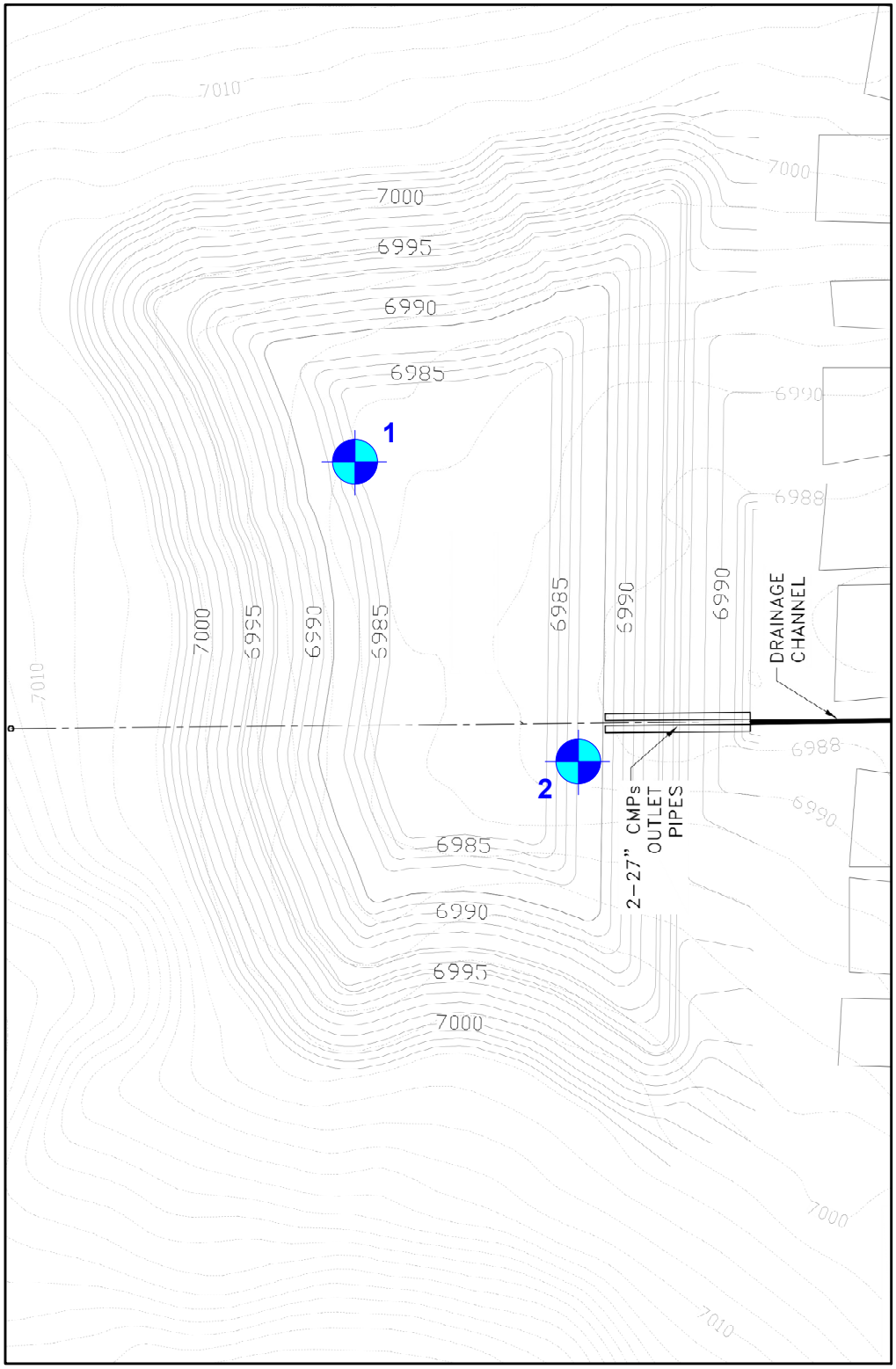
Test Location	Test Depth (ft.)	Infiltration Rate (minutes/inch)
Test Pit 1	4.0	20
Test Pit 2	4.0	15

This completes our current services on this project. If you have any questions concerning this information, or require additional consultation, design, observation, or testing services, please contact us. We look forward to working with you on future projects.

Sincerely,
WESTERN TECHNOLOGIES INC.
Geotechnical Engineering Services

Craig P. Wiedeman, P.E.
Senior Geotechnical Engineer

Copies to: Addressee (emailed)



Not to Scale

Approximate Test Pit Location

COF WWH DETENTION BASIN

Test Pit Location Diagram

Geotechnical Environmental Inspections Materials

Western Technologies Inc. The Quality People Since 1955

Western Technologies Inc.

