

**Preliminary  
Drainage Report  
For**

**Homewood Mountain Resort  
Master Plan Alternative 1A**

**Placer County, California**

**Prepared for:**

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**Submitted to:**

Placer County Community Development Resource Agency  
Engineering and Surveying Department

July 2011

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## 1.0 INTRODUCTION

This Preliminary Drainage report for the Homewood Mountain Resort in Homewood, Placer County, California was prepared by Nichols Consulting Engineers (NCE) at the request of Placer County Community Development/Resources Agency to evaluate existing and proposed stormwater runoff flows within the developed project area. The criteria set forth in the Placer County Stormwater Management Manual (SWMM) constitute the basis for this drainage report.

### 1.1 Project Description

#### 1.1.1 Existing Site Context/Conditions:

**Existing on-site Land Use(s):** Recreation with accessory uses, and seasonal uses. The property is exclusively used for a ski operation along with its accessory food & beverage and rental/retail uses. Seasonal uses include wedding receptions, the Lake Tahoe Music Festival's "Summer Concert Series", and other community events.

**Adjacent/Surrounding Land Uses:** Predominantly Residential, followed by Commercial/Tourist. Both of these land use designations typically flank the SR89 corridor.

**Current Site Details:** Total existing coverage on the entire property is +/- 1.8 million sq ft, whereas the base allowable coverage is just over 4 million sq ft. There are no existing Tourist Accommodation Units (TAUs), Residential Units (RUs), or any Commercial Floor Area (CFA) on the property. Parking lots are predominantly paved, with the exception of the Gravel "overflow" Lot at the North base. It is important to note that both the existing North Base and South Base areas are dominated by surface parking.

**Natural Features:** Include, but aren't limited to Watersheds (Homewood Mountain contains all or a portion of 3 watersheds); Alpine Lakes – such as Quail Lake and more than half of Lake Louise; creeks and associated tributaries – such as Madden, Quail, and Ellis; Mixed-Conifer type forests, all of which are on mountainous terrain ranging from a base elevation of +/-6230 ft to a top elevation of roughly 7800 feet.

#### 1.1.2 Proposed Site Context/Conditions:

**North Base:** Approximately 56 Residential Condominiums distributed among 4 smaller residential buildings, up to 20 of which are planned to be fractional ownership. The main hotel lodge includes approximately 30 Penthouse Condominium Units (Upper Floors of Hotel), up to 75 Traditional Hotel Rooms, and approximately 40 two-bedroom for sale Condo-Hotel Units. The North Base also includes a request for up to 25,000 sq ft of Commercial Floor Area and up to 13 workforce housing apartments attached to the east and north side of the day skier parking structure.

**South Base:** Up to 50 Residential Condominiums in the main hotel building plus 25 dual unit residential buildings are planned for the South Base area. The existing full vehicle shop/maintenance facility at the South Base will be eliminated with servicing of rubber-tire vehicles moved to an off-site location. Snow based equipment maintenance is planned at a new mid-mountain facility. The proposed plan relocates all existing day-skier access to the North Base area helping to further reinforce the sense of a neighborhood residential area. The existing culvert for the Homewood Creek is planned to be removed to allow the stream to be day-lighted and bridged.

**Between Base Areas (above Sacramento Avenue):** 16 townhomes on the Planned Development lot accessed via Tahoe Ski Bowl Way from the South Base.



**Mid-Mountain:** The mid-mountain will include a new 15,000+/- sq ft day lodge with a gondola terminal, food & beverage facility, outdoor dining, small sundry outlet, and an outdoor swimming facility for use during the summer months. The new mid-mountain lodge replaces the white tent structure and the existing concrete foundation located near the mid-mountain. The snow based vehicle shop/maintenance facility is proposed to be rebuilt in the mid-mountain area behind the proposed mid-mountain lodge.

**Parking at Base Areas:** Parking spaces provided at North Base include day skier parking in an underground 2 level parking structure, roughly 50 limited surface parking spaces at the retail and day skier drop-off area, and approximately 450 underground parking spaces directly below the building footprint of the hotel/lodge structure. The South Base will include approximately 150 parking spaces directly below the residential building footprint. This takes advantage of the excavation required for the building foundations and allows for more pervious landscape surface around the buildings (in lieu of surface parking).

## 1.2 Compliance with Regulations and Adopted Plans

This preliminary drainage report was prepared to conform with the Placer County Stormwater Management Manual (SWMM) and the requirements set forth by the Tahoe Regional Planning Agency (TRPA). The proposed drainage facilities and improvements for this project will be designed to meet compliance with the local, state, and regional regulations and adopted plans. The preliminary drainage report shows that proposed conditions mitigated cumulative stormwater flows will be less than existing conditions watershed flows for the 7 analyzed sub-watershed areas.

Construction related detention basins for on-site runoff will be designed as part of the construction SWPPP document.

## 2.0 Hydrologic and Hydraulic Design Criteria

### 2.1 Placer County Design Criteria

The storm drainage collection, conveyance and treatment facilities for the proposed project will be designed according to the Placer County Storm Water Management Manual (SWMM), dated September 1, 1990. All existing and proposed watersheds were analyzed using the Small Watershed Peak Flow Worksheet as shown in the included SWMM tables. According to the SWMM, the 10-year event is the minimum design storm for sizing all drainage facilities and all new development shall be planned and designed so that no damages occur to structures or improvements and to prevent loss of life during the 100-year event.

### 2.2 Precipitation and Snowmelt

Average annual precipitation ranges from 40 to 45 inches per year at the project site elevation. The majority of this precipitation occurs between November and May in the form of snow, which is included in the annual precipitation quantity as equivalent water content.

Though snow predominates the precipitation regime, treatment facilities will be designed using rainfall models.

### 2.3 Infiltration

Infiltration rates are dependant on soil type and vegetation. For the purpose of this drainage report, infiltration rates between 0.15 to 0.51 inches per hour were selected for each watershed by calculating the percentage of cover type for each soil group and averaging the infiltration rate accordingly. Cover types vary between good cover of woodland consisting of coniferous and broadleaf trees with a canopy density of at least 50% to paved streets and roads with open ditches. Soils of the soil group A have “low runoff potential with high infiltration

rates even when thoroughly wetted and consisting chiefly of deep, well to excessively drained sands and gravel.” Soils of the soil group B have “moderate infiltration rates when thoroughly wetted and consist chiefly of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission” (SWMM, 1990).

### 3.0 RUNOFF PEAK FLOW

#### 3.1 Runoff Peak Flow Analysis

The runoff flow analysis was conducted according to the computation of peak flows from small watershed outlined in the SWMM. This method allows an evaluation of the peak flow from a small watershed without extensive computation. It may be used to estimate the peak runoff from basins of up to 200 acres, in areas in which no significant ponding occurs.

The method is based on a relationship between the characteristic watershed response time and peak flow per unit area from precipitation patterns typical for the region. The peak flow is a function of the area, unit peak flow, infiltration rate, and impervious surface area and was calculated using the spreadsheet calculations included in this report.

The project area is located at elevations between 6,230 feet and 7,600 feet above sea level (ASL). Snow covered areas are assumed impervious since the ground beneath is likely to be saturated and could also be frozen. The portion of the watershed covered with snow depends on elevation and location relative to the Sierra Nevada crest according to the SWMM. Based on Table 5-4 of the SWMM, 90 percent impervious was selected for the winter peak flow calculations. The summer peak flows were calculated using the actual impervious coverage areas in each watershed for the existing and proposed conditions.

The peak flows for the post-project conditions were developed based on the requirements of the SWWM manual.

### 3.2 Peak Flow Analysis

The peak flow analysis was conducted by determining the runoff from the proposed layout of the development and drainage facilities. The following table summarizes the calculated peak flows for each watershed area for the existing and proposed development conditions during the summertime.

#### Summer - Peak Flow Rates Existing Conditions (10-, and 100-year)

WSA	Runoff Area (acres)	10-Year (cfs)	100-Year (cfs)
WSA 1	28.3	20.35	41.26
WSA 2	42.4	27.79	58.31
WSA 3	10.0	5.15	11.07
WSA 4	67.4	21.81	65.61
WSA 5	5.4	4.29	8.61
WSA 6	2.2	2.65	5.10
WSA 7	145.7	97.57	199.55
Totals:	301.4	179.61	389.51

#### Summer - Peak Flow Rates Proposed Conditions (10-, and 100-year)

WSA	Runoff Area (acres)	10-Year (cfs)	100-Year (cfs)
WSA 1	28.3	18.81	36.96
WSA 2	42.4	23.90	49.02
WSA 3	10.0	5.58	11.12
WSA 4	67.4	21.25	65.34
WSA 5	5.4	4.32	7.47
WSA 6	2.2	2.66	5.00
WSA 7	145.7	97.93	199.91
Totals:	301.4	174.45	374.82

#### Winter - Peak Flow Rates Existing Conditions (10-, and 100-year)

WSA	Runoff Area (acres)	10-Year (cfs)	100-Year (cfs)
WSA 1	28.3	25.12	46.03
WSA 2	42.4	37.38	67.90
WSA 3	10.0	8.72	14.65
WSA 4	67.4	56.45	100.25
WSA 5	5.4	5.79	10.13

WSA 6	2.2	3.28	5.73
WSA 7	145.7	140.82	242.81
Totals:	301.4	277.56	487.50

Winter - Peak Flow Rates Proposed Conditions (10-, and 100-year)

WSA	Runoff Area (acres)	10-Year (cfs)	100-Year (cfs)
WSA 1	28.3	21.87	40.02
WSA 2	42.4	32.65	57.77
WSA 3	10.0	7.91	13.08
WSA 4	67.4	54.34	98.43
WSA 5	5.4	5.2	8.34
WSA 6	2.2	3.18	5.52
WSA 7	145.7	140.86	242.84
Totals:	301.4	266.01	466.00

### 3.3 Infiltration Volume Analysis

Table 1 lists the required runoff volume to be stored or infiltrated on site. The proposed Low Impact Development (LID) and infiltration components are designed to store and infiltrate (at a minimum) the runoff generated by the 20-year, 1-hour event calculated at 1 inch over the impervious developed surface area.

Table 1: Impervious Surface Areas and Runoff Volumes

Underground Infiltration Galleries						
Gallery Type	North-1 SW	North-2 SW	North-3 SW	North-4 SW	South-1 SW	South-2 SW
Total Impervious Area (sf)	24,635	19,890	145,378	174,587	89,307	44,527
Required Infiltration Vol. (cf)	2,053	1,658	12,115	14,549	7,442	3,711
Proposed Gallery volume (cf)	2,681	2,167	15,904	23,441	9,650	8,040
Finish Grade (ft)	6238	6237.5	6238	6240.5	6269	6272
Bottom Elev. of Gallery (ft)	6234	6233	6233.5	6236	6264.5	6267.5
SHGW (ft)	6232	6231	6231.5	6234	6256.5	6263
GW Clearance (ft)*	2	2	2	2	8	4.5
Adjacent GW Monitoring Well Data (well#, SHGW)	MW3N, 6230.7	GP2, 6230.7	GP5, 6230.76	GP8, 6233.58	MW3S, 6256.5	GP4, <66262.93
Infil. Gallery Dimensions (ft)	48x36x3	63x22x3	120x78x3	124x121x3	90x80x2.5	100x52x3
Legend:	Note*					
SW= stormwater	Seasonal high groundwater levels are projected to rise 0.7 feet under stormwater galleries & 0.8 feet under groundwater reinjection galleries due to infiltration.					
GW= groundwater						
MW= monitoring well						
GP= monitoring well						

### 3.4 Treatment & Infiltration Area Descriptions

In order to meet TRPA requirements for treatment of storm water runoff from impervious surfaces, a series of bio swales, storm drain collection and sub-surface infiltration devices are proposed to be constructed with the development.

The intent of the proposed design is to collect all runoff from impervious areas such as the building roofs, walkways, roadways, and parking areas and convey it to infiltration trenches sized to meet TRPA requirements.



## 4.0 CONCLUSIONS

Design for the proposed Homewood Mountain Resort project incorporates current requirements by Placer County for storm water collection and conveyance as well as requirements by the TRPA. The SWMM post development calculations show a cumulative reduction in peak flow from existing to proposed conditions for the 10 and 100 year storm events. Therefore the proposed storm drain facilities are designed to capture, convey and infiltrate (at a minimum) runoff generated by the 20-year, 1-hour event at 1 inch over the impervious surface area per TRPA requirements.

The proposed storm drain collection, conveyance and infiltration facilities will comply with the Placer County Storm Water Management Manual (SWMM), dated September 1, 1990.

