

APPENDIX 13.0
PRELIMINARY DRAINAGE REPORT

NORTHSTAR CALIFORNIA
NORTHSTAR MOUNTAIN MASTER PLAN

**DRAFT
PRELIMINARY
DRAINAGE REPORT**

JUNE 2013

**AUERBACH ENGINEERING
CORPORATION**

DRAFT PRELIMINARY DRAINAGE REPORT

NORTHSTAR AT TAHOE
NMMP PROJECT
DRAFT PRELIMINARY DRAINAGE REPORT

TABLE OF CONTENTS

PAGE No.

1.0 Introduction 1

 1.1 Purpose 1

 1.2 Site Description..... 1

 1.3 Project Description..... 1

2.0 Existing Conditions 3

 2.1 Regional..... 3

 2.2 Existing Drainage Conditions..... 4

3.0 Hydrologic and Hydraulic Design Criteria 8

 3.1 Precipitation and Snowmelt 8

 3.2 Placer County Design Criteria 9

 3.3 RWQCB – Lahontan Criteria 9

4.0 Proposed Drainage Design..... 10

 4.1 Overview..... 10

 4.2 Developed Drainage Conditions 10

 4.3 HEC-1 Analysis Results..... 10

 4.4 Water Quality Treatment Systems..... 13

 4.4.1 Permanent BMP’s..... 13

 4.4.2 Construction BMP’s 13

5.0 100-Year Floodplain Analysis 13

6.0 Summary 15

Appendix 29

DRAFT PRELIMINARY DRAINAGE REPORT

NORTHSTAR AT TAHOE
NMMP PROJECT
DRAFT PRELIMINARY DRAINAGE REPORT

LIST OF FIGURES

PAGE No.

Figure 1.1	Project Location	16
Figure 1.2	Watershed Map	17
Figure 1.3	Existing Watersheds / Drainage Basins.....	18
Figure 1.4	Not Used.....	19
Figure 1.5	Proposed Watersheds / Drainage Basins.....	20
Figure 1.6	Model Schematic Watershed No. 1	21
Figure 1.7	Model Schematic Watershed No. 2	22
Figure 1.8	Model Schematic Watershed No. 3	23
Figure 1.9	Floodplain Map	24
Figure 1.10	Floodplain Section A-A & B-B.....	25
Figure 1.11	Floodplain Section C-C & D-D	26
Figure 1.12	Floodplain Section E-E & F-F	27
Figure 1.13	Floodplain Section G-G & H-H.....	28
Figure 1.14	Floodplain Section I-I & J-J.....	29

DRAFT PRELIMINARY DRAINAGE REPORT

NORTHSTAR AT TAHOE
NMMP PROJECT
DRAFT PRELIMINARY DRAINAGE REPORT

LIST OF TABLES

PAGE NO.

Table 1.1 Watersheds / Drainage Basins 8
Table 1.2 HEC-1 Results 12
Table 1.3 Floodplain Calculations 15
Table 1.4 Watershed Flow Comparisons 31

DRAFT PRELIMINARY DRAINAGE REPORT**1.0 INTRODUCTION**

This Preliminary Drainage Report is intended for submission with the Environmental Impact Report (EIR) that is being completed by others for the Northstar Mountain Master Plan (NMMP) Project (Project). The Report has been prepared at the request of Trimont Land Company, the owner of the Project.

1.1 Purpose

The purposes of this Report are:

- To describe the existing hydrologic characteristics of the project watersheds and compare them with proposed project conditions;
- To generally describe the proposed storm drainage and treatment system for the project;
- To evaluate the 100-Year floodplain of the West Fork of West Martis Creek and a tributary of Martis Creek (between Sawtooth Ridge and Lookout Mountain) at locations near the proposed Project facilities.

This Report is intended to provide an overview of the above bulleted items. Evaluations of existing and proposed project level facilities and the associated watershed systems have been made leading to the preparation of this Report. This Report has been prepared in conformance with the guidelines and procedures outlined in the Placer County Storm Water Management Manual (SWMM) and the Placer County Land Development Manual. In addition, it addresses requirements of the California Regional Water Quality Control Board (RWQCB) – Lahontan Region. Additional evaluations and recommendations will be developed during final design of the Project based on Lahontan design criteria established herein and in the approved EIR.

1.2 Site Description

The Project is located within the Northstar California (Northstar) ski resort which is located approximately six miles southeast of Truckee within Placer County via State Route (SR) 267. Northstar is located approximately six miles from the north shore of Lake Tahoe, 40 miles west from Reno, Nevada, and 96 miles east from Sacramento, California.