Job No.: 2528JW053

Plate: 1

COARSE-GRAINED SOILS

LESS THAN 50% FINES

GROUP SYMBOLS	DESCRIPTION	MAJOR DIVISIONS
GW	WELL-GRADED GRAVEL OR WELL-GRADED GRAVEL WITH SAND, LESS THAN 5% FINES	GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE SIZE
GP	POORLY-GRADED GRAVEL OR POORLY-GRADED GRAVEL WITH SAND, LESS THAN 5% FINES	
GM	SILTY GRAVEL OR SILTY GRAVEL WITH SAND, MORE THAN 12% FINES	
GC	CLAYEY GRAVEL OR CLAYEY GRAVEL WITH SAND, MORE THAN 12% FINES	
SW	WELL-GRADED SAND OR WELL-GRADED SAND WITH GRAVEL, LESS THAN 5% FINES	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE
SP	POORLY-GRADED SAND OR POORLY-GRADED SAND WITH GRAVEL, LESS THAN 5% FINES	
SM	SILTY SAND OR SILTY SAND WITH GRAVEL, MORE THAN 12% FINES	
SC	CLAYEY SAND OR CLAYEY SAND WITH GRAVEL, MORE THAN 12% FINES	

NOTE: Coarse-grained soils receive dual symbols if they contain 5% to 12% fines (e.g., SW-SM, GP-GC).

FINE-GRAINED SOILS

MORE THAN 50% FINES

GROUP SYMBOLS	DESCRIPTION	MAJOR DIVISIONS
ML	SILT, SILT WITH SAND OR GRAVEL, SANDY SILT, OR GRAVELLY SILT	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50
CL	LEAN CLAY OF LOW TO MEDIUM PLASTICITY, SANDY CLAY, OR GRAVELLY CLAY	
OL	ORGANIC SILT OR ORGANIC CLAY OF LOW TO MEDIUM PLASTICITY	
MH	ELASTIC SILT, SANDY ELASTIC SILT, OR GRAVELLY ELASTIC SILT	SILTS AND CLAYS LIQUID LIMIT MORE THAN 50
CH	FAT CLAY OF HIGH PLASTICITY, SANDY FAT CLAY, OR GRAVELLY FAT CLAY	
OH	ORGANIC SILT OR ORGANIC CLAY OF HIGH PLASTICITY	
PT	PEAT AND OTHER HIGHLY ORGANIC SOILS	HIGHLY ORGANIC SOILS

NOTE: Fine-grained soils may receive dual classification based upon plasticity characteristics (e.g. CL-ML).

SOIL SIZES

COMPONENT	SIZE RANGE
BOULDERS	Above 12 in.
COBBLES	3 in. – 12 in.
GRAVEL	No. 4 – 3 in.
Coarse	¾ in. – 3 in.
Fine	No. 4 – ¾ in.
SAND	No. 200 – No. 4
Coarse	No. 10 – No. 4
Medium	No. 40 – No. 10
Fine	No. 200 – No. 40
Fines (Silt or Clay)	Below No. 200

NOTE: Only sizes smaller than three inches are used to classify soils

CONSISTENCY

CLAYS & SILTS	BLOWS PER FOOT
VERY SOFT	0 – 2
SOFT	3 – 4
FIRM	5 – 8
STIFF	9 – 15
VERY STIFF	16 – 30
HARD	OVER 30

RELATIVE DENSITY

SANDS & GRAVELS	BLOWS PER FOOT
VERY LOOSE	0 – 4
LOOSE	5 – 10
MEDIUM DENSE	11 – 30
DENSE	31 – 50
VERY DENSE	OVER 50

NOTE: Number of blows using 140-pound hammer falling 30 inches to drive a 2-inch-OD (1⅜-inch ID) split-barrel sampler (ASTM D1586).

PLASTICITY OF FINE GRAINED SOILS

PLASTICITY INDEX	TERM
0	NON-PLASTIC
1 – 7	LOW
8 – 20	MEDIUM
Over 20	HIGH

DEFINITION OF WATER CONTENT

DRY
SLIGHTLY DAMP
DAMP
MOIST
WET
SATURATED

The number shown in **"TEST PIT"** refers to the approximate location of the same number indicated on the "Test Pit Location Diagram" as positioned in the field by pacing or measurement from property lines and/or existing features.

"EQUIPMENT TYPE" refers to the equipment used in the excavation of the test pit, and may include the width of the bucket on the excavator and the use of “rock” teeth or attachments.

"SAMPLE TYPE" refers to the form of sample recovery, in which **R** = Ring sample and **G** = Grab Sample.

"DRY DENSITY (LBS/CU FT)" refers to the laboratory-determined dry density in pounds per cubic foot.