## 5.0 REFERENCES

Placer County, Flood Control and Water Conservation District; *Stormwater Management Manual (SWMM)*; September 1990.

United States Forest Service; *Soil Survey Tahoe National Forest Area, California*, January 2002.

DISTRIBUTION

**JMA VENTURES LLC**

**HOMEWOOD MOUNTAIN RESORT**

July 29, 2011

Copies          3          Rebecca Taber, Placer County

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Electronic file   1          David Tirman, JMA

Copies          1          NCE Project File 514.02.14

QUALITY CONTROL REVIEWER



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Paul Pettersen  
Principal

## Appendix A

### SWMM Summary Table

**SWMM Summary Sheet**  
**Summer Impervious Calculations**  
**Homewood Mountain Resort**

**Lahontan 20-Yr, 1-Hr Storm Event Calculations**

Total Watershed Area (sf)	Impervious Area (sf)	Infiltration Requirement (in)	Required Volume (cf)	Proposed Infiltration Volume (cf)
13,128,756	659,130	0.9	54,324	60,059

**Placer County SWMM Model Calculations**

	10-YEAR PEAK FLOW			100-YEAR PEAK FLOW		
	Existing Conditions	Proposed Conditions	Exist/Proposed Difference	Existing Conditions	Proposed Conditions	Exist/Proposed Difference*
<b>WATERSHED AREAS</b>	[cfs]	[cfs]	[cfs]	[cfs]	[cfs]	[cfs]
WS-1	20.35	18.81	-1.54	41.26	36.96	-4.30
WS-2	27.79	23.90	-3.89	58.31	49.02	-9.29
WS-3	5.15	5.58	0.43	11.07	11.12	0.05
WS-4	21.81	21.25	-0.57	65.61	65.34	-0.28
WS-5	4.29	4.32	0.03	8.61	7.47	-1.15
WS-6	2.65	2.66	0.01	5.10	5.00	-0.10
WS-7	97.57	97.93	0.37	199.55	199.91	0.37
<b>TOTAL</b>	<b>179.61</b>	<b>174.44</b>	<b>-5.16</b>	<b>389.52</b>	<b>374.82</b>	<b>-14.70</b>

\* Negative numbers shown in the tables represent a reduction in flow from existing to proposed conditions.

**SWMM Summary Sheet**  
**Winter Impervious Calculations**  
**Homewood Mountain Resort**

**Lahontan 20-Yr, 1-Hr Storm Event Calculations**

Total Watershed Area (sf)	Impervious Area (sf)	Infiltration Requirement (in)	Required Volume (cf)	Proposed Infiltration Volume (cf)
13,128,756	659,130	0.9	54,324	60,059

**Placer County SWMM Model Calculations**

	10-YEAR PEAK FLOW			100-YEAR PEAK FLOW		
	Existing Conditions	Proposed Conditions	Exist/Proposed Difference	Existing Conditions	Proposed Conditions	Exist/Proposed Difference*
<b>WATERSHED AREAS</b>	[cfs]	[cfs]	[cfs]	[cfs]	[cfs]	[cfs]
WS-1	25.12	21.87	-3.25	46.03	40.02	-6.01
WS-2	37.38	32.65	-4.73	67.90	57.77	-10.13
WS-3	8.72	7.91	-0.81	14.65	13.08	-1.56
WS-4	56.45	54.34	-2.12	100.25	98.43	-1.82
WS-5	5.79	5.20	-0.59	10.13	8.34	-1.78
WS-6	3.28	3.18	-0.10	5.73	5.52	-0.21
WS-7	140.82	140.86	0.03	242.81	242.84	0.03
<b>TOTAL</b>	<b>277.57</b>	<b>266.00</b>	<b>-11.57</b>	<b>487.49</b>	<b>466.01</b>	<b>-21.48</b>

\* Negative numbers shown in the tables represent a reduction in flow from existing to proposed conditions.



## Appendix B

### SWMM Tables

Summer

**Nichols Consulting Engineers, Chtd.**

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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Summer Calculations					
Watershed	Existing Conditions WS-1					
Area (acres)	28.3	Elevation (ft)	6702	Return Period (years)	10	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	516	0.23	0.4			13.46
Collector 1	1942	0.38	0.1	20.7	15	3.36
Collector 2	369	0.18	0.05	25.3	15	0.48
Collector 3	221	0.02	0.05	28.3	1	0.37
Total Response Time (minutes)						17.67
Unit Peak Flow (cfs/acre)						0.91
Infiltration Rate (in/hr)					0.17	
Infiltration Factor (cfs/acre)					0.21	
Percent Impervious					8.5	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						20.35

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5. Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4 "Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and Streets and Roads (A = 0.07, B = 0.06).

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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Summer Calculations					
Watershed	Existing Conditions WS-2					
Area (acres)	42.4	Elevation (ft)	6645	Return Period (years)	10	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	500	0.27	0.4			12.63
Collector 1	1853	0.33	0.1	28.2	15	3.12
Collector 2	824	0.07	0.1	37.3	3	1.56
Collector 3	305	0.01	0.05	42.4	1	0.56
Collector 4						
Total Response Time (minutes)						17.88
Unit Peak Flow (cfs/acre)						0.91
Infiltration Rate (in/hr)					0.23	
Infiltration Factor (cfs/acre)					0.3	
Percent Impervious					10	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>27.79</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5.  
Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4  
"Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for  
Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and  
Streets and Roads (A = 0.07, B = 0.06).



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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Summer Calculations					
Watershed	Existing Conditions WS-3					
Area (acres)	10.0	Elevation (ft)	6593	Return Period (years)	10	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	500	0.18	0.4			14.36
Collector 1	1715	0.30	0.1	8.6	15	4.05
Collector 2	280	0.12	0.02	10.0	3	0.18
Collector 3						
Total Response Time (minutes)						18.60
Unit Peak Flow (cfs/acre)						0.91
Infiltration Rate (in/hr)					0.34	
Infiltration Factor (cfs/acre)					0.41	
Percent Impervious					3.8	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>5.15</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5. Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4 "Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and Streets and Roads (A = 0.07, B = 0.06).

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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Summer Calculations					
Watershed	Existing Conditions WS-4					
Area (acres)	67.4	Elevation (ft)	6652	Return Period (years)	10	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	500	0.18	0.4			14.26
Collector 1	2448	0.26	0.1	57.5	15	3.81
Collector 2	1456	0.04	0.02	67.4	3	0.92
Collector 3						
Total Response Time (minutes)						18.99
Unit Peak Flow (cfs/acre)						0.90
Infiltration Rate (in/hr)					0.51	
Infiltration Factor (cfs/acre)					0.62	
Percent Impervious					7.3	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>21.81</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5.  
Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4  
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3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for  
Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and  
Streets and Roads (A = 0.07, B = 0.06).



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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Summer Calculations					
Watershed	Existing Conditions WS-5					
Area (acres)	5.4	Elevation (ft)	7408	Return Period (years)	10	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	500	0.19	0.4			14.04
Collector 1	616	0.23	0.1	5.4	15	1.81
Collector 2						
Collector 3						
Total Response Time (minutes)						15.85
Unit Peak Flow (cfs/acre)						1.10
Infiltration Rate (in/hr)					0.26	
Infiltration Factor (cfs/acre)					0.31	
Percent Impervious					1.0	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>4.29</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5. Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4 "Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and Streets and Roads (A = 0.07, B = 0.06).

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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Summer Calculations					
Watershed	Existing Conditions WS-6					
Area (acres)	2.2	Elevation (ft)	7565	Return Period (years)	10	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	100	0.30	0.4			4.66
Collector 1	401	0.07	0.1	2.2	15	2.32
Collector 2						
Collector 3						
Total Response Time (minutes)						6.98
Unit Peak Flow (cfs/acre)						1.50
Infiltration Rate (in/hr)					0.26	
Infiltration Factor (cfs/acre)					0.31	
Percent Impervious					0.0	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>2.65</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5. Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4 "Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and Streets and Roads (A = 0.07, B = 0.06).



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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Summer Calculations					
Watershed	Existing Conditions WS-7					
Area (acres)	145.7	Elevation (ft)	7465	Return Period (years)	10	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	500	0.18	0.4			14.26
Collector 1	4308	0.27	0.1	145.7	15	5.24
Collector 2						
Collector 3						
Total Response Time (minutes)						19.50
Unit Peak Flow (cfs/acre)						1.00
Infiltration Rate (in/hr)					0.28	
Infiltration Factor (cfs/acre)					0.33	
Percent Impervious					1.1	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>97.57</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5. Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4 "Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and Streets and Roads (A = 0.07, B = 0.06).

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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Summer Calculations					
Watershed	Proposed Conditions WS-1					
Area (acres)	28.3	Elevation (ft)	6702	Return Period (years)	10	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	516	0.23	0.4			13.46
Collector 1	1942	0.38	0.1	20.7	15	3.36
Collector 2	1051	0.06	0.025	24.5	1	0.74
Collector 3						
Total Response Time (minutes)						17.56
Unit Peak Flow (cfs/acre)						0.91
Infiltration Rate (in/hr)					0.15	
Infiltration Factor (cfs/acre)					0.18	
Percent Impervious					22.3	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>18.81</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5. Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4 "Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and Streets and Roads (A = 0.07, B = 0.06).

\* The last collector area assumes a 50% reduction in the proposed development area due to stormwater runoff that is mitigated by proposed onsite stormwater infiltration devices.



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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Summer Calculations					
Watershed	Proposed Conditions WS-2					
Area (acres)	42.4	Elevation (ft)	6645	Return Period (years)	10	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	500	0.27	0.4			12.63
Collector 1	1853	0.33	0.1	28.2	15	3.12
Collector 2	1344	0.05	0.04	33.7	15	2.30
Collector 3	707	0.01	0.025	38.1	1	1.09
Total Response Time (minutes)						19.15
Unit Peak Flow (cfs/acre)						0.89
Infiltration Rate (in/hr)					0.26	
Infiltration Factor (cfs/acre)					0.32	
Percent Impervious					18.2	
Watershed Peak Flow (cfs): Area x Unit Peak Flow-(1-Percent Impervious) x Area x Infiltration Factor						<b>23.90</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5. Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4 "Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and Streets and Roads (A = 0.07, B = 0.06).

\* The last collector area assumes a 50% reduction in the proposed development area due to stormwater runoff that is mitigated by proposed onsite stormwater infiltration devices.

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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Summer Calculations					
Watershed	Proposed Conditions WS-3					
Area (acres)	10.0	Elevation (ft)	6593	Return Period (years)	10	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	500	0.18	0.4			14.36
Collector 1	1647	0.30	0.1	8.6	15	3.86
Collector 2	581	0.07	0.11	9.2	1	1.52
Collector 3						
Total Response Time (minutes)						19.74
Unit Peak Flow (cfs/acre)						0.90
Infiltration Rate (in/hr)					0.27	
Infiltration Factor (cfs/acre)					0.33	
Percent Impervious					11.5	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>5.58</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5. Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4 "Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and Streets and Roads (A = 0.07, B = 0.06).

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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Summer Calculations					
Watershed	Proposed Conditions WS-4					
Area (acres)	67.4	Elevation (ft)	6652	Return Period (years)	10	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	500	0.18	0.4			14.26
Collector 1	2448	0.26	0.1	57.5	15	3.81
Collector 2	1456	0.04	0.02	64.8	3	0.93
Collector 3						
Total Response Time (minutes)						19.00
Unit Peak Flow (cfs/acre)						0.90
Infiltration Rate (in/hr)					0.51	
Infiltration Factor (cfs/acre)					0.62	
Percent Impervious					7.6	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						21.25

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5. Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4 "Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and Streets and Roads (A = 0.07, B = 0.06).

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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Summer Calculations					
Watershed	Proposed Conditions WS-5					
Area (acres)	5.4	Elevation (ft)	7408	Return Period (years)	10	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	500	0.19	0.4			14.04
Collector 1	631	0.22	0.1	4.8	3	1.32
Collector 2						
Collector 3						
Total Response Time (minutes)						15.36
Unit Peak Flow (cfs/acre)						1.10
Infiltration Rate (in/hr)					0.22	
Infiltration Factor (cfs/acre)					0.26	
Percent Impervious					20.4	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>4.32</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5.  
Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4  
"Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for  
Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and  
Streets and Roads (A = 0.07, B = 0.06).

\* The last collector area assumes a 50% reduction in the proposed development area due to stormwater runoff that is mitigated by proposed onsite stormwater infiltration devices.