The Project area encompasses approximately 3,000 acres up mountain from the existing Northstar Village at an elevation ranging from 6,300 to 7,900 feet. Figure 1.1 presents the Project Vicinity Map. The existing area consists mainly of forest, skier trails, ski lift terminals, and the Northstar Village.

1.3 Project Description

The proposed Project is mainly within the existing ski terrain on the northern and western slopes of Mt. Pluto, the northeastern slopes of Sawtooth Ridge, and on Lookout Mountain. The majority of this property is zoned Forestry (FOR), where ski resort development is an allowed use.

DRAFT PRELIMINARY DRAINAGE REPORT

A portion of the Project area is zoned Timberland Production Zone (TPZ), which would require a Placer County rezone to FOR. The Project area has been managed to maintain forest health through Timber Harvest Plans (THP) approved by the California Department of Forestry (CDF). The Project is located on properties owned by CNL Income Northstar, LLC and CNL Income Northstar TRS, LLC (Assessor's Parcel Numbers 110-050-023, 110-050-024, 110-050-025, 110-050-038, 110-050-039, 110-050-040, 110-050-041, 110-070-008, 110-070-009, 110-070-010, 110-070-014, 110-070-015, 110-070-016), and Northstar Mountain Properties, LLC (Assessor's Parcel Numbers 110-050-046, 110-050-047, 110-050-048, 110-050-049, 110-080-086)

The Project is the consideration of planned on-mountain development at Northstar including additional lifts and ski pods; and infrastructure to accommodate these features including on-mountain skier service facilities and upgrades, snowmaking, utilities, and maintenance/access roadways. The Project also includes alternative recreational components such as camping, and cross-country skiing facilities. The Project represents the continued efforts of Northstar to evaluate and further define the overall resort experience given the needs of its guests, and the use of this information to develop a master plan that would guide the resort's future.

The Project involves project-level and program level components as described below. Some Project components are anticipated to be constructed within the next five to ten years. Given that some of the future ski pod improvements, skier service sites, and alternate recreation camping are not anticipated to be constructed in the near future, Northstar has proposed these components on a programmatic level. These improvements will continue to provide the day visitor with a broad mountain experience and will also accommodate the destination visitor, given the advent of the improved and expanded bed base and commercial Village. In addition, these improvements will offer the diverse ski terrain necessary to facilitate a positive guest experience and extend the vacation experience for the destination visitor in the winter and the summer. Program level components were not evaluated during this study.

The project-level components include:

- The C, J, V, W and Z lifts and associated terrain, snowmaking, fuel tanks and standby emergency power, and necessary utilities and maintenance/access roadways to service these lifts.
- Additional ski trails and the modernization of ski trails through widening to occur adjacent the Vista, Rendezvous, Arrow, Comstock, and Backside lifts.
- Five skier bridges necessary for ingress and egress to/from the V, W and Z lifts and associated terrain, and for Village run access.
- Skier service site improvements. The skier service sites will provide for improved food service, restroom facilities, and seating areas offered on-mountain. The project-level sites will include improvements to the existing Summit Deck and Grille facility located on

DRAFT PRELIMINARY DRAINAGE REPORT

the top of Mt Pluto; and a new warming hut with deck located on the backside of the resort, directly adjacent the Promise Land bottom terminal.

The program-level components include:

- The Q lift and the Castle Peak Gondola and associated terrain, snowmaking, fuel tanks and standby power, and necessary utilities and maintenance/access roadways to service these lifts.
- Four skier service sites. Two of the skier service sites will be located at the top of the C lift, and near the top of Lookout Mountain. The facilities will provide restrooms and some food service. The two other skier service sites include a campsite area located on the backside of the resort, and a cross-country center located to the west of Reservoir "A" and include the relocation of the cross-country center lodge.

2.0 EXISTING CONDITIONS

2.1 Regional

Northstar is situated on a predominantly northern facing mountain slope located within the southern border of the Truckee River Hydrologic Unit. This unit is located along the Nevada-California border on the eastern slope of the Sierra Nevada and contains a watershed with a drainage area of approximately 436 square miles. The Project site is located near the border between the Martis Valley Watershed and the Tahoe Basin Watershed. Four major drainages (or hydrologic subunits) occur within the Truckee River Hydrologic Unit, including the Truckee River, Prosser Creek, Martis Creek, and Donner Creek.

