

Heavenly Mountain Resort

Mitigation and Monitoring Plan
Annual Report (October 2020 –
September 2021)



Prepared for
Tahoe Regional Planning Agency



May 2, 2022

Photo courtesy of Heavenly Mountain Resort



now



Contact Information

Cardno
295 Highway 50, Suite 1
P.O. Box 1533
Zephyr Cove, NV 89448

Telephone: 208-272-9178
chris.donley@cardno.com

www.cardno.com
www.stantec.com

Document Information

Prepared for	Tahoe Regional Planning Agency
Project Name	Mitigation and Monitoring Plan Annual Report (October 2020 – September 2021)
File Reference	Heavenly MMP Annual Report 2021_DRAFT_050222.docx
Date	May 2, 2022

Also prepared by:



Heavenly Ski Resort
P.O. Box 2180, Stateline, NV 89449
www.skiheavenly.com



© Cardno 2022. Copyright in the whole and every part of this document belongs to Cardno and may not be used, sold, transferred, copied or reproduced in whole or in part in any manner or form or in or on any media to any person other than by agreement with Cardno.

This document is produced by Cardno solely for the benefit and use by the client in accordance with the terms of the engagement. Cardno does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by any third party on the content of this document.

This page intentionally left blank

Executive Summary

On April 25, 2007, the Tahoe Regional Planning Agency's Governing Board unanimously approved Heavenly Mountain Resort's 2006 Master Plan Amendment (MPA). "In 2013 Heavenly applied for applications with the USDA Forest Service and TRPA to amend the MPA 07 to expand non-skiing and summer use opportunities within the resort. The 2013 proposal, titled Epic Discovery, utilizes existing infrastructure and facilities (e.g., ski lifts, lodges and roads) to provide a wide variety of new summer activities for guests. The proposal was developed following the passage of the Federal Ski Area Recreational Opportunity Enhancement Act of 2011, which allows ski resorts operating on National Forest System lands to propose year-round non-skiing activities in order to attract a wider range of visitors to National Forests and help support employment and economic activity in local communities. The 2015 Master Plan amendment is referred to as the Heavenly Master Development Plan (MDP)."¹ This annual report summarizes monitoring and evaluation activities conducted at Heavenly Mountain Resort (Heavenly) between October 2020 and September 2021 as a result of the implementation of the Mitigation and Monitoring Plan (MMP) contained in the approved Master Plan Amendment.

The Mitigation and Monitoring Plan consists of planning measures, construction measures, operations and maintenance measures, and management response to monitoring and evaluation. The content of each measure is developed to mitigate potentially adverse effects from the implementation of Heavenly's Master Development Plan. As Heavenly implements the Master Development Plan, they must meet each applicable measure and utilize monitoring and evaluation results to adapt the measures if necessary.

Monitoring and evaluation are conducted by Heavenly, the Tahoe Regional Planning Agency (TRPA), the USDA Forest Service Lake Tahoe Basin Management Unit (LTBMU, or more generally, the Forest Service), Lahontan Regional Water Quality Control Board (Lahontan), and local and county offices. Heavenly and TRPA employ the services of Cardno (formerly Cardno ENTRIX, Inc.), Resource Concepts, Inc., J.C. Brennan and Associates, and Sierra Ecotone Solutions (Garth Alling, formerly with Hauge Brueck Associates), to conduct monitoring in their field of expertise. This annual report summarizes the monitoring results based on the data evaluation.

In summary, Heavenly is in compliance with all applicable mitigation measures of the MMP with the exception of partial compliance with regards to measure 7.4-3 (water quality), 7.5-6 (maintain flows in Heavenly Valley Creek), and 7.5-11 (snowmaking noise at Base areas). Heavenly is working to decrease water quality exceedances by decreasing the amount of huck salt applied on the mountain, addressing on-mountain erosion source areas, and implementing liquid brine solution to the parking lots and roadways leading to California Base Lodge to help limit the amount of deicer needed on the roadways. Additionally, Heavenly is continuing to maintain and adjust the StormFilter vault system to improve and optimize performance (Catalyst 2017). Parking lot improvements during summer 2018, 2020, and 2021 at the Upper California Base area and summer 2019, 2020, and 2021 at the Boulder Base area will continue to improve downstream water quality as eroding and failing pavement is being removed and replaced. Ongoing parking lot improvements are discussed further in the *Heavenly 5 Year Comprehensive Report 2017-2021* (Cardno 2022) and provided in Appendix II (electronic copy only). Replacement of inflow stream gage equipment at Heavenly Valley Creek has been planned, which would allow for more accurate measurements of flow into and out of the California reservoir. However, substantial snow depths during the 2016-2017 ski season damaged some of the new equipment and additional repairs are needed to accurately monitor flows into and out of the reservoir. Snowmaking noise exceedances above the PAS boundary limits at some of the monitored Base areas (California Main Lodge and Boulder Lodge) will continue unless the existing snowmaking equipment is replaced with quieter models, or infrastructure barriers are built around the lodge

¹ Heavenly Mountain Resort Master Development Plan, Page 1-1

areas. However, there have been no reported noise complaints associated with snow making over the past few years. Table 1-1 summarizes each of the measures contained in the MMP, the relevance of the measure to the period of interest, and whether or not Heavenly is in compliance with the measure.

Table of Contents

Executive Summary	iii
Chapter 1 – Introduction.....	1-1
Chapter 2 – Planning Measures.....	2-1
2.1 Introduction	2-1
2.2 Measure No. 7.3-1 TRPA Mitigation Monitoring Activities	2-2
2.3 Conclusion	2-3
Chapter 3 – Construction Measures	3-1
3.1 Introduction	3-1
3.2 Measure 7.4-1 Implement the Construction Erosion Reduction Program.....	3-1
3.3 Measure 7.4-2 Construct Infiltration Facilities	3-2
3.4 Measure 7.4-3 Meet Water Quality Standards	3-3
3.5 Measure 7.4-4 Implement Adaptive Ski Run Prescriptions.....	3-6
3.6 Measure 7.4-5 Control Runoff Due to Future Construction and Long-Term Operation Facilities	3-6
3.7 Measure 7.4-6 Avoid and/or Restore Future Disturbed SEZs.....	3-7
3.8 Measure 7.4-7 Avoid and / or Restore Future Disturbed Jurisdictional Wetlands and Waters	3-8
3.9 Measure 7.4-8 TRPA Land Coverage Mitigation.....	3-9
3.10 Measure 7.4-9 (BIO-1) Delay Sky Meadows Challenge Course, Sky Basin Coaster and East Peak Lake Water Activities Until Sierra Nevada Yellow- legged Frog Surveys and USFWS Consultation Are Complete	3-11
3.11 Measure 7.4-10 Reduce and Control Fugitive Dust	3-11
3.12 Measure 7.4-11 Minimize Removal/Modification of Deciduous Trees, Wetlands, and Meadows	3-13
3.13 Measure 7.4-12 (BIO-2) Active Raptor and Migratory Bird Nest Site Protection Program.....	3-13
3.14 Measure 7.4-13 Monitor and Protect Northern Goshawk.....	3-14
3.15 Measure 7.4-14 (BIO-4) Wildlife Nursery Site Survey.....	3-15
3.16 Measure 7.4-15 Utilize Boundary Management Plan to Manage Skier Access on Adjacent NFS Lands.....	3-15
3.17 Measure 7.4-16 Evaluate and Monitor Known Archaeological Resources within Comstock Logging Historic District	3-17
3.18 Measure 7.4-17 Identify and Protect Undiscovered Archaeological Resources	3-17
3.19 Measure 7.4-18 Protect the Tahoe Rim Trail	3-19
3.20 Conclusion	3-19
Chapter 4 – Operation and Maintenance Measures	4-1
4.1 Introduction	4-1
4.2 Measure 7.5-1 Watershed Maintenance and Restoration Program.....	4-1
4.3 Measure 7.5-2 (WATER-C1b) Ongoing Environmental Monitoring Program	4-1
4.4 Measure 7.5-3 (WATER-C1a) CA-1 Erosion Reduction Measures	4-3
4.5 Measure 7.5-4 (WATER-C3) NV-1 Erosion Reduction Measures	4-3
4.6 Measure 7.5-5 Maintain Water Rights Balance.....	4-4

4.7	Measure 7.5-6 Maintain Water Flows in Heavenly Valley Creek	4-5
4.8	Measure 7.5-7 Maintain Water Flows in Daggett Creek	4-6
4.9	Measure 7.5-8 Maintain Compliance with Water Entitlements.....	4-7
4.10	Measure 7.5-9 Reduce Vehicle Emissions.....	4-7
4.11	Measure 7.5-10 Snow Removal Noise Mitigation Methods	4-8
4.12	Measure 7.5-11 Snowmaking Noise Mitigation Methods for Base Areas	4-8
4.13	Measure 7.5-12 Rock Busting Noise Mitigation Methods	4-12
4.14	Measure 7.5-13 Restrict Hours of Amphitheater Operations	4-12
4.15	Measure 7.5-14 (TRANS-1) Traffic and Air Quality Mitigation Measure	4-13
4.16	Measure 7.5-15 Implement the Coordinated Transportation System (Public Transit Services).....	4-13
4.17	Measure 7.5-16 Protect Tahoe Draba Populations within Heavenly Mountain Resort	4-13
4.18	Measure 7.5-17 Minimize Loss/Degradation of Sensitive Plant Species	4-14
4.19	Measure 7.5-18 Invasive Plant Management.....	4-14
4.20	Measure 7.5-19 Monitor and Protect Nesting and Fledgling Bird Species	4-14
4.21	Measure 7.5-20 (BIO-3) Migratory Bird and Habitat Utilization Survey	4-15
4.22	Measure 7.5-21 (BIO-8) Wildlife Trash Management and Education Program	4-16
4.23	Measure 7.5-22 Maintain Timber Thinning Practices.....	4-16
4.24	Measure 7.5-23 Provide Employee Housing.....	4-17
4.25	Conclusion	4-17
Chapter 5 – Management Response to Monitoring and Evaluation		5-1
5.1	Introduction	5-1
5.2	Measure 7.6-1 Soil and Water Quality	5-1
5.3	Measure 7.6-2 Traffic and Parking	5-4
5.4	Measure 7.6-3 Late Seral/Old Growth Enhancement	5-9
5.5	Conclusion	5-9
Chapter 6 – Reference List.....		6-1

Appendices

Appendix I	Heavenly Mountain Resort Watershed Maintenance and Restoration Program (WMRP) 2021 Annual Report & Construction Season Summary (RCI)
Appendix II	Environmental Monitoring 5-Year Comprehensive Report Heavenly Mountain Resort Water Years 2017-2021 (Electronic Copy Only)
Appendix III	2021 Watershed Maintenance Restoration Program (WMRP) Updated Work List
Appendix IV	USFS Wildlife Trash Management and Education Program
Appendix V	2020-2021 Water Use Balance Report
Appendix VI	Daggett Creek Memorandum
Appendix VII	2022 Watershed Maintenance Restoration Program (WMRP) Proposed Work List
Appendix VIII	2021 Biological Results
Appendix IX	2021 Boundary Management Plan
Appendix X	2021 Annual Noise Monitoring Report
Appendix XI	2020-2021 Heavenly Shuttle & Route Schedule
Appendix XII	Forest Service Old Growth Completion Letter

Tables

Table 1-1	Summary of Mitigation and Monitoring Plan Measures	1-3
Table 2-1	Update on Projects Constructed Prior to the 2021 Construction Season	2-1
Table 2-2	Project Status as of October 2021	2-2
Table 3-1	Heavenly Mountain Resort Land Coverage Calculations	3-10
Table 3-2	Description of Work Completed at each Road Segment in 2021	3-12
Table 4-1	Noise Monitoring Results	4-11
Table 4-2	Heavenly Employee Housing Occupation	4-17
Table 5-1	Traffic Data on US Highway 50 and State Route 207	5-8

Figures

Figure 1-1	Location of Heavenly Mountain Resort	1-2
Figure 5-1	Heavenly's Vehicular Parking Map	5-5
Figure 5-2	Mapping Locations of the Traffic Count Sites	5-7
Figure 5-3	Graphical AADT Values 2008-2020	5-9

Acronyms

AADT	Average annual daily traffic
APE	Area of Potential Effect
AST	above-ground storage tank
BMI	benthic macroinvertebrate
BMP	Best Management Practices
CARB	California Air Resources Board
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CERP	Construction Erosion Reduction Program
CFA	commercial floor area
CNEL	Community Noise Equivalent Levels
COVID	coronavirus disease
CSLT	city of South Lake Tahoe
CTS	Coordinated Transit System
CWA	Clean Water Act
CWE	Cumulative Watershed Effects
HRR	Historic Resource Record
IBC	intermediate bulk container
IERS	Integrated Environmental Restoration Services
KGID	Kingsbury General Improvement District
LDL	Larson Davis Laboratories
LTBMU	Lake Tahoe Basin Management Unit
MDP	Master Development Plan
MMP	Mitigation and Monitoring Plan
MOU	Memorandum of Understanding
MPA	Master Plan Amendment
NDEP	Nevada Department of Environmental Protection
NDOT	Nevada Department of Transportation
NFS	National Forest System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NV	Nevada
PA	Programmatic Agreement
PAS	Plan Area Statement
RCI	Resource Concepts, Inc.

SCI	Stream conditioning inventory
SEZ	Stream environmental zone
SNYLF	Sierra Nevada yellow-legged frog
STPUD	South Tahoe Public Utility District
SWAMP	Surface Water Ambient Monitoring Program
SWE	Snow water equivalent
SWPPP	Storm water pollution prevention plans
TKN	Total kjeldahl nitrogen
TMDL	total maximum daily load
TOG	Top of Gondola
TRPA	Tahoe Regional Planning Agency
TRT	Tahoe Rim Trail
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USDAFS	U.S. Department of Agriculture-Forest Service
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
VES	Visual encounter surveys
WDR	Waste Discharge Requirements
WMRP	Watershed Maintenance and Restoration Program

This page intentionally left blank

Chapter 1 – Introduction

Heavenly Mountain Resort is located on the south shore of Lake Tahoe within El Dorado and Alpine Counties of California and Douglas County of Nevada (Figure 1-1). Land ownership is shared between the United States Department of Agriculture Forest Service (Forest Service) and Heavenly. Heavenly operates on National Forest lands through a special use permit, renewed in 2002 for a period of 40 years.

A Mitigation and Monitoring Plan (MMP) was first adopted during the approval of the 1996 Heavenly Master Plan. The MMP was revised based on measures that had been completed, measures that were no longer necessary, and new measures that are required to reduce potential impacts from implementation of the Master Plan Amendment. The amended Master Plan described the long-range development plans for Heavenly Mountain Resort. The latest EIR/EIS/EIS (Heavenly Mountain Resort Epic Discovery Project, February 2015) and August 2014 Master Plan Amendment, known as the Heavenly Master Development Plan (MDP), was finalized in May 2015 and contained updated environmental mitigation conditions, monitoring and reporting requirements. A number of past measures that were no longer applicable were removed, while there were a few additional measures were added to address the new Epic Discovery Projects.

The MMP requires continued compliance from the Heavenly Mountain Resort with existing local, regional, state, and national regulatory programs both in and out of the Tahoe Basin (Heavenly, 2007). The MMP also contains planning, construction, operations and maintenance measures, as well as management responses to monitoring and evaluations. Table 1-1 summarizes the measures contained in the MMP and MDP, their relevance to the time period of interest, and whether or not Heavenly is in compliance. As discussed above, additional measures were implemented, revised and/or removed based on the latest EIR/EIS/EIS document and MDP (May 2015). Table 1-1 provides a brief summary and update of these measures.

Implementation of the MMP is conducted through the work of numerous agencies and private consultants including Heavenly, Tahoe Regional Planning Agency (TRPA), the USDA Forest Service, Cardno (formerly Cardno ENTRIX and ENTRIX, Inc.), Resource Concepts, Inc. (RCI), j.c. Brennan and Associates, Sierra Ecotone Solutions, and Liquid Innovations. The monitoring period of October 2020 through September 2021 was chosen for the Annual Report in order to include the 2020-2021 ski season, the 2021 water year, and the 2021 summer construction season.

The Caldor Fire burned near the Heavenly Mountain Resort during water year 2021. The fire started on August 14, 2021 and burned west of Lake Tahoe. The rapid ascent of the fire along both Highways 50 and 89 caused evacuations in the Lake Tahoe Basin, forest closures, and smoky conditions. The fire reached Echo Summit and entered the Lake Tahoe Basin on August 30, 2021. Firefighters were able to stop the fire's progression; however, fire had both direct and indirect effects on Heavenly Mountain Resort and mitigation and monitoring measures, as discussed in detail in subsequent sections of this report.

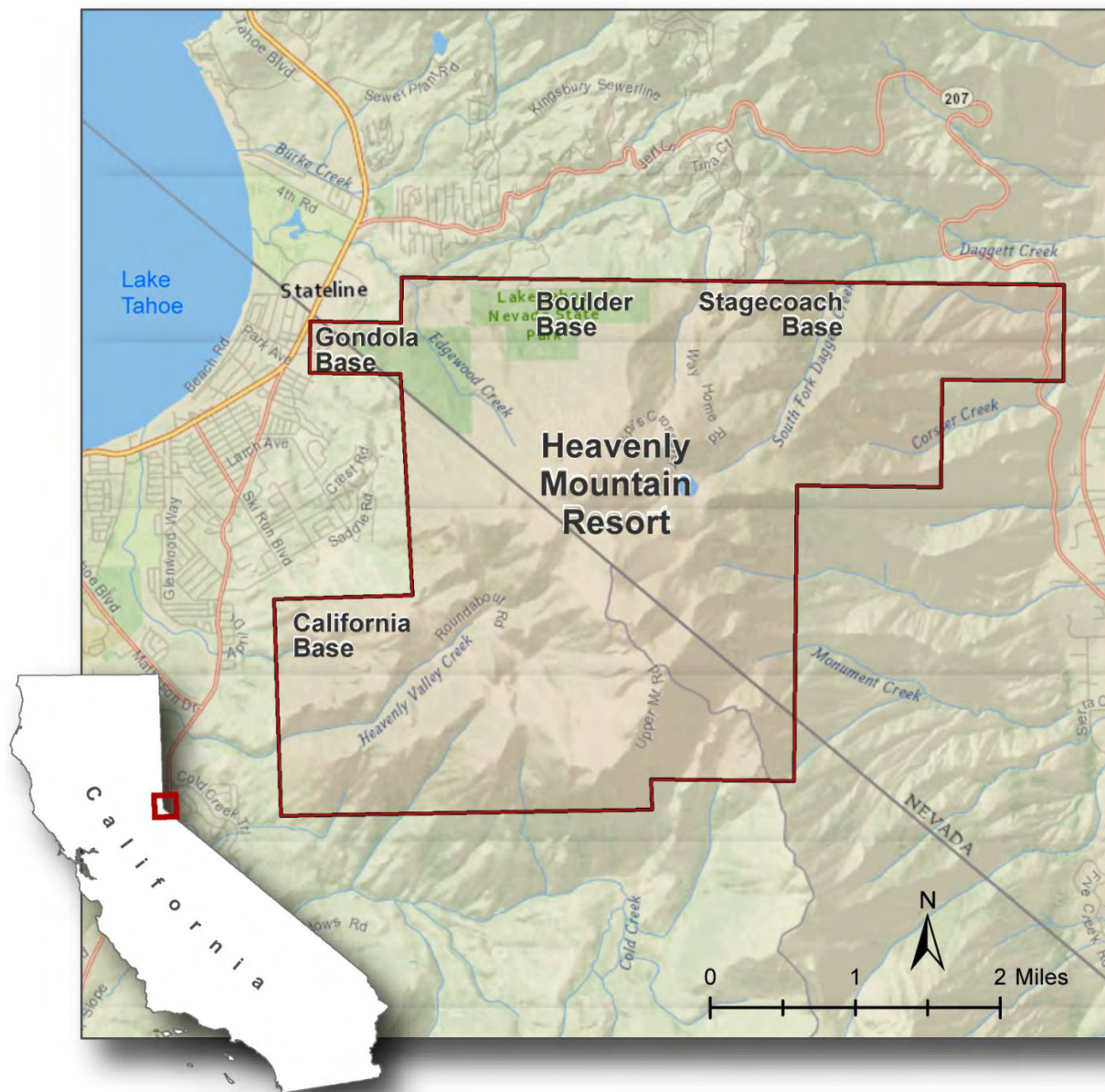


Figure 1-1 Location of Heavenly Mountain Resort

Table 1-1 Summary of Mitigation and Monitoring Plan Measures

Measure Number	Measure	2020-2021 Applicability	October 2021 Status	Discussed in Current Report	Compliance
Planning Measures					
7.3-1	TRPA Mitigation Monitoring Activities	All Projects and Operations	Complete	Yes	Yes
7.3-2	Design and site the proposed Powderbowl Lodge to minimize visibility from off-site views	None	Not Built	No	N/A
7.3-3	Design and Site the Proposed Gondola Mid-Station Restaurant to Minimize Visibility From Off-Site Views	None	Not Built	No	N/A
7.3-4	Design and Site the Proposed Sand Dunes Lodge to Minimize Visibility From Off-Site Views	None	Not Built	No	N/A
Construction Measures					
7.4-1	Implement the Construction Erosion Reduction Program	All Projects and Operations	Ongoing	Yes	Yes
7.4-2	Construct Infiltration Facilities	Annual CWE Work List	Ongoing	Yes	Yes
7.4-3	Meet Water Quality Standards	All Projects and Operations	Ongoing	Yes	Partial
7.4-4	Implement Adaptive Ski Run Prescriptions	Existing Ski Slopes and Future Trail Widening Projects.	Ongoing	Yes	Yes
7.4-5	Control Runoff due to Future Construction and Long-Term Operation Facilities	All Projects and Operations	Ongoing	Yes	Yes
7.4-6	Avoid and/or Restore Future Disturbed SEZs	All Projects and Operations	Project-Specific	Yes	Yes
7.4-7	Avoid and/or Restore Future Disturbed Jurisdictional Wetlands and Waters	All Projects and Operations. 401 Water Quality Certification post-construction permit approved.	Project-Specific	Yes	Yes
7.4-8	TRPA Land Coverage Mitigation	Updated with recent Projects (2021)	Ongoing	Yes	Yes
7.4-9	(BIO-1) Delay Sky Meadows Challenge Course, Sky Basin Coaster and East Peak Lake Water Activities Until Sierra Nevada Yellow-legged Frog Surveys and USFWS Consultation are Complete	Third Year of Monitoring Conducted in 2017, no additional surveys required until 2024.	Completed	Yes	Yes
7.4-10	Reduce and Control Fugitive Dust	Summer Operations	Ongoing	Yes	Yes

Measure Number	Measure	2020-2021 Applicability	October 2021 Status	Discussed in Current Report	Compliance
7.4-11	Minimize Removal/Modification of Deciduous Trees, Wetlands, and Meadows	All Projects and Operations. 401 Water Quality Certification post-construction permit approved.	Project-Specific	Yes	Yes
7.4-12	Active Raptor and Migratory Bird Nest Site Protection Program	All Projects	Ongoing – Project Specific	Yes	Yes
7.4-13	Monitor and Protect Northern Goshawk	All Projects	Ongoing – Project Specific	Yes	Yes
7.4-14	(BIO-4) Wildlife Nursery Site Survey	Surveys were completed prior to the 2021 construction season.	Ongoing – Project Specific	Yes	Yes
7.4-15	Utilize Boundary Management Plan to Manage Skier Access on Adjacent NFS Lands	Updated for Winter Operations	Ongoing	Yes	Yes
7.4-16	Evaluate and Monitor Known Archaeological Resources Within Comstock Logging Historic District	No Significant Changes	Ongoing	Yes	Yes
7.4-17	Identify and Protect Undiscovered Archaeological Resources	All Projects	Ongoing	Yes	Yes
7.4-18	Protect the Tahoe Rim Trail	All Projects and Operations in TRT Vicinity	Project-Specific; Not Built	Yes	Yes
Operations and Maintenance Measures					
7.5-1	Watershed Maintenance and Restoration Program	Summer Operations	Ongoing	Yes	Yes
7.5-2	(Water-C1b) Ongoing Environmental Monitoring Program	All Projects and Operations	Ongoing	Yes	Yes
7.5-3	(WATER-C1a) CA-1 Erosion Reduction Measures	All Projects and Operations	Ongoing	Yes	Implementing
7.5-4	(Water-C3) NV-1 Erosion Reduction Measures	All Projects and Operations	Ongoing	Yes	Implementing
7.5-5	Maintain Water Rights Balance	All Operations	Ongoing	Yes	Yes
7.5-6	Maintain Water Flows in Heavenly Valley Creek	All Operations	Ongoing	Yes	Partial
7.5-7	Maintain Water Flows in Daggett Creek	All Operations	Ongoing	Yes	Yes
7.5-8	Maintain Compliance with Water Entitlements	All Operations	Ongoing	Yes	Yes

Measure Number	Measure	2020-2021 Applicability	October 2021 Status	Discussed in Current Report	Compliance
7.5-9	Reduce Vehicle Emissions	All Operations	Ongoing	Yes	Yes
7.5-10	Snow Removal Noise Mitigation Methods	Winter Operations	Ongoing	Yes	Yes
7.5-11	Snowmaking Noise Mitigation Methods for Base Areas	Winter Operations	Ongoing	Yes	Partial
7.5-12	Rock Busting Noise Mitigation Methods	None	Not Built	No	N/A
7.5-13	Restrict Hours of Amphitheater Operations	None	Not Built	No	N/A
7.5-14	(TRANS-1) Traffic and Air Quality Mitigation Program	Heavenly paid into the Air Quality Mitigation Fund.	Completed	Yes	Completed
7.5-15	Implement the Coordinated Transportation System (Public Transit Services)	All Projects and Operations	Ongoing	Yes	Yes
7.5-16	Protect Tahoe Draba Populations within Heavenly Mountain Resort	All Projects and Operations	Project-Specific	Yes	Yes
7.5-17	Minimize Loss/Degradation of Sensitive Plant Species	All Operations	Ongoing	Yes	Yes
7.5-18	Invasive Plant Management	All Projects and Operations	Ongoing	Yes	Yes
7.5-19	Monitor and Protect Nesting and Fledgling Bird Species	No concerts occurred. Nesting bird surveys occurred concurrently with Measure 7.4-12 and 7.5-20.	Not Built	Yes	Yes
7.5-20	(BIO-3) Migratory Bird and Habitat Utilization Survey	Surveyed Proposed Epic Discovery Project Locations.	Ongoing	Yes	Implementing
7.5-21	(BIO-8) Wildlife Trash Management and Education Program	All Operations	Ongoing	Yes	Implementing
7.5-22	Maintain Timber Thinning Practices	All Operations	Ongoing	Yes	Yes
7.5-23	Provide Employee Housing	All Operations	Ongoing	Yes	Yes
Management Response to Monitoring and Evaluation					
7.6-1	Soil and Water Quality	All Projects and Operations	Ongoing	Yes	Yes
7.6-2	Traffic and Parking	All Operations	Ongoing	Yes	Yes
7.6-3	Late Seral/Old Growth Enhancement	All Operations	Completed	Yes	Yes

This Page Intentionally Left Blank

Chapter 2 – Planning Measures

2.1 Introduction

A majority of the planning measures are addressed within individual Tahoe Regional Planning Agency permits. Table 2-1 provides an update to the previous year's report (October 2019 to September 2020) project list and updates any existing open permits. Past projects and permits completed and closed are not shown. Projects and permits that were completed and closed in the last year are included with a strike-through and status comments. A few of the projects listed are completed but are waiting to receive final inspections for revegetation and Best Management Practices (BMPs) and closure.

Table 2-1 Update on Projects Constructed Prior to the 2021 Construction Season

Project	TRPA Permit #	Status as of October 2021
Tamarack Lodge	ERSP 2009-3571	Completed December 2010. BMP security released on 10/21/11. Still holding security until CFA is transferred/relocated allowing summer usage. Heavenly will continue to work with TRPA during water year 2022 to finish the transfer of CFA for summer usage. See condition 6 of permit.
Bear Cave Children's Ski School Lodge (Includes tubing hill modifications)	ERSP 2011-0513 & ERSP 2017-0589	Lodge completed in October 2011. Tubing lift road and hill completed. The construction deadline has expired on both permits. Final inspection was scheduled for September 2021, but Caldor Fire delayed the inspection. Inspection is anticipated for spring 2022, followed by permit closure. Permit conditions allow infrastructure to be removed and installed each season, even after the permit is closed.
Summer Activity Improvements (Multi-Line Zipline/Gondola Enclosure) and Wedding Arch Site Development	ERSP 2012-1147 & ESRP 2012-1147-01 & ESRP 2019-1089	Project features that have been completed were listed in secondary permit ERSP 2012-1147-01 and include: Discovery Forest/Black Bear Challenge Course Gear-up Deck and Access Trail, Family Loop Trail with Interpretive Exhibits, Base of Gondola Welcome Area, and associated Hiking Trail. The Weather Shelters along Canopy Tour Routes have not been constructed at this time. Final inspection of the completed project features was scheduled for September 2021, but Caldor Fire delayed the inspection. Inspection is anticipated for spring 2022. Enclosure of the ground floor of Gondola Top Station was completed under a different permit (ERSP 2019-1089), which has been completed and the permit has been closed (12/6/2019).
Hazard Reduction and Trail Widening	ERSP 2017-0015	This project was never started, and this permit number expired. No pre-grade inspection was done upon application. There are no current plans in place to move forward with this project. Final inspection to close out the expired permit was scheduled for September 2021 but delayed due to the Caldor Fire. Inspection is anticipated in spring 2022.
Outdoor Distribution Antenna System at California Lodge	ERSP 2019-0375	TRPA passed a pre-grade inspection in summer 2019. During the summer of 2020, the towers were installed along with the buildings, and trenching of the fiber cable. Final project details were completed during summer 2021, and a final inspection will be scheduled for summer 2022.