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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Summer Calculations					
Watershed	Proposed Conditions WS-6					
Area (acres)	2.2	Elevation (ft)	7565	Return Period (years)	10	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	180	0.32	0.4			6.52
Collector 1	376	0.30	0.22	2.2	3	1.54
Collector 2						
Collector 3						
Total Response Time (minutes)						8.06
Unit Peak Flow (cfs/acre)						1.45
Infiltration Rate (in/hr)					0.23	
Infiltration Factor (cfs/acre)					0.28	
Percent Impervious					5.9	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>2.66</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5. Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4 "Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and Streets and Roads (A = 0.07, B = 0.06).

\* The last collector area assumes a 50% reduction in the proposed development area due to stormwater runoff that is mitigated by proposed onsite stormwater infiltration devices.

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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Summer Calculations					
Watershed	Proposed Conditions WS-7					
Area (acres)	145.7	Elevation (ft)	7465	Return Period (years)	10	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	500	0.18	0.4			14.26
Collector 1	4308	0.27	0.1	145.7	15	5.24
Collector 2						
Collector 3						
Total Response Time (minutes)						19.50
Unit Peak Flow (cfs/acre)						1.00
Infiltration Rate (in/hr)					0.28	
Infiltration Factor (cfs/acre)					0.33	
Percent Impervious					1.2	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>97.93</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5. Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4 "Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and Streets and Roads (A = 0.07, B = 0.06).



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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Summer Calculations					
Watershed	Existing Conditions WS-1					
Area (acres)	28.3	Elevation (ft)	6702	Return Period (years)	100	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	516	0.23	0.4			13.46
Collector 1	1942	0.38	0.1	20.7	15	3.36
Collector 2	369	0.18	0.05	25.3	15	0.48
Collector 3	221	0.02	0.05	28.3	1	0.37
Total Response Time (minutes)						17.67
Unit Peak Flow (cfs/acre)						1.65
Infiltration Rate (in/hr)					0.17	
Infiltration Factor (cfs/acre)					0.21	
Percent Impervious					8.5	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>41.26</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5.  
Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4  
"Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for  
Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and  
Streets and Roads (A = 0.07, B = 0.06).

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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Summer Calculations					
Watershed	Existing Conditions WS-2					
Area (acres)	42.4	Elevation (ft)	6645	Return Period (years)	100	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	500	0.27	0.4			12.63
Collector 1	1853	0.33	0.1	28.2	15	3.12
Collector 2	824	0.07	0.1	37.3	3	1.56
Collector 3	305	0.01	0.05	42.4	1	0.56
Collector 4						
Total Response Time (minutes)						17.88
Unit Peak Flow (cfs/acre)						1.63
Infiltration Rate (in/hr)					0.23	
Infiltration Factor (cfs/acre)					0.3	
Percent Impervious					10	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>58.31</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5. Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4 "Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and Streets and Roads (A = 0.07, B = 0.06).



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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Summer Calculations					
Watershed	Existing Conditions WS-3					
Area (acres)	10.0	Elevation (ft)	6593	Return Period (years)	100	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	500	0.18	0.4			14.36
Collector 1	1715	0.30	0.1	8.6	15	4.05
Collector 2	280	0.12	0.02	10.0	3	0.18
Collector 3						
Total Response Time (minutes)						18.60
Unit Peak Flow (cfs/acre)						1.50
Infiltration Rate (in/hr)						0.34
Infiltration Factor (cfs/acre)						0.41
Percent Impervious						3.8
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>11.07</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5.  
Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4  
"Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for  
Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and  
Streets and Roads (A = 0.07, B = 0.06).

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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Summer Calculations					
Watershed	Existing Conditions WS-4					
Area (acres)	67.4	Elevation (ft)	6652	Return Period (years)	100	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	500	0.18	0.4			14.26
Collector 1	2448	0.26	0.1	57.5	15	3.81
Collector 2	1456	0.04	0.02	67.4	3	0.92
Collector 3						
Total Response Time (minutes)						18.99
Unit Peak Flow (cfs/acre)						1.55
Infiltration Rate (in/hr)					0.51	
Infiltration Factor (cfs/acre)					0.62	
Percent Impervious					7.3	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>65.61</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5. Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4 "Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and Streets and Roads (A = 0.07, B = 0.06).



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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Summer Calculations					
Watershed	Existing Conditions WS-5					
Area (acres)	5.4	Elevation (ft)	7408	Return Period (years)	100	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	500	0.19	0.4			14.04
Collector 1	616	0.23	0.1	5.4	15	1.81
Collector 2						
Collector 3						
Total Response Time (minutes)						15.85
Unit Peak Flow (cfs/acre)						1.90
Infiltration Rate (in/hr)					0.26	
Infiltration Factor (cfs/acre)					0.31	
Percent Impervious					0.5	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>8.61</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5.  
Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4  
"Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for  
Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and  
Streets and Roads (A = 0.07, B = 0.06).

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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Summer Calculations					
Watershed	Existing Conditions WS-6					
Area (acres)	2.2	Elevation (ft)	7565	Return Period (years)	100	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	100	0.30	0.4			4.66
Collector 1	401	0.07	0.1	2.2	15	2.32
Collector 2						
Collector 3						
Total Response Time (minutes)						6.98
Unit Peak Flow (cfs/acre)						2.60
Infiltration Rate (in/hr)					0.26	
Infiltration Factor (cfs/acre)					0.31	
Percent Impervious					0.0	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>5.10</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5.  
Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4  
"Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for  
Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and  
Streets and Roads (A = 0.07, B = 0.06).



**Nichols Consulting Engineers, Chtd.**

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Reno, Nevada 89509

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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Summer Calculations					
Watershed	Existing Conditions WS-7					
Area (acres)	145.7	Elevation (ft)	7465	Return Period (years)	100	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	500	0.18	0.4			14.26
Collector 1	4308	0.27	0.1	145.7	15	5.24
Collector 2						
Collector 3						
Total Response Time (minutes)						19.50
Unit Peak Flow (cfs/acre)						1.70
Infiltration Rate (in/hr)					0.28	
Infiltration Factor (cfs/acre)					0.33	
Percent Impervious					1.1	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>199.55</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5.  
Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4  
"Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for  
Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and  
Streets and Roads (A = 0.07, B = 0.06).

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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Summer Calculations					
Watershed	Proposed Conditions WS-1					
Area (acres)	28.3	Elevation (ft)	6702	Return Period (years)	100	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	516	0.23	0.4			13.46
Collector 1	1942	0.38	0.1	20.7	15	3.36
Collector 2	1051	0.06	0.025	24.5	1	0.74
Collector 3						
Total Response Time (minutes)						17.56
Unit Peak Flow (cfs/acre)						1.65
Infiltration Rate (in/hr)					0.15	
Infiltration Factor (cfs/acre)					0.18	
Percent Impervious					22.3	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						36.96

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5.  
Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4  
"Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for  
Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and  
Streets and Roads (A = 0.07, B = 0.06).

\* The last collector area assumes a 50% reduction in the proposed development area due to stormwater runoff that is mitigated by proposed onsite stormwater infiltration devices.



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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Summer Calculations					
Watershed	Proposed Conditions WS-2					
Area (acres)	42.4	Elevation (ft)	6645	Return Period (years)	100	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	500	0.27	0.4			12.63
Collector 1	1853	0.33	0.1	28.2	15	3.12
Collector 2	1344	0.05	0.04	33.7	15	2.30
Collector 3	707	0.01	0.025	38.1	1	1.09
Total Response Time (minutes)						19.15
Unit Peak Flow (cfs/acre)						1.55
Infiltration Rate (in/hr)					0.26	
Infiltration Factor (cfs/acre)					0.32	
Percent Impervious					18.2	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>49.02</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5. Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4 "Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and Streets and Roads (A = 0.07, B = 0.06).

\* The last collector area assumes a 50% reduction in the proposed development area due to stormwater runoff that is mitigated by proposed onsite stormwater infiltration devices.

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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Summer Calculations					
Watershed	Proposed Conditions WS-3					
Area (acres)	10.0	Elevation (ft)	6593	Return Period (years)	100	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	500	0.18	0.4			14.36
Collector 1	1647	0.30	0.1	8.6	15	3.86
Collector 2	581	0.07	0.11	9.2	1	1.52
Collector 3						
Total Response Time (minutes)						19.74
Unit Peak Flow (cfs/acre)						1.50
Infiltration Rate (in/hr)					0.27	
Infiltration Factor (cfs/acre)					0.33	
Percent Impervious					11.5	
Watershed Peak Flow (cfs): Area x Unit Peak Flow-(1-Percent Impervious) x Area x Infiltration Factor						<b>11.12</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5. Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4 "Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and Streets and Roads (A = 0.07, B = 0.06).

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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Summer Calculations					
Watershed	Proposed Conditions WS-4					
Area (acres)	67.4	Elevation (ft)	6652	Return Period (years)	100	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	500	0.18	0.4			14.26
Collector 1	2448	0.26	0.1	57.5	15	3.81
Collector 2	1456	0.04	0.02	64.8	3	0.93
Collector 3						
Total Response Time (minutes)						19.00
Unit Peak Flow (cfs/acre)						1.58
Infiltration Rate (in/hr)					0.51	
Infiltration Factor (cfs/acre)					0.62	
Percent Impervious					7.6	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>65.34</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5. Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4 "Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and Streets and Roads (A = 0.07, B = 0.06).

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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Summer Calculations					
Watershed	Proposed Conditions WS-5					
Area (acres)	5.4	Elevation (ft)	7408	Return Period (years)	100	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	500	0.19	0.4			14.04
Collector 1	631	0.22	0.1	4.8	3	1.32
Collector 2						
Collector 3						
Total Response Time (minutes)						15.36
Unit Peak Flow (cfs/acre)						1.75
Infiltration Rate (in/hr)					0.22	
Infiltration Factor (cfs/acre)					0.26	
Percent Impervious					20.4	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>7.47</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5. Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4 "Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and Streets and Roads (A = 0.07, B = 0.06).

\* The last collector area assumes a 50% reduction in the proposed development area due to stormwater runoff that is mitigated by proposed onsite stormwater infiltration devices.



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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Summer Calculations					
Watershed	Proposed Conditions WS-6					
Area (acres)	2.2	Elevation (ft)	7565	Return Period (years)	100	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	180	0.32	0.4			6.52
Collector 1	376	0.30	0.22	2.2	3	1.54
Collector 2						
Collector 3						
Total Response Time (minutes)						8.06
Unit Peak Flow (cfs/acre)						2.50
Infiltration Rate (in/hr)					0.23	
Infiltration Factor (cfs/acre)					0.28	
Percent Impervious					5.9	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>5.00</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5. Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4 "Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and Streets and Roads (A = 0.07, B = 0.06).

\* The last collector area assumes a 50% reduction in the proposed development area due to stormwater runoff that is mitigated by proposed onsite stormwater infiltration devices.

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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Summer Calculations					
Watershed	Proposed Conditions WS-7					
Area (acres)	145.7	Elevation (ft)	7465	Return Period (years)	100	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	500	0.18	0.4			14.26
Collector 1	4308	0.27	0.1	145.7	15	5.24
Collector 2						
Collector 3						
Total Response Time (minutes)						19.50
Unit Peak Flow (cfs/acre)						1.70
Infiltration Rate (in/hr)					0.28	
Infiltration Factor (cfs/acre)					0.33	
Percent Impervious					1.2	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>199.91</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5. Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4 "Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and Streets and Roads (A = 0.07, B = 0.06).

Winter



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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Winter Calculations					
Watershed	Existing Conditions WS-1					
Area (acres)	28.3	Elevation (ft)	6702	Return Period (years)	10	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	516	0.23	0.4			13.46
Collector 1	1942	0.38	0.1	20.7	15	3.36
Collector 2	369	0.18	0.05	25.3	15	0.48
Collector 3	221	0.02	0.05	28.3	1	0.37
Total Response Time (minutes)						17.67
Unit Peak Flow (cfs/acre)						0.91
Infiltration Rate (in/hr)					0.17	
Infiltration Factor (cfs/acre)					0.21	
Percent Impervious					90	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>25.12</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5.  
Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4  
"Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for  
Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and  
Streets and Roads (A = 0.07, B = 0.06).

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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Winter Calculations					
Watershed	Existing Conditions WS-2					
Area (acres)	42.4	Elevation (ft)	6645	Return Period (years)	10	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	500	0.27	0.4			12.63
Collector 1	1853	0.33	0.1	28.2	15	3.12
Collector 2	824	0.07	0.1	37.3	3	1.56
Collector 3	305	0.01	0.05	42.4	1	0.56
Collector 4						
Total Response Time (minutes)						17.88
Unit Peak Flow (cfs/acre)						0.91
Infiltration Rate (in/hr)					0.23	
Infiltration Factor (cfs/acre)					0	
Percent Impervious					90	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>37.38</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5. Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4 "Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and Streets and Roads (A = 0.07, B = 0.06).