The primary drainage basin in which the Project is located consists of approximately 3,145 acres and rises from the Martis Valley floor on the north at an elevation of about 5,860 feet to approximately 8,600 feet along the southernmost ridge of Mount Pluto to the south. This basin is characterized by steep mountain slopes around the perimeter (20-50%), with a relatively flat basin floor (5-15%). The area is generally forested with some open meadows.

The watershed exhibits little evidence of drainage courses that would act to convey a significant quantity of concentrated runoff, with the exception of the primary watercourses that constitute tributaries of Martis Creek including the West fork of West Martis Creek and West Martis Creek. Small watercourses do exist at the outfalls of existing culverts, however observation indicates that these flows are small and historically percolate into the forest soils and fractured volcanic subsoil shortly downstream of outfalls. The vast majority of runoff occurs by sheet flow, which is often interrupted by downed timber, pine needle duff, and rock outcroppings. Existing drainage is either percolated into the soil mantle or directed by existing slopes to topographic features that may act to further convey drainage to watercourses located below the Project site.

DRAFT PRELIMINARY DRAINAGE REPORT

The dominant vegetation type can be classified as Jeffrey Pine Forest. Jeffrey pine (*Pinus jeffreyi*) and white fir (*Abies concolor*) are the dominant tree species. Sagebrush, greenleaf manzanita, tobacco brush and squaw carpet are the predominant brush species. Since this area has been historically managed for timber resources, most trees are of small diameter (6"-24"), with canopy cover generally between 10% and 50%. Some dense stands of timber exist throughout the area, which would be classified as 50%+ canopy cover.

The watershed is currently used for summer and winter recreation such as mountain biking, hiking, downhill skiing, and cross-country skiing, as well as logging. A number of unimproved logging and maintenance roads cross the watershed and the Project area. These roads have seen substantial use over the many years of logging, and are generally stabilized in terms of their response to storm events.

2.2 Existing Drainage Conditions

Figure 1.2 presents three (3) distinct watersheds that have been modeled in HEC-1. Watershed No. 1 consists of the Northstar Village and the developed ski area above it. Watersheds No. 2 & No. 3 consists of primarily undeveloped areas located further to the west. The Project encompasses improvements in all three (3) areas. Figure 1.3 presents the existing watersheds/drainage basins, and Table 1.1 presents a summary of the infiltration rates for both existing and proposed watersheds/drainage basins.

Watershed No. 1

AREA 1-A(E)

Drainage basin Area 1-A(E) is 330 Acres and is primarily composed of forest, skier trails and several dirt roads. Flows travel in sheet flow through the forest and are eventually collected in a small swale that becomes the West Fork of West Martis Creek.

AREA 1-B(E)

Drainage basin Area 1-B(E) is 267 Acres and is primarily composed of forest, ski lifts, skier trails and several dirt roads. Flows travel overland through the forest and are collected in the West Fork of West Martis Creek.

AREA 1-C(E)

Drainage basin Area 1-C(E) is 331 Acres and is primarily composed of forest, ski lifts, skier trails and several dirt roads and comprises portions of the Northstar mid-mountain amenities and building as well as a portion of the Ritz-Carlton Hotel. Flows generally travel overland through the forest and are collected in the West Fork of West Martis Creek. Developed areas route runoff through infiltration trenches and/or detention devices (e.g. detention ponds).

DRAFT PRELIMINARY DRAINAGE REPORT**AREA 1-D(E)**

Drainage basin Area 1-D(E) is 166 Acres and is primarily composed of forest, ski lifts, skier trails and several dirt roads and comprises portions of the Northstar Mid-Mountain amenities and building as well as portions of the Ritz-Carlton Hotel and Highlands Drive. Flows generally travel overland through the forest and are collected in the West Fork of West Martis Creek. Developed areas route runoff through infiltration trenches and/or detention devises (e.g. detention ponds).

AREA 1-E(E)

Drainage basin Area 1-E(E) is 21 Acres and is primarily composed of forest with several dirt roads, paved roads and condominiums. Flows generally travel overland through the forest and are collected in the West Fork of West Martis Creek. Developed areas route runoff through infiltration trenches and/or detention devises (e.g. detention ponds).

AREA 1-F(E)

Drainage basin Area 1-F(E) is 178 Acres and is primarily composed of forest, several dirt roads, paved roads, a portion of Highlands Phase III and a majority of the Ritz Carlton Hotel. Flows are collected in infiltration trenches and detention ponds at the Hotel and are released as overland flows through the forest and are collected in the West Fork of West Martis Creek.