Table 2-2 Project Status as of October 2021

Project	TRPA Permit #	Status as of October 2021
Tamarack Area Improvements	ERSP 2016-0149	Trail widening was completed in 2016, while the installation of temporary sales kiosk, decommissioning of timber yard and BMP implementation/ winterization occurred in 2017. Features that have been completed include Temporary Spur Road, Tamarack Return Ski Trail Widening, Blue Streak Zip Line Tree Removal, Relocation of Existing Red Fir Handle Tow Lift (however, this is now located on the Skier's left side of East Street Trail). The Magic Carpet and the handle tow were completed; however, their location was flopped from what was initially shown in the permit plans and conditions. Portions of the permit that have not been completed include: the New Activity Ticket Kiosk, Magic Carpet Ski School Lift, and the Tamarack Lodge Deck Expansion. At this time, it is unknown when the un-completed portions of the permit will be budgeted for and/or re-permitted/constructed. Like other projects, final inspection was scheduled for September 2021, but Caldor Fire delayed the inspection. Inspection is anticipated for spring 2022, followed by permit closure.
Epic Discovery East Peak	ERSP 2013-0490 & ENVR 2013-0001	Past projects completed under this permit include the Mid-Station Canopy Tour, Alpine Coaster, Kids Zipline, East Peak Canopy Tour, and marked the beginning of Mountain Excursion Tours, hiking pathways, signage and welcome area. The 2017 construction season saw the opening of the Epic Discovery Center, additional trail signage/connections as well as repairs to the Alpine Coaster with additional permanent BMP implementation. Portions of the project that have not been completed include additional repairs to the Alpine Coaster, Panorama trail installation, Sky Meadows Observation Deck, Sky Meadows Zipline Canopy Tour and Challenge Course, Mountain bike demo center park and trails, Ridge Run Lookout Tower, East Peak Lake water activities, Sky Cycle and various associated BMPs. At this time, it is unknown when the un-completed portions of the permit will be budgeted for and/or re-permitted/constructed. Similar to other projects, final inspection was scheduled for September 2021, but Caldor Fire delayed the inspection. Inspection is anticipated for spring 2022, followed by permit closure.

2.2 Measure No. 7.3-1 TRPA Mitigation Monitoring Activities

This measure describes the Mitigation and Monitoring Agreement that Heavenly must enter into with TRPA.

Heavenly, TRPA, and Cardno ENTRIX entered a three-party ongoing monitoring agreement in January 2008. This 5-year agreement ended in December 2012. TRPA and Heavenly began the public process requesting proposals for contracting work related to the MMP. In February 2013, Cardno (formerly Cardno ENTRIX) was selected to continue this work for an additional four-year period through July of 2017, which required all three parties annually renew funding. Cardno was again selected as the preferred consultant of the following two five-year three-party monitoring agreements: August 2017 through July 2022. Cardno now Stantec (Cardno previously) was recently notified and awarded the next five-year contract extending from August 2022 through July 2027. In addition to the three-party agreement, Heavenly Mountain Resort separately provides funding to TRPA for staffing review related to the MMP measures and report. Heavenly is in compliance with this measure.

2.3 Conclusion

Heavenly complied with all applicable planning measures during the 2020-2021 monitoring period. Project-specific measures such as 7.3-2 (Powderbowl Lodge), 7.3-3 (Gondola Mid-Station Restaurant) and 7.3-4 (Sand Dunes Lodge) have yet to be constructed and will be discussed in future MMP annual reports upon planning, construction and/or completion.

This Page Intentionally Left Blank

Chapter 3 – Construction Measures

3.1 Introduction

The construction measures contained in the MMP are designed to limit the environmental impacts both during and following the construction of new projects within Heavenly Mountain Resort. Resource Concepts Inc. (RCI) assists Heavenly in developing their BMPs and conducts on-mountain monitoring of temporary construction BMPs and permanent BMPs for all Heavenly's capital improvement projects and Watershed Maintenance and Restoration Program (WMRP) projects (RCI, 2022). In 2017, Resource Concepts Inc. (RCI) replaced Integrated Environmental Restoration Services' (IERS) role and monitoring effort associated with the MMP as the firm transitioned into retirement. RCI, along with Heavenly staff, assisted in restoration treatment monitoring and directed implementation at troublesome erosive locations in prioritized watersheds within the resort boundaries. In the past, IERS led this effort in addition to providing various slope and soil cover treatment experiments. Adaptive management of these slope treatments provided a guide on which soil cover treatments were successful. Building upon the successful areas, Heavenly restoration crews now implement these documented beneficial slope treatments on continual problem areas to limit erosion runoff and enhancing soil characteristics.

3.2 Measure 7.4-1 Implement the Construction Erosion Reduction Program

Implement the Construction Erosion Reduction Program (CERP) would minimize the rate of soil loss related to construction activities at Heavenly. The CERP and Watershed Management Guidebook are design features that will be incorporated into construction activities through the Master Development Plan.

Heavenly contracts with RCI to ensure effective BMPs and restoration treatments are designed and implemented for each of their construction projects. During the 2021 construction season, RCI inspected both temporary and permanent constructed BMPs for implementation and effectiveness. RCI completed 13 evaluations of temporary BMP at 10 sites and 39 evaluations of permanent BMP at 38 sites.

Temporary BMP evaluations were performed at active construction sites on two-week intervals, except during the period when Heavenly access was closed to due wildfire restrictions. During the construction season, as mentioned above, RCI conducted 13 evaluations of temporary BMP at 10 active construction sites. During the evaluations, temporary BMPs were fully implemented during 92% of evaluations, and were 100% of the BMPs in place were effective. This resulted in a qualitative overall score of 92% and an "Excellent" rating. "Departures were related to poorly installed straw wattles and areas with minimal soil protection (mulch or vegetation). Heavenly staff acted promptly to correct temporary BMP departures when notified" (RCI, 2022).² Knowledge gained from years of monitoring and reporting have proven which (BMP) "methods and structures" are successful and better suited to limit erosion runoff on the mountain. Building upon past years' experience and lessons learned, Heavenly continues to require the BMP training program for staff, contractors, and other vendors, and by stressing the importance of erosion reduction issues and methods company-wide.

Permanent BMP evaluations were performed at the project completion for 2021 construction and WMRP projects and one-year post-construction for projects from the previous year. The 2021 evaluation report showed that permanent BMPs were "fully implemented at 97% and effective at 90% of the evaluations conducted. Effectiveness departures note where infiltration could be improved at water bars or through soil protection. Heavenly staff acted promptly with plans to correct departures" (RCI, 2022)³ Since both

² RCI. Heavenly Mountain Resort. Watershed Maintenance and Restoration Program. 2021 Annual Report & Construction Summary. Page 14.

³ RCI. Heavenly Mountain Resort. Watershed Maintenance and Restoration Program. 2021 Annual Report & Construction Summary. Page 15.

scores were over 90%, permanent BMPs received an overall “Excellent” score. Additional information related to BMP monitoring can be found in the Watershed Maintenance and Restoration Program (WMRP) 2021 Report (Appendix I).

The WMRP 2021 Report (Appendix I) provides examples on how the previous year (2020) recommendations were incorporated, implemented, or improved upon during the 2021 maintenance and monitoring season. The WMRP Report also lists additional recommendations for future monitoring, as summarized below:

Planning and Communication Process

- Continue to coordinate regarding the development and status of the Annual Work List.
- Continue to adapt to the COVID-19 pandemic restrictions and provide virtual BMPs, Facilities and Watershed Awareness Trainings, which covers the compliance requirements for all staff, new employees, and outside vendors/contractors.

WRMP Implementation and Effectiveness

- Continue to implement the Outcome Based Watershed Management Approach to modify existing BMPs and plan for future projects.

Monitoring and Assessment Process

- Continue to integrate monitoring results from previous seasons into the planning and implementation of future projects.
- Review road monitoring and inspection needs with respect to MMP requirements and consider updating protocols.

Since 2015, the USFS Region 5 has adhered to the new National US Forest Service BMP monitoring program. The final monitoring approach and protocol for monitoring assessment has yet to be released; however, the agency has actively been using the draft protocols over the past few years. Protocols from this program assess BMP implementation and effectiveness for a wide variety of land management practices including roadways, ski runs and facilities. All management practices associated with Heavenly Mountain Resort (on USFS lands) will be included in the sample pool for random selection and annual monitoring, which the USFS staff will conduct and report results. This USFS monitoring effort will supplement RCI's on-mountain monitoring effort. RCI's Watershed Maintenance and Restoration Program 2021 Annual Report is contained in Appendix I. Heavenly is in compliance with measure 7.4-1.

3.3 Measure 7.4-2 Construct Infiltration Facilities

This measure states that all new projects contributing to impervious surface shall be designed to infiltrate the 20-year, 1-hour storm.

The 2021 Annual Summer Work List listed eight (8) source locations to be improved and/or completed within the Heavenly Valley Creek watershed, and an additional source location project was added during the construction season, (for a total of nine [9] locations) (watershed CA-1, as listed in the Annual Work List). During the 2021 construction season, three source location projects were completed and addressed by BMP maintenance projects (such as maintenance at sediment basins and the base of lifts). The Upper Shop source BMP maintenance project is partially complete and will continue during the 2022 construction season. One erosion hot spot location project was completed (Groove Erosion Resistance, which included improving erosion resistance and drainage stability along the ski trail and access road) over the summer construction period.

Two multi-year master plan projects (the Sediment Removal at the Cal Dam Snowmaking Pond and American Tower Cell Tower and Fiber Optic Line Replacement) were completed. The Cal Dam Snowmaking Pond 401 Water Quality Certification post-construction report was reviewed by Lahontan and removed from their active database.

The third-party master plan Nevada (NV) Energy multi-year project (vault and powerline installations) is ongoing, occurred across several watersheds, and will continue in the summer of 2022. The additional resort maintenance project, TOG Water Tank Power, which included the underground power extension to the water tank, was added to the work list in summer 2021 and was completed. The 2021 completed Annual Summer Work List is included in Appendix III.

One erosion hot spot location project was completed in the Bijou Creek watershed (CA-6): the Cal Base Summer Access Road at the parking lot entrance was stabilized and erosion resistance was improved behind the lodge. Pictures of this project are included in Appendix I. No projects were scheduled or completed with watershed CA-7 (unnamed creek near the Gondola) during the 2021 construction season.

Within the Mott Canyon Creek watershed (NV-1), Heavenly completed one BMP maintenance project (Galaxy Road Sediment Basin), which extended into the Daggett Creek watershed. This involved the maintenance and sediment clean out of the Galaxy Road shoulder sediment basins.

Work associated with the NV Energy Distribution Project (a multi-year project) also occurred in the Edgewood Creek watershed (NV-3) and will continue in summer 2022. The multi-year Boulder Parking lot resurfacing project is also underway in the Edgewood Creek watershed, and much of the parking lot pavement was improved during the 2021 summer season. This project is covered by a Stormwater Pollution Prevention Plan (SWPPP) under the construction stormwater permit and allows sheet runoff from the parking lot to flow into the existing vault system prior to draining into Edgewood creek.

Within the Daggett Creek watershed (NV-2 and NV-5), Heavenly completed one BMP maintenance project, (Galaxy Road Sediment Basins, which extended into the Mott Canyon watershed), and work associated with the ongoing NV Energy Distribution Project. Resort maintenance was completed at the East Peak Lodge Well for the public water system by replacing the concrete collar around the wellhead to protect the source water, and the master plan East Peak Snowmaking Well project connection to a new NV Energy transformer was completed.

Annual resort-wide efforts addressing BMP maintenance were also completed in 2021. The BMP maintenance includes inspecting and restoring all areas damaged or affected by winter resort operations, erecting, and maintaining vehicle barriers and/or fences to keep unauthorized vehicles in designated areas and inspecting and maintaining drainage structures. Road maintenance is performed throughout the resort as outlined in the annual Heavenly Forest Service maintenance and monitoring agreement protocol.

Additional details regarding the 2021 completed projects can be found in RCI's WMRP 2021 Annual Report and Construction Season Summary (Attachments A in Appendix I), while the updated 2021 Annual Summer Work List can be found in Appendix III. All construction projects are summarized above, and no impervious capital improvement projects were constructed in 2021; however, all new and future projects will be designed to infiltrate the 20-year design storm runoff. Heavenly is in compliance with this measure.

3.4 Measure 7.4-3 Meet Water Quality Standards

Several items identified in the Master Development Plan's MMP aid in meeting water quality standards. These measures include implementing the Watershed Maintenance and Restoration Program, implementing the CERP, implementing the Environmental Monitoring Program, installation of BMPs at all facilities and parking lots, installation of a monitoring site on Daggett Creek, and prohibiting grooming on ski trails deficient of adequate snow cover.

From the period of October 2020 to September 2021, Heavenly Mountain Resort continued to implement both the Cumulative Watershed Effects (CWE) Restoration Program and Watershed Maintenance and Restoration Program. Each year, RCI helps Heavenly utilize adaptive management practices to prioritize maintenance and restoration projects. The completed BMP maintenance and project list for 2021 is located in Table 1, 2021 Completed Projects and BMP Installation/Maintenance (Attachment A of Appendix I). Detailed information concerning maintenance, monitoring, and implementation of WMRP projects is located in Appendix I.

The Environmental Monitoring Program issues reports on an annual basis and has been ongoing since 1991. The 2021 water year water quality monitoring was conducted monthly between October 1, 2020, and September 30, 2021. Additional biweekly spring runoff samples were collected for all seven of the stream monitoring sites from the beginning of April through the end of June.

More stringent water quality parameters took effect during the 2008-2009 water year at the California Parking Lot site (above Bijou Park Creek). Permit conditions stated that more stringent water quality standards would become effective once the BMP Retrofit Project and treatment system were in place at the California Parking Lot. For the 2021 water year, Heavenly reported annual average exceedances at Bijou Park Creek (43BPC-4) for total nitrogen, total phosphorus, and chloride, and a 90% percentile annual average exceedance of suspended sediment. Three storm samples were collected during the 2021 water year at the effluent sampling compliance location at the California parking lot StormFilter vault (43HVP-2). Typically, between three and five samples are collected during the water year, which can only be collected amid storm events, and during the 2021 water year, samples were collected in the first and third quarters. All three samples collected at the effluent sampling compliance location (43HVP-2), exceeded the limits for turbidity and total nitrogen. Total nitrogen exceedances were primarily driven by high concentrations of total kjeldahl nitrogen (TKN). One sample exceeded the standard for oil and grease, while the other samples were below the detectable limit (2.0 mg/L), which is also the not to exceed standard for this location. Total phosphorus was exceeded in two of the samples, both which occurred in the third quarter. Comparison of the inlet and effluent concentrations shows a drastic reduction in turbidity, and total nitrogen for all storm samples collected. Concentrations of oil and grease at the influent location that are below detectable limits (and, therefore, reported as ND, rather than a value), make it difficult to assess filtration through the StormFilter vault of oil and grease at the effluent location. Total phosphorus filtration through the system reduced outlet concentrations on one occasion, but not below the not exceed standard. While there is no state standard for chloride at this location, chloride concentrations were drastically reduced through the filtration system, when comparing values at the influent and effluent locations.

Although annual maintenance of the vaults and cartridge replacement continued in 2021, storm and snow melt runoff samples at the effluent monitoring location continue to be in exceedance and problematic, particularly in during spring runoff months. Additional storm samples are needed to draw conclusions on the vault system's filtration and treatment efficiency. Parking lot deterioration overtime may also increase sediment and nutrient loading into the vault system. Therefore, ongoing pavement repair and improvements at the California Base Area parking lot is important to reducing constituent loading. Paving improvements at the California Base Area during the summer of 2021 included 24,600 square feet of asphalt improvements (including spot patched). The entire lot was swept, crack filled, and sealed in July. During August and September, the California Base Parking Lot at Heavenly was used as the operations base (for logistics, planning, staging, and housing and feeding of fire crews) that increased traffic and usage to the parking lot. Off road vehicles used in fire operations were likely transporting additional fine sediment to the staging area. Separating out the impacts of increased use of the parking lot on downstream water quality is difficult. Recommendations for improving water quality at the California Parking Lot location, based on the past 5-years of data, is included in the *Heavenly 5 Year Comprehensive Report 2017-2021* (Cardno 2022), and provided in Appendix II (electronic copy only).

Annual average standards were exceeded along Heavenly Valley Creek at Sky Meadows (43HVC-1A), Below Patsy's Chair (43HVC-2), and the Property Line (43HVC-3) for total phosphorus and chloride during the 2021 water year. Total phosphorous and chloride were also exceeded at the reference reach along Hidden Valley Creek (43HDVC-5). Because the Hidden Valley Creek site (43HDVC-5) is the undeveloped and undisturbed watershed reference reach for the Heavenly stream monitoring locations, exceedances at this site demonstrate that Heavenly Mountain Resort operations are not solely responsible for elevated total phosphorus and chloride concentrations along Heavenly Valley Creek. *Heavenly 5 Year Comprehensive Report 2017-2021* (Cardno 2022), which includes all water year 2021 data, is provided in Appendix II (electronic copy only), and provides further discussion and results from water quality sampling at each monitoring location.

The Caldor fire burned through the Hidden Valley Creek watershed, including the reference site and reach for water quality monitoring and SCI monitoring (43HDVC-5 and HDVC-2). Water quality samples could not be collected during August and September at the Property Line (43HVC-3) and Hidden Valley Creek sites (43HDVC-5) due to active fire and subsequent forest closures, although the Caldor Fire did not burn the Property Line(43HVC-3) site. Since the fire occurred late in the water year (during the fourth quarter), during baseflow conditions, the long-term impacts of the fire and fire suppression operations remain to be seen, however, noticeable changes to the riparian habitat and channel bed at the Hidden Valley Creek site (43HDVC-5) were observed following a large rainstorm event in October 2021. Other potential impacts to sites that were not burned include fire suppression operation throughout the forest and potentially upstream of water quality monitoring sites, (including emergency clearing of powerlines throughout the South Lake Tahoe area), contributions of ash and smoke particulate matter to watershed surfaces, and the potential of increased erosion due to loss of groundcover and vegetation. The Caldor Fire burn severity map, photographs of the Hidden Valley Creek (43HDVC-5) site before and after the fire, and additional discussion of the relevancy of the reference reach is included in the *Heavenly 5 Year Comprehensive Report 2017-2021* (Cardno 2022), which is provided in Appendix II (electronic copy only).

To reduce the amount of huck salt and subsequent chloride readings in the stream samples, Heavenly requires employee training and management approval for any application use above one 40-pound bag in and around the terrain parks. Huck salt application is utilized in parking lots, walkways, and tram egress locations to provide a safer guest experience during the winter season. Huck salt is also used in the terrain park to prevent rutting, by allowing the snow surface to refreeze into a harder snow surface, helping to create a more stable base for taking off and landing areas around terrain park jumps. As reported in the *Heavenly 5 Year Comprehensive Report 2017-2021* (Cardno 2022), huck salt application volumes were similar in water year 2021 and 2020 (Section 8, Table 8-1). The 2021 water year marked the seventh-year salt application totals were monitored on a monthly basis at the California parking lot. Greater volumes of salt were used at the California parking lot during the 2021 water year, compared to the 2020 and 2019 water year, which can be attributed to the coinciding historic snowfall and busy holiday period in December 2020 as well as lower skier volumes and reservation requirements during the pandemic.

Lahontan amended the monitoring and reporting program in May 2011. The revised permit conditions intent was to provide a better representation of mountain operations with respect to environmental impact. Many of these amended conditions were incorporated into the Waste Discharge Requirements and Monitoring Program (R6T-2015-0021) finalized on May 14, 2015. Heavenly actively works to address mapped treatment areas to meet monitoring goals emphasizing soil and vegetation treatment approaches to reduce runoff and sediment transport. The treatment goals include implementation measures that will not cause an increase in runoff or sediment transport; sediment source control treatments that are self-sustaining or accompanied by an ongoing maintenance plan; and an adaptive management program for development, management, and future maintenance of problem source areas. As IERS has transitioned out of the Watershed Maintenance and Restoration Program, the 2021 construction season marks the fifth season that RCI has been retained to continue and maintain this effort. RCI continues to provide watershed and

inventory monitoring. While the methodology may differ slightly from IERS', the goal of this program is to address and prevent on-mountain erosion that ultimately improves future water quality results.

Additionally, RCI continues to collect flow data at the Daggett Creek flow monitoring station for compliance with water use permits as discussed in Chapter 4 (measure 7.5-7). If and when Ski Lift Z, or Ski Trails Z1, Z2, Z4, or Z8 are proposed for construction, a year prior to construction the Nevada Department of Environmental Protection (NDEP) and the Forest Service will determine the location and if water quality monitoring along Daggett Creek is necessary. Appendix VI contains the Daggett Creek Flow Monitoring report provided by RCI.

Heavenly, with guidance provided from the Lake Tahoe Basin Management Unit (LTBMU) - Forest Service, is required to have a minimum of 12-inches of compacted snow cover over all obstacles before grooming with snow cats is allowed. This policy protects soil and water resources, prevents significant damage to snow cats, and has been the standard practice for a number of years.

Heavenly strictly follows the Watershed Maintenance and Restoration Program as well as actively engages in the implementation of mountain wide BMPs. However, annual-average water quality exceedances along Heavenly Valley Creek and Bijou Park Creek indicate that Heavenly is only in partial compliance of this measure.

3.5 Measure 7.4-4 Implement Adaptive Ski Run Prescriptions

This measure requires all new ski runs to be revegetated according to the ski trail prescriptions in the Easy Street Run Hazard Reduction Program. It also calls for the evaluation of existing ski trails to determine if the prescription would be appropriate.

Heavenly and IERS (and now RCI) have worked together since 2006 to restore and monitor project-specific construction areas using site-specific soil function improvement and revegetation prescriptions built off of an adaptive management approach. Over the years IERS, in conjunction with Heavenly, have attempted a number of treatment methods limiting erosion and runoff. Treatment modifications have been made over time continuously improving restoration techniques and success leading to this adaptive management approach. Beginning in 2015 and continuing through the 2021 construction season, Heavenly, with past assistance from IERS and now RCI, has focused restoration treatment efforts on high and medium high hot spots identified in the CA-1 and NV-1 watersheds based on methodology developed and addressed in IERS's *Watershed Management Guidebook* (Drake and Hogan, 2013). Heavenly crews are familiar with the prescribed treatment methodology and address the "hotspots" issues previously described in measure 7.4-2. No new ski trails have been established in recent years and all restoration efforts and slope prescriptions follow the recommended treatment listed in Table 2 of *Heavenly Mountain Resort Outcome-Based Watershed Management, 2016 Restoration and Monitoring Annual Report* (Drake and Hogan, 2016) (included in the 2016 Mitigation and Monitoring Plan Annual Report as Appendix II).

3.6 Measure 7.4-5 Control Runoff Due to Future Construction and Long-Term Operation Facilities

Both broad and project-specific measures are identified for Heavenly to comply with the MMP. Each new project is to have permanent and temporary BMPs as part of its design and construction. New snowmaking should be above ground, with certain exceptions. A formal BMP maintenance program shall be continued including annual mapping documenting maintenance activities.

As discussed in measure 7.4-2, Heavenly conducted the second and final year of work on Cal Dam Snowmaking Pond Improvements master plan project, a multi-year project. One other multi-year master plan projects were initiated by third parties in 2020 was also completed (American Tower Company Cell Tower & Fiber Optic Line Replacement project), while a third multi-year project will continue into 2022 (NV Energy Vault and Power Line Replacement). These projects are multi-phase and multi-year projects, with

2020 marking the first year of construction, and completion occurring in 2021, or planned for 2022. An additional single year master plan project included the East Peak Snowmaking Well project, that provides an electrical connection from the well to the new NV Energy transformer. Resort maintenance projects include the TOG Water Tank Power project, Boulder Parking Lot improvements, and the East Peak Lodge Well project. Details of all these projects are included in Appendix I.

The completion status for the 2021 Annual Summer Work List is included in Appendix III and is summarized in RCI's report (Table 1 found in Attachment A of Appendix I). All master plan projects include infiltration BMP's detail designs and implementation locations on the project plan sets as well as the permit packages. This information is typically provided on erosion control sheets and/or storm water pollution prevention plans (SWPPP) addressing construction and project facility runoff (including project completion). Additionally, Heavenly focuses on resort-wide maintenance and improvements of temporary and permanent on-mountain BMPs.

Upcoming projects, hotspot areas to address, as well as maintenance to existing BMPs for the 2022 construction season can be found in the 2021 Annual Watershed Maintenance Restoration Program Work List (informally called the CWE work list) found in Appendix VII. All permanent BMPs are designed and maintained to infiltrate at least the 20-year, 1-hour storm. BMP effectiveness and maintenance monitoring is performed by RCI as part of the Environmental Monitoring Program. The 2021 BMP monitoring results are included in the annual report contained in Appendix I.

No new snowmaking lines were installed in 2021; and there were no snow making line repairs completed in 2021 either. All future snowmaking lines are planned to be constructed above ground unless additional mitigation measures are included allowing for underground installation. As discussed in measure 7.4-4, IERS previously mapped the location of primary sources of erosion "hot spot" locations in past annual reports. These locations have been prioritized and addressed since initially mapped; however continual monitoring and maintenance will be included in future years' restoration and maintenance projects and Work Lists.

Heavenly actively works with the Tahoe Regional Planning Agency (TRPA) and local entities for permit coverage on all new and future projects. Temporary erosion control plans denoting proposed BMP locations are included with project design permit packages.

Heavenly is currently in compliance with this measure.

3.7 Measure 7.4-6 Avoid and/or Restore Future Disturbed SEZs

A number of project-specific mitigation measures for avoiding disturbance to SEZs are identified in the MMP.

No new infrastructure/facilities were constructed that enacted this measure requiring future mitigation measures to reduce SEZ disturbance. Maintenance and modifications regarding work done in 2020 to the California Dam Snowmaking Pond and associated sediment removal required limited access through an existing SEZ. RCI worked with Heavenly on project-specific plan implementation to avoid disturbing Sky Meadow. This construction measures included:

- "Hand crews and one piece of heavy equipment was walked through the meadow (reusing steel plates) to install the diversion structure for the creek around the impoundment.
- Some grasses were pushed down during this exercise, but no wheel ruts occurred and no soil was exposed.
- A very small section of existing sod was removed and replaced during the construction/placement of the diversion pipe.
- Upon completion, there was practically no trace of the diversion once removed."⁴

⁴ Sutherland, Jill. RCI. Personal Communication April 7, 2021.

Construction associated with the sediment removal project was limited to existing disturbed areas and access roads mostly. Where equipment accessed the pond, the disturbed bank was revegetated and improved the pre-project slope condition. All appropriate agency permits were obtained for this project, and all resource protection measures and restorations were conducted. The project's 401 Water Quality Certification post-construction report was reviewed by Lahontan and removed from the active database.

Under the basin-wide Caldor Fire Response program, NV Energy distribution lines near Heavenly Resort boundaries were cleared of vegetation. This work was completed by a contractor for NV Energy. A portion of this work occurred across Edgewood Creek and the associated SEZ, downstream of the Lower Edgewood water quality monitoring site (43HVE-2) and within the Lower Edgewood SCI monitoring reach (EC-2). Approvals for the vegetation management were issued by TRPA, LTBMU, and Nevada State Lands, work was done in conjunction with the Caldor Fire Incident Management Team, and BMPs in accordance with the work approval were followed. While work was conducted outside of Heavenly boundaries, proximity to the water quality and SCI monitoring sites warrant mention in this report.

Heavenly is in compliance with this measure.

3.8 Measure 7.4-7 Avoid and / or Restore Future Disturbed Jurisdictional Wetlands and Waters

This measure requires that any project implemented by Heavenly will be located off jurisdictional wetlands and that Sky Meadows Deck and Boulder Operations be relocated off wetlands. If development within the wetlands cannot be avoided, Heavenly is required to obtain a Section 404 permit from the USACE and comply with all requirements set forth in the permit including coordinating with CDFW to comply with Section 1600 if removal of vegetation is needed. Additionally, any tree removal activity needed for ski lifts or trails will be conducted in a fashion that does not disturb wetlands.

Additional actions regarding this measure will be implemented if and when the Powderbowl Lodge is built and/or the Sky Meadows Deck is relocated. The Sky Meadows log deck area adjacent to Heavenly Valley Creek was restored in 2013 and the area under the deck received a shade tolerant seed mixture and a thin layer of pine needles to protect the seeds in 2016.

Prior to constructing and implementing the California Dam Snowmaking Pond Sediment Removal project, a wetland delineation was conducted by RCI as part of the planning and permitting process. The wetland delineation informed construction activities as well as aided in permitting constraints assisting with avoidance of jurisdictional wetland and water ways. Post-construction monitoring of the project was conducted in 2021 per permit certification requirements and submit to Lahontan. Specific project and wetland discussion are included in Measure 7.4-8 above.