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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Winter Calculations					
Watershed	Existing Conditions WS-3					
Area (acres)	10.0	Elevation (ft)	6593	Return Period (years)	10	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	500	0.18	0.4			14.36
Collector 1	1715	0.30	0.1	8.6	15	4.05
Collector 2	280	0.12	0.02	10.0	3	0.18
Collector 3						
Total Response Time (minutes)						18.60
Unit Peak Flow (cfs/acre)						0.91
Infiltration Rate (in/hr)					0.34	
Infiltration Factor (cfs/acre)					0.41	
Percent Impervious					90	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>8.72</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5.  
Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4  
"Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for  
Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and  
Streets and Roads (A = 0.07, B = 0.06).



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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Winter Calculations					
Watershed	Existing Conditions WS-4					
Area (acres)	67.4	Elevation (ft)	6652	Return Period (years)	10	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	500	0.18	0.4			14.26
Collector 1	2448	0.26	0.1	57.5	15	3.81
Collector 2	1456	0.04	0.02	67.4	3	0.92
Collector 3						
Total Response Time (minutes)						18.99
Unit Peak Flow (cfs/acre)						0.90
Infiltration Rate (in/hr)					0.51	
Infiltration Factor (cfs/acre)					0.62	
Percent Impervious					90	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>56.45</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5.  
Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4  
"Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for  
Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and  
Streets and Roads (A = 0.07, B = 0.06).

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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Winter Calculations					
Watershed	Existing Conditions WS-5					
Area (acres)	5.4	Elevation (ft)	7408	Return Period (years)	10	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	500	0.19	0.4			14.04
Collector 1	616	0.23	0.1	5.4	15	1.81
Collector 2						
Collector 3						
Total Response Time (minutes)						15.85
Unit Peak Flow (cfs/acre)						1.10
Infiltration Rate (in/hr)					0.26	
Infiltration Factor (cfs/acre)					0.31	
Percent Impervious					90	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>5.79</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5.  
Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4  
"Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for  
Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and  
Streets and Roads (A = 0.07, B = 0.06).



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Reno, Nevada 89509

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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

90	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Winter Calculations					
Watershed	Existing Conditions WS-6					
Area (acres)	2.2	Elevation (ft)	7565	Return Period (years)	10	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	100	0.30	0.4			4.66
Collector 1	401	0.07	0.1	2.2	15	2.32
Collector 2						
Collector 3						
Total Response Time (minutes)						6.98
Unit Peak Flow (cfs/acre)						1.50
Infiltration Rate (in/hr)						0.26
Infiltration Factor (cfs/acre)						0.31
Percent Impervious						90
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>3.28</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5.  
Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4  
"Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for  
Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and  
Streets and Roads (A = 0.07, B = 0.06).

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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Winter Calculations					
Watershed	Existing Conditions WS-7					
Area (acres)	145.7	Elevation (ft)	7465	Return Period (years)	10	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	500	0.18	0.4			14.26
Collector 1	4308	0.27	0.1	145.7	15	5.24
Collector 2						
Collector 3						
Total Response Time (minutes)						19.50
Unit Peak Flow (cfs/acre)						1.00
Infiltration Rate (in/hr)					0.28	
Infiltration Factor (cfs/acre)					0.33	
Percent Impervious					90	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>140.82</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5. Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4 "Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and Streets and Roads (A = 0.07, B = 0.06).



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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Winter Calculations					
Watershed	Proposed Conditions WS-1					
Area (acres)	28.3	Elevation (ft)	6702	Return Period (years)	10	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	516	0.23	0.4			13.46
Collector 1	1942	0.38	0.1	20.7	15	3.36
Collector 2	1051	0.06	0.025	24.5	1	0.74
Collector 3						
Total Response Time (minutes)						17.56
Unit Peak Flow (cfs/acre)						0.91
Infiltration Rate (in/hr)					0.15	
Infiltration Factor (cfs/acre)					0.18	
Percent Impervious					90	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>21.87</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5.  
Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4  
"Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for  
Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and  
Streets and Roads (A = 0.07, B = 0.06).

\* The last collector area assumes a 50% reduction in the proposed development area due to stormwater runoff that is mitigated by proposed onsite stormwater infiltration devices.

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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Winter Calculations					
Watershed	Proposed Conditions WS-2					
Area (acres)	42.4	Elevation (ft)	6645	Return Period (years)	10	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	500	0.27	0.4			12.63
Collector 1	1853	0.33	0.1	28.2	15	3.12
Collector 2	1344	0.05	0.04	33.7	15	2.30
Collector 3	707	0.01	0.025	38.1	1	1.09
Total Response Time (minutes)						19.15
Unit Peak Flow (cfs/acre)						0.89
Infiltration Rate (in/hr)					0.26	
Infiltration Factor (cfs/acre)					0.32	
Percent Impervious					90	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>32.65</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5. Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4 "Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and Streets and Roads (A = 0.07, B = 0.06).

\* The last collector area assumes a 50% reduction in the proposed development area due to stormwater runoff that is mitigated by proposed onsite stormwater infiltration devices.



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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Winter Calculations					
Watershed	Proposed Conditions WS-3					
Area (acres)	10.0	Elevation (ft)	6593	Return Period (years)	10	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	500	0.18	0.4			14.36
Collector 1	1647	0.30	0.1	8.6	15	3.86
Collector 2	581	0.07	0.11	9.2	1	1.52
Collector 3						
Total Response Time (minutes)						19.74
Unit Peak Flow (cfs/acre)						0.89
Infiltration Rate (in/hr)					0.27	
Infiltration Factor (cfs/acre)					0.33	
Percent Impervious					90	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>7.91</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5. Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4 "Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and Streets and Roads (A = 0.07, B = 0.06).

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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Winter Calculations					
Watershed	Proposed Conditions WS-4					
Area (acres)	67.4	Elevation (ft)	6652	Return Period (years)	10	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	500	0.18	0.4			14.26
Collector 1	2448	0.26	0.1	57.5	15	3.81
Collector 2	1456	0.04	0.02	64.8	3	0.93
Collector 3						
Total Response Time (minutes)						19.00
Unit Peak Flow (cfs/acre)						0.90
Infiltration Rate (in/hr)					0.51	
Infiltration Factor (cfs/acre)					0.62	
Percent Impervious					90	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>54.34</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5. Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4 "Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and Streets and Roads (A = 0.07, B = 0.06).

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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Winter Calculations					
Watershed	Proposed Conditions WS-5					
Area (acres)	5.4	Elevation (ft)	7408	Return Period (years)	10	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	500	0.19	0.4			14.04
Collector 1	631	0.22	0.1	4.8	3	1.32
Collector 2						
Collector 3						
Total Response Time (minutes)						15.36
Unit Peak Flow (cfs/acre)						1.10
Infiltration Rate (in/hr)					0.22	
Infiltration Factor (cfs/acre)					0.26	
Percent Impervious					90	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>5.20</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5. Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4 "Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and Streets and Roads (A = 0.07, B = 0.06).

\* The last collector area assumes a 50% reduction in the proposed development area due to stormwater runoff that is mitigated by proposed onsite stormwater infiltration devices.



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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Winter Calculations					
Watershed	Proposed Conditions WS-6					
Area (acres)	2.2	Elevation (ft)	7565	Return Period (years)	10	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	180	0.32	0.4			6.52
Collector 1	376	0.30	0.22	2.2	3	1.54
Collector 2						
Collector 3						
Total Response Time (minutes)						8.06
Unit Peak Flow (cfs/acre)						1.45
Infiltration Rate (in/hr)					0.23	
Infiltration Factor (cfs/acre)					0.28	
Percent Impervious					90	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>3.18</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5. Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4 "Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and Streets and Roads (A = 0.07, B = 0.06).

\* The last collector area assumes a 50% reduction in the proposed development area due to stormwater runoff that is mitigated by proposed onsite stormwater infiltration devices.



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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Winter Calculations					
Watershed	Proposed Conditions WS-7					
Area (acres)	145.7	Elevation (ft)	7465	Return Period (years)	10	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	500	0.18	0.4			14.26
Collector 1	4308	0.27	0.1	145.7	15	5.24
Collector 2						
Collector 3						
Total Response Time (minutes)						19.50
Unit Peak Flow (cfs/acre)						1.00
Infiltration Rate (in/hr)					0.28	
Infiltration Factor (cfs/acre)					0.33	
Percent Impervious					90	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>140.86</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5.  
Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4  
"Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for  
Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and  
Streets and Roads (A = 0.07, B = 0.06).

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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Winter Calculations					
Watershed	Existing Conditions WS-1					
Area (acres)	28.3	Elevation (ft)	6702	Return Period (years)	100	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	516	0.23	0.4			13.46
Collector 1	1942	0.38	0.1	20.7	15	3.36
Collector 2	369	0.18	0.05	25.3	15	0.48
Collector 3	221	0.02	0.05	28.3	1	0.37
Total Response Time (minutes)						17.67
Unit Peak Flow (cfs/acre)						1.65
Infiltration Rate (in/hr)					0.17	
Infiltration Factor (cfs/acre)					0.21	
Percent Impervious					90	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>46.03</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5.  
Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4  
"Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for  
Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and  
Streets and Roads (A = 0.07, B = 0.06).



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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Winter Calculations					
Watershed	Existing Conditions WS-2					
Area (acres)	42.4	Elevation (ft)	6645	Return Period (years)	100	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	500	0.27	0.4			12.63
Collector 1	1853	0.33	0.1	28.2	15	3.12
Collector 2	824	0.07	0.1	37.3	3	1.56
Collector 3	305	0.01	0.05	42.4	1	0.56
Collector 4						
Total Response Time (minutes)						17.88
Unit Peak Flow (cfs/acre)						1.63
Infiltration Rate (in/hr)					0.23	
Infiltration Factor (cfs/acre)					0	
Percent Impervious					90	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						67.90

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5.  
Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4  
"Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for  
Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and  
Streets and Roads (A = 0.07, B = 0.06).

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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Winter Calculations					
Watershed	Existing Conditions WS-3					
Area (acres)	10.0	Elevation (ft)	6593	Return Period (years)	100	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	500	0.18	0.4			14.36
Collector 1	1715	0.30	0.1	8.6	15	4.05
Collector 2	280	0.12	0.02	10.0	3	0.18
Collector 3						
Total Response Time (minutes)						18.60
Unit Peak Flow (cfs/acre)						1.50
Infiltration Rate (in/hr)					0.34	
Infiltration Factor (cfs/acre)					0.41	
Percent Impervious					90	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>14.65</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5. Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4 "Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and Streets and Roads (A = 0.07, B = 0.06).



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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Winter Calculations					
Watershed	Existing Conditions WS-4					
Area (acres)	67.4	Elevation (ft)	6652	Return Period (years)	100	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	500	0.18	0.4			14.26
Collector 1	2448	0.26	0.1	57.5	15	3.81
Collector 2	1456	0.04	0.02	67.4	3	0.92
Collector 3						
Total Response Time (minutes)						18.99
Unit Peak Flow (cfs/acre)						1.55
Infiltration Rate (in/hr)					0.51	
Infiltration Factor (cfs/acre)					0.62	
Percent Impervious					90	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>100.25</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5. Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4 "Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and Streets and Roads (A = 0.07, B = 0.06).

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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Winter Calculations					
Watershed	Existing Conditions WS-5					
Area (acres)	5.4	Elevation (ft)	7408	Return Period (years)	100	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	500	0.19	0.4			14.04
Collector 1	616	0.23	0.1	5.4	15	1.81
Collector 2						
Collector 3						
Total Response Time (minutes)						15.85
Unit Peak Flow (cfs/acre)						1.90
Infiltration Rate (in/hr)					0.26	
Infiltration Factor (cfs/acre)					0.31	
Percent Impervious					90	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>10.13</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5.  
Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4  
"Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for  
Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and  
Streets and Roads (A = 0.07, B = 0.06).



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1885 S. Arlington Ave., Suite 111

Reno, Nevada 89509

(775) 329-4955

**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Winter Calculations					
Watershed	Existing Conditions WS-6					
Area (acres)	2.2	Elevation (ft)	7565	Return Period (years)	100	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	100	0.30	0.4			4.66
Collector 1	401	0.07	0.1	2.2	15	2.32
Collector 2						
Collector 3						
Total Response Time (minutes)						6.98
Unit Peak Flow (cfs/acre)						2.60
Infiltration Rate (in/hr)					0.26	
Infiltration Factor (cfs/acre)					0.31	
Percent Impervious					90	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>5.73</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5.  
Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4  
"Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for  
Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and  
Streets and Roads (A = 0.07, B = 0.06).