AREA 1-G(E)

Drainage basin Area 1-G(E) is 38 Acres and is primarily composed of the existing Village Complex that includes building, parking, ski lifts and skier trails. Flows are collected in the storm water collection system (detention pond, infiltrator, bioswale) and conveyed to the West Fork of West Martis Creek.

AREA 1-H(E)

Drainage basin Area 1-H(E) is 673 Acres and is primarily composed of forest with several dirt roads and the Reservoir "A". Flows travel overland through the forest and are collected by the West Fork of West Martis Creek.

AREA 1-I(E)

Drainage basin Area 1-I(E) is 144 Acres and is primarily composed of forest and several dirt roads. Flows travel overland through the forest and are collected by West Martis Creek.

AREA 1-J(E)

Drainage basin Area 1-J(E) is 214 Acres and is primarily composed of forest, several dirt roads and a portion of Highlands View Road. Flows travel overland through the forest and are collected by West Martis Creek.

DRAFT PRELIMINARY DRAINAGE REPORT**AREA 1-K(E)**

Drainage basin Area 1-K(E) is 60 Acres and is primarily composed of forest, a portion of the Northstar Property Owners Association recreational center, and a small group of condominiums at the northern end. Flows travel overland through the forest and are collected by West Martis Creek.

AREA 1-L(E)

Drainage basin Area 1-L(E) is 40 Acres and is primarily composed of forest with a portion of the area containing subdivision development. Flows are generally overland and collected in small swales which convey flows into the West Fork of West Martis Creek and West Martis Creek.

AREA 1-M(E)

Drainage basin Area 1-M(E) is 78 Acres and is primarily composed of forest with a portion of the area containing subdivision development. Flows are generally overland and collected in small swales which convey flows into the West Fork of West Martis Creek.

AREA 1-N(E)

Drainage basin Area 1-N(E) is 47 Acres and is primarily composed of forest with a portion of the area containing subdivision development. Flows are generally overland and collected in small swales which convey flows into the West Fork of West Martis Creek and West Martis Creek.

Watershed No. 2**AREA 2-A(E)**

Drainage basin Area 2-A(E) is 377 Acres and is primarily composed of forest and skier trails. Flows travel in sheet flow through the forest and are eventually collected in a small swale that becomes one of the forks of West Martis Creek.

AREA 2-B(E)

Drainage basin Area 2-B(E) is 183 Acres and is primarily composed of forest. Flows travel in sheet flow through the forest and are eventually collected in a small swale that becomes one of the forks of West Martis Creek.

AREA 2-C(E)

Drainage basin Area 2-C(E) is 216 Acres and is primarily composed of forest. Flows travel in sheet flow through the forest and are eventually collected in a small swale that becomes one of the forks of West Martis Creek.

AREA 2-D(E)

Drainage basin Area 2-D(E) is 402 Acres and is primarily composed of forest. Flows travel in sheet flow through the forest and are eventually collected in a small swale that becomes one of the forks of West Martis Creek.

DRAFT PRELIMINARY DRAINAGE REPORT***Watershed No. 3*****AREA 3-A(E)**

Drainage basin Area 3-A(E) is 537 Acres and is primarily composed of forest and skier trails. Flows travel in sheet flow through the forest and are eventually collected in a small swale that becomes one of the forks of West Martis Creek.

AREA 3-B(E)

Drainage basin Area 3-B(E) is 313 Acres and is primarily composed of forest and skier trails. Flows travel in sheet flow through the forest and are eventually collected in a small swale that becomes one of the forks of West Martis Creek.

AREA 3-C(E)

Drainage basin Area 3-C(E) is 289 Acres and is primarily composed of forests. Flows travel in sheet flow through the forest and are eventually collected in a small swale that becomes one of the forks of West Martis Creek.

AREA 3-D(E)

Drainage basin Area 3-D(E) is 321 Acres and is primarily composed of forests. Flows travel in sheet flow through the forest and are eventually collected in a small swale that becomes one of the forks of West Martis Creek.

AREA 3-E(E)

Drainage basin Area 3-E(E) is 208 Acres and is primarily composed of forests. Flows travel in sheet flow through the forest and are eventually collected in a small swale that becomes one of the forks of West Martis Creek.