Prescribed hazardous tree reduction efforts were conducted in 2021, as discussed further in Measure 7.4-11, most of which were outside jurisdictional wetlands or waters. As discussed above in Measure 7.4-6, vegetation management along an NV Energy distribution line, outside of Heavenly Resort boundaries at Edgewood Creek and the associated SEZ, was conducted in late summer 2021 as part of the Caldor Fire Response program with the appropriate approvals and BMPs in place. When hazard tree removal is needed, Heavenly continues to follow the TRPA Code of Ordinance Chapter 6 (tree removal) standard practice procedure. This ordinance requires that USFS staff mark of all hazard trees to be removed prior to Heavenly staff removing the tree(s). If future trail widening occurs near jurisdictional waters or a stream environmental zone (SEZ), tree removal operations will occur over existing snowpack reducing and limiting ground disturbance and impacts within the watershed and jurisdictional waters. Heavenly is in compliance with this measure.

3.9 Measure 7.4-8 TRPA Land Coverage Mitigation

To utilize available land coverage within the Heavenly Project area, TRPA must make appropriate relocation findings included in the Code of Ordinances and BMPs must be installed and maintained as outlined in the CERP.

As outlined in the Draft 06 EIR/EIS/EIS, Heavenly had 434,580 square feet of available banked and available land coverage within the Heavenly Project area designated as stream enhancement zones (SEZ). RCI provided the following updated table (Table 3-1) which reflects changes throughout the years to this initial land coverage value based on completed and proposed projects. The table was last updated in December 2021, and RCI confirmed no additional updates since that date.⁵ Currently, Heavenly has 217,170 square feet of available banked land coverage in non-wetland land capability areas. Heavenly is in compliance with this measure.

⁵ Sutherland, Jill, RCI. Personal communication April 18, 2022

Table 3-1 Heavenly Mountain Resort Land Coverage Calculations

Coverage Summary Table (December 2021)			
Maximum Allowable Coverage (per Master Plan)	1a	1b	Total
Maximum Allowable Coverage per Master Plan			2,053,854
Balance Remaining of Coverage / Banked Coverage per the Final EIR/EIS/EIS ¹	434,580	4,464	439,044
Project Subtotals			
Northbowl/Olympic Express Lifts Project Balances	960	396	1,356
Gondola Hiking trails	54,501	0	54,501
Mid-Station Road	50,469	0	50,469
Northbowl/Olympic Express Lifts - Plan Revision	216	0	216
World Cup/East Bowl Snowmaking - Plan Revision	283	0	283
Calif. Base Surface Lift Replacement	1,572	0	1,572
Skyline Trail Grading and Snowmaking	1,134	0	1,134
Top of the Gondola Lodge	42,387	0	42,387
Adjusted Gondola Permit Coverage	-27,519	0	-27,519
Umbrella Bar Relocation	651	0	651
Covered Surface Lift and Snowmaking	10,039	0	10,039
California Side Trail Widening	0	0	0
Adventure Peak Improvements	6,207	0	6,207
Zipline Adventure Ride	4,916	0	4,916
Verizon Angel's Roost Cell Tower and Back-up Building	584	0	584
Epic Race Course Electrical	0	0	0
Summer Activities	22,213	0	22,213
Tamarack Lodge Modifications	537	0	537
Adventure Peak Epic Discoveries	58,154	0	58,154
Removal of Gondola Hiking Trails	-54,501	0	-54,501
East Peak Basin Epic Discoveries	1,210	0	1,210
Sky Meadows Basin Epic Discoveries	26,816	772	27,588
Top of Gondola Temporary Hub	150	0	150
Summer Activities - Climbing Wall Revisions ²	348	0	348
Tamarack Project Area Additional Activities	6,090	0	6,090
Adventure Peak Epic Discoveries Revisions	8,885	0	8,885
2016 Trail Widening and Hazard Reduction	0	0	0
Cal Base Lodge Drainage BMPs	0	0	0
California Base UST Removal AST Installation	216	0	216
Gondola Enclosure Project	0	0	0
ATC HUB and Fiber/Node Project	892	0	892
Cal Dam Snowmaking Pond Maintenance	0	0	0
<i>Subtotals</i>	<i>217,410</i>	<i>1,168</i>	<i>218,578</i>
Balance Remaining Upon Project Completion	217,170	3,296	220,466

¹ Includes 10,541 square feet of existing coverage attributed to Sky Deck

² Revises original coverage numbers submitted as a part of the Summer Activities Project.

3.10 Measure 7.4-9 (BIO-1) Delay Sky Meadows Challenge Course, Sky Basin Coaster and East Peak Lake Water Activities Until Sierra Nevada Yellow-legged Frog Surveys and USFWS Consultation Are Complete

Heavenly shall delay implementation of projects in Sky Meadows or East Peak Lake until protocol surveys are completed. If Sierra Nevada yellow-legged frog (SNYLF) are found present, Heavenly will consult with agencies regarding impacts to the species and required protection measures that may or may not allow for the projects to proceed. If SNYLF are not determined to be present, Heavenly may start informal consultation with the California Department of Fish and Wildlife and USFWS regarding habitat protection measures that may allow for the projects to proceed.

Protocol surveys for the SNYLF were completed in 2014, 2015, and 2016 in accordance with USFWS visual encounter surveys (VES). Protocols require a minimum of three VES surveys in the past 10 years, according to USFS/USFWS standards, and state that at least one survey must be completed following a year having at least 80% snowpack. The 2015-2016 average snowfall winter season produced enough snow to meet the 80% snowpack requirement. Surveys were completed according to protocol and no additional surveys are required to meet this measure. Collected survey information has been provided to USFS LTBMU and will be presented again to the agencies prior to project implementation related to the Epic Discovery Projects at Sky Meadows and East Peak Lake. If Epic Discovery Projects are scheduled to be implemented 10 years following the first survey date (2014), additional surveys will be conducted.

SNYLF surveys were completed at Daggett Creek in 2017 and 2018 (two in each year, for a total of four surveys) in accordance with the Galaxy Lift Replacement pre-construction survey requirements for work near and at Daggett Creek, thus completing VES surveys for the work conducted on the Galaxy Lift. SNYLF surveys were conducted in 2020, prior to implementation of the dredging operations at the CA Dam. The survey conducted in July reported adequate habitat for the SNYLF; however, no frogs were found. Instead, several long-toed salamanders were found and relocated prior to construction activities.

Projects during the 2021 construction season were not near SNYLF habitat, and therefore no additional surveys were conducted. Heavenly is in compliance with this measure.

3.11 Measure 7.4-10 Reduce and Control Fugitive Dust

During project construction, Heavenly employees and contractors are required to implement mitigation measures to minimize the generation and transport of fugitive dust. These measures may include the use of chemical dust suppressants and/or water on unpaved roads, grading and excavated areas, as well as cleaning onsite paved roadways daily in order to remove excess dirt and mud.

RCI monitors the effectiveness of the Heavenly Mountain Resort dust control measures during their temporary and permanent BMP inspections. Heavenly continues to utilize a 2,000-gallon water tanker truck for dust abatement of roads, which is the largest potential source of dust at Heavenly. Heavenly also uses a 4-wheel drive truck, which is fitted with two 275-gallon plastic IBC totes and a pump, to provide dust control on steeper roadways not accessible by the larger weight water truck. "Water trucks were observed to be in use on a regular basis during site inspections for active construction projects and routine watering of access roads across Heavenly for effective dust control in 2021".⁶ The Heavenly environmental and compliance manager was in close contact with the water truck driver and on-site staff throughout the summer season discussing watering strategy, truckloads, and problem areas.

Table 3-2 summarizes the roadway segments that were improved, maintained, regraded, or resurfaced with road base. This information can additionally be found in the Appendix II (electronic copy only). In 2021, a total of 14.03 miles of Heavenly Forest Service roads have been repaired and/or maintained by Heavenly staff. Road base and/or binder was applied to multiple road segments. Work related to the NV

⁶ RCI. Heavenly Mountain Resort. Watershed Maintenance and Restoration Program. 2021 Annual Report & Construction Season Summary. Page 12.

Energy Distribution Project was completed along several road sections and included conifer tree trimming and installation of power lines in some locations. Road shoulders were covered with pine needle or wood chip much to slow sheet flow from road surfaces, drainage and water bars were maintained, and road delineation ropes were installed do discourage travel off designated roads.

Table 3-2 Description of Work Completed at each Road Segment in 2021

Road Section Name	Road Segment	Distance (miles)	Description of Work
NV Gate to Titos Corner	13N53B	0.1	Water bar maintenance and applied road base where needed
Titos	13N53.5	0.2	Water bar maintenance and applied road base where needed; NV Energy tree maintenance
Chute to Midway Switchbacks	13N53	0.4	Water bar maintenance and applied road base where needed; NV Energy tree maintenance
Titos to base of North Bowl	13N53C	0.3	Inspected, conducted minor maintenance -- no road base needed
Stage switchbacks	13N53	0.6	Water bar maintenance and applied road base where needed; NV Energy tree maintenance
NV Trail to East Peak	13N53	0.8	Water bar maintenance and applied road base where needed; NV Energy tree maintenance
Pepis/Comet to base East Peak to top of North Bowl	13N54	0.5	Water bar maintenance and applied road base where needed
T7 Road	13N54	0.2	Inspected, conducted minor maintenance – no road base needed; NV Energy Distribution Project
Steve's and Crossover	13N54	0.9	Inspected, conducted minor maintenance – no road base needed; NV Energy Distribution Project
Power Station Road	13N53A	0.4	Inspected, conducted minor maintenance -- no road base needed
Galaxy	13N53E.1	1.2	Water bar maintenance and applied road base/drain rock where needed
Orion's	13N52B	0.6	Water bar maintenance and applied road base where needed
Top of Dipper Road	13N52F	0.2	Water bar maintenance and applied road base where needed
Groove Road to Upper Shop	12N41	0.6	Water bar maintenance, sediment pond cleanout, and applied road base where needed
Maggies Creek to Cal Dam	12N40	0.9	Water bar maintenance, sediment pond cleanout, and applied road base where needed
Cal Dam to Sky Deck	12N40	0.3	Inspected, conducted minor maintenance -- no road base needed
Hellwinkle's	12N40	0.4	BMPs, applied road base, conducted compaction and watered
LCT to VS/Top of Gondola	12N40	1.4	Water bar maintenance and applied road base where needed
Top of Gondola Tam to Coaster	12N40.5	0.2	Compaction of walking trails. Maintained water bar at tube hill
Upper CA Ridge	13N52	1.2	Water bar maintenance, grade work, and applied road base
Upper CA Switchbacks	13N52i	0.33	Grade work, compaction, and BMPs (Woods Trail to Upper Ridge Run)
Roundabout – Top of WC-Pistol	12N40	0.7	Water bar maintenance and applied road base where needed
Roundabout – Pistol-Cut	12N40	1.1	Water bar maintenance and applied road base where needed
Roundabout – Cut-Creek	12N40	0.5	Water bar maintenance and applied road base where needed; V-ditch cleanout
Total		14.03	

Additionally, quarterly and annual reports to Lahontan document all California Base Lodge sweeping, cinder and dirt removal in the main lodge parking areas. The 2021 water year parking lot sweeping numbers can be found in Appendix II (electronic copy only). Heavenly is in compliance with this measure.

3.12 Measure 7.4-11 Minimize Removal/Modification of Deciduous Trees, Wetlands, and Meadows

Before any construction project Heavenly must have a qualified biologist conduct a vegetation survey and identify all deciduous trees, wetlands, and meadows located within or adjacent to the proposed construction corridor. Heavenly is then required to implement a final engineered alternative that avoids the loss or degradation of the identified riparian or wetland communities. If these communities are unable to be avoided, Heavenly must mitigate for the impacts.

When planning indicates, Heavenly actively works with RCI on individual projects located in sensitive areas containing deciduous trees, wetlands, and/or meadows to conduct surveys and delineations. In 2020, as discussed in Measure 7.4-7, a wetland delineation was conducted at the California Dam location by RCI as part of the planning and permitting process of the Cal Dam Snowmaking Pond Sediment Removal project and helped to identify construction constraints and develop avoidance measures. These delineations are required for Clean Water Act (CWA) permitting and help to minimize the disturbance and possible loss of deciduous trees, wetlands, and meadows by defining the extents of these areas. No deciduous trees were removed as part of that project, and the Cal Dam Snowmaking Pond Sediment Removal project followed all avoidance measures to minimize modifications to associated wetlands and meadows. The project's 401 Water Quality Certification post-construction report was reviewed by Lahontan in fall 2021 and removed from the active database.

As discussed in Measure 7.4-6 and 7.4-7, under the basin-wide Caldor Fire Response program, NV Energy distribution lines near Heavenly Resort boundaries were cleared of vegetation. This work was completed by a contractor for NV Energy. A portion of this work occurred across Edgewood Creek and the associated SEZ, outside of the Heavenly Resort boundaries, downstream of the Lower Edgewood water quality monitoring site (43HVE-2) and within the Lower Edgewood SCI monitoring reach (EC-2), and included some deciduous trees (*Populus tremuloides*, quaking aspen). Approvals for the vegetation management were issued by TRPA, LTBMU, and Nevada State Lands, work was done in conjunction with the Caldor Fire Incident Management Team, and BMPs in accordance with the work approval were followed.

Heavenly is in compliance with this measure.

3.13 Measure 7.4-12 (BIO-2) Active Raptor and Migratory Bird Nest Site Protection Program

This measure requires that before construction activities, a migratory bird nest site survey will be conducted to identify any active raptor nest sites within the project area. During initial construction activities, a Forest Service biological monitor is required to be onsite to evaluate if any migratory bird nests are within 100 feet of the construction corridor. If any nests are found, the biological monitor will stop construction and consult with the Forest Service and TRPA staff within 24 hours to determine the next appropriate actions.

Under the direction and oversight of the Forest Service, qualified staff from Sierra Ecotone Solutions conduct annual raptor and migratory bird nest surveys. In accordance with the design features identified in the Biological Evaluation and Epic Discovery EIR/EIS/EIS required nesting bird surveys for summer activities were performed on June 12-15, 2021.

The nesting bird surveys at the top of the Gondola, Mountain Coaster, and surrounding areas indicated there were no active nests within the facilities or immediate vicinity. One active mountain chickadee nest

was located in a cavity approximately 120 meters north of the Mountain Coaster, however, the nest will not be impacted by facility activities due to the distance from the Mountain Coaster and the lack of trails in the nearby vicinity. Potential suitable nesting habitat for varieties of bird species, including snags containing cavities, were observed, although only the single cavity was observed as active. Sierra Ecotone Solutions generally recommends retaining these snags within project areas, where feasible, to maintain suitable nesting locations for cavity nesters.

Additionally, Sierra Ecotone Solutions performed surveys for auditory and visual detection of the California spotted owl. These surveys are conducted and completed in potentially suitable habitat within the surrounding project areas. Protocol for surveying habitat conservation areas and spotted owls is followed as outlined by the Forest Service. The survey points used since the 2007 field season were utilized again in 2021 to provide continuity of data collected.

California spotted owl surveys conducted in 2021 resulted in no auditory or visual detection of the species within the survey area. Spotted owl call point locations are included in Appendix VIII, 2021 Biological Survey Results. Spotted owl protocol states if there has been no detection for two consecutive years, it can be assumed the results are accurate for an additional 2 years without performing additional surveys. The completion of the 2021 field surveys for the California spotted owls' results in meeting the 2-year protocol for this species. The 2-year timeline starts on the last day of the last survey, which would be June 18, 2021; therefore, if implementation of projects would commence prior to June 18, 2023, no further surveys for the California spotted owl would be necessary. However, if construction does not commence prior to this date, 2-year protocol surveys must be continued. The survey results and data sheets are located in Appendix VIII, 2021 Biological Survey Results. The 2021 monitoring season was the fourth year that non-nesting migratory birds were monitored (California spotted owl [discussed in this section] and northern goshawk [discussed in Measure 7.4-13, below]). To better understand the extent of migratory bird utilization of the above reference project locations, bird point counts were performed to determine species diversity, nesting data, and population sites, and will continue for one additional year. The first year of collected data (2018) was considered baseline data to compare with future surveys results to better understand fluctuations and changes of migratory bird utilization of the project areas. Upon completion of the five-year dataset, a summary report and analysis of migratory bird habitat utilization will be prepared.

Additional nesting bird and bat roost surveys were performed as part of preconstruction surveys for the NV Energy Distribution Project area. The NV Energy Distribution Project preconstruction surveys were conducted on May 24-26, 2021. The project area was surveyed for nesting birds, and no active nests were observed within the immediate vicinity of the proposed project. Two dark-eyed unco nests were located within the project area buffer, but a sufficient distance from the proposed active construction area (75 and 130 meters), that the nests will not be subject to construction impacts. Additionally, a red-breasted nuthatch was located in a snag approximately 90 meters from the proposed work area, which is sufficient distance to prevent nest impacts. The project area was surveyed for the presence of bat roosts in rock crevices, snags, and within dense trees. No evidence of bat roosts was observed during the surveys. A review of the preconstruction survey results, and a map of the survey area can be found in the 2021 Biological Survey Results located in Appendix VIII. Heavenly is in compliance with this measure.

3.14 Measure 7.4-13 Monitor and Protect Northern Goshawk

Preconstruction surveys for northern goshawks are required for any projects that propose to affect or are within half a mile of any suitable northern goshawk habitat. Surveys are required to be in accordance with the most recent Forest Service Region 5 protocol. Additionally, Heavenly Mountain Resort is required to fund updated northern goshawk habitat maps at 5-year intervals throughout the life of the Master Plan Amendment. These maps will be used when conducting any preconstruction surveys.

Sierra Ecotone Solutions is approved by the Forest Service to conduct northern goshawk surveys. Surveys were conducted and completed in suitable habitat within and adjacent to the project area for northern goshawk based on the updated habitat map generated by the Forest Service for the environmental analysis of the Master Plan Amendment. In 2021, both dawn acoustical and broadcast survey methods were utilized and completed according to protocol. No auditory or visual detections of the northern goshawk were documented within the survey area in 2021. The completion of the 2021 field surveys for the northern goshawk meet the 2-year protocol timeline. The northern goshawk protocol does not include any discussion as to the validity of surveys for any duration of time after protocol has been met. However, since northern goshawks have been detected in previous years, Sierra Ecotone Solutions recommends the continuation of goshawk surveys to determine if goshawks are nesting within the special use permit boundary. Results, call point location maps, and data sheets from the surveys conducted in 2021 are contained in the 2021 Biological Survey Results Summary, located in Appendix VIII. As discussed in Measure 7.4-12, the 2021 monitoring season was the fourth year that non-nesting migratory birds were monitored. Upon completion of the five-year dataset (following next year), a summary report and analysis of migratory bird habitat utilization will be prepared.

Projects that propose to affect, or are within half a mile of, any suitable northern goshawk habitat are required to have preconstruction surveys completed for northern goshawks. All surveys will be in accordance with the most recent Forest Service Region 5 protocol. No projects within suitable northern goshawk habitat were scheduled for the 2021 construction season.

Additionally, Heavenly Mountain Resort is required to fund updated northern goshawk habitat maps at 5-year intervals throughout the life of the Master Plan Amendment. These maps will be used when conducting any preconstruction surveys. Heavenly is in compliance with this measure.

3.15 Measure 7.4-14 (BIO-4) Wildlife Nursery Site Survey

Heavenly shall conduct preconstruction wildlife nursery and den site surveys within 100 meters of ground disturbance activities. Findings of the survey will be reported to the USFS LTBMU, which has the authority to effect the construction schedule, dates of active construction, and/or modify the facility location to provide adequate protection.

In 2021, Sierra Ecotone Solutions completed preconstruction surveys for wildlife nursery and marten den sites for the continuation of the NV Energy Distribution Project (a multi-year project). Project areas were surveyed for marten den locations and for the presence of wildlife species in accordance with the design features identified in the Biological Evaluation and the Epic Discovery EIR/EIS/EIS. The NV Energy Distribution Project area was surveyed on May 24-26, 2021. Each survey was conducted on foot, up to 100 meters from the respective proposed project area. No nursery and/or den sites were observed at any of the surveyed project area locations. The NV Energy Distribution Project area lies within the known home range of a reproductive female marten, as documented in the Epic Discovery EIR/EIS/EIS. Any visual evidence of marten activity during the construction of the project is required to be reported to USFS LTBMU biologists.

A review of the surveyed results and a map of the survey area can be found in the 2021 Biological Survey Results located in Appendix VIII. Heavenly is in compliance with this measure.

3.16 Measure 7.4-15 Utilize Boundary Management Plan to Manage Skier Access on Adjacent NFS Lands.

This measure requires that Heavenly Mountain Resort prohibits skier access from the gondola mid-station. Access is permitted through managed skier gates along the ski area boundary.

Heavenly provides stationed employees at the Gondola mid-station to explain to skiers and riders that the mid-station is only for sightseeing and that one more stop is available where one can ski or ride. If guests

with skis or snowboard equipment stop at the mid-station, Heavenly employees require them to leave their equipment on a rack near the gondola where it can be monitored. In past years, during and after larger snowstorm events, rider tracks can be seen from the mid-station. The Heavenly Mountain Resort policy calls for employees to contact dispatch and security to apprehend the violators at the bottom of the Gondola.

The mid-station also acts as a physical barrier to accessible skiable terrain. It is an elevated platform with a 10-15-foot drop to the ground. The stairs leading to an area below the mid-station are roped off and marked "For Authorized Personnel Only." Heavenly does its due diligence to maintain compliance with this measure prohibiting skier access from the mid-station.

During years of increased precipitation and snowfall (for example, the 2016-2017 ski season), skiing and prohibiting access from the Gondola mid-station becomes more problematic. The physical barrier and height are limited due to snow depth. Evidence of ski/snowboard tracks below the deck have been visible after large snow events. The 2020-2021 was a lower precipitation year; and therefore, snowfall totals were not significant enough to provide adequate depth and continuous skiing/access from the Gondola mid-station.

The latest Boundary Management Plan was updated March 2022 (Heavenly Mountain Resort, 2022) and included in Appendix IX. Signage is posted at location that people have traditionally existed the boundary with metal gates that require "physical action" by a skier/rider to open them and are installed at various locations to provide backcountry access. At these locations, a steel gate hangs horizontally from a single post and a self-closing mechanism. The Fulstone and Beach Gates (see location details in the Boundary Management Plan, Appendix IX) will be periodically closed due to:

- Active avalanche control with explosives. The gates and terrain will open once active avalanche work is completed.
- Early season conditions when Killebrew Canyon is not yet open due to lack of snow or inability to secure the boundary perimeter. A secure boundary rope is required around Killebrew Canyon prior to allowing access to these gates, which prevents access into the uncontrolled terrain, except at gate locations.

Otherwise, the gates are not typically closed otherwise during other operations, as these designated areas are treated the same as any other backcountry access area.⁷ The warning signs state the avalanche danger scale, backcountry checklist, and acknowledgement that one will accept full responsibility for their actions and cost associated with their rescue. The gate postings also include the North American Public Avalanche Danger scale and USDAFS Access Point Notice among other signage. Skiers/riders may be cited by local authorities should they enter backcountry areas when gates are closed. In the event that search and rescue is required beyond the ski area boundary, the skier/rider may also be charged for the cost of their rescue.

The gate locations are located in areas in which people have traditionally accessed out-of-bounds areas. The six access points and gates are located at the following locations: Fire Break, Raley's Gulch, Fulstone Canyon, Stateline Gate, the Beach and Broad Daylight. Heavenly provides and maintains counters at each of the gates for the entire ski season, and gate usage (number of users) will be monitored and reported to the Forest Service. Detailed information on Heavenly's Boundary Management policy can be found in Appendix IX. Heavenly is in compliance with this measure.

⁷ Heavenly Mountain Resort Boundary Management Plan, 2022. Revised March 2022.

3.17 Measure 7.4-16 Evaluate and Monitor Known Archaeological Resources within Comstock Logging Historic District

Prior to construction activities, a qualified professional must formally evaluate the project area for the National Register of Historic Places (NRHP). The LTBMU Heritage Resources staff keeps a record of possible historic sites at Heavenly Mountain Resort.

The LTBMU Heritage Resources staff keeps a record of possible historic sites at Heavenly Mountain Resort. If and when future projects lie within the known study area, Heavenly will plan for and avoid any known prehistoric site and additional surveys will be conducted as needed.

LTBMU Heritage Resources staff conducted evaluations of archaeological resources sites in the Comstock Logging Historic District site within the Heavenly boundary before 2007. Evaluations concluded that all sites but one (the Flume Site) were eligible for the NRHP (Maher, 2012). Monitoring of these eligible sites occurred throughout 2009 and 2010. Proposed ski runs and potential construction in the Galaxy Pod area prompted monitoring in this area in 2011 (Maher 2012). Surveys were conducted in 2011 for the trail widening project on the California side to ensure that there was no conflict with the Comstock Logging Historic District site.

Additional surveys in the area adjacent to the California trails for the Heavenly Mountain Resort Tamarack Project were completed during the 2015 summer months. The surveys were performed due to the improvement of winter and summer activities in the area of the Tamarack Pod of Heavenly Mountain Resort. The proposed improvements include a new activity ticketing sales kiosk, relocation of the existing Red Fir handle tow lift, addition of new Magic Carpet ski school lift, Tamarack return trail ski widening and the Blue Streak Zip line tree removal. According to the Heritage Resources Inventory Report, all improvements except for much of the Blue Streak Zip Line tree removal and Tamarack return trail ski widening were previously surveyed. An intensive pedestrian survey of the un-surveyed portions of the Area of Potential Effect (APE) was performed on October 22, 2015, and observed no cultural resources (Fuller, 2015b). The project was determined to have no effect on cultural resources listed on or eligible for inclusion in the National Register of Historic Places.

There have been no updates to this measure since the last documented evaluation in 2015. Updates were not provided by LTBMU in the past several years, as the LTBMU Heritage Staff position has been vacant. The position was recently filled by Kenneth Biddle (LTBMU – Archaeologist). Mr. Biddle confirmed that there are no new updates to this measure. It should be noted that Heavenly actively works collectively with the LTBMU ensuring project planning and construction activities are in accordance with all USFS protocols including documenting and avoiding known cultural resources within the resort boundary. Heavenly is in compliance with this measure.

3.18 Measure 7.4-17 Identify and Protect Undiscovered Archaeological Resources

The LTBMU Heritage Resources staff will spot-check any proposed construction areas in consultation with the appropriate State Historic Preservation Office. If previously undiscovered resources are discovered during construction, all activity will be put on hold until the LTBMU Heritage Resources staff for either California or Nevada assess it for eligibility to the NRHP, compliance with TRPA Code Section 29, and/or (in the event of a prehistoric or ethnographic find) for Native American values.

LTBMU Heritage Resources staff has prepared a comprehensive list of historical sites within the Heavenly boundary. Surveys are done prior to choosing locations for projects. Heavenly employees and contracted construction workers receive training prior to project commencement on the protocol for an encounter with possible archaeological resources.

In 2009, to assist in project scoping and field study, a general meeting at the offices of Heavenly Mountain Resort and a site visit focusing on the Gondola's APE was conducted (Lindstrom and Blom, 2009). Heritage

concerns were addressed by project archaeologist Susan Lindstrom and John Maher, Heritage Resource Coordinator for the USFS LTBMU. Devin Gonzales Blom and Susan Lindstrom conducted a surface archaeological reconnaissance between October 26 through 29, 2009.

In accordance with the Ski Area Recreational Opportunity Enhancement Act of 2011 (SAROE), Heavenly Mountain Resort moved forward with the proposal to add multiple summer use activities on Heavenly Mountain naming this effort the Epic Discovery Proposal. Projects under this proposal aim to attract a large segment of summer and non-ski/ride visitors seeking more managed recreation opportunities. Activities at the following locations: Adventure Peak, East Peak Basin and Sky Meadows Basin include (but are not limited to): zip lining, mountain biking, hiking, kayaking, paddle boarding, fishing, and construction of observations points and lookout towers. Additionally, educational opportunities, mountain excursion tours and emergency evacuation protocol will be implemented mountain wide.

Supplemental archaeological studies were completed in 2013 reviewing the Top of the Gondola Summer Activities. It was determined that 95% of the area was already surveyed and no cultural resources were found. A screening undertaking letter was submitted finding that “little or no potential to affect historical properties”⁸. “All other projects for the Heavenly Mountain Resort 2013 Summer Activities (list) are within previously surveyed areas and do not endanger any cultural sites” (Fuller, 2013). These undertakings fell within Stipulation 7.4 (b) of the Programmatic Agreement [PA] (Fuller, 2015a); therefore, the proposed improvements may be implemented without any further Section 106 consultation or review. Furthermore, survey of the project area is documented in multiple previous Historic Resource Records (HRRs) with the most current and relevant being R2005051900022 (Fuller, 2015b). As the scope or design of the proposed projects are altered, additional review by the Heritage Resources Program will be required.