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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Winter Calculations					
Watershed	Existing Conditions WS-7					
Area (acres)	145.7	Elevation (ft)	7465	Return Period (years)	100	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	500	0.18	0.4			14.26
Collector 1	4308	0.27	0.1	145.7	15	5.24
Collector 2						
Collector 3						
Total Response Time (minutes)						19.50
Unit Peak Flow (cfs/acre)						1.70
Infiltration Rate (in/hr)					0.28	
Infiltration Factor (cfs/acre)					0.33	
Percent Impervious					90	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>242.81</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5.  
Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4  
"Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for  
Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and  
Streets and Roads (A = 0.07, B = 0.06).



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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Winter Calculations					
Watershed	Proposed Conditions WS-1					
Area (acres)	28.3	Elevation (ft)	6702	Return Period (years)	100	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	516	0.23	0.4			13.46
Collector 1	1942	0.38	0.1	20.7	15	3.36
Collector 2	1051	0.06	0.025	24.5	1	0.74
Collector 3						
Total Response Time (minutes)						17.56
Unit Peak Flow (cfs/acre)						1.65
Infiltration Rate (in/hr)						0.15
Infiltration Factor (cfs/acre)						0.18
Percent Impervious						90
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>40.02</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5. Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4 "Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and Streets and Roads (A = 0.07, B = 0.06).

\* The last collector area assumes a 50% reduction in the proposed development area due to stormwater runoff that is mitigated by proposed onsite stormwater infiltration devices.

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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Winter Calculations					
Watershed	Proposed Conditions WS-2					
Area (acres)	42.4	Elevation (ft)	6645	Return Period (years)	100	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	500	0.27	0.4			12.63
Collector 1	1853	0.33	0.1	28.2	15	3.12
Collector 2	1344	0.05	0.04	33.7	15	2.30
Collector 3	707	0.01	0.025	38.1	1	1.09
Total Response Time (minutes)						19.15
Unit Peak Flow (cfs/acre)						1.55
Infiltration Rate (in/hr)					0.26	
Infiltration Factor (cfs/acre)					0.32	
Percent Impervious					90	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>57.77</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5.  
Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4  
"Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for  
Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and  
Streets and Roads (A = 0.07, B = 0.06).

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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Winter Calculations					
Watershed	Proposed Conditions WS-3					
Area (acres)	10.0	Elevation (ft)	6593	Return Period (years)	100	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	500	0.18	0.4			14.36
Collector 1	1647	0.30	0.1	8.6	15	3.86
Collector 2	581	0.07	0.11	9.2	1	1.52
Collector 3						
Total Response Time (minutes)						19.74
Unit Peak Flow (cfs/acre)						1.45
Infiltration Rate (in/hr)					0.27	
Infiltration Factor (cfs/acre)					0.33	
Percent Impervious					90	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>13.08</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5. Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4 "Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and Streets and Roads (A = 0.07, B = 0.06).

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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Winter Calculations					
Watershed	Proposed Conditions WS-4					
Area (acres)	67.4	Elevation (ft)	6652	Return Period (years)	100	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	500	0.18	0.4			14.26
Collector 1	2448	0.26	0.1	57.5	15	3.81
Collector 2	1456	0.04	0.02	64.8	3	0.93
Collector 3						
Total Response Time (minutes)						19.00
Unit Peak Flow (cfs/acre)						1.58
Infiltration Rate (in/hr)					0.51	
Infiltration Factor (cfs/acre)					0.62	
Percent Impervious					90	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>98.43</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5. Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4 "Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and Streets and Roads (A = 0.07, B = 0.06).

\* The last collector area assumes a 50% reduction in the proposed development area due to stormwater runoff that is mitigated by proposed onsite stormwater infiltration devices.



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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Winter Calculations					
Watershed	Proposed Conditions WS-5					
Area (acres)	5.4	Elevation (ft)	7408	Return Period (years)	100	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	500	0.19	0.4			14.04
Collector 1	631	0.22	0.1	4.8	3	1.32
Collector 2						
Collector 3						
Total Response Time (minutes)						15.36
Unit Peak Flow (cfs/acre)						1.75
Infiltration Rate (in/hr)						0.22
Infiltration Factor (cfs/acre)						0.26
Percent Impervious						90
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>8.34</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5. Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4 "Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and Streets and Roads (A = 0.07, B = 0.06).

\* The last collector area assumes a 50% reduction in the proposed development area due to stormwater runoff that is mitigated by proposed onsite stormwater infiltration devices.

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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Winter Calculations					
Watershed	Proposed Conditions WS-6					
Area (acres)	2.2	Elevation (ft)	7565	Return Period (years)	100	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	180	0.32	0.4			6.52
Collector 1	376	0.30	0.22	2.2	3	1.54
Collector 2						
Collector 3						
Total Response Time (minutes)						8.06
Unit Peak Flow (cfs/acre)						2.50
Infiltration Rate (in/hr)					0.23	
Infiltration Factor (cfs/acre)					0.28	
Percent Impervious					90	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>5.52</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5. Woods with some Underbrush - Low = 0.4

2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4 "Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and Streets and Roads (A = 0.07, B = 0.06).

\* The last collector area assumes a 50% reduction in the proposed development area due to stormwater runoff that is mitigated by proposed onsite stormwater infiltration devices.



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**Placer County Flood Control and Water Conservation District  
Small Watershed Peak Flow Worksheet**

Date	7/29/2011					
Engineer	Jack Norberg					
Project	Homewood Mountain Resort - Winter Calculations					
Watershed	Proposed Conditions WS-7					
Area (acres)	145.7	Elevation (ft)	7465	Return Period (years)	100	
	Length (ft)	Slope (ft/ft)	Manning's n value	Contributing Area (acres)	Side Slope (ft/ft)	Response Time (minutes)
Overland Flow	500	0.18	0.4			14.26
Collector 1	4308	0.27	0.1	145.7	15	5.24
Collector 2						
Collector 3						
Total Response Time (minutes)						19.50
Unit Peak Flow (cfs/acre)						1.70
Infiltration Rate (in/hr)					0.28	
Infiltration Factor (cfs/acre)					0.33	
Percent Impervious					90	
Watershed Peak Flow (cfs): $\text{Area} \times \text{Unit Peak Flow} - (1 - \text{Percent Impervious}) \times \text{Area} \times \text{Infiltration Factor}$						<b>242.84</b>

1. Manning's n Values taken from Placer County, Storm Water Management Manual (SWMM), Table 5-5.  
Woods with some Underbrush - Low = 0.4

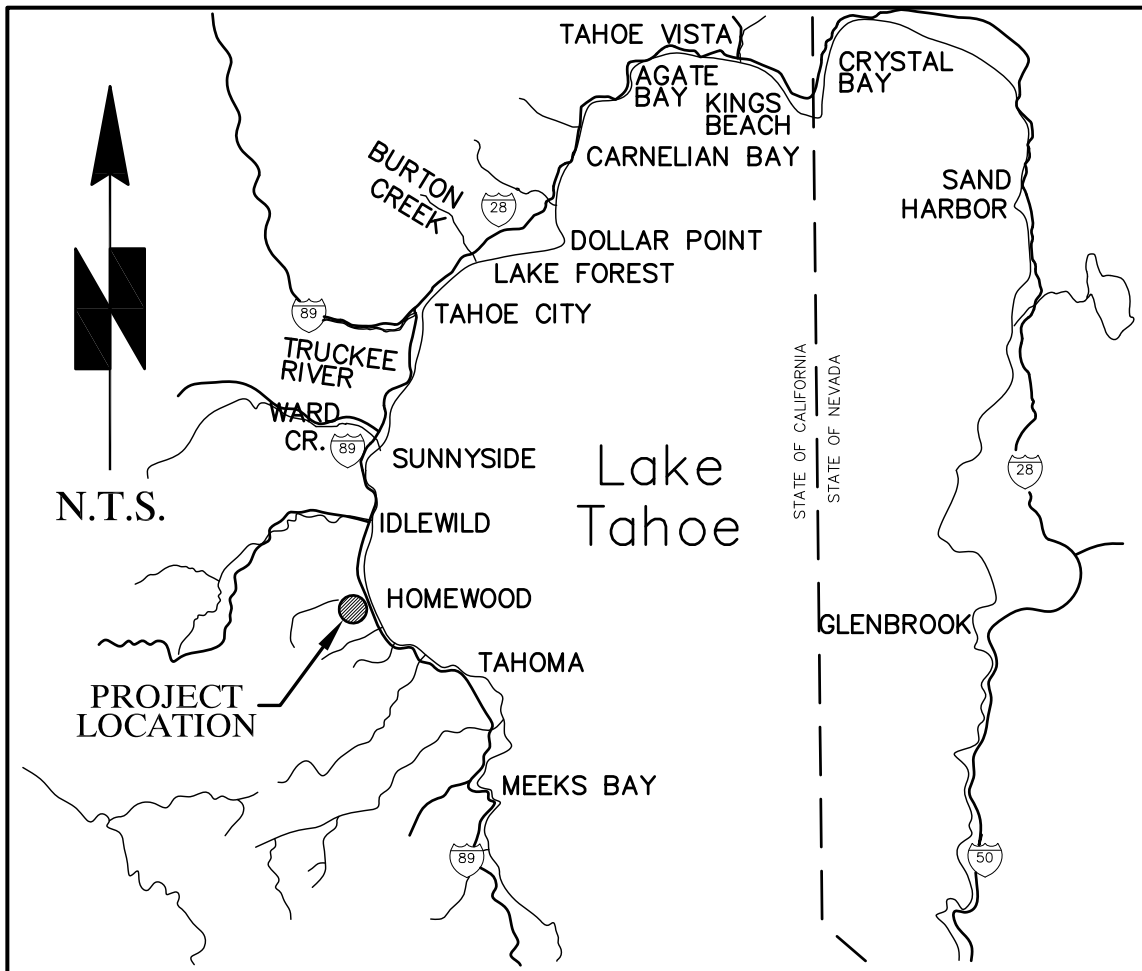
2. Percent Impervious taken from Placer County, Storm Water Management Manual (SWMM), Table 5-4  
"Snow Covered Areas" Elevation 6,500 feet East = 90%

3. Infiltration Rates taken from Placer County, Storm Water Management Manual (SWMM), Table 5-3, for  
Hydrologic Soil Groups with Good Woodland- Coniferous Cover (A = 0.53, B = 0.26, C = 0.15, D = 0.11) and  
Streets and Roads (A = 0.07, B = 0.06).

## Appendix C

### Figures





**VICINITY MAP**



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**VICINITY/SITE MAP  
HOMEWOOD MOUNTAIN RESORT  
PLACER COUNTY  
CALIFORNIA**