AREA 3-F(E)

Drainage basin Area 3-F(E) is 53 Acres and is primarily composed of forests. Flows travel in sheet flow through the forest and are eventually collected in a small swale that becomes one of the forks of West Martis Creek.

DRAFT PRELIMINARY DRAINAGE REPORT

Table 1.1 Watersheds / Drainage Basins									
Northstar California NMMP Project									
Trimont Land Company									
Drainage Basin (Existing/ Proposed)	Area (acres)	(E) Undeveloped Areas		(E) Developed Areas		(P) Undeveloped Areas		(P) Developed Areas	
		Weighted Infiltration Rate	Weighted % Impervious	Weighted Infiltration Rate	Weighted % Impervious	Weighted Infiltration Rate	Weighted % Impervious	Weighted Infiltration Rate	Weighted % Impervious
Watershed No. 1									
Area 1-A	330	0.19	2.0	0.00	0.00	0.19	2.0	0.00	0.00
Area 1-B	268	0.19	2.0	0.00	0.00	0.19	2.0	0.25	65.00
Area 1-C	331	0.19	2.0	0.25	67.00	0.19	2.0	0.25	67.00
Area 1-D	166	0.21	2.0	0.25	66.00	0.21	2.0	0.25	66.00
Area 1-E	21	0.21	2.0	0.25	68.00	0.2	2.0	0.25	65.00
Area 1-F	144	0.18	2.0	0.25	92.00	0.19	2.0	0.25	68.00
Area 1-G	38	0.22	2.0	0.25	65.00	0.21	2.0	0.25	65.00
Area 1-H	673	0.21	2.0	0.25	0.00	0.21	2.0	0.25	65.00
Area 1-I	144	0.21	2.0	0.25	65.00	0.21	2.0	0.25	65.00
Area 1-J	214	0.21	2.0	0.25	65.00	0.21	2.0	0.25	65.00
Area 1-K	60	0.21	2.0	0.25	65.00	0.21	2.0	0.25	93.00
Area 1-L	40	0.22	2.0	0.25	65.00	0.22	2.0	0.25	65.00
Area 1-M	78	0.22	2.0	0.25	69.20	0.22	2.0	0.25	69.20
Area 1-N	47	0	0	0.25	68.13	0	0	0.25	68.13
Watershed No. 2									
Area 2-A	377	0.19	2.0	0	0	0.18	2	0	0
Area 2-B	183	0.22	2.0	0	0	0.22	2	0	0
Area 2-C	216	0.22	2.0	0	0	0.22	2	0	0
Area 2-D	402	0.2	2.0	0	0	0.20	2	0	0
Watershed No. 3									
Area 3-A	537	0.19	2.0	0	0	0.18	2.0	0	0
Area 3-B	313	0.19	2.0	0	0	0.18	2.0	0	0
Area 3-C	289	0.21	2.0	0	0	0.21	2.0	0	0
Area 3-D	321	0.21	2.0	0	0	0.20	2.0	0	0
Area 3-E	208	0.22	2.0	0	0	0.21	2.0	0	0
Area 3-F	53	0.22	2.0	0	0	0.22	2.0	0	0

3.0 HYDROLOGIC AND HYDRAULIC DESIGN CRITERIA**3.1 Precipitation and Snowmelt**

Average annual precipitation at Northstar ranges from 35 inches per year at the Village (elevation 6320') to 40 inches per year at the Top of Mount Pluto (elevation 8610'). The majority of this precipitation occurs between November and May and is in the form of snowfall, which is included in the annual precipitation numbers as equivalent water content. However, as snow dominates the precipitation regime, both conveyance and treatment facilities will be designed using rainfall models.

DRAFT PRELIMINARY DRAINAGE REPORT**3.2 Placer County Design Criteria**

The storm drainage collection and conveyance systems for Project will be designed according to the SWMM, dated September 1, 1990 (portions updated in 1994 and 1997), and distributed by the Placer County Flood Control and Water Conservation District. All pre-development and post-development flows have been calculated using the Army Corps of Engineer's HEC-1 software program. Methodology of use of the HEC-1 program followed the requirements set forth within SWMM. Major factors include:

- Kinematic Wave methodology
- PDP software for precipitation data
- Overland flow lengths (SWMM Addendum 1 – Part 1)
- Uniform distribution for rainfall – based on elevations above cloudburst region (4,000 feet) (SWMM V-C-3b)
- Snow coverage and snow melt rates (SWMM V-C-4 and V-D-2)

Infiltration rates and impervious values were obtained from Table 5-3 of the SWMM and based on soils group B. Woodland areas were given an infiltration rate of 0.22 and imperviousness of 2%. Existing and proposed ski trails were given an infiltration rate of 0.16 and imperviousness of 2%. Landscaped, residential and commercial areas were given an infiltration rate of 0.25 and imperviousness of 65%. Paved roads and parking lots were given an infiltration rate of 0.25 and imperviousness of 95%.