Improvements in the Tamarack Pod area of the resort required tree removal along the Blue Streak Zip Line and the Tamarack Return Trail. The tree removal areas were inventoried for cultural resources in 2015 and no cultural resources were located in either area (Fuller, 2016). Additional improvements on the Nevada portion of the Heavenly Mountain Resort are being proposed which include an aerial challenge course called the Discovery Forest Zipline Canopy Tour (which will be self-guided routes consisting of wooden columns, platforms and rope walkways/bridges), the Zipline Center and portions of the Bear Cave Challenge Course similar to the Boulder Cove Challenge Park. “These projects will mostly use current standing trees for support of aerial course and ziplines, two post holes will be dug for the Zipline Center so the total disturbance will be less than one cubic meter of cumulative ground disturbance per acre” (Fuller, 2013).

For all ski seasons, skiing and access to the Galaxy area (and chairlift) is dependent on snow depths. As part of the management plan, Heavenly actively monitors snow depth in this area and closes the Galaxy Pod area and archaeological sites due to insufficient snow cover. The Galaxy area and chairlift had been closed the prior to 2018-2019 ski season for lift replacement upgrade to a 3-person chair. Chairlift construction was completed during the summer of 2018, allowing for resort to open the new lift during the 2018-2019 ski season, which was a slightly above average snowpack, and a spring snowpack that was sufficient for coverage. The 2019-2020 and 2020-2021 ski season’s snowfall, although below average, also provided enough depth and cover to protect the Pod sties and allow for the Galaxy area/chair lift to be open to the public. However, the below average snowpack and early spring snow melt contributed to early season closure of the Galaxy area in both years, despite other sections of the mountain remaining open. The lack of snow, or early spring snow melt, prevents both groomed and ungroomed concentrated skiable return trails to the Galaxy chairlift. When open with sufficient snow coverage, recreational users cross the sensitive site without knowledge and previous summer surveys have shown no evidence of guest impacts due to snow cover skiing/ridding usage (Fuller, 2016).

⁸ Lake Tahoe Basin Management Unit (LTBMU 2013), TB-2013-01. RT2013051900013. Screened Undertaking (Class B Undertaking) Letter.

Two road segments were discovered as extensions of a Comstock-era wood haul road which was first recorded by S&S Archaeological Consultants in 1992, as leading downward from the Mott Canyon area to the upper reaches of the South Fork of Daggett Creek (Lindstrom and Blom 2009). These new heritage resources have been recorded on State of Nevada IMACS archaeological site records in accordance with established guidelines. Updates to these forms were completed. Copies of this report and accompanying site records have been forwarded to the USFS LTBMU for their review and processing. An additional copy has been placed on file with the Nevada State Museum, which maintains the archaeological inventory for the State of Nevada (Lindstrom and Blom 2009).

Like the information provide in Measure 7.4-16, there have been no new updates regarding cultural resources monitoring during construction projects over the past few years (2018 through 2020), as LTBMU Heritage Staff position was vacant for several years. Recently hired LTBMU Archeologist, Mr. Biddle, confirmed no new updates for this measure. There is no additional information to report on either the Galaxy Pod or Comstock-era logging roadways at this time, although back-to-back below average precipitation (water years 2020 and 2021) caused the Galaxy Pod area to close early in the spring, as discussed above. Heavenly is in compliance with this measure.

3.19 Measure 7.4-18 Protect the Tahoe Rim Trail

In order to protect the Tahoe Rim Trail (TRT) and allow for its continued used during construction of resort facilities, Heavenly Mountain Resort is required to rope off any hazardous areas within or adjacent to the TRT, prohibit construction of permanent structures which may block the use of the trail, as well as inform the public of any potential closures along the TRT.

There were no construction projects during the 2021 summer season that affected the TRT or public access on the trail system. However, the Northbowl Lift Replacement project, (construction planned for 2022/2023, see 2022 Annual Summer Work List, Appendix VII), crosses the TRT. When projects do occur that may impact the trail system and the public, Heavenly will place staff with radios along the trail to hold the public at safe locations while helicopters and equipment are in use that may pose a potential hazard to through hikers/users.

Portions of the TRT through the Heavenly Mountain Resort facilities were closed during the Caldor Fire, as part of the larger overall LTBMU Backcountry Closure. This order (Forest Order No. 19-21-06) was in effect from September 18, 2021, through October 15, 2021.

Heavenly is in compliance with this measure.

3.20 Conclusion

During construction, measures of the MMP are implemented during each specific proposed project. Heavenly Mountain Resort maintains compliance with these measures during the planning, design, construction, and post-construction phases for each project. Three multi-year Master Plan Implementation Projects were initiated during the 2020 construction window (Cal Dam Snowmaking Project, American Tower Corporation Project, and Nevada Energy Distribution Project), and work on these projects continued during the 2021 construction season. The Cal Dam Snowmaking Project and American Tower Corporation Project were completed, and the work on the NV Energy Distribution Project will continue into the 2022 construction season. A fourth Master Plan Implementation Project, the East Peak Snowing Well, was initiated and completed during the 2021 construction season. For all Master Plan Projects, Heavenly follows mitigation and permit requirements for construction. With regards to water quality results, annual average creek constituent results do not meet Lahontan limits (measure 7.4-3), though Heavenly is actively limiting salt and deicer applications and monitoring/tracking salt on-mountain applications. The *Bijou Park Creek Evaluation Report* was completed and submitted as an appendix to the *Heavenly 5 Year Comprehensive Report 2012-2016* (Cardno 2017). The purpose of the Bijou Park Creek evaluation and the surrounding watershed was to show potential improvements that Heavenly could incorporate to

improve downstream water quality conditions. The report lists three specific recommendations for improvements. “The first measure calls for the continued source reduction for chloride. The second measure suggests modifying and improving the StormFilter system and the third potential recommendation is to develop a site-specific standard for chloride in Bijou Park Creek or establish an alternative background location to better reflect the development of Bijou Park Creek.”⁹ At this time, Heavenly has not implemented the last two recommendations. The two newest biological monitoring measures (7.4-9 and 7.4-14) were implemented in 2015 and monitoring continued through the 2021 monitoring period. Data collected for the Sierra Nevada Yellow-legged Frog (conducted prior to the Cal Dam Replacement Project in 2020) and marten populations (conducted prior to work on the Nevada Energy Distribution Project in 2021) were presented to the appropriate agencies prior to any project work. Data related to other Master Plan projects will be submitted to the appropriate agencies in the future as projects moves forward.

⁹ Catalyst Environmental Solutions. Bijou Park Creek Evaluation Report – Heavenly Mountain Resort Waste Discharge Requirements Associated with Lahontan Regional Water Quality Control Board Order No. R6T-2015-0021. WDID 6A090033000. January 2017. Page 62.

Chapter 4 – Operation and Maintenance Measures

4.1 Introduction

The operation and maintenance measures contained in the MMP govern both summer and winter activities necessary to run Heavenly Mountain Resort. While construction measures are project-specific, operation and maintenance measures encompass annual daily resort operations. These ongoing measures are usually related to either summer or winter activities.

4.2 Measure 7.5-1 Watershed Maintenance and Restoration Program

Heavenly will implement the Watershed Maintenance and Restoration Program. This program will be updated determined by ongoing monitoring. Cumulative Watershed Effects (CWE) tools were used to assess the Epic Discovery Project; however, these tools are no longer sensitive enough to be useful on project-level scale. The Forest Service will monitor road maintenance which will be incorporated in developing the restoration and maintenance schedule for road segments. Future Master Plan implementation and monitoring will be reviewed as part of the Ongoing Environmental Monitoring Program (Measure 7.5-2). The Waste Discharge Requirements (WDRs) ensure that measures are implemented and maintained (Heavenly, 2015).

In the past, each year Heavenly had prioritized CWE projects based on maintenance needs, costs, funds, proximity to water bodies and erosion potential as well as construction implementation. Beginning with the 2016 construction season, all future projects moving forward will be prioritized based on the Watershed Maintenance and Restoration Program (Epic Discovery Draft EIR/EIS/EIS Appendix 3.1-D). These projects have been “organized in phases based on Priority ski trails and road segments treatment needs as well as tied to capital project implementation phasing.”¹⁰ RCI continued BMP implementation and effectiveness monitoring during the 2021 construction season. Results from the 2021 monitoring effort are located in *Heavenly Mountain Resort Watershed Maintenance and Restoration Program – 2021 Annual Report & Construction Season Summary Report*, (Appendix I). Based on revisions to this measure, RCI will continue to monitor and inspect BMPs shifting from the CWE tools and instead focus on compliance with the WDRs. Appendix III contains the updated maintenance and project status for the Watershed Maintenance and Restoration Program 2021 construction Annual Summer Work List. Additional BMP and maintenance projects completed are listed in Appendix I. Appendix VII contains the list of proposed Watershed Maintenance and Restoration Program projects planned for 2022. Heavenly is in compliance with this measure.

4.3 Measure 7.5-2 (WATER-C1b) Ongoing Environmental Monitoring Program

This measure addresses the Lahontan Board Order No. R6T-2003-0032A2 waste discharge requirements (WDRs) and implements the monitoring and reporting program for Heavenly Mountain Resort. The Program includes monitoring the following components: Water Quality, BMP Effectiveness, Riparian Condition and Condition/Trend Monitoring. Additional roads and trails will be monitored within the special use permit boundary to comply with current Forest Service protocols (includes the Mountain Bike Park as it applies only to watershed NV-1); and in-stream fine sediment monitoring will be required for the Heavenly Valley Creek Sky Meadows Reach only. This effort will help to assess poor biotic health scores and document the effectiveness of mitigation measures in the area (Heavenly, 2015).

¹⁰ Heavenly Mountain Resort Master Development Plan, Page 7-20

The Environmental Monitoring Program continues to be funded by Heavenly but has been implemented by Cardno (formerly Cardno ENTRIX) and RCI since 2005. Heavenly renewed their contract with Cardno (formerly Cardno ENTRIX) and RCI to complete water quality monitoring and BMP effectiveness monitoring in January 2008 for a 5-year period, and 2012 marked the end of the contracted work. Through the public process, TRPA and Heavenly again selected Cardno and their sub-consultant team to continue this work through July 2017, at which another request for proposal was solicited through the public process. Cardno and their sub-consultant teams were again selected through the formal selection process to continue work for the next 5-year period (2017-2022).

Water quality monitoring was conducted monthly between October 1, 2020, and September 30, 2021, and biweekly during spring runoff at the seven sites specified in the *Heavenly 5 Year Comprehensive Report 2017-2021* (Cardno 2022) and provided in Appendix II (electronic copy only). The 2021 water year marked the sixth year that the sampling locations abided by the new Waste Discharge Requirements and Monitoring and Reporting Program (R6T-2015-0021). The biggest change in the revised/new program was with regards to runoff sampling. In the past, runoff sampling was required weekly; however, the revised program only requires biweekly sampling during the runoff season (typically late March to June). The two Nevada Edgewood Creek monitoring locations are outside of the Lahontan Water Control Board's jurisdiction but will continue to be monitored on a similar frequency. The 2021 water year results were reported to Lahontan and the Forest Service in the quarterly and annual report and as an electronic copy only in Appendix II of this report.

The Lahontan WDR permit also requires storm samples from the three California Base Parking Lot area StormFilter™ sampling locations (43HVP-2, 43HVP-1a and 43HVP-1b). Three storm samples were collected during the 2021 water year. Results from these samples are included in the *Heavenly 5 Year Comprehensive Report 2017-2021* (Cardno 2022), Appendix II (electronic copy only).

Pursuant to the latest Lahontan Mitigation and Monitoring Program (MMP) amendment, BMP effectiveness reporting is now only submitted annually as an appendix to this report. Results from BMP effectiveness monitoring were discussed previously within measure 7.4-1 and can be found in Appendix I. Through an adaptive management approach, the effective soil cover program shifted from a photo monitoring program to an implementation of slope stability and cover at prioritized "hot spots" within the watershed. This approach and shift were first documented in the Environmental Monitoring Program 2014 Annual Report and are reflected in the Mitigation and Monitoring Program.

In accordance with Monitoring and Reporting Program, Heavenly is required to monitor and survey stream conditioning inventory (SCI) at once every four years corresponding with the second year of the benthic macroinvertebrate (BMI) sampling on Heavenly Valley and Hidden Valley Creeks. BMI sampling occurs on a 2-year on and 2-year off schedule with results collected in 2006/2007, 2010/2011, 2014/2015, and 2018/2019, followed by SCI sampling at the end of the four-year rotation. The 2019 season marked the second year of BMI collection in the four-year rotation, which were followed by SCI surveys. Edgewood and Daggett Creeks were also included in the SCI surveys to align with the California stream surveys. Results of the 2019 SCI surveys are included in the *Environmental Monitoring Program Annual Report Water Year 2019* (Cardno 2020). Trend analysis of the long-term SCI data is reported and discussed in the *Heavenly 5 Year Comprehensive Report 2017-2021* (Cardno 2022), Appendix II (electronic copy only) of this report. The next rounds of required BMI sampling will occur in 2022 and 2023, while the next SCI surveys will occur in 2023.

As discussed above, the second year of BMI samples in the four-year rotation were collected in 2019. Samples are collected, scored, and analyzed in order to provide trends for stream health, according to the 2-year on and 2-year off schedule. Due to the poor BMI scores at the Sky Meadows reach, the Upper Hidden Creek reference reach was established in 2015 to compare results at two meadow reach environments. Additional samples were collected at these two sites during the summer of the 2016 water year providing two consecutive years of BMI data for the reference reach. Both water quality and BMI

results at the Sky Meadows Reach (43HVC-1a) will need to show improvement before this site can be removed from the sampling regiment and potential TMDL listing. Due to the relatively low number of samples collected and variability in results over the years, an upward trend in biotic conditions at the Heavenly Valley Creek sites cannot yet be confirmed. A summary of the results of all past BMI sampling is included in the *Heavenly 5 Year Comprehensive Report 2017-2021* (Cardno 2022), Appendix II of this report (electronic copy only).

Once constructed, the proposed Mountain Bike Park Trails (only planned for the Nevada side) will be monitored in compliance with Forest Service protocol (Nevada side). Fine sediment monitoring along Heavenly Valley Creek at all sites during BMI in 2018 and 2019, following the updated Surface Water Ambient Monitoring Program (SWAMP) protocols. Results of the fine sediment monitoring are included in the *Heavenly 5 Year Comprehensive Report 2017-2021* (Cardno 2022), Appendix II of this report (electronic copy only). Heavenly is in compliance with this measure.

4.4 Measure 7.5-3 (WATER-C1a) CA-1 Erosion Reduction Measures

Prior to or concurrent to disturbance in Sky Basin, sources of erosion that will directly affect Heavenly Valley Creek and BMI scores will be mitigated as outlined in Epic Discovery Draft EIR/EIS/EIS Appendix 3.1F. This measure lists the priority of each project prior to disturbance. The status and implementation of these mitigation measures will be documented through measure 7.5-2 (Heavenly, 2015).

Upon completion of the 2017 construction season, Heavenly addressed the completion of all remaining hot spot prioritization projects within the CA-1 watershed. Documentation regarding these treatments were provided in RCI's *Watershed Maintenance and Restoration Program 2017 Annual Report & Construction Season Summary* submitted four years ago (Attachment A of Appendix I of the 2017 report). During the 2021 construction season, Heavenly addressed two additionally inventoried erosion hotspot locations within California watershed. Heavenly completed the Groove Erosion Resistance project within the CA-1 watershed, which improved erosion resistance and drainage stability near the summer access road and Groove ski trail. Heavenly also completed the Cal Base Summer Access project within the CA-6 watershed, which stabilized the summer access road at the parking lot entrance and improved erosion resistance behind the lodge. Photographs of both projects are included in Appendix I. Completion of these repairs are documented in the 2021 Annual Summer Work List status update (Appendix III). RCI continues to monitor and document hot spot status updates including work completed and maintenance updates. Documentation of erosion reduction measures proves compliance for future potential construction projects within Sky Basin. RCI has summarized the 2021 completed construction measures in Table 1, Attachment A of the *Watershed Maintenance and Restoration Program 2021 Annual Report & Construction Season Summary* (Appendix I). Heavenly continues progress towards the full implementation of the measure.

4.5 Measure 7.5-4 (WATER-C3) NV-1 Erosion Reduction Measures

Prior to or concurrent to disturbance in Mott Canyon watershed (NV-1), highest risk (greatest potential for sediment loading into the channel) sources of erosion shall be implemented as outlined in Epic Discovery Draft EIR/EIS/EIS Appendix 3.1G. This measure lists the priority of each project prior to disturbance. The status and implementation of these mitigation measures will be documented through measure 7.5-2 (Heavenly, 2015).

During the 2016 construction season IERS and RCI monitored and documented the listed phase hotspot locations for compliance and potential future construction affecting the Mott Canyon watershed (NV-1). The NV-1 Erosion Hot Spot Summary Matrix table was previously provided in *IERS 2016 Restoration and Monitoring Annual Report* (IERS 2016) (Appendix II, Table 4, in the 2017 MMP). As proposed projects in Nevada are planned and built, these high priority "hotspot" locations will be addressed. Heavenly continues progress towards the full implementation of the measure.

4.6 Measure 7.5-5 Maintain Water Rights Balance

This measure specifies that Heavenly shall implement a water use/water rights monitoring program to estimate the quantity of water supplied by each source and where the water is used.

The Water Use Balance Report for the 2020-2021 water year contains detailed records on water used for snowmaking and can be found in Appendix V. The Heavenly Mountain Resort's snowmaking system consumed a total of 151.43 million gallons of water during the 2020-2021 ski season, an increase from the 128.08 million gallons of water during the 2019-2020 water year, both of which were below average precipitation years. Snowmaking water use in California totaled 88.50 million gallons, and snowmaking water use in Nevada totaled 62.93 million gallons during the 2020-2021 ski season.

During the 2020-2021 ski season, Heavenly purchased a total of 84.15 million gallons of water. South Tahoe Public Utility District (STPUD) supplied Heavenly with 55.95 million gallons, while Kingsbury General Improvement District (KGID) supplied the remaining 28.19 million gallons purchased. All purchased water supplied by outside utility providers has been supplied in compliance with their approved water rights or similar permits. Results from the water balance report state that 34 million gallons of water were transferred into the Basin (Lake Tahoe), while approximately 26.9 million gallons were transferred from Nevada to California during the 2020-2021 ski season.

The sources and use of water for the calendar year of 2021, rather than water year, are discussed below. During the analysis of water use for 2021, errors were observed in past year's calculations (one month left out of the totals), therefore all past totals were underreported. Totals for 2021 and comparisons to corrected past data are reported below. Estimated water usage is based on calculations from monthly water meter readings. Water usage for each of the facilities below typically fluctuate from year to year due to snowpack, increased summer activities on the mountain, and changes between lodges uses to better help distribute guests. The 2021 operational year continued to be impacted by the COVID-19 restrictions, although a reduced severity compared to the previous year. This may have been impacted water consumption. Winter operations may have been impacted, as season pass holders were required to make ski reservations in advance, and limited number of tickets were sold daily. Summer operations continued to be scaled back due to limiting guest numbers for dining and summer activities to better allow for physical distancing as well as the Caldor fire and basin evacuation in August 2021. Despite limitations of guest at individual activities, many outdoor activities and venues saw an increase in visitor-ship following the COVID-19 pandemic, as outdoor activities were considered relatively safe. Overall, consumption was considerably greater than 2020 values, and more similar to 2018 and 2019 values, although still reduced.

- **California Main Lodge:** Water for the lodge is supplied by South Tahoe Public Utility District. No consumption data is provided by STPUD. Annual flat fee charges for STPUD water are based on the size of the water meter.
- **Lakeview Lodge/Snow Beach Community Water System:** Water for these facilities is supplied by an underground well. The estimated consumption for the 2021 calendar year was 95,500 gallons, which is below the corrected 2020 consumption value. The Lakeview Lodge did not open during the 2020-2021 ski season, and summer activities were limited due to fire and smoke impacts, both which contributed to a lower than typical consumption rate during 2021.
- **Sky Deck Barbeque and Bathrooms:** Water for these facilities is supplied by an underground well and two new consumption meters were installed in October 2017: A single 2-inch meter for the bathrooms and a single 1-inch meter for the restaurant. The total estimated consumption for the 2021 calendar year was 285,552 gallons, which is well above the corrected 2020 metered estimated consumption. Increase use of the restrooms during the summer months and changes to operations have increased water consumption.
- **Adventure Peak (Top of Gondola/Gondola Mid-Station):** Water for these facilities is supplied by an underground well. The 2021 estimated consumption for the period was 953,000 gallons,

which was well above the 2020 usage, but well below the 2018 2019 corrected consumption. The 2020 numbers reflect pump failure at the top of gondola, which brought the system offline for repairs. The facility opened late during the 2021 season, and at reduced capacity, contributing to a lower than typical consumption rate during 2021 compared to years' past.

- **Boulder Lodge:** Water for the lodge is supplied by Kingsbury Improvement District (KGID). Estimated consumption for the period based on water invoices from KGID is 108,450 gallons. Similar to all of the other lodge reported consumption numbers, the Boulder Lodge reported numbers are lower than past years likely due to COVID-19 and reduction in guest capacity.
- **Stagecoach Lodge:** Water for the lodge is supplied by KGID. Estimated consumption for the period based on water invoices from KGID is 312,810 gallons, which was also below the 2020 usage values for similar reasons as previously discussed.
- **East Peak Lodge:** Water for this facility is supplied by an underground well. Estimated potable consumption for the 2021 period is 706,100 gallons, which is considerably less than the corrected 2020 values. Water consumption at the East Peak Lodge has continued decline since 2018.
- **East Peak Well:** Water from the well is used to recharge the East Peak Lake/Reservoir and subsequent snowmaking operation. For the 2021 calendar year, 78.78 million gallons of water were used, which was considerably greater than the 2020 usage. The East Peak Well was used to fill East Peak Lake as the runoff season did not replenish the lake to a level that could be used for snowmaking.

Future net transfers between the Carson River Watershed and the Tahoe Basin, and between Nevada and California will be minimized by further balancing water supplies during the season and managing summer irrigation practices. Heavenly is in compliance with this measure

4.7 Measure 7.5-6 Maintain Water Flows in Heavenly Valley Creek

This measure requires a water use/water rights monitoring program specific to the California Reservoir and Heavenly Valley Creek.

This mitigation measure requires that Heavenly manage the reservoir and dam such that, “the dam releases equal inflow to the reservoir during the summer such that in-stream flows are not increased” (Heavenly, 2015). The installation of a flowmeter on the existing transfer line between the Cal Dam reservoir and East Peak system,¹¹ helping to calculate interstate water transfers. Additional solar powered equipment, batteries and data loggers were installed at both the Sky Meadows (upstream of the reservoir) and Patsy’s flume (downstream) retrofit sites in the summer of 2016 to gauge in the inflow and outflow from the reservoir. Unfortunately, additional equipment and phone lines were needed in order for the equipment and recorded data to work properly. It was anticipated that these two gauges would be online for the 2017-2018 ski season and snowmaking effort; however, the repaired equipment was further damaged due to the 2016-2017 snow totals,¹² and repairs have not been completed to date. For the 2020-2021 ski season, 48.6 million gallons were discharged from Cal Dam, which balances with 48.7 million gallons flowing into the reservoir, indicating that there was no increase in pumped flows throughout the ski season (minor differences are likely due to rounding errors during the calculations). While balancing over the 2020-2021 ski season, Heavenly is in partial compliance with this measure as they continually attempt to maintain and balance flows into and out of the California reservoir ensuring that water rights are not exceeded. Additional monitoring equipment and repairs are needed to accurately ensure the water balance usage associated with the California reservoir is correct.

¹¹ Barthold, Scott. Heavenly Mountain Resort Water Use Report, 2020-2021 Season. Snomatic Controls and Engineering, Inc. Page 3.

¹² Papandrea, Frank. Personal communication April 24, 2017.

Prior to the 2015-2016 ski season, during several years of drought conditions, Heavenly had an increased need for snowmaking due to the lack of natural snowfall, a need that continues in years of low snowfall or years of low early season snowfall. Limited early season snowfall prior to the holiday season storm, and low snowfall through January-March during the 2020-2021 ski season resulted in additional snowmaking and water usage. Heavenly actively aims for opening the resort around the Thanksgiving holiday weekend and in doing so, Heavenly is often relying heavily on snowmaking operations if early season snowfall is minimal. The operation of the East Peak well was thought to have reversed the historical experience of transferring water from California to Nevada, and during the 2020-2021 ski season, the transfer of 26.9 million gallons from Nevada to California is a result of filling the East Peak Reservoir with water from the East Peak well, and using that water for snowmaking on the California side. The prior ski season (2019-2020) had a similar, but smaller (17.5 million gallons) transfer of water from Nevada to California.

However, the most recent water balance report calculates that a net total of 34 million gallons of water were transferred out of the Tahoe basin during the 2019-2020 ski season. The prior ski season water balance report noted that 24.4 million gallons were transferred out of the basin during the 2019-2020 season, and an even smaller volume was transferred out during the 2018-2019 season (1.20 million gallons).

Overall, transfers were less close to being balanced for the 2020-2021 ski season than they were during the prior two seasons, likely due to limited snowfall (apart from the single holiday season storm), changes in guest location usage from to changes in operations due to the COVID-19 pandemic as well as fire suppression pumping in response to the Caldor fire and data loss (pumping numbers) associated with intermittent power once the fire reached the basin. New meter installation at Malcolm's vault may simplify the water balance in future years, and additional, "future net transfers will be minimized by further balancing water supplies during the season and managing summer irrigation practices."¹³

The revised measure also requires another source for summertime irrigation besides Heavenly Valley Creek. Heavenly is transitioning towards drought resistant plants/seed mixtures to ease the reliance on water from Heavenly Valley Creek, dam and reservoir. As mentioned above, Heavenly is in partial compliance with this measure

4.8 Measure 7.5-7 Maintain Water Flows in Daggett Creek

The MMP specifies that Heavenly shall install a flow gauge at East Peak Lake, monitor input via precipitation and output from East Peak Lake, and maintain release rates that satisfy water right permit 50525.

The water rights permit is based on snow making usage as opposed to maintaining flows in Daggett Creek. The permit states that 0.5 cfs of water can be used from November through March for snow making operations. There are a number of inputs to determine this value such as: well usage, stream flows out of the dam, and water pumped in and out of the reservoir used for snow making. Appendix V contains the 2020-2021 snowmaking and water balance report, while Appendix VI contains the 2020-2021 estimated stream flow data collected and prepared by RCI on Daggett Creek. Data are collected continuously at 15-minute intervals at the gage located below East Peak Lake on the south fork of Daggett Creek; stored flow data are collected and downloaded twice a year from this location.

In addition to collecting periodic flow measurements, a new probes and data logger equipment were installed in July 2017. The new data logger provides more accurate data collection and software analysis for possible discrepancies. Water depth is calculated by the software from water pressure, barometric pressure, and water temperature. The probe data logger has been set to log continuously at 15-minute intervals, as was the previous data logger. During both the 2018 and 2019 water year's, RCI made

¹³ Barthold, Scott. Heavenly Mountain Resort Water Use Report, 2019-2020 Season. Snomatic Controls and Engineering, Inc. Page 4.

multiple in-stream measurements on a range of flow conditions to correlate Daggett Creek discharge to data collected from the new equipment.

The battery life of the 2017 probes has diminished and requires replacement. To replace the batteries, the probes will need to be removed from the field and sent to the manufacturer, prior to return and reinstallation in the field. The entire process is estimated at approximately six months. To avoid a lapse in data collection, RCI purchased a second set of probes, which were installed in the beginning of October 2020. The original set has been sent to the manufacturer for battery replacement.

Overall, the installation and calibration of the new equipment is providing reliable high-quality data. However, there was a period of missing data in water year 2021: May 19, 2021, through August 3, 2021. During this period, data from the data logger was corrupted due to a failure of the device used transfer information from the in-situ probes to a computer (referred to as the “shuttle”). RCI attempted to retrieve the data in June, observed the corrupted data, and worked with the manufacturer to troubleshoot the shuttle failure and install a replacement. This lapse of data is shown in the “Daggett Creek Estimate Flow: Water Year 2021” graph in Appendix VI of this report.

The estimate flow results of the water year 2021 for Daggett Creek is included in Appendix VI. The below average snowpack likely resulted in lower runoff values in Daggett Creek. The 2021 water year peak likely occurred between May and June however, the actual peak was not collected since it was a part of the missing data set. The observed peak occurred in fall 2020 at less than 2 cfs, which appears to be related to a series of precipitation events (Appendix B of the *Heavenly 5 Year Comprehensive Report 2017-2021* (Cardno 2022) and provided in Appendix II (electronic copy only). Additionally, a small discharge jump occurred in September 2021, and does not appear to be related to a precipitation event. The RCI report hypothesizes that the September discharge increase may be related to downstream vegetation encroachment and pine needle build up that may have caused ponding at the flow measurement site, and RCI will continue to maintain the site to improve data accuracy. Overall, data demonstrate that minimum flows were maintained in Daggett Creek throughout water year 2021, but that minimum flows were generally low. Heavenly is in compliance with this measure.

4.9 Measure 7.5-8 Maintain Compliance with Water Entitlements

Similar to measure 7.5-5, Heavenly shall implement a water use/water rights monitoring program and comply with existing California, Nevada, and local provider water restrictions on an annual basis.