FIGURE

1

DRAWN  
CKC

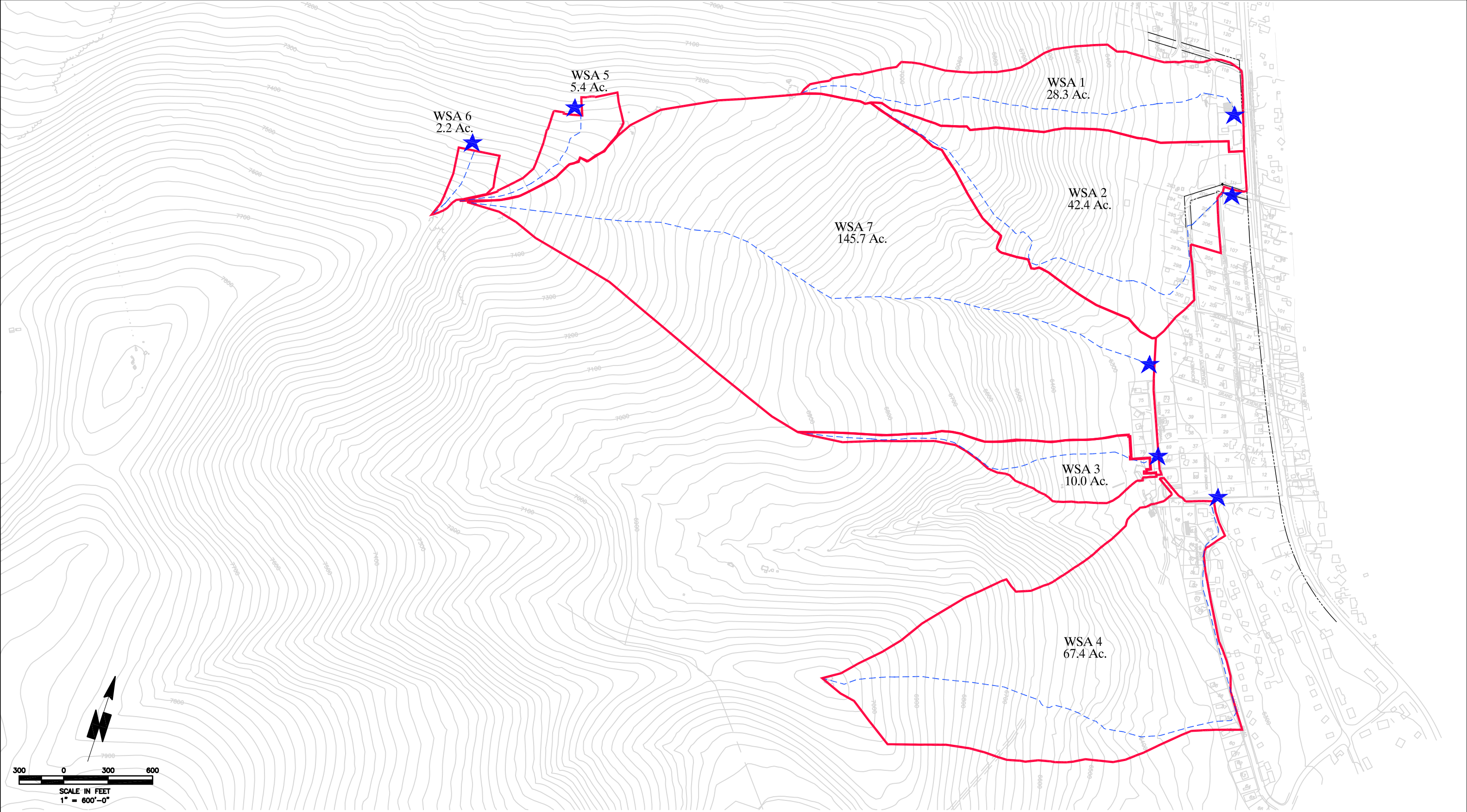
JOB NUMBER  
A514.02.14

APPROVED

DATE  
JULY 2011

REVISED

DATE

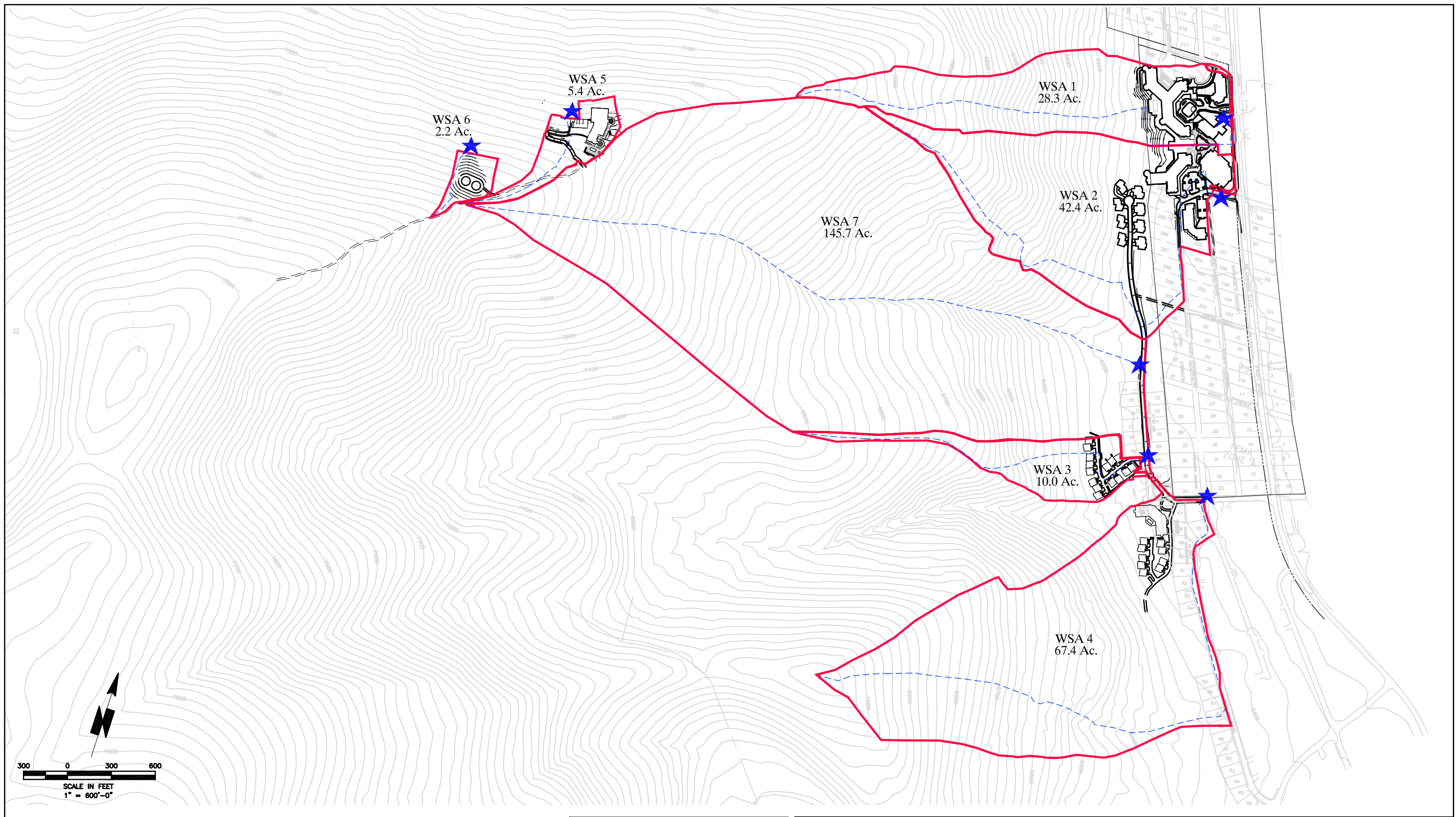


LEGEND

- FLOW PATH
- WATERSHED BOUNDARY
- ★ CONCENTRATION POINT

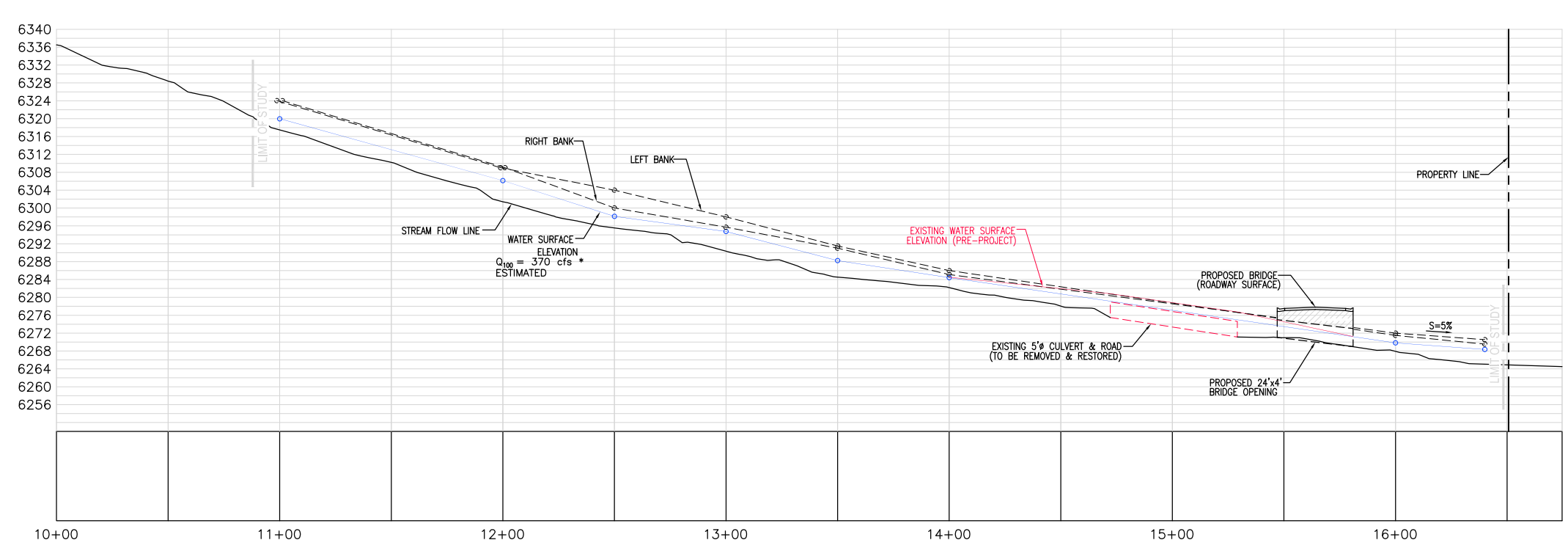
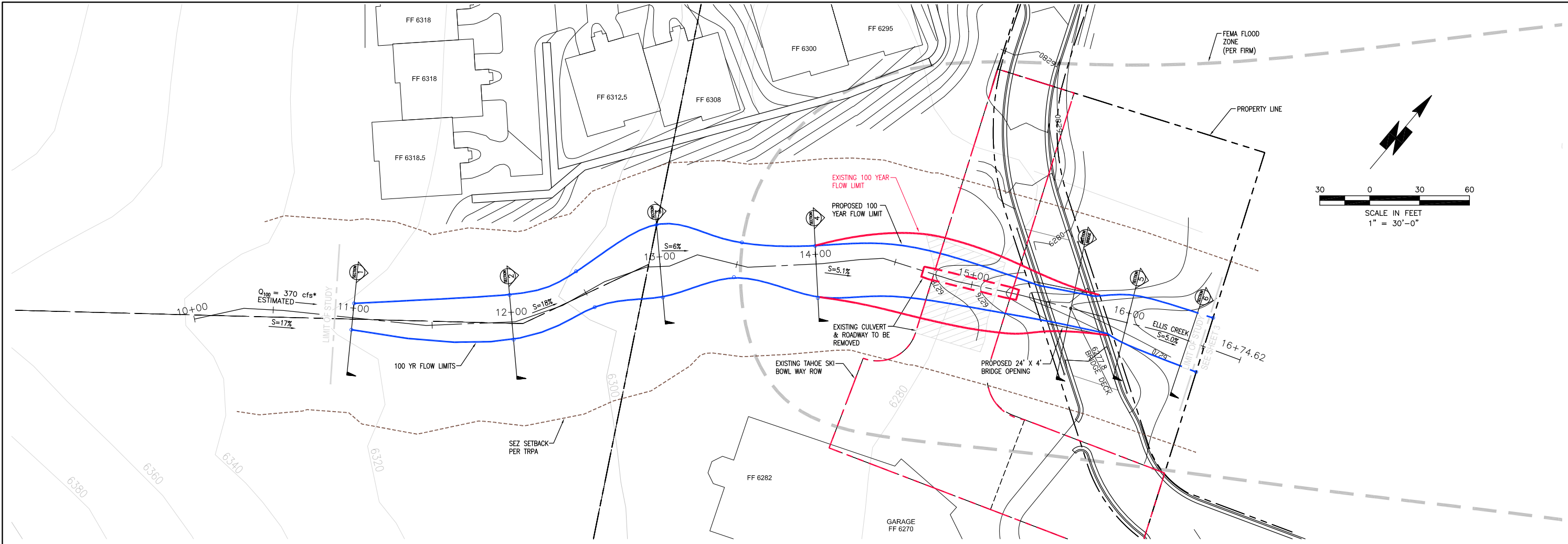
	<b>Nichols Consulting Engineers, Chtd.</b>	HOMEWOOD MOUNTAIN RESORT		SHEET
	1885 S. Arlington Ave., Suite 111	EXISTING CONDITIONS		2
	Reno, NV 89509	WATERSHED AREAS		
	(775) 329-4955			
DRAWN CKC	JOB NUMBER A514.02.14	APPROVED	DATE JULY 2011	REVISED DATE





LEGEND	
	FLOW PATH
	WATERSHED BOUNDARY
	CONCENTRATION POINT

	<b>Nichols Consulting Engineers, Chtd.</b>		HOMEWOOD MOUNTAIN RESORT		SHEET <b>3</b>
	1885 S. Arlington Ave., Suite 111		PROPOSED DEVELOPMENT		
	Reno, NV 89509		WATERSHED AREAS		
	(775) 329-4955				
	DRAWN CKC	JOB NUMBER A514.02.14	APPROVED	DATE JULY 2011	



NOTES  
100 YEAR PEAK FLOW ESTIMATED FROM COMPARISON WATERSHED (1997 FLOOD FOR WARD/BLACKWOOD CREEK AT 465 cfs/ONE SQUARE MILE OF WATERSHED AREA). THIS INFORMATION WAS PROVIDED BY PLACER COUNTY FLOOD CONTROL DISTRICT. TOTAL ESTIMATED WATERSHED AREA FOR HOMEWOOD CREEK CONTRIBUTING AT PROJECT DEVELOPMENT BOUNDARY IS 506 ACRES WHICH YIELDS AN ESTIMATED FLOW OF 370 cfs FOR THE PURPOSES OF THIS CHANNEL ANALYSIS.