Our modeling results were compared to values provided the Placer County Flood Control and Water Conservation District's memorandum regarding the Squaw Creek Analysis dated April 10, 1998. The Squaw Creek memo assumes 493 cfs per square mile. Both full-snow and no-snow coverage conditions were calculated for elevations above 7,000 feet. Table 1.2 provides HEC-1 flow rates for existing and proposed conditions. Table 1.4 in the Appendix shows comparison of the no-snow, with-snow and Squaw Creek flows.

All storm water runoff collection and conveyance systems will be designed to transmit, at a minimum, summer season 10-year flows while demonstrating that the 100-year flows can be safely handled without damage to person or property.

3.3 RWQCB-Lahontan Criteria

The RWQCB requires treatment be provided for all stormwater collected from impervious surfaces. The RWQCB has established that Waste Discharge Requirements can be satisfactorily met if facilities are constructed which provide a storage and/or infiltrated volume equal to 0.7 inches of rainfall over all impervious surfaces. This criterion is applicable to all areas tributary to the Truckee River Basin excluding the Lake Tahoe Basin. Overflow provisions shall be made for all stormwater treatment facilities.

DRAFT PRELIMINARY DRAINAGE REPORT**4.0 PROPOSED DRAINAGE DESIGN****4.1 Overview**

For the purposes of compliance with California Environmental Quality Act (CEQA), the following primary questions should be answered in this preliminary report with some degree of confidence:

- Could post-project drainage flows exceed the capacity of downstream facilities to safely convey them?
- Could the post-project drainage regime lead to erosion or water quality degradation?

If either of these conditions could exist, impacts to the environment could be considered significant and warrant further analysis. Given the size of the watersheds involved and the relatively small changes to be expected in the watersheds, and given the requirement to design and construct the project in accordance with the County and Lahontan criteria, it is extremely unlikely that such conditions will occur. Moreover, given that the current County policy is to consider all natural ground at this elevation nearly impermeable due to snow cover, there is automatically little effect on downstream drainage systems due solely to conversion of natural ground to impervious surfaces. In light of this, Placer County has requested that pre-project and post-project conditions be evaluated utilizing a no snow condition as well as a winter event analysis. This information will be used to further evaluate the overall increase in runoff from watersheds on an annual basis, and can assist in drawing conclusions regarding environmental impacts.

4.2 Developed Drainage Conditions

As previously presented in Figure 1.2, three (3) distinct watersheds have been modeled using HEC-1. The existing watersheds are identical to the proposed watersheds with an exception to changes to the runoff curve numbers that reflect the development of the Project.

Runoff curve numbers from areas 1-A(F), 1-B(F), 1-C(F), 1-D(F), 1-E(F), 1-F(F), 1-H(F), 1-I(F), 1-J(F), 2-A(F), 2-B(F), 3-A(F), 3-B(F), 3-C(F), & 3-D(F) were modified to reflect primarily trail clearing for future skier trails, skier service site and ski lifts. Figure 1.5 presents the proposed watersheds and drainage basins.

4.3 HEC-1 Analysis Results

Model schematics for the three (3) watersheds are presented in Figures 1.6, 1.7, and 1.8, respectively. A summary for pre-project and post-project peak flows is presented in Table 1.2.

DRAFT PRELIMINARY DRAINAGE REPORT***Watershed No. 1***

Drainage basins from Watershed No. 1 converge at confluence point (C1.7) along the West Martis Creek. The only significant difference between pre-project and post-project conditions is due to skier trail clearing, a ski bridge, ski lifts, and terminals and to install snowmaking lines. These facilities result in a maximum 1.6% increase of 10-year peak flow and a maximum of 1.0% increase for 100-year peak flow.