Heavenly complied with all applicable water rights during the 2020-2021 monitoring period and prepared a water use/water rights report which is contained in Appendix V. Heavenly purchases additional water supplies from both KGID (Nevada) and STPUD (California) to meet water demands above and beyond their water rights. To help combat water needs, the East Peak well was dug, constructed and began operation during 2011-2012 snowmaking season. For the 2020-2021 ski season, 78.78 million gallons of water were pumped from the East Peak Well; greater than the 2019-2020 pumped volume (51.51 million gallons). The 2019-2020 ski season was reduced in length due to COVID-19 resort closures, which likely reduced pumped volumes. The 2020-2021 ski season was a typical duration, and a drought year, and both factors may have increased volume of water pumped from the East Peak well, as compared to the prior pandemic short year. However, the East Peak Well was used to fill East Peak Lake during the summer of 2021, as the runoff season did not replenish the lake to a level that could be used for snowmaking, which likely a greater contributor to the increase in pumped volume. Heavenly is in compliance with this measure.

4.10 Measure 7.5-9 Reduce Vehicle Emissions

Heavenly is to work with responsible agencies to implement a mitigation package that will reduce the potential increase of ambient carbon concentrations. The mitigation package includes using contributions to develop best available control technologies and using these technologies for construction, expansion

and improvement of the bus system, and improved parking management. In addition, Heavenly shall consider offering skiers/riders the option of both a morning and afternoon half-day lift ticket to reduce peak parking hour traffic.

To mitigate the resort's contribution to carbon emissions, Heavenly has implemented a carbon mitigation package that is centered on reducing vehicular traffic. Heavenly uses low emission vehicles for both transit and operations. The entire fleet of Heavenly snowmobiles has 4-stroke engines. Heavenly also uses state-of-the-art snowcats with Tier 3 and Tier 4 California Air Resources Board (CARB) engines. The emissions from Tier 3 and Tier 4 snowcats are the cleanest available on the market.

During the ski season, Heavenly provides free shuttle service between all base areas and lodging facilities. Personal vehicular traffic and parking is discouraged at the gondola base through limited paid parking. Employees can buy subsidized monthly bus passes and Heavenly provides free bus service on existing routes to employees from 8:00AM to 6:00PM. In typical years, Heavenly coordinates the operation of group ski tour buses in effort to reduce individual vehicular trips. However, due to COVID-19 restrictions, tour bus operations for the 2020-2021 ski season were suspended. Heavenly anticipates returning to typical tour bus operations for the 2021-2022 ski season.

Heavenly also contributed to the start-up and operation of the Coordinated Transit System (CTS) and contributed the 20% required local match for Capital Vehicle Replacement Grants from the Federal Transit Administration through 2017. Due to operational troubles, in 2018 Heavenly began to operate their own fleet of buses, to better serve their needs, as discussed in Measure 7.5-15.

Additionally, Heavenly currently offers skiers and riders half-day afternoon lift tickets as discussed as a mitigation measure to help reduce the influx of skiers/riders during the morning rush peak parking hour traffic. Heavenly is in compliance with this measure.

4.11 Measure 7.5-10 Snow Removal Noise Mitigation Methods

To reduce noise created from the snow removal process; this measure states that Heavenly should minimize night time snow removal and attempt to construct noise barriers along the perimeters of parking lots using snow.

There are no formal noise measurements conducted during snow removal operations to determine the effect on the increased CNEL at the base parking areas; however, there were no known complaints filed with the local jurisdictions, Heavenly, TRPA, or the Forest Service. Additionally, Heavenly's snow removal plan calls for constructing snow berm barriers along the perimeter of the California Base, Boulder, and Stagecoach parking lots. Snow is typically removed early in the morning, prior to opening to the public, beginning with areas furthest from adjacent houses and pushed towards the houses to build noise barriers. At the California Base area, the upper parking lot is cleared first, and clearing of the lower parking lot is conducted during the daytime and evening hours. The 2020-2021 ski season had lower than average snowfall, resulting in a lower volume of snow storage and thus limited noise barrier snow berms, however, no noise complaints related to snow removal at the aforementioned parking lots were received during the ski season. Heavenly is in compliance with this measure.

4.12 Measure 7.5-11 Snowmaking Noise Mitigation Methods for Base Areas

This measure calls for a reduction of Community Noise Equivalent Levels (CNELs) at the base areas to 1982 values or TRPA Plan Area Statement (PAS) noise standards, whichever is less, through the implementation of snowmaking technology.

The CNELs are measured annually by j.c. Brennan and Associates. Results for the 2020-2021 season are contained in the Heavenly Ski Resort Master Plan Noise Monitoring Survey located in Appendix X.

Heavenly has maintained a long-term noise monitoring station at the California Base area which is located on the USFS property directly east of the California Base parking area and across from Keller Road (PAS 085). As discussed in past reports, the previous noise monitoring location (adjacent to the Tahoe Seasons Resort) had reached its limitations due to noise associated with vehicular traffic. The new location on the southeast corner of Keller Road and Saddle Road, on USFS property, is setback from the road to reduce noise measurements associated with traffic, while still capturing snowmaking noise. The monitoring equipment used for the noise level measurements is a Larson Davis Laboratories (LDL) Model 820 precision integrating sound level meter, calibrated with an LDL Model CAL 200 acoustical calibrator. Each month the equipment was checked for calibration and data was downloaded (j.c. Brennan, 2021). Continuous snowmaking noise level measurements, at the permanent noise monitoring site, were conducted between November 1, 2020, and March 16, 2021, and reported in average dBA for the given period (daily or averaged over the entire monitoring period).

Short-term noise monitoring is conducted at various locations at the base areas and on the mountain. This noise monitoring occurs for a short period, as snowmaking may only occur in these locations a few times a year. Short-term noise monitoring is reported in dBA hourly Leq. Predicted values over a 24-hour period at each site would be 6.6 dBA higher than the measured hourly Leq, assuming snowmaking operations occur continually for the 24-hour period.

Monitoring noise results from the 2020-2021 ski season CNEL value at the Heavenly California Base exceeded the PAS standards, and results are included in Table 4-1. The 2020-2021 results were slightly higher than the past year and are nearly identical to the 2017-2018 and 2019-2020 snowmaking season values. The total number of days monitored was 136 for the 2020-2021 ski season. This total was higher than the past two monitoring years (120 and 119 days); however, this value of 136 total monitoring days is far less than the typical 150 days monitored. The annual noise report highlights the fact that, all daily measurements with and without snowmaking operations were not in compliance with PAS CNEL standards. The CNEL measurement on days without snowmaking was 56.8 dBA, which is elevated above the PAS dBA standard of 55 dBA. The elevated non-snowmaking noise readings are influenced by roadway traffic, wind, and individuals recreating on USFS property where the sound meter is located.¹⁴ The report included in Appendix X includes information on daily measurements, daily use of snowmaking equipment, and types of equipment used each day.

Heavenly has completely replaced the air-water snowmaking nozzles at the base of California with (quieter) fan guns.¹⁵ However, even with consistent use of quieter fan guns for snowmaking at the lower portion of the California Mountain, CNEL levels associated with snowmaking are exceeded. Heavenly has implemented all but the following Master Plan noise mitigation methods to help reduce CNEL levels at the California Base area:

- Use of setbacks to reduce noise exposures at PAS boundaries;
- Use of noise reduction housings for air/water nozzles;
- Use of barriers at low-mounted air/water nozzles.

In an effort to help reduce CNEL levels during snowmaking operations, Heavenly staff closely monitor snowfall and snowpack produced through storms and snowmaking operations. The monitoring of current conditions aids in determining when to discontinue snowmaking operations and reduce nighttime operations of snowmaking to lower noise levels.

Short-term noise level measurements of snowmaking operations were conducted during the 2020-2021 ski season at the Boulder Base on December 27, 2020, and results are included in Table 4-1 shown

¹⁴ j.c. Brennan & Associates, Inc., Master Plan Mitigation Monitoring – 2020-2021 Heavenly Ski Resort. j.c. Brennan & Associates, Inc. Auburn, CA. Page 10.

¹⁵ j.c. Brennan & Associates, Inc., Master Plan Mitigation Monitoring – 2020-2021 Heavenly Ski Resort. j.c. Brennan & Associates, Inc. Auburn, CA. Page 7.

above. Predicted 24-hour CNEL measurement is 70.6 dBA at the Boulder Base location and 67.6 dBA for the Jacks Circle location respectively. Both monitoring sites are not in compliance with PAS CNEL standards.

Short-term noise measurements were conducted at the Stagecoach Base area on December 14, 2020, at three different locations, and the results are included in Table 4-1. All noise monitoring locations near the Stagecoach Base are outside TRPA jurisdiction, as these locations are outside of the basin and PAS boundaries. The Stagecoach noise monitoring sites reference the 1996 background measured Master Plan values of 82-92 dBA equivalent or energy-averaged sound level (L_{eq}). The 2020-2021 L_{eq} noise measurements is 79 dBA for the Quaking Aspen site. This value is slightly lower than the 1996 background measured noise levels (82-92 dBA). The L_{eq} monitoring values at the Entrance to the Ridge site (55 dBA) and Eagle Nest monitoring site (61 dBA) were approximately 20 dBA less than the typical measured noise levels at the Quaking Aspen and Master Plan limits.

Table 4-1 Noise Monitoring Results

Monitoring Station	Monitoring Frequency	PAS	PAS CNELs Criteria / Measurement for Master Plan	2017-2018 Results ¹	2018-2019 Results ¹	2019-2020 Results ¹	2020-2021 Results ¹
California Base	Continuous	Within PAS 085 & 087	55 dBA	57.9 dBA	58.7 dBA	58.0 dBA	58.2 dBA
Boulder Base Area	Short-term	Within PAS 086	55 dBA	66 dBA²	62 dBA²	64 dBA⁴	64 dBA⁴
Jack Circle/Bonnie Court	Short-term	Within PAS 082	55 dBA 65 dBA ³	63 dBA ²	58 dBA ²	60 dBA ⁴	61 dBA ⁴
Quaking Aspen Road (Stagecoach)	Short-term	N/A. Outside of TRPA jurisdiction	82-92 dBA ³	77 dBA ²	74 dBA ²	81 dBA ⁴	79 dBA ⁴
Entrance to the Ridge (Stagecoach)	Short-term	N/A. Outside of TRPA jurisdiction	N/A	45.2 dBA ²	52 dBA ²	54 dBA ⁴	55 dBA ⁴
Eagles Nest (Stagecoach)	Short-term	N/A. Outside of TRPA jurisdiction	N/A	61 dBA ²	58 dBA ²	59 dBA ⁴	61 dBA ⁴
Party Rock	Short-term	Within PAS 080	50 dBA	39 dBA ²	37 dBA ²	39 dBA ⁴	Not measured
Liz's/Canyon Runs	Short-term	Within PAS 095	55 dBA	Not measured/ Inaccessible	Not measured/ Inaccessible	Not measured/ Inaccessible	Not measured/ Inaccessible

¹ **Bold** text denotes CNEL values that exceed the PAS CNEL Master Plan Measurement levels.

² Short-term ambient noise measurements in hourly Leq. Predicted CNEL values at each site would be 7 dBA higher than the measured hourly Leq, assuming snowmaking operations occur continually for a 24-hour period.

³ CNEL Measured Leq for the Master Plan in 1996

⁴ Short-term ambient noise measurements in hourly Leq. Predicted CNEL values at each site would be 6.6 dBA higher than the measured hourly Leq, assuming snowmaking operations occur continually for a 24-hour period

Remote Plan Area short term noise monitoring did not occur for the 2020-2021 ski season. Monitoring of the Party Rock site (noise measurement site 7) was omitted because past monitoring of this site indicated that snowmaking operations were either inaudible or could not be distinguished due to other background noises. Previously collected noise measurement CNEL data at the Party Rock site show compliance with PAS CNEL standards. No noise measurements were not conducted at the upper mountain Remote Plan Area in PAS 095, which is generally located adjacent to the ski area boundary, and southeast Liz's and Canyon Runs. This site has not been monitored over the past several years due to either no snowmaking operations, accessibility difficulties during snowmaking (graveyard monitoring), or field observations of past snowmaking operations were barely audible at this location.

Heavenly has actively pursued several of the mitigation measures for noise reduction at base areas listed in the Master Plan Amendment. However, measured CNELs values still exceeded PAS CNEL Standards, as discussed above, and the time period for replacing equipment with quieter fan gun technology has been exceeded. In addition, noise measurements at the California Base continuous monitoring site meet or exceeded the PAS CNEL criteria even on days when snowmaking does not occur. This correlation suggests that ambient noise influences the noise measurements and Heavenly's snow making operations are not entirely to blame for CNEL levels exceeding PAS standards. Moving forward, Heavenly would like to review the PAS boundary CNEL limits and the monitoring/reporting requirements with TRPA. Continual growth and visitors to Tahoe area are likely increasing ambient noise and have likely increased the previously set historical CNEL PAS boundary levels. Heavenly would also like to discuss the applicability and noise monitoring requirements for the remote Plan Area monitoring sites as well as the out of basin snowmaking locations near the Stagecoach Base. The remote Plan Area are often inaudible (Party Rock) and accessibility issues at the Remote Plan Area prevent data collection. The three monitoring locations associated with the Stagecoach Base area are locations that are not under TRPA jurisdiction or within PAS standards and monitoring data has shown levels are at or below the 1996 background Master Plan values (82-92 dBA L_{eq}). Heavenly is in partial compliance with this measure.

4.13 Measure 7.5-12 Rock Busting Noise Mitigation Methods

In order to mitigate the impact to a less than significant level, Heavenly must control the number, size and location of "rock busting" blasts (to meet PAS noise standards). Heavenly will continue to implement Rock Busting Noise Mitigation from the Master Plan.

There were no rock busting activities and subsequent noise monitoring mitigation measures performed during the 2021 construction season. The Heavenly Noise Monitoring Survey states that, "rock busting is such an infrequent event, and is not considered to be a significant noise source, and therefore it is recommended that this mitigation monitoring measure is removed" (j.c. Brennan, 2021). While discussing measure 7.5-11 with TRPA, this measure shall also be reviewed/discussed with the possibility of removal during the next amendment or Master Plan update. Currently, this measure is not applicable.

4.14 Measure 7.5-13 Restrict Hours of Amphitheater Operations

This measure restricts the hours of concert noise to the daytime and early evening hours and restricts the concerts to less than 6 hours.

Heavenly has conducted a concert simulation noise study; however, no concerts occurred or were monitored during the 2021 summer season. Currently, this measure is not applicable.

4.15 Measure 7.5-14 (TRANS-1) Traffic and Air Quality Mitigation Measure

This measure requires that Heavenly contribute to the Air Quality Mitigation Fund in accordance with Chapter 65 – Traffic and Air Quality Mitigation Program of the TRPA Code of Ordinances. Fees generated will be used to support programs that reduce VMT, improve air quality, and encourage alternate modes of transit (Heavenly 2015).

Pursuant to Heavenly receiving the TRPA Epic Discovery Summer Improvements Permit, Heavenly contributed to the Air Quality Mitigation Fund in 2016. Contributions to the Air Quality Mitigation Program complete this measure. When additional projects are proposed that increase new daily vehicle trips by 200 or more, Heavenly will again be required to contribute to the Mitigation Fund in accordance with the mitigation fee schedule in the TRPA Rules of Procedure. This measure has been completed.

4.16 Measure 7.5-15 Implement the Coordinated Transportation System (Public Transit Services)

This measure states that Heavenly shall continue to implement their portion of the ongoing air quality and traffic mitigation measures contained in the Coordinated Transportation System (CTS) Memorandum of Understanding (MOU).

Heavenly contributed to the CTS Mitigation Fund in 2017; however, in 2018, Heavenly began operating a fully in-house bus fleet to provide better transit services for employees and guests. Heavenly employees and guests experienced delays and lack of service during the winter of 2016/2017 as buses and routes were halted due to weather and staffing issues. To better service their needs, Heavenly paused from paying into the mitigation fund and started their own transit operation in the summer of 2018. Heavenly has continued to operate their own fleet. The winter bus fleet provides transit between lodges, the Transit Center/Village and employee parking lots, while the summer bus fleets transports guests and employees from the California Main Lodge to the Transit Center Village. Heavenly estimates that they had approximately 113,682 bus riders during the 2020-2021 ski season. This total likely includes employees as well who ride to bus to and from work. Heavenly is anticipating expanding the bus fleet capabilities in future seasons. Heavenly is in compliance with this measure.

4.17 Measure 7.5-16 Protect Tahoe Draba Populations within Heavenly Mountain Resort

Seven specific measures to protect Tahoe draba populations are identified for implementation in the MMP: surveys, fencing, boardwalks, avoidance, rock removal, monitoring, and an interpretive program.

During the 2021 construction season, Heavenly Mountain Resort complied with all applicable measures regarding protection of the Tahoe draba populations. Tahoe draba surveys are required prior to projects located within potential draba habitat. In 2021, surveys for Tahoe draba (*Draba asterophora*) were performed along the alignment of the J-Lift and Northbowl Lift Replacement projects by Sierra Ecotone Solutions, and results are reported in the 2021 Biological Survey Results located in Appendix VIII of this report. Surveys were conducted in August. No Tahoe draba populations or individual species were observed. Should any plants or populations be observed, all species data would be recorded with a GPS unit and provided to LTBMU staff for use in future environmental documents. The 2021 Biological Survey Results located in Appendix VIII includes botanical survey results and data sheets.

Each summer, Heavenly places interpretive signs about Tahoe draba along well-used driving and hiking routes to alert employees and visitors. Mandatory summer employee orientation (2021 BMPs, Facilities, and Watershed Awareness Training, known as the BMP Breakfast), includes a section on Tahoe draba and habitat protection. A copy of the 2021 BMP Breakfast presentation is included in Appendix E of *Heavenly 5 Year Comprehensive Report 2017-2021* (Cardno 2022) and provided in Appendix II of this report (electronic copy only). Future Master Plan projects will incorporate the new out of Basin fencing and boardwalks

spanning sensitive area requirements along with the other mitigation measures to protect draba populations. Heavenly is in compliance with this measure.

4.18 Measure 7.5-17 Minimize Loss/Degradation of Sensitive Plant Species

To protect sensitive plants at Heavenly, projects must be surveyed prior to construction and buffers must be placed around sensitive plants species. Facilities should also be sited to avoid riparian and old growth habitats.

During the 2021 construction season, sensitive plant monitoring efforts and rare plant surveys were along the alignment of the J-Lift and Northbowl Lift Replacement projects. Surveys were conducted in August, by Sierra Ecotone Solutions. There were no observations of rare plant species within the survey area. The botanical survey results and data sheets are included in Appendix VIII. Documentation of this monitoring effort and associated datasheets were provided to the LTBMU. At this time, no recommendations have been made by LTBMU staff for minimizing loss and degradation of sensitive plant species documented in past Biological Survey Results. Heavenly is in compliance with this measure.

4.19 Measure 7.5-18 Invasive Plant Management

To prevent the spread of noxious weeds, Heavenly must develop and implement a long-term integrated weed management plan, use clean vehicles and materials for construction and stage them in weed-free areas, monitor new construction for 3 years, and implement an annual employee orientation and training program.

At the beginning of the 2021 summer season, there were five known invasive plant sites within the Heavenly Resort Special Uses Permitted Area. Perennial pepperweed (*Lepidium latifolium*) was present at two sites, and bull thistle (*Cirsium vulgare*) were present at three sites. One of the bull thistle populations was resurveyed during the 2021 survey field season (the population that had been treated during the 2020 field season), and no plants were observed.

Additionally, during the 2021 field season, LTBMU conducted botanical surveys along the 2022 proposed Liberty Resilience Corridor Project. During the surveys, six new infestations of invasive plants were found and three of the infestations were treated. Treated infestations included one infestation of Scotch broom (*Cytisus scoparius*), one infestation of common St. Johnswort (*Hypericum perforatum*), and one infestation of perennial pepperweed. Three infestations of cheatgrass (*Bromus tectorum*) were observed and documented, but not treated. The LTBMU will continue to monitor past invasive plant populations until 3 years of zero plants have been observed, then the population will be considered “eradicated”, and area will no longer be regularly monitored for invasive plants. At the end of the 2021 field season there are now eleven active invasive plant sites within Heavenly’s resort boundaries, and during the 2022 field season, all eleven invasive plant population sites will be surveyed and potentially treated.

In addition to the LTBMU invasive plant monitoring, Sierra Ecotone Solutions surveyed for invasive plants as part of the botanical surveys for the alignment of the J-Lift and Northbowl Lift Replacement projects. There were no invasive plant species observed in either surveyed project area. The botanical survey results and data sheets are included in Appendix VIII, Biological Survey Results. In accordance with this measure, the annual BMP Breakfast will continue to include information regarding invasive plant species and covers BMP to employees and contractors regarding the requirement for contracted vehicles to be free of debris and seeds prior to driving in/around the mountain. Heavenly is in compliance with this measure.

4.20 Measure 7.5-19 Monitor and Protect Nesting and Fledgling Bird Species

This measure specifies allowable dates (after August 1) for summer concerts at the Gondola top station. Prohibition of concerts prior to this time allows for most local resident birds to complete fledging and

minimize potential nest failure. This measure will maintain TRPA sound level recommendations at the Gondola top station during nesting and fledging periods.

No concerts occurred at the top of the Gondola during 2021 summer season. No concerts have been held since 2009. If, or when, concerts are scheduled, they will be scheduled after the specified allowable August 1 date. Despite that no concerts were scheduled for the 2021 summer season, nesting bird surveys were performed on June 12-15, 2021, at the top of the Gondola venue and surrounding areas in accordance with the Epic Discovery EIR/EIS/EIS. No active nests were observed within the immediate vicinity. One active mountain chickadee nest was located in a cavity approximately 120 meters north of the Mountain Coaster, however, the nest will not be impacted by any Gondola venue activities due to the distance from the facilities and the lack of trails in the nearby vicinity (Alling, 2021b). See Section 3.13 Measure 7.4-12 above, and Appendix VII, 2021 Biological Survey Results for more details.

There were three top-of-mountain wedding venues at Heavenly Mountain Resort: Lakeview Lodge, Tamarack Lodge, and the Blue Sky Terrace. The Tamarack Lodge wedding venue was located near the Gondola top station, while the Blue Sky Terrace was located at the Gondola mid-station. Both of these two locations have since been removed as wedding venues. Transportation logistics during windy conditions made the use of the gondola problematic and such Heavenly has stopped offering weddings at these locations. The Lakeview Lodge located near the top of tram is the only wedding venue Heavenly currently offers. Weddings follow the same noise restrictions as potential concerts and cease operations by 10 p.m. There are no noise restrictions at upper mountain venue locations, however, noise restrictions are in place for base lodges. Hours are restricted for noise associated with concerts to daytime and early evening and start dates after August 1. If concerts were to occur, they would need to cease operations by 10 p.m.; however, it is recommended that concerts cease operation by sunset per the Final EIR/EIS/EIS (February 2015). In addition, concerts should not extend for more than 6 hours. These conditions are consistent with the hours of operations assumed for the amphitheater noise study in the EIR/EIS/EIS. If warranted, Heavenly may conduct additional nesting and fledgling bird species surveys at the top of the gondola area to provide information regarding no detrimental effect allowing for modifications to the hours of limitations associated with concerts. Heavenly is in compliance with this measure.

4.21 Measure 7.5-20 (BIO-3) Migratory Bird and Habitat Utilization Survey

Heavenly shall perform annual nesting bird surveys for the following projects: Mid-Station Canopy Tour, Sky Cycle Canopy Tour, East Peak Zipline Canopy Tour, Sky Meadows Zipline Canopy Tour and the Sky Meadows Challenge Course. These surveys shall be completed prior to the start of project operations during the breeding season and shall identify migratory birds nesting on or immediately adjacent to proposed structures and equipment associated with the projects listed above.

Nesting bird surveys and migratory bird surveys for the top of the Gondola and surrounding areas were performed on June 12-15, 2021, by Sierra Ecotone Solutions. One active mountain chickadee nest was located in a cavity approximately 120 meters north of the Mountain Coaster, however, the nest will not be impacted by any Gondola venue activities due to the distance from the facilities and the lack of trails in the nearby vicinity (Alling, 2021b). See Section 3.13 Measure 7.4-12 above, and Appendix VII, 2021 Biological Survey Results for more details. While no other nests were found, suitable habitat features (snags with cavities) were found that would benefit a variety of bird species. In 2020, Sierra Ecotone Solutions noted “efforts should be made to retain these snags within the project area where feasible in order to maintain suitable nesting locations for cavity nesters” (Alling, 2020). In addition, the NV Energy Distribution Project area was surveyed for nesting birds on May 24-26, 2021. No active nests were found within the project area, though two nests were found outside of the project disturbance limit. The 2021 nesting bird survey reports for all activities and projects are included in Appendix VIII.

The 2021 monitoring season was the fourth year that non-nesting migratory birds were monitored (California spotted owl and northern goshawk). To better understand the extent of migratory bird

utilization of the above reference project locations, bird point counts were performed to determine species diversity, nesting data, and population sites, and will continue for one additional year. The first year of collected data (2018) was considered baseline data to compare with future surveys results to better understand fluctuations and changes of migratory bird utilization of the project areas. Upon completion of the five-year dataset, a summary report and analysis of migratory bird habitat utilization will be prepared. Heavenly continues progress towards the full implementation of the measure.

4.22 Measure 7.5-21 (BIO-8) Wildlife Trash Management and Education Program

Heavenly shall create and implement a trash management operation for the entire resort consisting of wildlife proof trash containers and a trash removal and management plan. The removal and management plan will include specified storage areas and practices to prevent access to refuse by wildlife species. Additionally, an educational component will be included in an effort to decrease litter and improper feeding and ramifications to wildlife. The plan shall be reviewed annually by Forest biologists.

A wildlife trash management and education plan was started in 2016 as a condition of the approved EIR/EIS/EIS for the Epic Discovery Program and continued through the 2021 season. The program continues to be implemented annually with reviews provided by Heavenly and the US Forest Service (USFS) LTBMU. The goal of this program is for timely removal of refuse from deposit points; educate Heavenly guests and staff about proper waste management; and to keep interactions between wildlife and humans to a minimum. During summer operations, wildlife proof receptacles in and around Adventure Peak/Top of Gondola area are serviced each day of operations, and garbage removed from the remote receptacles are consolidated to the new Tamarack Lodge dumpster for removal. Trash is no longer taken down the Gondola, rather it is consolidated into the new dumpster, and the dumpster is serviced weekly by South Tahoe Refuse. These waste operations are handled by the Heavenly Adventure Peak grounds crew, staff, and/or lift personnel. Removing food and garbage waste daily is vital to the success of the program. During winter months and ski season operations, trash is hauled out by snowcats to the base areas for appropriate disposal.

Dumpsters are located at the California Main Lodge lower parking lot for different waste streams such as landfill waste, kitchen food waste, and recycling. These dumpsters are animal proof and are serviced by the South Tahoe Refuse and Recycling Services and are closely monitored by Heavenly environmental staff and Food and Beverage management staff. Since 2013, all of these California Base dumpsters were made animal proof and the wildlife incidents have been significantly reduced. Bear Bins will be deployed before summer operations and activities begin at the Adventure Peak/Top of Gondola location. These bins are relocated from the TOG area at the end of the summer season, as to not interfere with winter operations and are stored at the East Peak Canopy Tour gear-up deck after the summer operating season has concluded.

Eventually this program will expand into Sky Meadows and East Peak Lake/Lodge as future expansion projects in these regions come online. Details regarding the updated Wildlife Trash Management and Education Program can be found in Appendix IV. Heavenly continues progress towards the full implementation of the measure.

4.23 Measure 7.5-22 Maintain Timber Thinning Practices

Heavenly must work with the Forest Service to determine areas that require timber thinning as established by the LTBMU Land and Resource Management Plan. Practices should help prevent catastrophic wildfire but be consistent with management criteria for maintenance and enhancement of wildlife values.

Each year, Heavenly and USFS vegetation management specialists review thinning and hazard reduction needs. When areas are identified for thinning, timber thinning practices are consistent with both the

Forest Service management criteria and the TRPA Code of Ordinance Chapter 6 (tree removal). Heavenly staff removed two dead trees and LTBMU marked several additional hazard trees for removal near Steins. Heavenly staff removed three hazard trees on private property under lift lines. Additionally, NV Energy removed 6 trees near powerlines prior to the Caldor Fire evacuation orders. As new projects and plans are developed, trees to be removed continue to will be mapped, surveyed, and submitted for review prior to removal. Heavenly is in compliance with this measure.

4.24 Measure 7.5-23 Provide Employee Housing

Heavenly must assist in providing employee housing as well collect and report monthly employee housing. Heavenly will continue to maintain its housing program.

Heavenly's employee housing assistance program is in place to match workers with available housing if needed. Based on revisions to this measure, the percentage of occupancy (occupied beds) will be tracked monthly moving forward. Table 4-2 lists the monthly occupancy totals starting in October 2020. Due to the COVID19 pandemic and management changes, occupancy numbers have been lower than numbers prior to 2020. Unlike some past year's values, the total number of beds available (72) were consistent throughout the water year (and calendar year) as there were no renovations/repairs preventing room closures. The EIR/EIS/EIS and subsequent Master Development Plan and mitigation measures no longer require employee housing survey information. Heavenly is in compliance with this measure.