"WATER (MOISTURE) CONTENT” (% of Dry Wt.) refers to the laboratory-determined water content in percent using the standard test method ASTM D2216.

"USCS" refers to the “Unified Soil Classification System” Group Symbol for the soil type as defined by ASTM D2487 and D2488. The soils were classified visually in the field, and where appropriate, classifications were modified by visual examination of samples in the laboratory and/or by appropriate tests.

These notes and test pit logs are intended for use in conjunction with the purposes of our services defined in the text. Test pit log data should not be construed as part of the construction plans nor as defining construction conditions.

The test pit logs depict our interpretations of subsurface conditions at the locations and on the date(s) noted. Variations in subsurface conditions and characteristics may occur between test pits. Groundwater levels may fluctuate due to seasonal variations and other factors.

The stratification lines shown on the test pit logs represent our interpretation of the approximate boundary between soil or rock types based upon visual field classification at the test pit location. The transition between materials is approximate and may be more or less gradual than indicated.

DATE EXCAVATED: **8-29-18**
LOCATION: **See Location Diagram**
ELEVATION: **Not Determined**

TEST PIT NO. 1

EQUIPMENT: **DEERE 310K**
EXCAVATION TYPE: **24'' bucket**
FIELD ENGINEER: **G. Burr**

MOISTURE CONTENT (% OF DRY WT.)	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT.	DEPTH (FEET)	USCS	GRAPHIC	SOIL DESCRIPTION
		G				CH		Fat CLAY; with sand, trace gravel, brown/red, wet
34.1	84	R		push				
					5			color change to light brown at 8 feet
					10			**Backhoe Refusal at 10 Feet on Severly Weathered Limestone**
					15			

N- **STANDARD PENETRATION TEST**
R- **RING SAMPLE**
C- **CORE: %RECOVERY/RQD**
G- **GRAB SAMPLE**
B- **BUCKET SAMPLE**

NOTES: **Groundwater Not Encountered**

WESTERN TECHNOLOGIES INC.
2400 Huntington Drive
Flagstaff, AZ 86004-8934

PROJECT: **COF WWH DETENTION BASIN**
PROJECT NO.: **2528JW053**

PLATE **A-3**

TEST PIT LOG

DATE EXCAVATED: **8-29-18**
LOCATION: **See Location Diagram**
ELEVATION: **Not Determined**

TEST PIT NO. 2

EQUIPMENT: **DEERE 310K**
EXCAVATION TYPE: **24'' bucket**
FIELD ENGINEER: **G. Burr**

MOISTURE CONTENT (% OF DRY WT.)	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT.	DEPTH (FEET)	USCS	GRAPHIC	SOIL DESCRIPTION
		G				GC		Clayey GRAVEL; with cobbles and boulders, some sand, brown, moist
21.2		R	○	push				
					5			color change to light brown at 6 feet
					10			
					15			**Backhoe Stopped at 12 Feet**

N- **STANDARD PENETRATION TEST**
R- **RING SAMPLE**
C- **CORE: %RECOVERY/RQD**
G- **GRAB SAMPLE**
B- **BUCKET SAMPLE**

NOTES: **Groundwater Not Encountered**

WESTERN TECHNOLOGIES INC.
2400 Huntington Drive
Flagstaff, AZ 86004-8934

PROJECT: **COF WWH DETENTION BASIN**
PROJECT NO.: **2528JW053**

PLATE **A-4**

TEST PIT LOG

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

Test Pit No.	Depth (ft)	USCS Class.	Particle Size Distribution (%) Passing by Weight							Atterberg Limits		Laboratory Compaction Characteristics			Remarks
			3"	¾"	#4	#10	#40	#200	2µ	LL	PI	Dry Density (pcf)	Optimum Moisture (%)	Method	
1	0-5	CH	100	98	98	95	91	81.7		51	26				2
2	0-5	GC	82	61	56	55	50	44.9		52	35				2

NOTE: NP = Non-plastic
µ = microns (2µ = 0.002mm)

REMARKS

Classification / Particle Size / Moisture-Density Relationship
1. Visual
2. Laboratory Tested
3. Minus #200 Only
4. Test Method ASTM D698/AASHTO T99
5. Test Method ASTM D1557/AASHTO T180
6. From the ADOT Family of Curves

Geotechnical Environmental Inspections Materials
Western Technologies Inc. The Quality People Since 1955
wt-us.com

PROJECT: COF WWH DETENTION BASIN
JOB NO.: 2528JW053

PLATE
B-1

SOIL PROPERTIES

NORTH

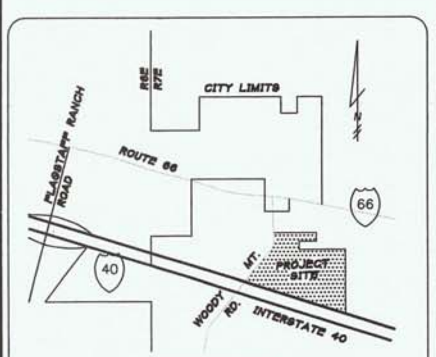
1"=300'
GRAPHIC SCALE

(IN FEET)
1 inch = 300 ft.