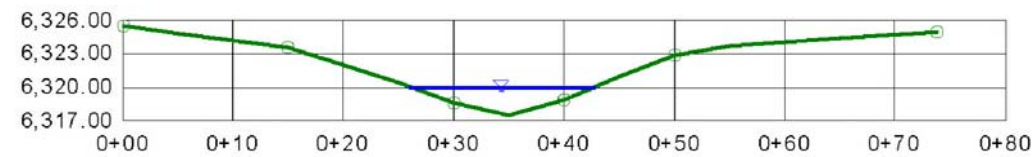
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DATE: \_\_\_\_\_

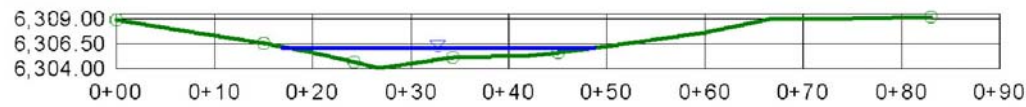
REVISIONS		DESIGNED: CKC		CHECKED: CKC	
No.	Date	No.	Date	No.	Date
Nichols Consulting Engineers, Chtd. Engineering & Environmental Services 1885 S. Arlington Ave., Suite #111 Reno, NV 89509 Ph: (775) 329-0855 Fax: (775) 329-5098					
HOMEWOOD VILLAGE RESORTS, LLC					
HOMEWOOD VILLAGE RESORTS, LLC P.O. BOX 3938 TRUCKEE, CALIFORNIA 96160					
SOUTH BASE ELLIS CREEK CHANNEL PLAN & PROFILE					
SHEET 1 OF 3					





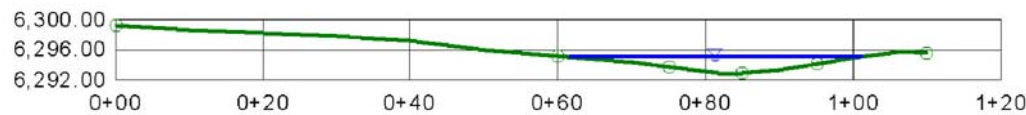
CHANNEL CROSS SECTION - STA: 11+00  
MAX. WATER SURFACE ELEV: 6319.97  
MAX. WATER VELOCITY: 15.91 ft/s  
Q<sub>100</sub>=370 CFS

SECTION 1



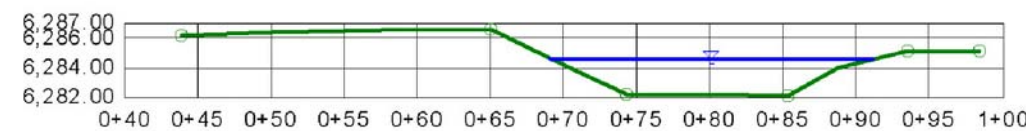
CHANNEL CROSS SECTION - STA: 12+00  
MAX. WATER SURFACE ELEV: 6306.14  
MAX. WATER VELOCITY: 12.11 ft/s  
Q<sub>100</sub>=370 CFS

SECTION 2



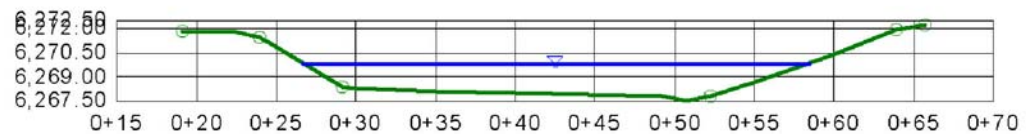
CHANNEL CROSS SECTION - STA: 13+00  
MAX. WATER SURFACE ELEV: 6295.04  
MAX. WATER VELOCITY: 7.85 ft/s  
Q<sub>100</sub>=370 CFS

SECTION 3



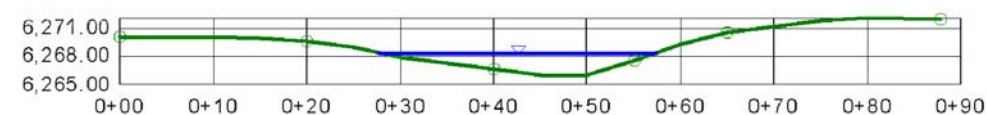
CHANNEL CROSS SECTION - STA: 14+00  
MAX. WATER SURFACE ELEV: 6284.57  
MAX. WATER VELOCITY: 9.59 ft/s  
Q<sub>100</sub>=370 CFS

SECTION 4



CHANNEL CROSS SECTION - STA: 15+00  
MAX. WATER SURFACE ELEV: 6269.82  
MAX. WATER VELOCITY: 7.16 ft/s  
Q<sub>100</sub>=370 CFS

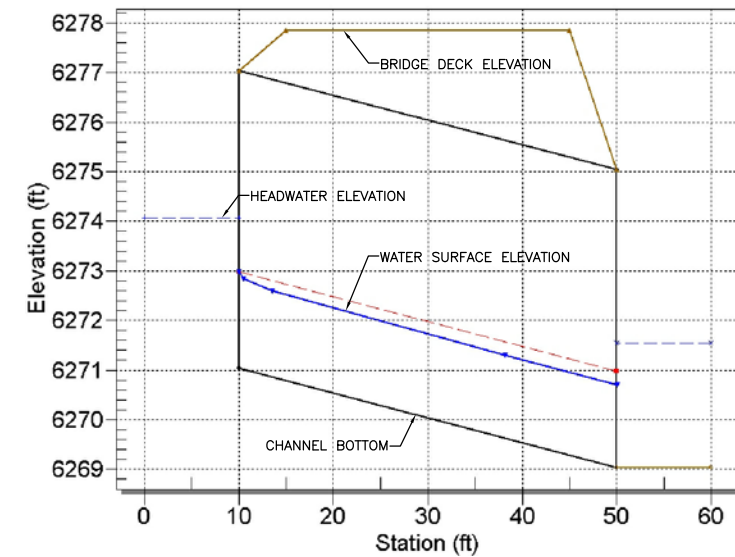
SECTION 5



CHANNEL CROSS SECTION - STA: 16+40  
MAX. WATER SURFACE ELEV: 6268.35  
MAX. WATER VELOCITY: 8.52 ft/s  
Q<sub>100</sub>=370 CFS

SECTION 6

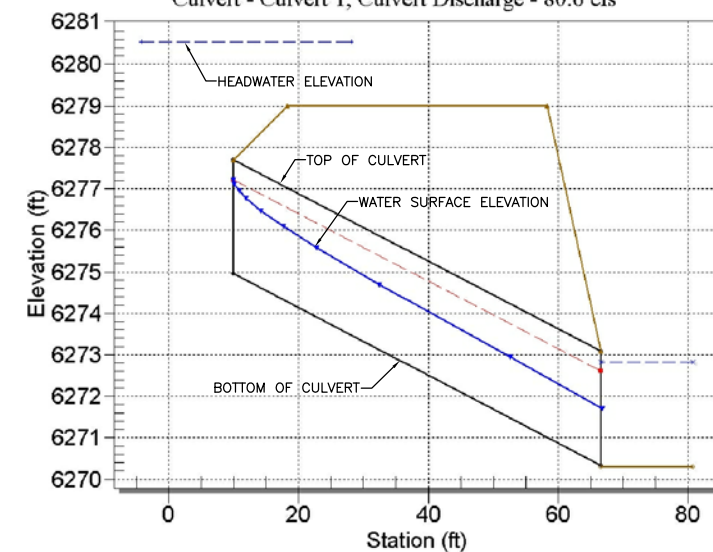
Crossing - Proposed Homewood Bridge (bottomless), Design Discharge - 370.0 cfs



CHANNEL CROSS SECTION AT PROPOSED BRIDGE  
HEADWATER ELEV: 6274.02  
OUTLET VELOCITY: 9.26 ft/s  
TAILWATER VELOCITY: 8.46 ft/s  
Q<sub>100</sub>=370 CFS

SECTION BRIDGE

Crossing - Ex Homewood Creek, Design Discharge - 370.0 cfs  
Culvert - Culvert 1, Culvert Discharge - 80.6 cfs



CHANNEL CROSS SECTION AT EXISTING CULVERT  
HEADWATER ELEV: 6280.54  
OUTLET VELOCITY: 15.919 ft/s  
TAILWATER VELOCITY: 10.664 ft/s  
Q<sub>100</sub>=370 CFS

SECTION CULVERT

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DATE: \_\_\_\_\_

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SHEET 2 OF 3

SOUTH BASE  
STREAM DAYLIGHTING  
CROSS SECTIONS

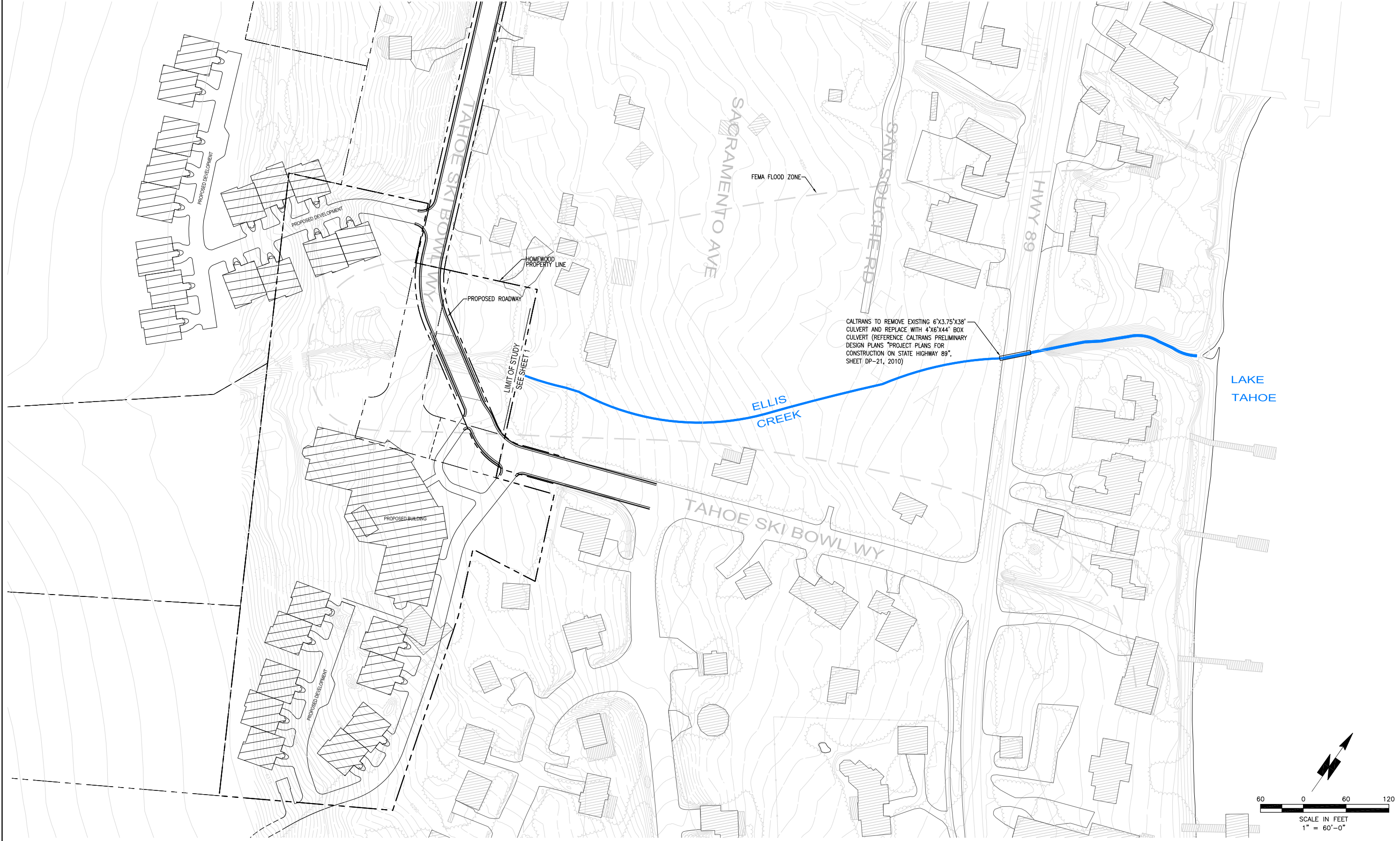
HOMWOOD VILLAGE RESORTS, LLC  
HOMWOOD VILLAGE RESORTS, LLC  
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TRUCKEE, CALIFORNIA 96160

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REVISIONS

DESIGNED: CKC  
DRAWN: CKC  
CHECKED: CKC  
JOB No: AS14.02.14  
SCALE: AS NOTED  
DATE: 07/29/2011

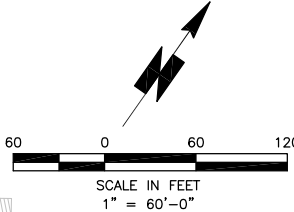
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No.: \_\_\_\_\_




NOTE  
MAPPING & TOPO BY TRISTATE SURVEYING LTD.