Particular attention was giving to the impacts at confluence points C1.3, C1.4, C1.5, C1.6 and C1.7 due the proximity of existing developments including The Village and the Aspen Grove condominiums. A thorough review of past drainage reports for The Village indicates that runoff from proposed project areas does not enter the Village drainage system and is routed to the West Fork of West Martis creek, with the exception of low flow events (below 8 csf), which is routed to the existing infiltration system located under the northeast corner of the Village parking lot. No runoff from the proposed project areas is routed to the existing detention basin upslope of the Aspen Grove condominiums. Please refer to the Northstar Mountain Master Plan – Drainage Influence on Aspen Grove Condominiums supplemental memorandum, dated April, 2013, by Auerbach Engineering Corporation, for a thorough description of drainage at this area.

Watershed No. 2

Drainage basins from Watershed No. 2 converge at confluence point (C2.2) along one of the forks of the West Martis Creek. The only significant difference between pre-project and post-project conditions is due to skier trail clearing, ski lifts and terminals and to install snowmaking lines. These facilities result in a maximum 1.8% increase of 10-year peak flow and a maximum of 1.7% increase for 100-year peak flow.

Watershed No. 3

Drainage basins from Watershed No. 3 converge at confluence point (C3.3) along one of the forks of the West Martis Creek. The only significant difference between pre-project and post-project conditions is due to skier trail clearing, ski lifts and terminals and to install snowmaking lines. These facilities result in a maximum 4.2% increase of 10-year peak flow and a maximum of 2.8% increase for 100-year peak flow.

DRAFT PRELIMINARY DRAINAGE REPORT

Table 1.2 HEC-1 Results Northstar NMMP Project Trimont Land Company								
Watershed No. 1								
Confluence Point	Existing		Future		Increase			
	10-yr Peak (cfs)	100-yr Peak (cfs)	10-yr Peak (cfs)	100-yr Peak (cfs)	10-yr (cfs)	100-yr (cfs)	10-yr (%)	100-yr (%)
C1.1	221	461	229	472	8	11	3.5	2.3
C1.2	341	703	349	714	8	11	2.3	1.5
C1.3	398	811	404	826	6	15	1.5	1.8
C1.4	470	955	475	973	5	18	1.1	1.8
C1.5	651	1465	661	1483	10	18	1.5	1.2
C1.6	48	156	48	156	0	0	0.0	0.0
C1.7	675	1552	686	1568	11	16	1.6	1.0
Watershed No. 2								
Confluence Point	Existing		Future		Increase			
	10-yr Peak (cfs)	100-yr Peak (cfs)	10-yr Peak (cfs)	100-yr Peak (cfs)	10-yr (cfs)	100-yr (cfs)	10-yr (%)	100-yr (%)
C2.1	104.5	315	106	320	1.5	5	1.4	1.6
C2.2	276	792	281	806	5	14	1.8	1.7
Watershed No. 3								
Confluence Point	Existing		Future		Increase			
	10-yr Peak (cfs)	100-yr Peak (cfs)	10-yr Peak (cfs)	100-yr Peak (cfs)	10-yr (cfs)	100-yr (cfs)	10-yr (%)	100-yr (%)
C3.1	211	553	220	565	9	12	4.1	2.1
C3.2	345	923	360	950	15	27	4.2	2.8
C3.3	395	1068	407	1090	12	22	2.9	2.0
Notes: cfs = cubic feet per second yr = year								

DRAFT PRELIMINARY DRAINAGE REPORT**4.4 Water Quality Treatment Systems****4.4.1 Permanent BMP's**

In order to meet Lahontan requirements for treatment of stormwater runoff from impervious surfaces, various strategies will be employed. Runoff from impervious areas will be limited to roof runoff at proposed lift terminals. This runoff will be treated in accordance with Lahontan requirements by construction of infiltration trenches. These trenches will be sized for the final drainage reports based on exact impervious areas.

In areas where the forest will be cleared for skier trails, ski lifts, or any trenching an extensive amount of revegetation will occur. In addition to the required revegetation, water bars will be installed to divert water back into the forested areas. The water bars will be designed as vegetated swales which in themselves will provide detention and infiltration and will mitigate the post-project runoff to amounts equal to or below pre-project levels.

4.4.2 Construction BMP's

A range of additional BMP's will be utilized on the project to prevent water quality degradation and to promote the detention and treatment objectives, as follows:

- 1) Gravel construction entrances to minimize tracking of earthen material to adjoining streets.
- 2) Erosion control fencing and vegetation protection fencing will be used on the down slopes of terminal grading activities.
- 3) Diversion dikes to divert sheet flow from newly disturbed areas until revegetation can be completed and ground stabilized.
- 4) Straw bale sumps to detain and filter runoff in channel sections during construction.