Table 4-2 Heavenly Employee Housing Occupation

Month/Year	% Occupied	Beds Occupied (73 Total Beds)
October 2020	3%	2
November 2020	85%	61
December 2020	60%	43
January 2021	86%	62
February 2021	63%	45
March 2021	60%	43
April 2021	14%	10
May 2021	17%	12
June 2021	31%	22
July 2021	36%	26
August 2021	29%	21
September 2021	28%	20
Average Occupancy Ski Season Rate (Oct 2020 – Sept 2021)	42.5%	30.6
Average Annual Rate (Jan 2021 – Dec 2021)	47.8%	34.4

4.25 Conclusion

Compliance with the operations and maintenance portion of the MMP is an ongoing process. Heavenly complies with the MMP through careful planning, implementation, utilization of industry experts, and educating employees on the importance of each measure. Heavenly is in compliance with nearly all of the existing Operation and Maintenance measures and they are actively addressing newer measures established in the Final EIR/EIS/EIS Epic Discovery Project and MDP. Measures that are in partial compliance include: 7.5-6 Maintain Water Flows in Heavenly Valley Creek and 7.5-11 Snowmaking Noise

Mitigation Methods for Base Areas. In-stream monitoring equipment at Heavenly Valley Creek at the California Dam is needed to effectively measure flows into and out of the California reservoir in order to better balance water transfers in the future. However, the 2020-2021 water year water transfers were less balanced than the past years', likely due to limited snowfall and changes in guest location usage due to changes in operations due to the COVID-19 pandemic. Additionally, the Caldor fire interrupted data collection (intermittent power) as well as preemptive summer pumping for fire protection skewed the balance transfer values. The noise monitoring measure regarding snowmaking is in non-compliance with the CNEL PAS levels at the California and Boulder Base Areas. However, there have been no public complaints regarding snowmaking activities, and there has been a declining trend in noise levels over the past monitored years.

Chapter 5 – Management Response to Monitoring and Evaluation

5.1 Introduction

The Heavenly Mountain Resort response to monitoring and evaluation is as important as the monitoring and evaluation itself. This portion of the MMP is to encourage an adaptive management approach through collaboration between Heavenly and relevant interested agencies and parties.

5.2 Measure 7.6-1 Soil and Water Quality

To comply with measure 7.6-1, the results of various monitoring reports on soil and water quality are contained in this report. Heavenly's response to these reports is integral in achieving environmental improvements. Within 60 days of receiving completed monitoring reports, Heavenly, Forest Service, Lahontan, and TRPA will collaborate as necessary to develop an action plan based on monitoring results.

Heavenly has employed Cardno in a three-party contract with the TRPA to implement water quality monitoring services. For the 2021 water year, (from October 2020 through September 2021), Cardno provided Quarterly Reports to Lahontan, the Forest Service, and the TRPA in fulfillment of the monitoring and reporting requirements set forth in the Lahontan Waste Discharge Requirements (WDR's). Quarterly reports were submitted on the following dates: February 1, May 1, and July 30, of 2021. The *Heavenly 5 Year Comprehensive Report 2017-2021*, which included the fourth quarter results for the 2021 water year, along with a summary of the past 5-years of data, was submitted on January 15, 2022. Due to the close working relationship of Heavenly staff and field monitors, Heavenly often responds to field directives and implements corrective actions before field and work order reports are generated by the agencies.

Annual averages for total phosphorus and chloride exceeded the state standard at Sky Meadows (43HVC-1A), Property Line (43HVC-3), and Below Patsy's (43HVC-2) water quality monitoring locations for the 2021 water year. The total phosphorus and chloride exceedances cannot be attributed solely to the Heavenly Mountain Resort operations as annual averages of these two parameters were also exceeded at the water quality reference site located along Hidden Valley Creek (43HDVC-5). Annual averages for total phosphorus, total nitrogen, and chloride all exceeded the state standards at the Bijou Park Creek (43BPC-4) location for the 2021 water year. Although annual average values for total phosphorus and chloride standards were exceeded at the reference site along Hidden Valley Creek, constituent annual average values at Bijou Park Creek were substantially higher than the reference reach and state standard values.

The 2021 water year marked the tenth year the California Parking Lot Filter Vault Effluent point results were reported to the Lahontan. Turbidity and total nitrogen exceeded the state standard for all three samples collected during the 2021 water year. The total phosphorus standard was exceeded in two samples, and oil and grease were exceeded in one sample. These parameters were also in exceedance of the standards at the two inlet locations on the date of outlet exceedance, although overall, water quality improves between the inlet and outlet locations as it moves through the filter system. Heavenly has continued to prioritize their maintenance and filter replacement efforts. In July 2021, 207 ZPG and 14 Phosphosob™ filters were replaced, while the remaining vaults were cleaned. The Phosphosob™ media has shown some improvement with efficiency of total phosphorus removal, and comparison of inlet and effluent concentrations showed reduction in total phosphorus through the filtration system. Heavenly continues to be proactive in attempting to limit discharge exceedances; and the latest WDR's required a feasibility study with regards to chloride levels within Bijou Park Creek in association with California Parking Lot runoff. The feasibility study included additional sampling along Bijou Park Creek and led to

the *Bijou Park Creek Evaluation Report* (Catalyst 2017). The evaluation report concluded that Heavenly should: 1) continue to limit chloride usage; 2) modify and improve the StormFilter system; and, 3) formulate a new site-specific chloride standard for Bijou Park Creek or establish an alternate background reference location for Bijou Park Creek.¹⁶ At this point in time, Heavenly has not implemented the last two action items, though they are attempting to limit chloride/salt usage and alternatively use liquid brine when appropriate. The 2017 ski season marked the first use of brine application as a deicer agent aiding in the reduction of deicer application. During the 2021 water year, Heavenly applied 300 gallons of liquid brine in lieu of abrasives. This application volume is the median annual volume since brine was introduced to the facility as a deicing alternative. In many years, the timing of storms prevents the use of brine, as brine can only be effectively applied as a pre-treatment prior to snowfall. Heavenly is making brine application a higher priority moving forward following CalTrans and the county's lead in the application of brine prior to storm events to further reduce deicer amounts and usage.

Accumulated precipitation during the 2021 water year (22.2 inches) was considerably less than 1991-2020 average of 34.5 inches, as such; peak runoff values were considerably less than average conditions. The 2021 water year was marked by very limited but consistent monthly snowfall. The 2021 water year marks the second year of drought, following four water years of near or above average precipitation accumulation, with the 2017 water having the greatest accumulation (70.5 inches). The four years of near or above average precipitation (2016-2019) followed four years of drought (2012-2015). Snow water equivalent (SWE) measurements for 2021 (16.2 inches) were proportional to the precipitation accumulation, but similarly lower than 1991-2020 average of 24.9 inches.

Heavenly used 71,292 lbs. of deicer and abrasives in water year 2021, a substantial decrease from 230,644 lbs. in 2017, and the lowest volume of deicer using in the past five-year period. Usage of deicer is highly dependent on precipitation storm cycles and cold temperatures, which vary year to year. Heavenly has moved forward with only using the smaller spreader truck as opposed to the older less accurately reporting dump truck. Heavenly's spreader truck is fitted with a deicer application sensor gauge, which accounts for both road conditions and temperature controlling the ideal amount of deicer application needed for success. The sensor also records the amount of deicer applied more accurately. Reducing the amount of deicer applied to the roadways helps limit the amount of chloride detected in the waterways. Residual chloride tends to remain in the environment and is difficult and expensive to remove. 2021 water year snowfall totals were below average, the volume of deicer and abrasives applied is most comparable to the 2018 season (76,543 lbs), which was a slightly higher, but still below average precipitation year.

Deicer and abrasives applied to roadways are typically recovered by Heavenly and their subcontracted vendors during the spring and summer months. A total of 102,040 pounds of deicer and abrasives were recovered during water year 2021. Over the past several years, Heavenly has recovered a greater volume of deicer and abrasives than it has applied. This may be due to removal of deicer that CSLT has applied on the roads leading to Heavenly, removal of portions of deteriorated parking lot, or removal of natural sediment that has built up on the roadway. Deicer application and recovery results can be found in Table 7-1 of the *Heavenly 5 Year Comprehensive Report 2017-2021* (Cardno 2022) found in Appendix II of this report (electronic copy only).

BMP effectiveness and monitoring is performed by RCI. Lahontan's latest Waste Discharge Requirements/Monitoring and Reporting Program (R6T-2015-0021) requires all quarterly and annual BMP reporting reports to be included and submitted with this Mitigation and Monitoring Plan. The BMP Effectiveness Monitoring 2021 Annual Report is included in Appendix I. This report summarizes findings, results, and trends that occurred throughout the summer/construction season. The annual report also provides updates to past recommendations posed in the previous report as well as new/additional recommendations for improving existing and proposed BMP implementation moving forward. Feedback

¹⁶ Catalyst Environmental Solutions. *Bijou Park Creek Evaluation Report – Heavenly Mountain Resort Waste Discharge Requirements Associated with Lahontan Regional Water Quality Control Board Order No. R6T-2015-0021*. WDID 6A090033000. January 2017. Page 62

and comments from each of the agencies as well as lessons learned are passed along for incorporation and implementation by Heavenly's operations staff. The monitoring goal is to always be in compliance with BMP installation and maintenance. With all parties in agreement to limit runoff, erosion, and sediment transport. Modified mitigation measures in the EIR/EIS/EIS and MDP suggest a change in the reporting and monitoring effort; however, BMP effectiveness and erosion prevention will remain the focus. Heavenly and their team of consultants will adapt to these changes ensuring compliance with this measure.

Prior erosion resistance monitoring efforts focused on treating primarily high and medium priority hotspots identified in both Heavenly Valley Creek and Mott Canyon watersheds (CA-1 and NV-1). Due to total watershed drainage area and proximity to Lake Tahoe, the CA-1 watershed remains a priority for addressing erosion hotspot issues as shown by the number of projects on both the 2021 and 2022 Watershed Maintenance Restoration Program (WMRP) Work Lists (Appendix III and VII). The 2021 summer and construction season marked the ninth season Heavenly continued to follow the outcome-based watershed management approach formerly in collaboration with IERS and now transitioning to collaboration with RCI. The 2021 results are discussed in the Heavenly Mountain Resort Watershed Maintenance and Restoration Program (WMRP) 2021 Annual Report and Construction Season Summary found in Appendix I, and discussed in Measures 7.4-1, 7.4-2, 7.5-3, and 7.5-4.

RCI has provided updates on past/previous recommendations based on these three focus processes: the planning and communication, the watershed implementation and effectiveness, as well as the monitoring and assessment process. Additional details regarding recommendation updates can be found in RCI's WMRP 2021 Annual Report (Appendix I) and are summarized in Measure 7.4-1. Within these three process categories, RCI has provided additional recommendations specific and vital for improving processes moving forward.

Recommendations regarding planning and communication processes moving forward include the "continued coordination regarding the development and status of the Annual Work List" (between Heavenly departments and staff). RCI also recommended to continue to adapt to the COVID-19 pandemic restrictions for the 2021 construction season and provide a virtual option for the BMPs, Facilities and Watershed Awareness Training which covers the compliance requirements for all staff, new employees, and outside vendors/contractors.¹⁷ The annual training occurs prior to on mountain construction and documentation of this meeting is included as an appendix to both RCI's WMRP 2021 Report (Appendix I) as well as the *Heavenly 5 Year Comprehensive Report 2017-2021* (Appendix II, electronic copy only).

RCI's recommended Watershed Maintenance and Restoration Program (WMRP) Implementation and Effectiveness processes are to "continue to implement the Outcome Based Watershed Management Approach to modify existing BMPs and plan for future projects"¹⁸.

The monitoring and assessment process recommendations include "continuing to integrate monitoring results from the previous seasons into the planning and implementation of future projects" as well as "reviewing the road monitoring and inspection needs with respect to the MMP requirements and consider updating protocols."¹⁹

Through a combined multi-agency effort and key monitoring implementations, Heavenly is presently in compliance with most of these ongoing mitigation measures. Agency and public responses to this annual report during the 60-day comment period will be assessed and integrated into an action plan if necessary. No comments were received for the previous year's 2020 report. The implementation of any action plan

¹⁷ Heavenly Mountain Resort Watershed Maintenance and Restoration Program 2020 Annual Report and Construction Season Summary. RCI. Page 5 (Appendix I)

¹⁸ Heavenly Mountain Resort Watershed Maintenance and Restoration Program 2020 Annual Report and Construction Season Summary. RCI. Page 5 (Appendix I)

¹⁹ Heavenly Mountain Resort Watershed Maintenance and Restoration Program 2020 Annual Report and Construction Season Summary. RCI. Page 6 (Appendix I)

items will be discussed in the annual report the following year (for example comments on this 2021 report would be detailed in the 2022 report). Updates regarding removed, modified and new measures in this report were established in the EIR/EIS/EIS Epic Discovery Project and subsequent MDP. In response to this measure, an electronic copy of this report will be linked from the Heavenly website to the report posting on TRPA's website. Heavenly is currently in compliance with all of their reporting requirements.

5.3 Measure 7.6-2 Traffic and Parking

Heavenly is to prepare a parking monitoring report at the end of each ski season that includes the following:

- *Days during which overflow parking was used on Ski Run Boulevard, South Benjamin Drive, and Galaxy Bowl and any days when overflow parking was full.*
- *The number of parking spaces used at Galaxy Bowl each day this area was used for overflow parking.*
- *An explanation regarding any days during which these overflow parking areas were filled.*

The monitoring reports are to be shared with the TRPA, Douglas County, El Dorado County, and the City of South Lake Tahoe and posted on the appropriate websites, not limited to the Heavenly website. Based on the results of the monitoring reports, an action plan will be devised by Heavenly and interested parties within 60 days.

The California off-site parking areas are typically used during the holiday weekends and the week between Christmas and New Year's. During the 2021 water year (the 2020/2021 ski season), off-site parking was utilized 33 days. A total of 8,328 vehicles were counted along California off-site parking locations along Ski Run Boulevard, Saddle, Regina, Needle Peak and Keller roadways. The roadway width along Ski Run Boulevard allows for additional paved parking along both sides of the street, while still allowing ample width for two-way traffic. Additional overflow parking, on the Nevada side of the Heavenly Ski Resort along the roads outside of the Boulder and Stagecoach parking lots, is no longer shown or allowed due to safety protocols implemented by the Douglas County Sheriff's Department and Heavenly Security. Both the Sheriff's Department and Heavenly Security actively patrol and prevent parking along these roadways. Heavenly's parking map is shown on Figure 5-1 below detailing the locations for visitors to park both on-site and off-site.

To assess Heavenly compliance with the mitigation measure to reduce vehicle traffic, data was gathered from Nevada Department of Transportation (NDOT) (NDOT 2022) and the California Department of Transportation (Caltrans) on average annual daily traffic (AADT) on US Highway 50 and Kingsbury Grade. Sites along these passes were chosen to represent major points of access to Heavenly. These sites are displayed in Figure 5-2. AADT values from 2008 through 2020 for each site are shown in Table 5-1 and graphically displayed in Figure 5-3. Traffic volume values are reported for the latest year of available data (2020) and the 2021 values will be reported in next year's report.



Figure 5-1 Heavenly's Vehicular Parking Map²⁰

²⁰ https://www.skiheavenly.com/-/aemasset/image/upload/Heavenly/Files/ParkingMap_19Nov2018.pdf

Traffic numbers, for the major access points to Heavenly Mountain Resort for the 2020 year, decreased from the 2019 values at all but one traffic monitoring site (NV 53150 Kingsbury Grade increased from the 2019 AADT values). The California ingress/egress traffic count numbers fell from the previous reported values in 2018 and 2019 years. This decrease is likely due to the COVID pandemic, resort closure, travel restrictions and lock down. Likewise, the two Nevada US Highway 50 traffic-monitoring locations also showed a decrease in vehicle numbers. Traffic counts at both the inbound (east) and outbound (west) California monitoring locations along Highway 50 fell from prior years' data. The inbound monitoring site on US Highway 50 at the intersection of Echo Lakes Road (CA – MP 65.62) reported an annual average daily traffic value (AADT) of 10,200 vehicles. While the outbound (west) US Highway 50 monitoring location located at the intersection of Ski Run Boulevard (CA-MP 79.29) reported an AADT value of 27,500. Traffic counts slightly decreased as well at the Nevada monitoring location along Highway 50 west of SR-28 on Spooner Summit (NV-0050036) from 13,700 in 2019 to 13,200 AADT values in 2020. Likewise, AADT values lessened at the US Highway 50 monitoring site near the Stateline (NV-0050044) from 27,400 in 2019 to 26,400 in 2020. The outlier monitoring site in which traffic counts increased from the 2019 AADT values occurred at the SR-207 Kingsbury Grade (NV-0053150) monitoring location. The 2020 AADT values increased from 12,300 vehicles in 2019 to an AADT traffic count value of 14,400 for the 2020 year.

Prior to the pandemic, traffic counts at the monitoring sites have increased since tracking began in 2007. The sole exception being the traffic counts at the monitoring site on US Highway 50 at the intersection of Ski Run Boulevard (CA-MP 79.29). This site has fluctuated in recent years, spiking in 2017 (30,300) but then falling back to 2011-2013 levels in 2018 and 2019. See Table 5-1 and Figure 5-3 for values and graphical representation of the traffic counts. Traffic counts at US Highway 50 at the intersection of Echo Lakes Road (CA – MP 65.62), Nevada SR-207 on Kingsbury Grade (NV-0053150), and US Highway 50 near the state line (NV-0050044), have been trending up since 2014 and neglecting the 2020 pandemic values. Traffic counts on US Highway 50 west of SR-28 on Spooner Summit (NV-0050036) have varied over the past five years but remained somewhat consistent since 2014.

While vehicular numbers to South Lake Tahoe fluctuate year to year, these values do not necessarily correlate with skier visits or Heavenly's influence on traffic numbers. Media coverage of drought cycles and snowstorm events tend to correlate better with the number of skier visits. As previously mentioned, Figure 5.3 shows graphical representation of the traffic count data from 2007 through 2020. With this limited data set, it is hard to draw finite conclusions or trends; however, in recent years the traffic count values appear to be increasing (outside of pandemic year beginning in 2020). Reviewing the thirteen years of traffic data collected, the general trend for four of the five traffic monitoring locations shows an increase traffic volume into South Lake Tahoe. The traffic data suggest that there are annual fluctuations within these values that may be associated with precipitation and drought years.

The 2015-2016 ski season was an average precipitation and snowfall year that followed a number of consecutive drought years. As previously stated, increased snowfall may correlate with the increased traffic counts reported. For example, the 2015-2016 and 2016-2017 ski seasons had well above average precipitation and snowfall for the years and the traffic counts exhibited increases traffic counts. However, the vehicle traffic numbers are not substantially greater than the upward trajectory of the data suggests. The 2018-2019 ski season (year prior to pandemic), an above average precipitation year, exhibited the similar higher traffic counts compared to the previous season. While the traffic data is not yet available for the 2020-2021 season, the below average precipitation, global pandemic (COVID-19), and skier reservation system requirements are likely going to exhibit lower traffic counts again. Travel restrictions and resort closures were two measures implemented in 2020 to curb transmission and community spread of the virus. The 2020 traffic numbers are historically low, and it will be interesting in years to come to see if traffic numbers rebound to pre-pandemic values.

As stated above, this report, which includes the traffic information, will be posted on TRPA's website. Heavenly is in compliance with this measure.

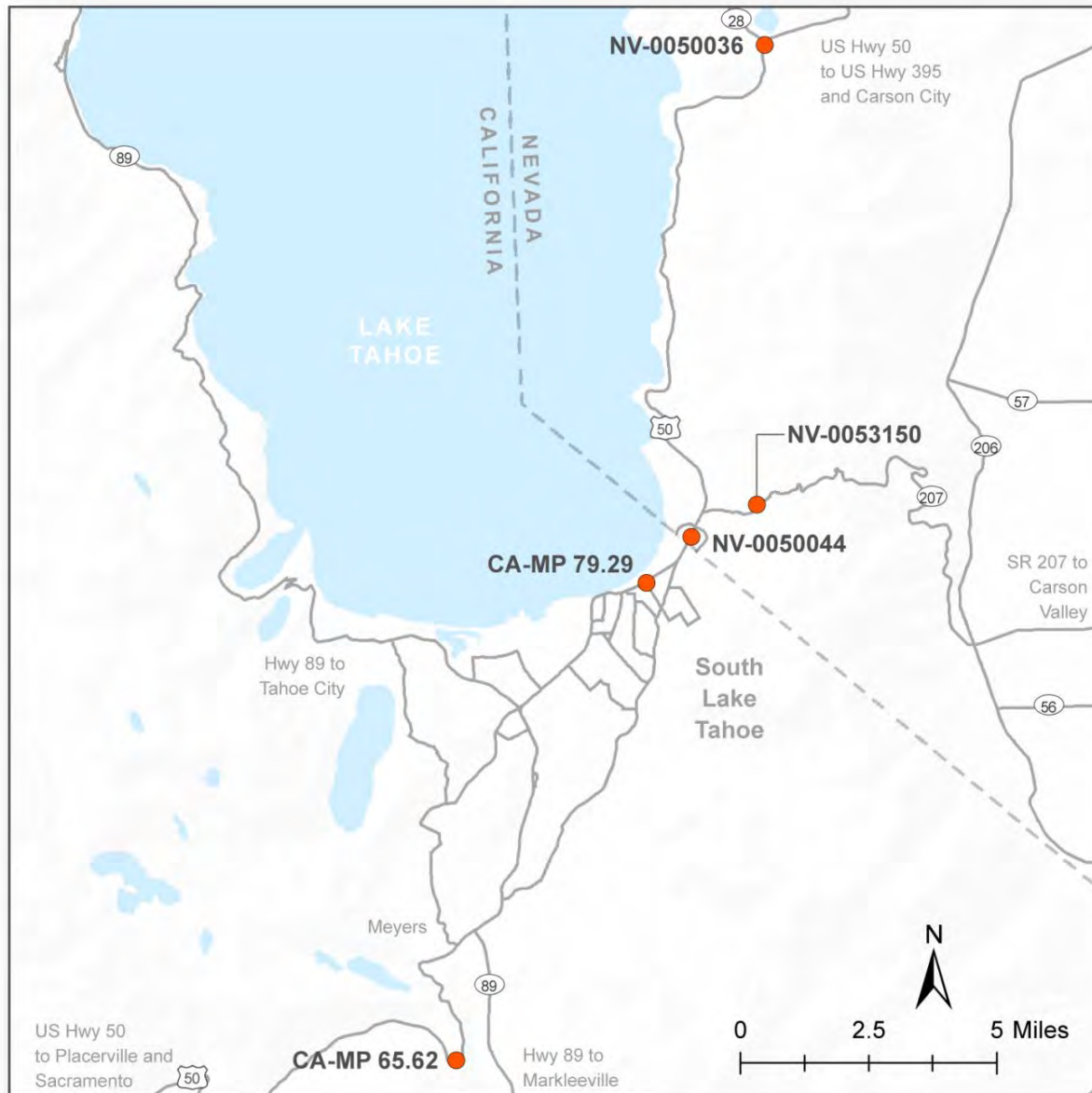


Figure 5-2 Mapping Locations of the Traffic Count Sites

Table 5-1 Traffic Data on US Highway 50 and State Route 207

State – Station	Location	AADT 2008	AADT 2009	AADT 2010	AADT 2011	AADT 2012	AADT 2013	AADT 2014	AADT 2015	AADT 2016	AADT 2017	AADT 2018	AADT 2019	AADT 2020 ⁴
NV - 0050036	US-50, 0.4 Mile West of SR-28 at MP 12	10,000	10,000	12,000	12,000 ¹	11,500 ¹	11,500	13,000	13,000	13,500 ¹	13,900 ¹	12,800	13,700	13,200 ¹
NV – 0053150	SR-207 (Kingsbury Grade) 0.5 Mile East of US-50	11,000	11,000	11,100 ¹	11,100 ¹	10,000	10,200	9,500	10,000	10,800	12,400	13,700	12,300	14,400
NV – 0050044	US-50, 300' East of the NV-CA State line	25,000	24,000	24,000	27,000	22,500	21,500	21,500 ¹	25,000	26,000 ¹	27,000 ¹	26,900 ¹	27,400 ¹	26,400 ¹
CA – MP 79.29	US-50 at the intersection of Ski Run Blvd ²	31,500	31,500	30,000	30,500	30,500	30,500	31,500	32,000	29,400	33,000	30,300	30,300	27,500
CA – MP 65.62	US-50 at the intersection of Echo Lakes Road ³	8,900	8,900	8,900	8,900	8,000	8,000	8,100	10,000	10,800	10,800	11,100	11,100	10,200

Sources:

NDOT Data: <https://www.dot.nv.gov/home/showpublisheddocument/19726/637605578312630000>
<https://www.dot.nv.gov/home/showpublisheddocument/19730/637605578318730000>
<https://ndot.maps.arcgis.com/apps/webappviewer/index.html?id=278339b4605e4dda8da9bddd2fd9f1e9>
<https://www.dot.nv.gov/doing-business/about-ndot/ndot-divisions/planning/traffic-information>
 Caltrans Data: <https://dot.ca.gov/programs/traffic-operations/census>

Notes:

- ¹ Data Adjusted or Estimated by the provided source
- ² Annual Average Daily Traffic (Back AADT) Traveling West Bound
- ³ Annual Average Daily Traffic (Ahead AADT) Traveling East Bound
- ⁴ The 2020 year began the COVID-19 Pandemic, in which the resort closed early, and state side travel restrictions were in place.

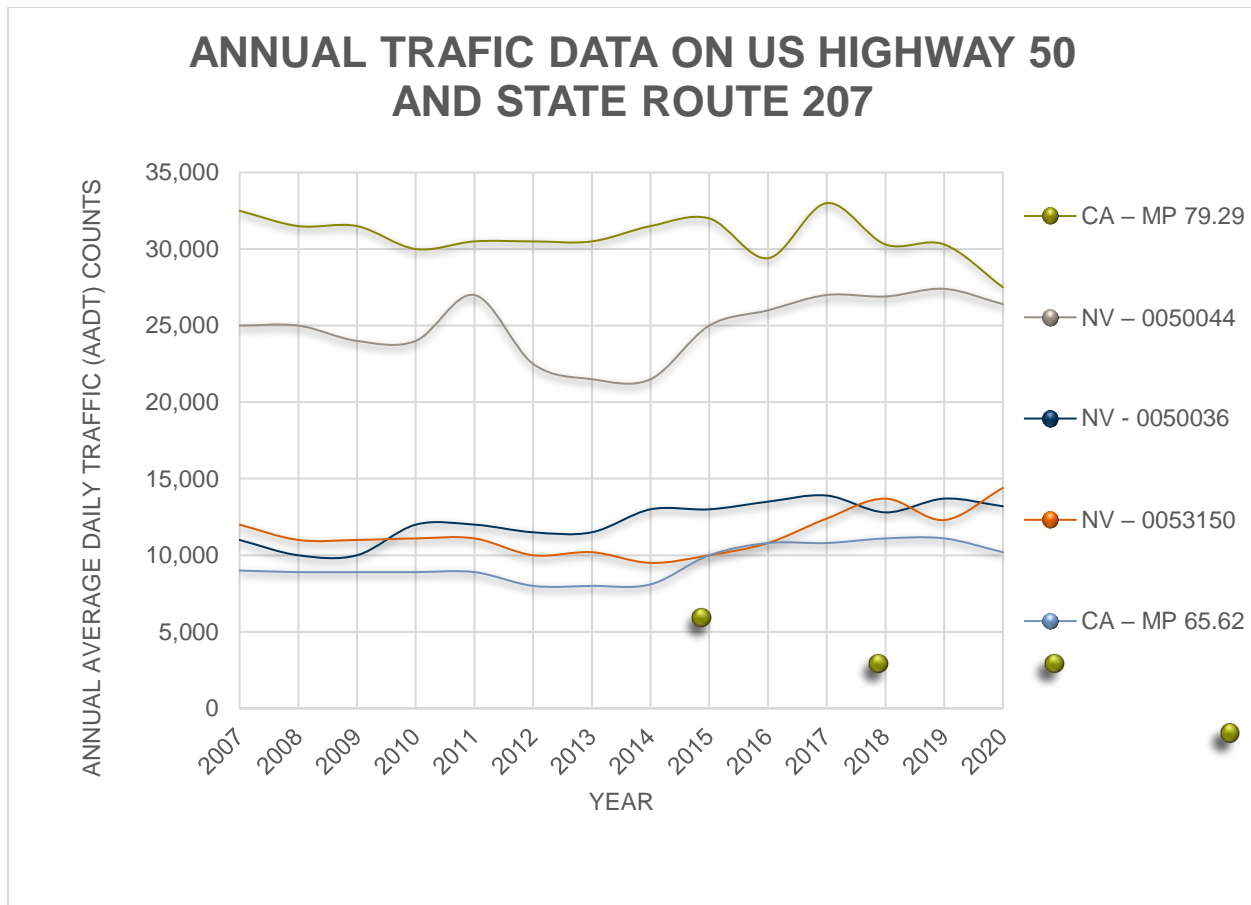


Figure 5-3 Graphical AADT Values 2008-2020

5.4 Measure 7.6-3 Late Seral/Old Growth Enhancement

Monitoring is required every 5 years to track the progress of any enhanced forest or stand.