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DATE: 07/29/2011



DATE: \_\_\_\_\_

SOUTH BASE ELLIS CREEK AREA MAPPING	HOMEWOOD VILLAGE RESORTS, LLC  HOMEWOOD VILLAGE RESORTS, LLC P.O. BOX 3938 TRUCKEE, CALIFORNIA 96160	 <b>Nichols Consulting Engineers, Chtd.</b> Engineering & Environmental Services 1885 S. Adington Ave., Suite #111 Reno, NV 89509 Ph: (775) 329-0955 Fax: (775) 329-5098	DESIGNED: <b>CKC</b>	REVISIONS			
			DRAWN: <b>CKC</b>	No.	Date	CHKD	APPD
			CHECKED: <b>AS</b>				
			JOB No: <b>AS14.02.14</b>				
			SCALE: <b>AS NOTED</b>				
			DATE: <b>07/29/2011</b>				



## Appendix D

### Ellis Creek Channel Analysis

**Table 1 - Summary of Culvert Flows at Crossing: Proposed Homewood Bridge**

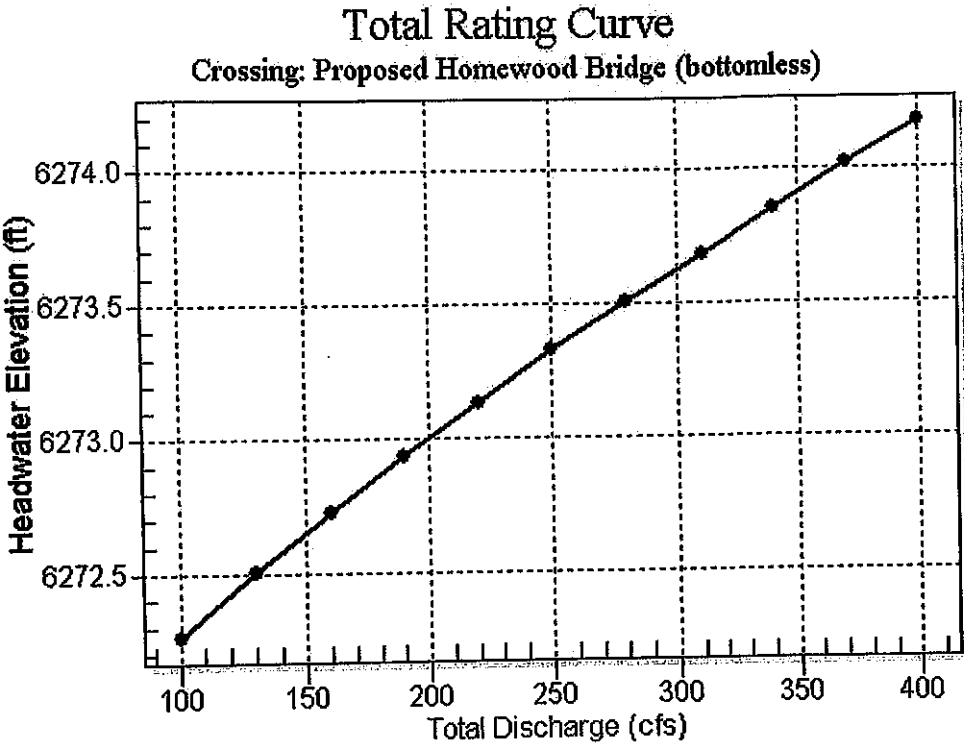
Headwater Elevation (ft)	Total Discharge (cfs)	Prop. Culvert Discharge (cfs)	Roadway Discharge (cfs)	Iterations
6272.27	100.00	100.00	0.00	1
6272.51	130.00	130.00	0.00	1
6272.73	160.00	160.00	0.00	1
6272.94	190.00	190.00	0.00	1
6273.14	220.00	220.00	0.00	1
6273.33	250.00	250.00	0.00	1
6273.51	280.00	280.00	0.00	1
6273.68	310.00	310.00	0.00	1
6273.85	340.00	340.00	0.00	1
6274.02	370.00	370.00	0.00	1
6274.18	400.00	400.00	0.00	1
6277.80	1114.98	1114.98	0.00	Overtopping



**Table 2 - Culvert Summary Table: Prop. Culvert**

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
100.00	100.00	6272.27	1.265	0.0*	1-S2n	0.732	0.790	0.740	1.388	5.628	6.034
130.00	130.00	6272.51	1.506	0.0*	1-S2n	0.855	0.945	0.875	1.567	6.185	6.461
160.00	160.00	6272.73	1.727	0.0*	1-S2n	0.978	1.100	0.990	1.723	6.726	6.819
190.00	190.00	6272.94	1.936	0.0*	1-S2n	1.101	1.243	1.103	1.862	7.172	7.128
220.00	220.00	6273.14	2.136	0.0*	1-S2n	1.217	1.363	1.222	1.989	7.499	7.402
250.00	250.00	6273.33	2.327	0.0*	1-S2n	1.305	1.482	1.305	2.105	7.977	7.649
280.00	280.00	6273.51	2.509	0.0*	1-S2n	1.393	1.602	1.401	2.213	8.324	7.874
310.00	310.00	6273.68	2.684	0.0*	1-S2n	1.481	1.722	1.482	2.315	8.715	8.081
340.00	340.00	6273.85	2.855	0.0*	1-S2n	1.570	1.835	1.575	2.410	8.994	8.274
370.00	370.00	6274.02	3.021	0.0*	1-S2n	1.658	1.936	1.665	2.500	9.260	8.455
400.00	400.00	6274.18	3.179	0.0*	1-S2n	1.746	2.036	1.746	2.587	9.543	8.623

Rating Curve Plot for Crossing: Proposed Homewood Bridge (bottomless)

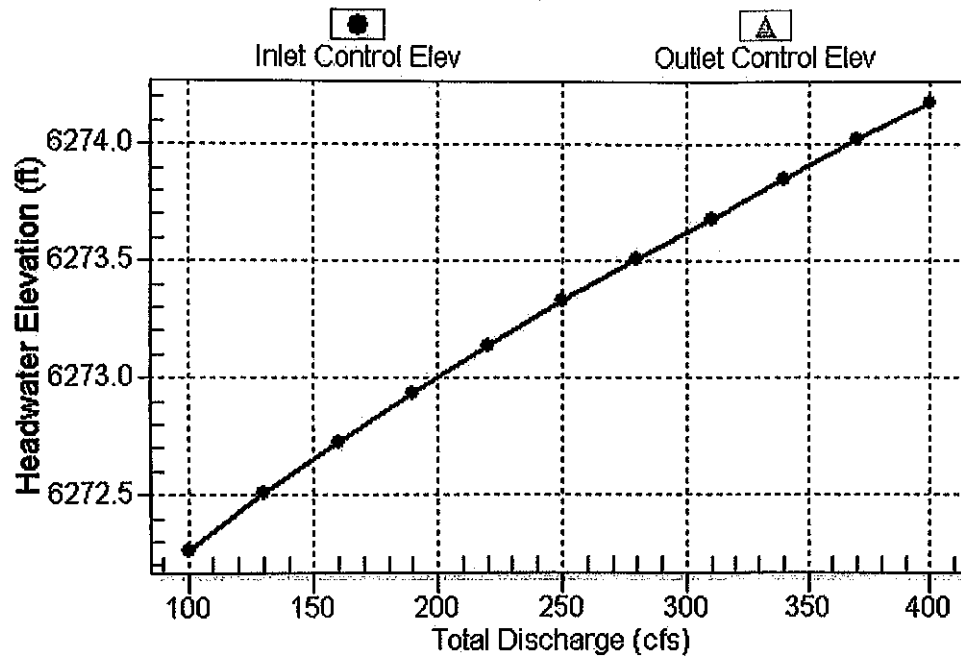




Culvert Performance Curve Plot: Prop. Culvert

Performance Curve

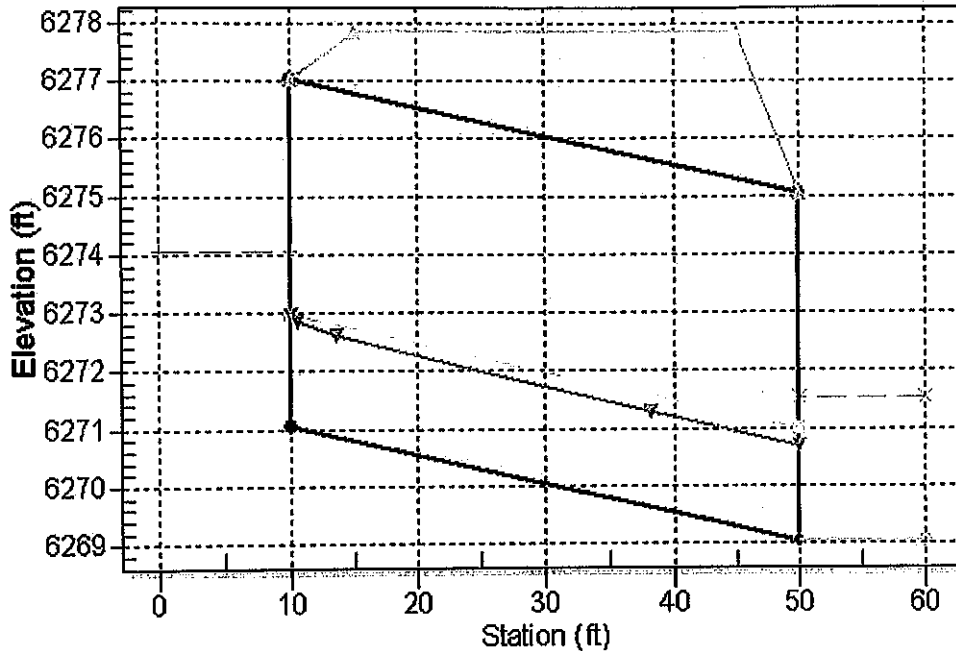
Culvert: Prop. Culvert



### Water Surface Profile Plot for Culvert: Prop. Culvert

Crossing - Proposed Homewood Bridge (bottomless), Design Discharge - 370.0 cfs

Culvert - Prop. Culvert, Culvert Discharge - 370.0 cfs



### Site Data - Prop. Culvert

Site Data Option: Culvert Invert Data

Inlet Station: 10.00 ft

Inlet Elevation: 6271.00 ft

Outlet Station: 50.00 ft

Outlet Elevation: 6269.00 ft

Number of Barrels: 1

### Culvert Data Summary - Prop. Culvert

Barrel Shape: Arch-Box, Concrete

Barrel Span: 24.00 ft

Barrel Rise: 6.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0150 (top and sides)

Manning's n: 0.0500 (bottom)

Inlet Type: Conventional

Inlet Edge Condition: Square Edge with Headwall

Inlet Depression: NONE



**Table 3 - Downstream Channel Rating Curve (Crossing: Proposed Homewood**

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
100.00	6270.39	1.39	6.03	4.33	1.13
130.00	6270.57	1.57	6.46	4.89	1.15
160.00	6270.72	1.72	6.82	5.38	1.17
190.00	6270.86	1.86	7.13	5.81	1.18
220.00	6270.99	1.99	7.40	6.21	1.19
250.00	6271.11	2.11	7.65	6.57	1.20
280.00	6271.21	2.21	7.87	6.91	1.21
310.00	6271.31	2.31	8.08	7.22	1.22
340.00	6271.41	2.41	8.27	7.52	1.23
370.00	6271.50	2.50	8.45	7.80	1.23
400.00	6271.59	2.59	8.62	8.07	1.24

**Tailwater Channel Data - Proposed Homewood Bridge (bottomless)**

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 5.00 ft

Side Slope (H:V): 5.00 (1:1)

Channel Slope: 0.0500

Channel Manning's n: 0.0500

Channel Invert Elevation: 6269.00 ft

**Roadway Data for Crossing: Proposed Homewood Bridge (bottomless)**

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 25.00 ft

Crest Elevation: 6277.80 ft

Roadway Surface: Paved

Roadway Top Width: 30.00 ft



# Crossing: Proposed Homewood Bridge (bottomless), Culvert: Prop. Culvert

Front View (Not to scale)