5.0 100-YEAR FLOODPLAIN ANALYSIS

The 100-year floodplain has been analyzed along the West Fork of West Martis Creek for the area near Ski Bridge No. 4 and a tributary of the Martis Creek between Sawtooth Ridge and Lookout Mountain for the areas around the lift bottom terminals V and W and the associated skier bridges (1, 2, 3 & 5). This has been done on a conceptual level based on the best topography available. Figure 1.9 presents the floodplain limits in this area. The floodplain ranges from approximately 20-feet to 100-feet wide and one (1) feet to six (6) feet in depth.

Figures 1.10, 1.11, 1.12, 1.13 & 1.14 present cross sections for the floodplain and Table 1.3 presents calculations used to determine the limits of the floodplain. Based on the preliminary analysis, the grading for the proposed lift bottom terminals V and W does not appear to encroach into the floodplain.

DRAFT PRELIMINARY DRAINAGE REPORT

Design of the skier bridges is still in the conceptual phase. However, a bridge alternative analysis has shown that the only proposed skier bridge that could impact the 100-year floodplain is Skier Bridge No. 1. Approximately 240 square feet of the 100-year flood plain would be impacted by the center pier of Skier Bridge No. 1. The end abutments would be beyond the floodplain limits. Possible hydrologic impacts due to the center pier include scour and an increase to the water surface elevation and floodplain width upstream. Proposed mitigation for the loss of water volume within the floodplain would be to remove an equivalent amount of soil from the floodplain immediately upstream of the bridge pier. The approximate loss of water volume is 15 cubic yards. An area of approximately 5,000 square feet with no mapped wetlands is available 50 feet upstream of the proposed bridge pier location. Removing approximately three-inches of soil across an area of 2,000 square feet would mitigate any increase of water surface elevation and floodplain width. Scour protection will be included in the final design.

Ultimate floodplain impacts to the West Fork of West Martis Creek and West Martis Creek were studied by Civil Solutions in 2001 (Preliminary Project Hydrology Report for the Village at Northstar, An Analysis of: The West Fork of Martis Creek (upstream of Northstar Drive)). Civil Solutions utilized the Squaw Creek flow rates to map the 10-year and 100-year floodplains of the West Fork of West Martis Creek above, below and adjacent to Northstar Village. This analysis showed that 1,898 cfs will stay within the banks of the West Fork of West Martis Creek at the areas of the Village as well as pass through the culvert below Northstar Drive. This is 330 cfs greater than what the proposed unmitigated storm water runoff was calculated to be. It is therefore assumed that the proposed mitigated runoff will not cause overbank conditions or impacts to downstream drainage facilities.

DRAFT PRELIMINARY DRAINAGE REPORT

Table 1.3 Floodplain Calculations						
Northstar OMMP Project Booth Creek Ski Holdings, Inc.						
Description	Peak Flow (cfs)	Channel Slope (%)	Manning's (n)*	WSE (ft)	Depth (ft)	Width (ft)
Section A-A	357	16	0.10	6841.1	1.1	58
Section B-B	357	12	0.10	6780.3	1.3	70
Section C-C	565	10	0.10	6676.7	2.7	64
Section D-D	565	10	0.10	6621.2	2.2	88
Section E-E	950	7	0.10	6522.4	2.4	74
Section F-F	950	8	0.10	6501.7	1.7	106
Section G-G	220	8	0.10	6501.7	1.7	106
Section H-H	220	8	0.10	6501.7	1.7	106
Section I-I	826	8	0.10	6501.7	1.7	106
Section J-J	826	8	0.10	6501.7	1.7	106

Notes:
 cfs = cubic feet per second
 ft = feet
 WSE = water surface elevation
 * Manning's n from Placer County SWMM, Table 8-1 Manning N for Natural Streams - Floodplain

6.0 SUMMARY

As previously noted, the planned Project design incorporates current requirements by Placer County and Lahontan for water quality protection, and for stormwater collection and conveyance. Because the maximum peak flows for a winter storm analysis will not be affected by this Project, an additional winter storm analysis is not necessary.

As previously presented in Table 1.2, any increase in runoff as a result of this Project is estimated to be minimal. While the analysis shows a decrease in infiltration as a result of converting forested land into ski trails, the installation of waterbars and an intensive revegetation program will mitigate the anticipated increase in runoff. This occurs because any rainfall that would travel down proposed skier trails will be carried, via the waterbars, back to the forested areas.