The forestry work for the restored stand was completed in 2007. In 2013, the LTBMU staff visited the restoration stand site to review the mitigation measure requirements. Results from the monitoring effort proved that the past mitigation measure objectives have been met. The EIR/EIS/EIS Epic Discovery Project and MDP removed past mitigation measure VEG-3 (7.5-25 Late Seral/Old Growth Forest Enhancement) in response to the monitoring conclusions. The LTBMU compliance letter is included in Appendix XII. No late seral/old growth stands were removed during the 2021 construction season, nor were there additional stands that required monitoring. When an old growth stand is scheduled for removal, a new stand of equal or greater acreage will be established and future monitoring of the new stand will be governed by this measure. Heavenly is currently in compliance with this ongoing measure.

5.5 Conclusion

Heavenly continues to work proactively with their subject-area experts and educating/training their own employees to immediately respond and address on-mountain erosion issues and problem areas. More often than not, Heavenly modifies and repairs minor BMP and erosion source issues before they become potential problems and larger issues. The 2021 BMP monitoring report highlights BMP effectiveness as well as provides updates to prior year's recommendations. The report also provides additional recommendations and improvements to continue the program's success at limiting storm runoff and sediment sources. Resolving and preventing erosion is one key component in improving future water quality monitoring results.

Heavenly's active on-mountain involvement and attention to each of mitigation measures listed in the Master Development Plan have not triggered an action plan. If measures fall out of compliance, action plans will be developed ensuring a path for future compliance while addressing responses and feedback gathered from the local agencies and interested parties generated from this report.

Chapter 6 – Reference List

- Alling, Garth. (2020). Principal Biologist. Sierra Ecotone Solutions. Heavenly Mountain Resort. 2020 Summer Activities Nesting Bird Survey Results. June 30, 2020.
- Alling, Garth. (2021a). Principal Biologist. Sierra Ecotone Solutions. Heavenly Mountain Resort. 2021 NV Energy Distribution Project Pre-Construction Biological Survey Results. June 3, 2021.
- Alling, Garth. (2021b). Principal Biologist. Sierra Ecotone Solutions. Heavenly Mountain Resort. 2021 Summer Activities Nesting Bird Survey Results. June 18, 2021.
- Alling, Garth (2021c). Principal Biologist. Sierra Ecotone Solutions. Heavenly Mountain Resort. North Bowl Plant Species List. August 2021.
- Alling, Garth. (2021d). Principal Biologist. Sierra Ecotone Solutions. Heavenly Mountain Resort. 2021 Biological Survey Results Summary. December 9, 2021.
- Alling, Garth (2021e). Principal Biologist. Sierra Ecotone Solutions. Heavenly Mountain Resort. 2021 NV Energy Distribution Project Pre-Construction Biological Survey Results - Addendum. February 15, 2022.
- Barthold, Scott (2022). Heavenly Mountain Resort Water Use Report, 2020-2021 Operating Year. Snomatic Controls and Engineering, Inc.
- Cardno (2017). Heavenly 5 Year Comprehensive Report 2012-2016. January 2017.
- Cardno (2020). Environmental Monitoring Program Annual Report - Heavenly Mountain Resort Water Year 2019-2020. Cardno, Zephyr Cove, Nevada.
- Cardno (2022). Heavenly 5 Year Comprehensive Report 2017-2021. January 2022.
- Catalyst Environmental Solutions. (2017). *Bijou Park Creek Evaluation Report – Heavenly Mountain Resort Waste Discharge Requirements Associated with Lahontan Regional Water Quality Control Board Order No. R6T-2015-0021. WDID 6A090033000*. January 2017.
- Drake, K. and Hogan M. (2013). *Watershed Management Guidebook: An Outcome-Based Guide to Watershed Management*. Prepared for the California State Water Resources Control Board.
- Drake, K. and Hogan M. (2016). *Heavenly Mountain Resort Outcome-Based Watershed Management, 2016 Restoration and Monitoring Annual Report*.
- Fuller, Thomas L. (2013). Assistant Heritage Resource Manager. Lake Tahoe Basin Management Unit (LTBMU). USDA Forest Service Region 5. Heavenly Mountain Resort 2013 Summer Activities – Nevada Side Undertakings, March 14, 2013.
- Fuller, Thomas L. (2015a). Assistant Heritage Resource Manager. Lake Tahoe Basin Management Unit (LTBMU). USDA Forest Service Region 5. Heavenly Epic Discovery 2014, April 21, 2015.
- Fuller, Thomas L. (2015b). Assistant Heritage Resource Manager. Lake Tahoe Basin Management Unit (LTBMU). USDA Forest Service Region 5. Heritage Resources Inventory Report, November 19, 2015.
- Fuller, Thomas L. (2016). Assistant Heritage Resource Manager. Lake Tahoe Basin Management Unit (LTBMU). USDA Forest Service Region 5. Personal Communication March 28, 2016.
- Heavenly Mountain Resort. (2007). *Mitigation and Monitoring Plan*.
- Heavenly Mountain Resort. (2015). *Master Development Plan*.

Heavenly Mountain Resort. (Revised March 3, 2022). *Boundary Management Plan*.

IERS (2016). Heavenly Mountain Resort Outcome-Based Watershed Management, 2016 Restoration and Monitoring Annual Report. Tahoe City, CA.

j.c. Brennan & Associates, Inc. (2021). Master Plan Noise Monitoring Survey 2020-2021 Ski Season Heavenly Ski Resort. j.c. Brennan & Associates, Inc. Auburn, CA.

Lake Tahoe Basin Management Unit (LTBMU) (2013). TB-2013-01. RT2013051900013. Screened Undertaking (Class B Undertaking) Letter.

Lindstrom, Susan and Blom, Devin. (2009). *Heavenly Mountain Resort 2010 Capital, Projects Heritage Resource Inventory*. Prepared for SE Group – Frisco, Colorado.

Maher, John. (2012). Archeologist. Lake Tahoe Basin Management Unit (LTBMU). USDA Forest Service. Personal Communication. April 3, 2012.

Nevada Department of Transportation (NDOT). (2022). 2020 Annual Traffic Report. Accessed April 2022. <https://www.nevadadot.com/doing-business/about-ndot/ndot-divisions/operations/traffic-information/-folder-1478> and <https://ndot.maps.arcgis.com/apps/webappviewer/index.html?id=278339b4605e4dda8da9bdd2fd9f1e9>

Papandrea, Frank. (2017) Heavenly Mountain Resort. Environmental Sustainability & Compliance Manager. Vail Resorts, Inc., Personal Communication. April 24, 2017.

Resource Concepts Inc. (RCI). (2022). Heavenly Mountain Resort Watershed Maintenance and Restoration Program (WMRP) 2021 Annual Report & Construction Season Summary.

Sutherland, Jill (2021). RCI. Personal Communication April 7, 2021.

Sutherland, Jill (2022). RCI. Personal Communication April 18, 2022.

Heavenly Mountain Resort
Mitigation and Monitoring Plan Annual Report
(October 2020 – September 2021)

APPENDIX

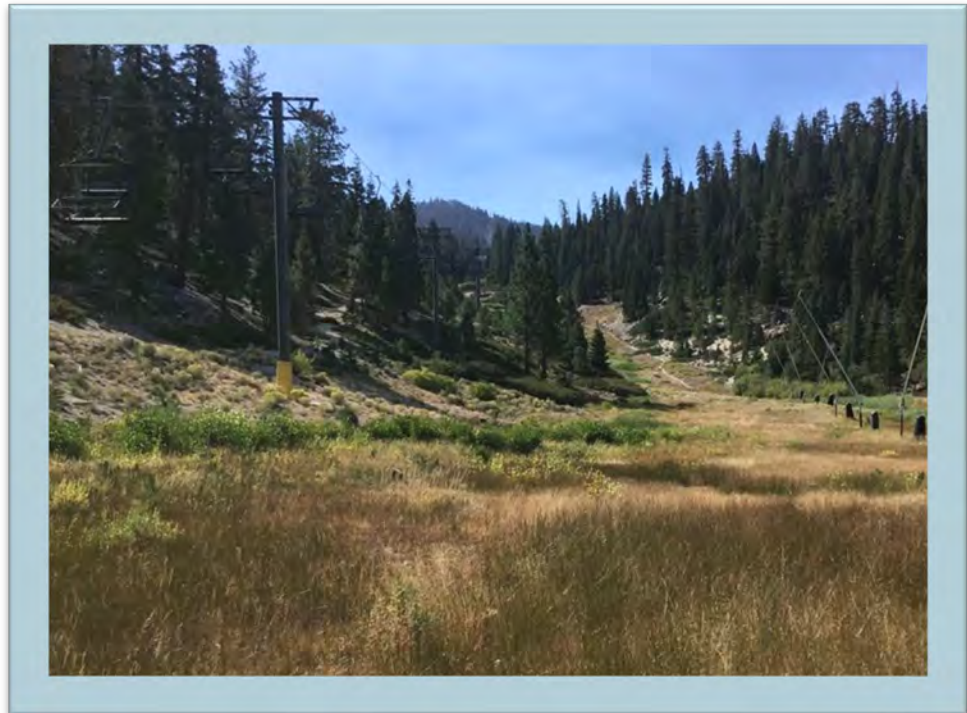
I

HEAVENLY MOUNTAIN RESORT WATERSHED
MAINTENANCE AND RESTORATION
PROGRAM (WMRP) 2021 ANNUAL REPORT &
CONSTRUCTION SEASON SUMMARY (RCI)

April 2022

Heavenly Mountain Resort

Watershed Maintenance and Restoration Program 2021 Annual Report & Construction Season Summary



Prepared for:

Cardno
295 Highway 50, Suite 1
P.O. Box 1533
Zephyr Cove, NV 89448

Prepared by:

Resource Concepts Inc.
340 N. Minnesota Street
Carson City, NV 89703-4152



April 2022

Heavenly Mountain Resort

Watershed Maintenance and Restoration Program
2021 Annual Report & Construction Season Summary

Prepared for:

Cardno
295 Highway 50, Suite 1
P.O. Box 1533
Zephyr Cove, NV 89448

Prepared by:

Resource Concepts, Inc.
340 North Minnesota Street
Carson City, NV 89703-4152
(775) 883-1600
(775) 883-1656 Fax
www.rci-nv.com

TABLE OF CONTENTS

	<u>Page</u>
Introduction	1
Regulatory Overview	1
Outcome Based Watershed Management Approach	3
Planning and Response to 2021 Recommendations.....	5
Planning and Communication Process	5
WMRP Implementation and Effectiveness	5
Monitoring and Assessment Process.....	6
2021 Construction Season Activities	7
Resort Maintenance Projects (RM/M).....	7
Master Plan Implementation Projects (P)	8
WMRP Projects (EH-CA & EH-NV).....	8
Monitoring Results.....	11
Heavenly Mountain Resort Waste Discharge Requirements.....	11
Resources Tracking.....	11
Road Maintenance & Dust Control.....	11
WMRP Treatments and Treatment Outcomes	12
Project BMP Implementation and Effectiveness	14
Watershed Assessment for Hot Spots	15
Recommendations	16
Planning & Communication Process.....	16
WMRP Implementation and Effectiveness	16
Monitoring & Assessment Process	16
References.....	17

Attachments

- Attachment A 2021 Tables
- Attachment B 2021 BMPs, Facilities, and Watershed Awareness Training
- Attachment C 2021 BMP Effectiveness Monitoring Evaluation Forms

Acronyms & Abbreviations

BMPs	Best Management Practices
CERP	Construction Erosion Reduction Program
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
Heavenly	Heavenly Mountain Resort
IERS	Integrated Environmental Restoration Services
Lahontan	Lahontan Regional Water Quality Control Board
LTBMU	Lake Tahoe Basin Management Unit
MDP	Heavenly Master Development Plan MDP
MMP	Mitigation and Monitoring Plan
RCI	Resource Concepts, Inc.
SWPPP	Stormwater Pollution Prevention Plan
TRPA	Tahoe Regional Planning Agency
USDA	United States Department of Agriculture
USFS	United States Forest Service
WMRP	Watershed Maintenance and Restoration Program
WDRs	Waste Discharge Requirements

File Doc: 2022-04-15 Rpt 2021 Heavenly Annual 17-615.5 CARDNO js-jm-ca L4-18.docx

Introduction

This report provides a summary of activities and monitoring results for the Heavenly Mountain Resort (Heavenly) Watershed Maintenance and Restoration Program (WMRP) for the 2021 construction season. The purpose of the annual report is to address WMRP implementation and monitoring, including elements of the Construction Erosion Reduction Program (CERP), in relation to the following requirements:

- Heavenly's 2015 Waste Discharge Requirements (WDRs, Board Order No. R6T-2015-0021, WDID No. 6A090033000).
- The Mitigation and Monitoring Plan (MMP) as updated through the 2015 Environmental Impact Report (EIR)/EIR/Environmental Impact Statement (EIS) for the Heavenly Master Development Plan (MDP), which incorporates requirements of the United States Department of Agriculture (USDA) Forest Service Lake Tahoe Basin Management Unit (LTBMU), the Tahoe Regional Planning Agency (TRPA), and the Lahontan Regional Water Quality Control Board (Lahontan).

The 2021 annual report has been prepared by Resource Concepts, Inc. (RCI) under contract with Cardno. RCI has conducted monitoring to evaluate the success of Best Management Practices (BMPs) at Heavenly since 2005.

Regulatory Overview

Evaluation Criteria

The summary of activities and monitoring provided by the annual report addresses the requirements in Section C of the 2015 WDRs:

1. *Track and report the status of mitigation/restoration projects included in the WMRP.*
2. *Complete an annual erosion assessment of the ski area and identify restoration projects to be completed.*
3. *Develop an Annual Worklist with maintenance and restoration projects to be completed during the summer construction season, including mitigation projects required from previous Master Plan commitments and projects identified by BMP monitoring and erosion assessments.*
4. *Implement and report the results of the Construction Erosion Reduction Program, including the review of the temporary and permanent construction BMPs implemented at the Facility (BMP maintenance and effectiveness).*

Rating criteria is provided in the WDRs, Section I.A.D, Table 3 "Heavenly Valley Creek TMDL Targets" for both WMRP implementation and BMP effectiveness scoring or monitoring results. Heavenly must result in a rating of "Good" or better.

WMRP Implementation Criteria

Excellent: All WMRP projects implemented and maintained according to Annual Work List timeline

Good: All WMRP projects implemented according to Annual Work List; but some project components need reestablishing (for example, reseeding is necessary on some revegetation sites)

Fair: Only partial implementation of Annual Work List projects has been achieved according to timeline; or Annual Work List projects are one year behind schedule

Poor: No Annual Work List projects have been implemented, or Annual Work List projects are two years or more behind schedule

BMP Effectiveness Scoring Criteria

Excellent: 90% of BMPs implemented correctly and functioning effectively; no evidence of sediment leaving the site and entering the stream channel

Good: 75% to 90% of BMPs implemented correctly and functioning effectively; some evidence of sediment leaving the site, but no sediment reaching the stream channel

Fair: 50% to 75% of BMPs implemented correctly and functioning effectively; some evidence of sediment leaving the site, some sediment reaching the stream channel

Poor: Less than 50% of BMPs implemented correctly and functioning correctly; evidence of sediment leaving the site, excessive sediment reaching the stream channel

For the purposes of the WMRP Implementation Criteria, “WMRP Projects” and “Annual Work List Projects” are those projects designated as EH-CA or EH-NV on the Annual Work List, whose primary purpose is watershed maintenance and restoration. Other capital projects (P) or Resort Maintenance Projects (RM or M) are primarily infrastructure construction and maintenance projects. While these projects utilize construction BMPs (CERP requirements) and are subject to BMP effectiveness monitoring, the implementation does not satisfy a watershed restoration objective.

Reporting Period

As explained in previous annual reports, the construction season (typically June through October) is logical for a reporting period for operations at Heavenly. However, it does not correspond directly with the Water Year reporting timeframe indicated in the WDRs.

- The first quarter of the 2021 Water Year (October 1 through December 31, 2020) was reported previously as part of the “Heavenly Mountain Resort Watershed Maintenance and Restoration Program 2020 Annual Report & Construction Season Summary” (RCI, April 2021).
- Evaluations were not conducted during the second quarter of the 2021 Water Year (January 1 through March 31, 2021) because Heavenly was covered with snow.
- Evaluations were started for the construction season in June 2021 at the end of the third quarter of the 2021 Water Year (April 1 through June 30, 2021).
- Evaluations were conducted during the fourth quarter of the 2021 Water Year (July 1 through September 30, 2021) and the first quarter of the 2022 Water Year (October 1 through December 31, 2021).

These evaluation periods have been combined into one report to present the logical progression of summer maintenance and construction projects. This report format satisfies the WDR requirement for submittal of an annual report for WMRP and BMP effectiveness monitoring.

Outcome Based Watershed Management Approach

Watershed maintenance and restoration is an on-going long-term commitment throughout the Lake Tahoe Basin with an actively managed program at Heavenly. For the last ten years, Heavenly has been utilizing an outcome-based management system that both meets compliance standards and assesses actual performance of BMPs. Integrated Environmental Restoration Services (IERS) pioneered this outcome-based watershed approach in the *Watershed Management Guidebook* prepared for the California State Water Resources Control Board. This management style acknowledges the complexities of a watershed and allows for collection of useful information to make decisions that result in measurable sediment control. Outcome-based management provides a framework to encourage new ideas and methods that achieve quantifiable results. The *Watershed Management Guidebook* outlines five steps that drive the outcome-based management process being used at Heavenly:

- **AIMING:** articulating goals and objectives, defining success criteria, and identifying known and unknown information.
- **GAINING UNDERSTANDING:** gathering on-the-ground information at the site/project and watershed and assessing strategies for a site-specific implementation plan. Monitoring results from past projects are used as the basis for developing treatment strategies for new projects that are most likely to achieve project objectives and success criteria. Often this step includes small-scale development plots to test different treatment approaches.
- **DOING:** the part of the process where the plan is understood, implemented, and documented to support monitoring and continual improvement.
- **ACHIEVING:** directly assessing project performance/effectiveness relative to goals and success criteria and reporting this information annually.
- **IMPROVING:** embracing unexpected project outcomes, sharing project successes and failures with others, making adjustments to projects that did not achieve their intended outcome(s), and integrating lessons learned into future projects.

One of the results of this outcome-based watershed management approach is the shift from “effective soil cover” based heavily on vegetative cover to “erosion resistance”. Erosion resistance combines a wide range of factors including mulch, rock, soil density, infiltration, slope, and surface roughness as well as vegetation. The WMRP has helped Heavenly to shift efforts away from watershed restoration projects that require temporary irrigation and repeated reseeding of disturbed areas. By emphasizing soil edaphic factors (the physical, chemical, and biologic conditions of the soil), projects have become more successful over time since plant cover is not the only contributor to erosion resistance.

Heavenly’s program continues to be one of the most successful multi-year examples of adaptive management applied to erosion and sediment control in the Lake Tahoe Basin. The following fundamental goals are guiding these efforts (IERS 2016).

Treatment Goals

- To implement projects that result in no net increase in runoff or sediment transport;
- To implement sediment source control treatments that are either self-sustaining OR are accompanied by a plan for ongoing maintenance and management to maintain erosion resistance; and,
- To develop and demonstrate an applied adaptive management program for development, management, and maintenance activities in upper watersheds.

Monitoring Goals

- To quantitatively assess whether projects result in no net increase in runoff or sediment transport;
- To identify and quantify indices of long-term ecosystem sustainability to the greatest extent possible;
- To use monitoring data to determine the cost-effectiveness of restoration techniques; and,
- To use monitoring data to improve effectiveness of future treatments.

Adaptive management principles have been similarly applied to Heavenly's CERP through BMP effectiveness monitoring. The CERP and *Watershed Management Guidebook* provide guidelines for the temporary and permanent BMPs incorporated into all construction projects at Heavenly. Since 2004, monitoring results and recommendations have been used by Heavenly to improve structural and non-structural BMPs. Nonstructural practices range from long standing traffic management on summer access roads to communication for allocating resources during the hectic summer construction season. BMP effectiveness monitoring provides a framework within the WMRP to track performance and meet compliance standards.

Planning and Response to 2021 Recommendations

The recommendations from the 2020 WMP Annual Report were incorporated into the 2021 activities WMP implementation and monitoring activities. To help illustrate the adaptive management process, responses to these recommendations are summarized below.

Planning and Communication Process

Continue to coordinate regarding the development and status of the Annual Work List.

The Annual Work List provides a reference for Heavenly staff and consultants conducting monitoring to track anticipated capital projects, maintenance projects, and WMP hot spot projects. During the year, Heavenly staff provided status updates on project progress. Table 1 in Attachment A notes the completion status of each project on the 2021 Annual Work List at the end of the construction season.

Continue to adapt to the COVID-19 pandemic restrictions and provide virtual BMPs, Facilities, and Watershed Awareness Training which covers the compliance requirements for all staff, new employees, and outside vendors/contractors.

In 2021, Heavenly conducted the annual BMPs, Facilities, and Watershed Awareness Training at a series (Attachment B) of both virtual and in-person meetings to adapt to the requirements of the pandemic.

- Pre-season training was conducted and documented with all on-mountain Heavenly staff through a series of 3 weekly workshops in June (Appendix F, Cardno January 2021).
- Similar training was required for vendors/contractors allowed on-mountain at Heavenly.
- Heavenly's security staff reviewed and documented rules of the road for anyone issued a vehicle pass.
- The NV Energy Project contractors conducted training per the Construction Storm Water Permit and Storm Water Pollution Prevention Plan.
- The ATC Hub, Fiber, and Node Project contractors conducted training per the Construction Storm Water Permit and Storm Water Pollution Prevention Plan.

Communication between Heavenly staff, contractors, design professionals, agencies, and inspectors was maintained prior to and during the construction season.

WMP Implementation and Effectiveness

Implementation of the WMP in 2021 continued to build on the experience gained in previous years by incorporating recommended measures and assessing restoration treatment and BMP effectiveness.

Continue to implement the Outcome Based Watershed Management Approach to modify existing BMPs and plan for future projects.

The five-step outcome-based process continues to be implemented in 2021 projects.

- Aiming to complete BMP treatments according to the annual work schedule. All 2021 WMRP projects were completed.
- Gaining understanding of watershed conditions and identifying hotspot locations for improvement through monitoring. In 2021, the Groove Erosion Resistance project utilized techniques developed through the outcome-based watershed management approach, loosening soil and incorporating woodchips to enhance soil infiltration.
- Heavenly staff demonstrated understanding of BMP design and have been doing the labor to successfully implement WMRP treatment strategies. Staff at Heavenly effectively communicated the progress of their annual projects with RCI.
- One-year post construction monitoring assessed the performance of treatments and determined if goals were achieved. For the one-year post construction monitoring, 2020 WMRP projects scored “implemented” and “effective”.
- Improving watershed conditions is achieved by applying innovative treatment solutions. In 2021, drain rock buffers were installed by key California Base locations to enhance infiltration and filter sediment/debris from sheet flow runoff.

Monitoring and Assessment Process

Continue to integrate monitoring results from previous seasons into the planning and implementation of future projects.

In 2021, the Nevada watersheds were monitored for “hot spots” and four projects were selected for improving watershed conditions. Three projects were identified in the Edgewood Creek Watershed and one in the Mott Canyon watershed.

Review road monitoring and inspection needs with respect to MMP requirements and consider updating protocols.

The United States Forest Service (USFS) National Core BMP Program provides guidelines for BMPs; however, the monitoring approach and protocol for monitoring assessment has never been released. Heavenly staff continue to coordinate road maintenance and condition monitoring with the USFS under their on-going maintenance agreement and special use permit conditions.

2021 Construction Season Activities

The 2021 construction season monitoring began in May and ended in mid-November. From August to September the mountain was intermittently closed by the USDA Forest Service and inaccessible for monitoring due to the smoke hazard and extreme fire danger from 2021 wildland fires. The status of each 2021 project at the end of the season is included as Table 1 in Attachment A. Construction season activities included annual resort maintenance projects, WMRP hot spot projects, and key Master Plan Implementation projects.

Resort Maintenance Projects (RM/M)

Resort maintenance projects at Heavenly regularly consist of:

- routine infrastructure maintenance,
- periodic equipment upgrade/replacement,
- maintenance of erosion reduction and sediment capture BMPs, and
- preparation of the Top of Gondola (Adventure Peak) area for summer guest access.

Annual Facilities/BMP Maintenance

Heavenly managers utilize a detailed electronic spreadsheet to track and allocate resources (personnel, materials, and equipment). In addition to specific projects highlighted as M or RM in the Annual Work List, the workload typically includes routine annual inspections of water quality protection measures, lift and snowmaking system maintenance, preparation for summer activities (installation and removal of split rail fence, tubing lanes, ropes course infrastructure, zip lines, gem panning, and interpretive signs), hazard tree removal, tree trimming, and brush cutting.

Road access controls and delineation, and road maintenance and dust control are also routinely implemented throughout the summer and fall (Heavenly 2021 Roads Maintenance Report). Annual maintenance of sediment basins and drainage features in key locations are also called out in the Annual Work List (Powderbowl/Groove Chair Base, Maggie's Sediment basins, Hellwinkel's Sediment Basins, and Galaxy Road Sediment Basins). These key facilities are inspected and cleaned (if needed) after spring snowmelt and after summer storm events to maintain sediment capture capacity.

- Source water protection measures were taken to improve the East Peak Lodge wellhead by replacing the concrete collar.
- Heavenly extended power from new NV Energy facilities at the East Peak Snowmaking Well and the Gondola Water Tank.
- The Boulder Parking Lot project included the pavement removal and replacement, BMP upgrades, the annual removal of sediment from snow storage areas. Located in Nevada, the multi-year project was covered by a Stormwater Pollution Prevention Plan (SWPPP) under the construction stormwater permit.
- The California Dam Snowmaking Pond maintenance activities were completed in 2020 with post construction monitoring of the meadow and bank stabilization in 2021. The 401 Water Quality Certification post construction report was reviewed by Lahontan and removed from the active database on December 30, 2021.

Master Plan Implementation Projects (P)

Master Plan Implementation Projects typically include key capital improvement projects identified through Heavenly's Master Plan. In 2021, this involved two third-party utility projects.

- The NV Energy Project is an on-going multi-year project covered under a standalone Nevada construction stormwater permit and SWPPP. In 2021, NV Energy installed vaults and the conduits for medium voltage conductors extending from the top of North Bowl down Crossover to the top of Gondola and up to the top of Olympic Chair from the Von Schmitt's road.
- The ATC Hub, Fiber, and Node Project was a multi-year project that was covered under a standalone California construction stormwater permit and SWPPP. The majority of the project was constructed in 2020. Final activities completed in June 2021 included installation of a natural gas line extension near the Tamarack Lodge and a short segment of underground fiber near the Mombo ski trail. Lahontan approved the Notice of Termination for the ATC Hub, Fiber, and Node Project stormwater permit in August 13, 2021.

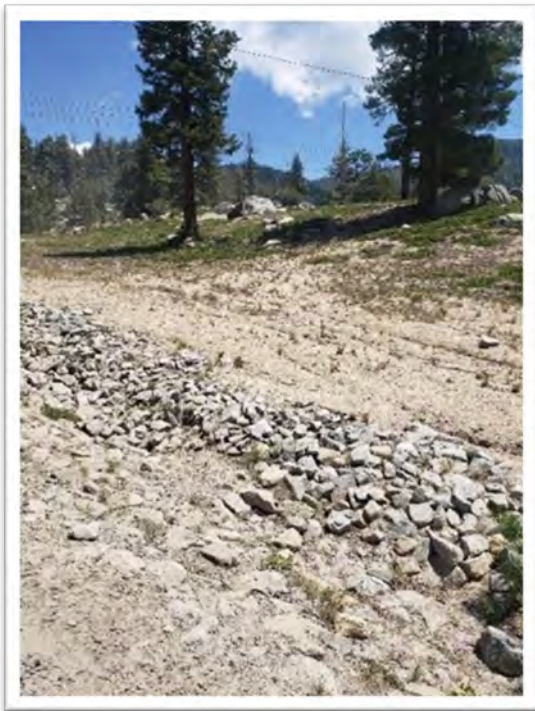
WMRP Projects (EH-CA & EH-NV)

Through the WMRP (Drake 2013 and IERS 2016), erosion hot spots are identified and ranked, then treatments are developed based on site conditions. Each hot spot may require a different treatment level ranging from mulch to the "full restoration" with mulch, soil tilling, seeding and compost application. Heavenly has implemented a range of restoration methods over more than a decade of erosion control work; the goal is to continue to explore innovative approaches to increase cost efficiencies and ecologically sound outcomes in watershed management. Targeted watershed assessments for erosion hot spots are conducted each year.

The annual WMRP assessments for 2019 and 2020 were used to identify two project areas for the 2021 construction season work list. The following section outlines treatments implemented for these two projects in 2021.

Groove Erosion Resistance – (EH-CA)

This 2021 WMRP project is located along the summer access road between the lower Groove Lift terminal and the intersection with the Top-of-Tram summer access within approximately 500 feet of the Heavenly Valley Creek. Hot spots within 100-500 feet proximity from the stream are ranked as a medium risk of erosion (M). Areas along the road shoulder showed evidence of minor rilling and the beginning stages of further erosion, that would contribute sediment to the existing drainage system BMPs. Permanent drainage BMPs along the road consist of waterbars, rock-lined swales, and sediment basins that are maintained annually to remove accumulated sediment. Soil treatment for areas adjacent to the swales, included: ripping, wood chip incorporation, soil roughening, seeding, and mulch application ("rip and chip" treatment). In addition, waterbars along the road were rebuilt and the rock-lined ditches realigned. Improving erosion resistance of soils will reduce the source of sediment and improve effectiveness of the sediment capture BMPs.