DEVELOPED CONDITION BASINS

HEC-1 STORM FLOW SUMMARY			HEC-1 STORM FLOW SUMMARY		
BASIN	ACRES	Q100 (CFS)	BASIN	ACRES	Q100 (CFS)
B1	0.97	4	CP1	---	16
B1A	0.65	4	CP2	---	28
B2	2.63	12	CP2B	---	37
B3	1.31	6	CP2D	---	36
B4	1.48	4	CP3	---	39
B4A	1.08	4	CP4	---	53
B4B	1.41	5	CP5	---	68
B4C	1.38	4	CP6	---	68
B5	0.95	3	CP7	---	69
B6	1.67	9	CP8	---	7
B7	2.91	12	CP9	---	NOT USED
B8	1.75	8	CP10	---	82
B9	1.71	9	CP11	---	399
B10	2.63	11	CP12	---	11
B11	2.94	15	CP13	---	19
B12		NOT USED	CP14	---	28
B13	1.14	6	CP15	---	NOT USED
B14	0.83	3	CP16	---	39
B15	0.56	3	CP17	---	47
B16	1.62	9	CP18	---	60
B17	0.50	4	CP19	---	56
B17A	0.49	4	CP20	---	347
B18	1.29	7	CP21	---	125
B18A	0.52	3	CP22	---	17
B19	2.53	12	CP23	---	366
B20	1.27	6	CP24	---	370
B21	1.61	9	CP25	---	15
B22	1.12	6	CP26	---	NOT USED
B23	0.65	3	CP27	---	9
B24	0.34	4	CP28	---	11
B25	1.26	5	CP29	---	18
B25A	0.32	3	CP30	---	93
B26	1.26	6	CP31	---	127
B27	2.29	10	CP32	---	4
B28	0.69	3	CP33	---	318
B28A	0.31	4			
B29	0.43	4			
B30	2.82	14			
B31	0.59	4			
B32	2.66	13			
B33	3.87	21			
B34	3.28	16			
B35	2.87	9			
B36	7.59	34			
B37	2.10	6			
B38	3.15	8			
B39	0.27	4			
B40	1.02	7			
B41	3.34	9			
W1	0.65	2			
W2	3.02	8			
W3	0.71	2			
A1	2.75	7			
ROFF1	270.88	300			
ROFF2A	13.90	32			
ROFF2B	0.94	31			
ROFF2C	3.04	9			
ROFF2D	3.78	13			
ROFF2E	13.30	28			
ROFF2F	6.12	22			
ROFF2G	4.36	12			
ROFF3	37.43	85			

NOTE
FLOWS SHOWN DO NOT REFLECT STORM DRAIN DEDUCTIONS



VICINITY MAP
NOT TO SCALE

NOTE: SEE FIGURE 11 FOR DETAILED ON-SITE FLOW PATTERNS

NOTE: THIS INDEX IS PROVIDED ONLY TO SHOW FLOW PATTERNS AND FLOW VALUES

LEGEND	
(XX)	BASIN
[XX]	DETENTION BASIN 1
△XX	WASH 1
⬡XX	AMPHITHEATER 1
▩	WATERS OF THE US

REV	DESCRIPTION	BY	DATE	AGEN. APP.	DATE

PROJ NO:
DESIGN: RCW
DATE: 12/21/04
SCALE: AS SHOWN
CADFILE: BASINS.dwg

STAMP DATE:
EXP. DATE:

8395 W. SUNSET ROAD
Suite 190
Las Vegas, NV 89113
Tel: 702-650-0572
Fax: 702-307-4222
Web: trcsolutions.com

TRC
Customer-Focused Solutions
BV Engineering Nevada

PREMIERE ACQUISITIONS LLC
PRESIDIO IN THE PINES
DEVELOPED CONDITION BASIN MAP (OVERALL)

SHEET
FIG 12
1 OF 1 SHTS
PROJECT ID
601.006N

G:\601-001N Presidio in the Pines\Tech\Drainage\Dwg\Add#1\Hydrology Final Submittal\OFF-SITE BASINS DEVELOPED_11-30-04.dwg dwhitehead Tue, 21 Dec 2004 - 11:17am