Before: Exposed soils alongside road shoulder and rock-lined swale.



After: "Rip and chip" treatment on shoulder and refurbished rock-lined swale.

Groove Erosion Resistance – 2021 WMRP Project

Summer Access at California Base Lodge – (EH-CA)

On the east side of the California Base Lodge, in the Bijou Creek watershed, two areas were identified for this 2021 WMRP project where erosion resistance could be improved by constructing drain rock "buffers". These "buffers" slow runoff and enhance infiltration, thereby reducing potential for sediment and woodchips to be conveyed into paved areas, which runoff to the storm drain systems connecting to Bijou Creek. A 6-foot-wide buffer of 1.5-inch drain rock, lined with filter fabric, was constructed for approximately 300 feet between the summer access road and the paved patios behind the lodge. Another 6-foot buffer of 3-to-8-inch diameter rock, lined with filter fabric, was built at the summer maintenance road entrance to the parking lot. Larger rock was used to withstand the occasional vehicle traffic.



Before: Loose soils and woodchip mulch adjacent to patio pavement behind Lodge.



After: Drain rock buffer installed behind the Lodge between access and patio.



Before: Loose soils and woodchips.



After: Rock riprap buffer at parking lot entrance.

Cal Base Summer Access – 2021 WMRP Project

Monitoring Results

Monitoring includes both observations and quantitative scoring protocols. Observations capture successful management activities necessary to implement the WMRP through the outcome-based management approach. Quantitative methods include the protocols for scoring treatment outcomes at erosion hot spots developed by IERS (Hauge Brueck 2014 and Hauge Brueck 2015), as well as the protocol used by RCI (Parsons 2006 and RCI 2018) to score BMP implementation and effectiveness.

Heavenly Mountain Resort Waste Discharge Requirements

Heavenly continued to prioritize reducing erosion and increasing soil resistance for maintenance, construction, and restoration projects during the summer of 2021. Results of the monitoring conducted by RCI include BMP effectiveness scoring used for inspections, as well as observations of WMRP treatment implementation and outcomes. Monitoring in 2021 was limited this year when the mountain was closed by the USFS and inaccessible from August to September due to the smoke from the summer wildfires.

WMRP Implementation

With respect to the rating criteria for WMRP implementation, 2021 received an overall score of “Excellent” since “all WMRP projects were implemented and maintained according to the work list timeline”.

BMP Effectiveness Scoring

With respect to the rating criteria for BMP effectiveness scoring, 2021 received an overall score of “Good” because “75% to 90% of BMPs implemented correctly and functioning effectively; some evidence of sediment leaving the site, but no sediment reaching the stream channel”.

Resources Tracking

Heavenly tracks and updates resources used for on-mountain maintenance and capital projects throughout the construction season. The inventory includes useful information such as project tasks and location, schedule, personnel required, estimated hours of labor required, priority ranking, materials anticipated, and actual material imported or utilized.

Tracking in 2021 included 7,160 hours dedicated to resort BMP maintenance, starting as the snowmelts during the spring season. Activities included: rebuilding waterbars on ski trails, cleaning and inspecting sediment basins, maintaining seepage at the California Base area, sediment removal from Boulder parking lot snow storage areas, and maintenance of temporary irrigation at Lower Olympic revegetation sites. This inventory has helped allocate resources and facilitate maintenance of erosion reduction measures throughout the summer season. In conjunction with BMP installation and maintenance, Heavenly staff continued to document conditions at the resort through their annual inspection program (Heavenly Mountain Resort, November 2021).

Road Maintenance & Dust Control

Road monitoring is conducted by Heavenly staff in accordance with WDRs and USFS protocols under Heavenly’s Road Maintenance Agreement with the LTBMU for system roads. In keeping with the WMRP

approach to provide targeted monitoring to address on-the-ground erosion issues, Heavenly is tracking road projects on an annual basis (Appendix F, Cardno January 2021). In 2021, Heavenly reported a total of 14 miles of on-mountain roadway network that were maintained. Of this total, 6.4 miles of roads were in Nevada and 7.6 miles of roads were in California. Road maintenance activities included: maintaining waterbars on summer access roads, inspecting Wells Fargo Road to determine culvert effectiveness, application of aggregate road base where needed, and refurbishing sediment basins. Additionally, road shoulders were spot treated with pine needle or wood chip mulch to slow sheet flow leaving road surfaces, and drainage channels were maintained.

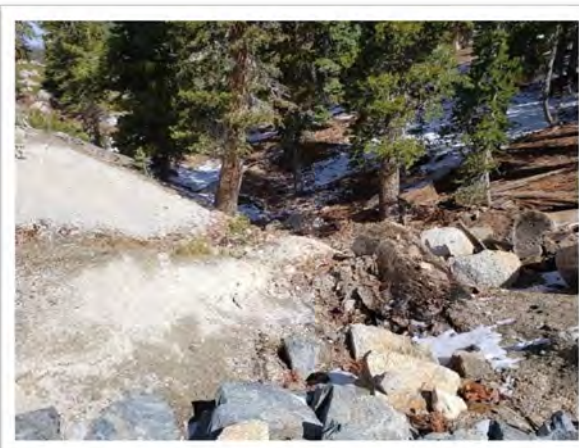
Water tanker trucks were used for dust abatement on roads, which are typically the greatest potential source of dust on the mountain. Water trucks were observed to be in use on a regular basis for active construction projects and routine watering of summer access roads across Heavenly for effective dust control in 2021.

WMP Treatments and Treatment Outcomes

Over more than a decade, monitoring programs at Heavenly have been using protocols that quantify erosion reductions and indicators of erosion resistance. Supplemental guidance for applying effective treatments and techniques for achieving WMP goals is updated annually; see Tables 2 through 5 in Attachment A. The information is available for reference by inspectors, design professionals, and Heavenly staff. Hot spots are evaluated before and after treatment to observe the effectiveness of treatment outcomes. The following WMP hot spots were treated in 2020 and reviewed in 2021 (one year after construction).

Ridge Bowl Check Dams and Outlet – EH-CA

To reduce the potential for erosion and sediment transport, a steep gully was identified as a 2020 hot spot location at Ridge Bowl. Treatment included embedding rip rap to armor the existing drop. At the base of the drop, pine needles and woodchips were hand-tilled into the soil to increase infiltration, then riprap was placed on top of the conditioned soil.



2020 Before Repairs



1-Year Post Construction (2021)

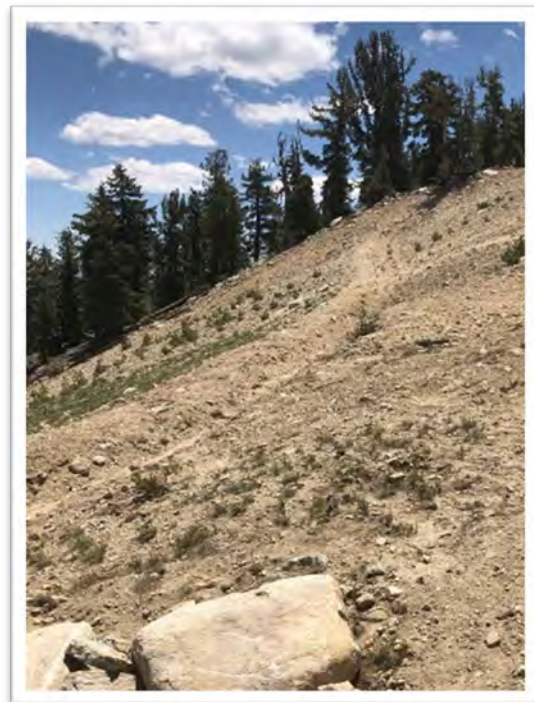
Monitoring in 2021 indicated the treatment was effective, vegetation establishment is progressing, and the riprap remains stable. At the top edge of the embankment there is a small area that may need future maintenance to redistribute the pine needle and wood chip mulch.

Big Dipper Run – EH-NV

The Big Dipper Run WMRP project in 2020 involved repairing waterbars and outlets that had overtopped and failed, causing rilling on the ski slope between waterbars. In 2020, sediment that accumulated in the waterbars was removed to reestablish depth and grade. Wood chips were also incorporated into the swales created by the waterbars to improve infiltration and sediment capture.



2020 Repairs



1-Year Post Construction (2021)

In ski trail areas with rilling, wood chips were raked into the soil, then seed and mulch were applied. Monitoring showed waterbars with mulch swales were effectively intercepting snowmelt runoff, capturing sediment, and resisting erosion.

Lower Olympic – EH-NV

After the completion of the Olympic Snowmaking Line Upgrade project in 2018, portions of the ski trail were regraded and reseeded. Revegetation is a multiyear process and appears to be successful. However, after the heavy spring runoff in 2019, rilling and a gully started to occur at the steeper section of the ski trail below the summer access road. Identified as a 2020 WMRP project, a waterbar was built crossing the steep ski trail below the access road to intercept runoff. Woodchips were incorporated into the bottom of the swale consistent with techniques developed through the WMRP. Small rock checks were also placed along the swales to dissipate energy. Monitoring in 2021 showed that vegetation establishment continues to progress on the ski slope and waterbars are successfully reducing erosion and sediment transport.



2020 Revegetation



2021 Revegetation



2020 Rill Formation



2021 Primary Water Bar

Project BMP Implementation and Effectiveness

The annual monitoring conducted for projects during the 2021 construction season included active construction monitoring, post-construction monitoring (one-year), and follow up visits after maintenance activities. A total of 13 Temporary BMP evaluations at 10 sites and 39 Permanent BMP evaluations at 38 sites were performed in 2021. The BMP evaluation reports are provided as Attachment C of this report.

Temporary BMP evaluations were performed for active construction on two-week intervals, except during the period when access to Heavenly was closed due to wildland fire restrictions. Results showed Temporary BMPs monitored were fully implemented at 92% and effective at 100% of the evaluations. The overall score for temporary BMPs fully implemented and effective was 92%. Departures were related to poorly installed straw wattles and areas with minimal soil protection (mulch or vegetation). Heavenly staff acted promptly to correct temporary BMP departures when notified.

Permanent BMP evaluations were performed at the project completion (2021 construction and WMP projects) and one-year post construction for projects from prior years. Permanent BMPs monitored were fully implemented at 97% and effective at 90% of the evaluations conducted. Effectiveness departures noted where infiltration could be improved at waterbars or through soil protection. Heavenly staff acted promptly with plans to correct departures.

Watershed Assessment for Hot Spots

In 2021, WMP hotspot assessments included evaluation of the Nevada watersheds consistent with the WDR requirement to rotate watersheds on an annual basis (Bijou Creek watershed in 2019 and Heavenly Valley Creek watershed in 2022). Erosion hot spot ranking was completed based on IERS ranking criteria (IERS, 2016). The annual WMP assessments from 2021 were used to identify the following WMP projects for implementation during the 2022 construction season.

Watershed	Hot Spot Name	Erosion Risk	Active Erosion	Active Deposition	Proximity to Stream/SEZ	Connectivity to Stream/SEZ	Watershed Priority	Problem Description	Treatment Recommendation
NV-3	Upper Olympic 1	M	Y	Y	L	L	M	Gully on ski trail and water bar failure	Reestablish nearby waterbars, fill gully, and condition soils in areas affected by erosion and sediment deposition.
NV-3	Upper Olympic 2	L	Y	Y	L	L	M	Rilling on ski trail	Reestablish nearby waterbars and condition soils in areas affected by erosion and sediment deposition.
NV-3	Edgewood Creek Summer Access	H	Y	Y	H	H	H	Sediment deposition adjacent to access road	Review source of runoff and sediment, improve road cross drainage, remove sediment, and add control BMPs. Any excavation is limited in this active utility corridor.
NV-1	Orion at Skyline Trail	M	Y	Y	L	L	L	Water bar failure	Reestablish waterbar and improve road cross drain stability. Activity may be restricted by Tahoe Draba occurrences.

Recommendations

Planning & Communication Process

- Continual training with the “BMPs, Facilities and Watershed Awareness Training”, which covers the compliance requirements for all staff, new employees, and outside vendors/contractors.
- Continue to coordinate regarding the development and status of the Annual Work List, road maintenance activities, resort BMP inspections and annual resources allocation/tracking.
- Obtain copies of third-party SWPPP documentation.

WMRP Implementation and Effectiveness

- Continue to implement the Outcome Based Watershed Management Approach to modify existing BMPs and plan for future projects.

Monitoring & Assessment Process

- Continue to integrate monitoring results from previous seasons into the planning and implementation of future projects.
- Review road monitoring and inspection needs with respect to MMP requirements and consider updating protocols.

References

- Cardno (January 2017). Heavenly 5-Year Comprehensive Report 2012-2016.
- Cardno (January 2022). Environmental Monitoring Program Comprehensive Report, Heavenly Mountain Resort, Water Years 2017–2021.
- Drake, K. and Hogan, M. (2013). Watershed Management Guidebook: An Outcome based Guide to Watershed Management. Prepared for the California State Water resources Control Board. 2013
- Hauge Brueck Associates (2014). Heavenly Mountain Resort Epic Discovery Project Final EIR (CEQUA) and Environmental Impact Statement (TRPA/NEPA), SCH # 2013112051.
- Hauge Brueck Associates (2015). Heavenly Mountain Resort Epic Discovery Project Draft EIR/EIS/EIS.
- Heavenly Mountain Resort (June 2021). 2021 BMPs/Facilities and Watershed Training Presentation PowerPoint and Meeting Attendance.
- Heavenly Mountain Resort (November 2021). 2021 Heavenly Mountain Resort Roads Report
- Heavenly Mountain Resort (November 2021). HMR 4th Quarter Inspection WY2021
- Heavenly Mountain Resort (2021). Personal communication B. Hickman tracking/inventory spreadsheet.
- IERS (2016). Heavenly Mountain Resort Outcome-Based Watershed Management Program 2016 Restoration and Monitoring Annual Report.
- Lahontan Regional Water Quality Control Board (2015) Monitoring and Reporting Program. R6T-2015-0021 Waste Discharge Requirements.
- Parsons (2006). Heavenly Mountain Master Plan Amendment 2005 Draft EIR/EIS/EIS.
- Resource Concepts, Inc. (2018) Heavenly Mountain Resort Watershed Maintenance and Restoration Program (WMRP) 2017 Annual Report & Construction Season Summary, Attachment C.
- Resource Concepts, Inc. (April 2021). Heavenly Mountain Resort Watershed Maintenance and Restoration Program (WMRP) 2020 Annual Report and Construction Season Summary.

Attachment A

2021 Tables

Table 1. 2021 Completed Projects and BMP Installation/Maintenance

	Location	Treatment
California Projects		
M	Upper Shop	Maintain existing waterbars, ditches, drop inlets and culverts.
M	Powderbowl/Groove Chair Base	Maintain rock-lined ditches at base of Groove Lift and sediment basin at base of Powderbowl Lift.
M	Maggie's Sediment Basins	Maintain and clean out sediment in Maggie's Road shoulder sediment basins.
M	Hellwinkel's Sediment Basins	Maintain and clean out sediment in Hellwinkel's road shoulder sediment basins.
P/RM	Cal Dam Snowmaking Pond	Post-construction 401 Certification monitoring.
EH-CA	Groove Erosion Resistance	Improve erosion resistance and drainage stability near summer access road and Groove ski trail.
RM	TOG Water Tank Power	Underground power extension TOG Water Tank.
EH-CA	Cal Base Summer Access	Stabilize summer access road at parking lot entrance and improve erosion resistance behind lodge.
California & Nevada Projects		
P	ATC Cell Tower & Fiber Optic Line Replacement	Third-party project- Completed 2nd Year and final Multi Year Phased Project. Work completed included the gas line connection at the Top of the Gondola and fiber relocation at Mambo.
P	NV Energy	Third-party project completed by NV Energy – Vault and Power Line Installations.
Nevada Projects		
RM	Boulder Parking Lot	Continue phased approach to repair pavement in coordination with Heavenly Base Ops. Completed 3rd Year of the Multi-year phased project.
M	Galaxy Road Sediment Basins	Maintain and clean out sediment in Galaxy Road shoulder sediment basins.
RM	East Peak Lodge Well	Resort maintenance around wellhead for public water system.
P	East Peak Snowmaking Well	Resort connection to new NV Energy transformer.

M	BMP Maintenance
P	Master Plan Implementation Project
RM	Resort Maintenance Project
EH-CA	Erosion Hotspot Inventory California
EH-NV	Erosion Hotspot Inventory Nevada

Table 2. Permanent BMP Implementation – Recommendations and Responses

Year Added	Observations/Recommendations	2021 Responses/Actions
2004/2005	Revegetation specifications need to be updated to present standards in the Lake Tahoe Basin.	Heavenly seed mix was used for all projects.
2004/2005	Design of facilities to treat or infiltrate the 20-year 1-hour event need to be site-specific. Infiltration areas should be flat bottomed, filled with sufficient gravel or drain rock, and bordered with rocks (4 to 8" diam.).	Existing drip line infiltration trenches were maintained.
2004/2005	Trench settlement can be prevented by compaction and mounding.	Backfill for trenching was compacted or plow was used.
2004/2005	Use fiber rolls for long-term slope stabilization as well as temporary erosion control.	Fiber rolls were used for temporary erosion control and long-term slope protection throughout projects.
2006	Gravel and riprap specifications should include: sizing, gradation, angularity, and geotextile installation underneath.	Large native rock was used for slope protection. ATC plans included specifications for gravel used.
2007	Geotextile fabric installation for slope stabilization must address anchor trenches at fabric edges, overlaps, and appropriate anchor intervals for lined channels and steep slopes.	Geotextile material installed at Cal Dam face lining used anchor trenches.
2008	New prescriptions for soil amendments and revegetation need better coordination regarding timing, accessibility, and materials availability.	The tracking spreadsheet developed and updated by the snow surfaces manager continues to help in coordination for revegetation and soil amendment materials.
2009	Waterbars should be elongated and installed at an angle to the direction of traffic.	Implemented on summer access roads and restored where underground fiber installed.
2009	Road base should be applied in areas with steep slopes, water quality concerns (proximity to SEZ/stream crossings), and high traffic areas where rutting and dust may be a problem.	"Road base" was used to effectively stabilize select road segments and for annual road maintenance activities.
2010	Excess fill could be reused on-site to build up road base in depressed areas and improve drainage.	Not applicable in 2020.
2011	Riprap installation on steep slopes provides better stabilization than cover with mulch.	ATC used riprap slope protection behind Node buildings.
2012	Incorporation of wood chip mulch provides erosion resistance and effective cover.	Wood chip mulch incorporation has proven effective and was used routinely on projects.

Year Added	Observations/Recommendations	2021 Responses/Actions
2013	Wattles constructed by Heavenly in-house from coir fabric and pine needles on-site provide a cost effective, easily constructible alternative to straw wattles.	Pine needle coir logs continue to be effectively used for active construction, and infiltration basin outlets, and for longer term sediment control until permanent stabilization is established.
2014	Removal of sediment from collection areas can be achieved by dry vactoring for extra capacity.	Sediment vactoring of drop inlets is done periodically at the Boulder Parking Lot and CA Base Parking Lot.
2015	Testing of new available BMP technology helps determine innovative methods to incorporate into plans.	Not applicable in 2020.
2016	Compost filter socks may be used as an alternative to straw wattles for permanent stabilization in select areas.	Compost filter socks were no longer implemented. Winter conditions can cause them to freeze, become ineffective, and hinder snow cat traffic.
2017	Culvert installation in locations of concentrated flows can help pass runoff under roads rather than across.	Culverts were inspected and maintained on the mountain; no new culverts were installed.
2018	Mulch and seed applied with a hydroseeder can help establish erosion resistance in steep areas. Implement in combination with other BMPs in locations with concentrated runoff flows.	Not applicable in 2020.
2019	Review project for topography, upgradient drainage area, slope, and slope length to identify potential for highly concentrated runoff flows and install robust energy dissipaters accordingly.	Reviewed for 2020 and 2021 project locations.
2021	Observed track out of sediment and woodchips from runoff flow into storm drains.	Built drain rock “buffers” along the summer access road behind the Cal Base Lodge.

Table 3. Permanent BMP Effectiveness – Recommendations and Responses

Year Added	Observations/Recommendation	2021 Responses/Actions
2004/2005	Soil cover was not typically achieved with straw mulch after the first construction season.	Wood chips were reapplied in high traffic areas, along road shoulders. No straw has been used on the mountain for more than a decade.
2004/2005	Revegetation develops minor deficiencies after construction, requiring on-going correction for several years to provide effective soil cover.	Mulch incorporation/tilling has resulted in higher revegetation success rates. Soil erosion resistance, rather than soil effective cover, is used for design. Spot remediation performed on projects as needed.
2006	Fabric installed on steep slopes often slides down in small sections, even anchored securely during installation. Geotextile needs continuing maintenance if vegetation is not established.	Geotextile fabric and revegetation has previously been phased out in favor of riprap or mulching and tilling restoration treatments. Fabrics or other matting material may need to be considered on steep slopes where other treatments alone will not provide adequate erosion resistance.
2007	Projects using wood chip mulch and soil amendments appear to provide longer lasting effective cover, particularly in high traffic areas. Heavenly will continue spot treatments at facility sites where barren areas occur.	New wood chips added annually throughout high traffic areas at Adventure Peak/Gondola Top Station area where most Summer Activities are located.
2008	Sediment from outside the project area has the potential to impair the long-term effectiveness of SEZ restoration and soil stabilization projects unless follow-up work is performed.	Sediment capture facilities are cleaned and maintained throughout the resort as routine maintenance (examples include Upper Shop, Hellwinkel's, Maggie's, and Galaxy Road).
2009	Wood borders for infiltration areas and trenches are often caught and pulled out by equipment in the winter, particularly in areas alongside roadways. Rock borders keyed into the soil are a more stable option to prevent movement of gravel.	Wood borders have been replaced with rock borders around all infiltration areas. Rock borders were observed to hold up well from previous years; wood borders are no longer used.
2010	Rock armored channels routing runoff from drip lines to infiltration areas are more effective than drip line trenches. Channel low points must be well defined; otherwise, new channels erode around rocks.	Dripline infiltration areas and outlet channels are refurbished throughout the resort as routine maintenance.
2011	Water bar outlet protection using energy dissipaters and enhanced infiltration is effective.	Water bar outlets are protected with pine needle coir logs and rock check dams at many locations. Outlet protection is maintained annually.
2012	Channels lined with rock or fabric accumulate sediment over time. Sediment should be routinely removed from the channels and used for fill in low areas on roads or removed from the site.	Channels were refurbished throughout the resort as routine maintenance.

Year Added	Observations/Recommendation	2021 Responses/Actions
2013	On steep slopes requiring pedestrian access, rock steps provide access without causing erosion.	Rock steps were not installed on projects this year.
2014	Water bar outlets, energy dissipaters and areas to enhance infiltration of road runoff accumulate sediment and need to be cleaned periodically.	Sediment capture facilities are cleaned and maintained throughout the resort as routine maintenance (examples include Upper Shop, Hellwinkel's, Maggie's, and Galaxy).
2014	New mulch incorporation and revegetation treatment for slope stabilization should be implemented in areas prone to erosion or with erosive soils.	Mulch incorporation and revegetation have proven to be effective on projects with shorter slope lengths and no concentrated runoff flows.
2015	New available BMP technology should continue to be considered (past years: "Filtrexx Compost Filter Socks," "Durawattles" and "Shred Vac" and hydroseeder) and evaluated for effective erosion resistance.	Not applicable in 2020.
2016	Pine needle filter berms along ski slopes are effective at slowing and infiltrating runoff.	No new filter berms were installed in 2019.
2017	Culverts installed where concentrated flows cross roadways help to abate chronic erosion and protect water quality.	Existing culverts are routinely inspected and maintained.
2018	Hydroseeding can be effective when used on steep slopes or hard to reach areas.	Not applicable in 2020.
2019	Hydroseed applied to steep slopes with long slope lengths or concentrated flows does not provide adequate erosion resistance and should be used in conjunction with other control measures.	Not applicable in 2020.
2021	Geotextile wattles were originally placed between the border of the pavement and the summer access roads and needed replacement.	Drain rock "buffers," used to filter runoff into the storm drain system, will be inspected for effectiveness in 2022.

Table 4. Temporary BMP Implementation – Recommendations and Responses

Year Added	Observations/Recommendation	2021 Responses/Actions
2004/2005	BMPs should not be disassembled prematurely. Specifically, plans did not specify clearly that fiber rolls were to remain after construction.	Sediment fence is always removed before the end of the season. Fiber rolls/coir logs typically remain in place at water bar outlets and parallel to slopes.
2004/2005	Place BMPs prior to construction, to ensure readiness for summer storms or winter closures.	BMPs were in place prior to construction project initiation, including small maintenance projects and stockpiles.
2004/2005	Clean out/repair BMPs after runoff events.	Repairs to and maintenance of temporary BMPs was conducted after runoff events for on-going projects.
2004/2005	Maintain BMPs through project, to ensure readiness for summer storms or winter closures.	Temporary BMPs were in place and maintained at active construction sites.
2006	Temporary BMPs may concentrate runoff to a discharge point (sediment fence, fiber rolls, and temporary diversion). Provide energy dissipation and stabilization at the point where the temporary BMPs terminate.	Outlet protection used for temporary sediment fence installed at sediment placement area for the snowmaking pond maintenance project.
2006	If a construction project initially proposed for a single season must be extended over the winter, winterization plans should be added to the design documents.	Construction disturbance was stabilized on projects started in 2020; no winterization plans were required.
2007	Maintenance of sediment fence can be reduced by using proper T-Posts for support and adequate burial of fabric edges. Designs should allow for alternative fencing at sites with substantial rock or limited access.	Sediment fence was used for construction and maintenance projects in 2020.
2007	Dust control for soil stockpiles can be improved. If snowmaking water is unavailable, stockpiles should be covered with plastic sheeting.	Stockpiles were both watered and covered in 2020.
2008	Location of sediment barriers shown on project plans needs to be parallel to slopes or with energy dissipaters along the flow line and at discharge points.	Sediment barriers installations met this condition in 2020.
2009	Staging areas should have temporary BMPs in place before materials stockpiled on-site.	All staging of materials and equipment included temporary BMPs.

Year Added	Observations/Recommendation	2021 Responses/Actions
2011	Rope fencing for road delineation is typically removed prior to winter. Vehicles and equipment should observe road corridors when fencing is not in place.	Rope fencing installed throughout the resort. Staff and contractors were reminded throughout the season to observe delineated road corridors.
2012	Communication with outside contractors regarding importance of observing BMPs.	Outside contractors were notified of BMPs during the pre-season training and throughout the season.
2013	Coir logs constructed in-house from coir fabric and pine needles can be used in lieu of straw wattles.	Coir logs were used throughout the resort at and infiltration basin outlets and at active construction sites.
2014	Employee training on BMPs including field installation methods should be conducted for all new employees and as a refresher for continuing employees.	Employee training modified to the pandemic in 2020. It included pre-season training both virtually and in the field. Trail crew employees receive additional field training in the proper installation of temporary BMPs.
2015	Reports completed by field crews can be beneficial in tracking materials used, types of BMPs installed and labor required to help in project planning.	Tracking documents were maintained by Heavenly with quantities of pine needles, wood chips, fiber rolls, water truck loads, BMPs, and road base.
2016	Compost filter socks are an alternative to straw wattles and sediment fence in select areas.	Filtrexx Compost Filter Socks were tested on site in 2017 and were shown to not be effective in certain situations due to mountain conditions.
2017	Stockpiling wood chip or pine needle mulch in strategic locations (near active construction sites, near observed erosion) provides quick access for field crews to spread mulch for erosion resistance.	Wood chips and pine needles were used on all projects in 2020.
2018	Alternative dust control methods may be necessary on steep roadways.	A 4WD truck rigged with two 275-gallon water filled IBC totes and a pump provides dust control for steep access roads on the mountain.
2019	Plan for potential stormwater dewatering operations to ensure proper discharge procedures are understood by all personnel.	Dewatering alternatives implemented for snowmaking pond maintenance project.
2020	Prevent storage of materials or equipment in flow lines.	Concerns noted and corrected for projects in 2020.

Table 5. Temporary BMP Effectiveness – Recommendations and Responses

Year Added	Observations/Recommendation	2021 Responses/Actions
2004/2005	Disturbance outside construction limits should be controlled by delineating access areas with rope fencing.	Require rope fencing and orange construction fence was used to delineate sites in 2020.
2006	Exposed soils with potential for sediment delivery to SEZ should be managed with sediment barriers.	Pine needle wattles and rock check dams used to prevent sediment delivery to SEZ are routinely maintained.
2007	Dust control for stockpiles is more effective when snowmaking water can wet down soils. Plastic sheeting is less effective and difficult to keep anchored in windy conditions.	Stockpile watering and covering were used in 2020. As noted, plastic sheeting requires continual maintenance to remain effective.
2008	Sediment fence is effective in containing excavated stockpiled soils. If stockpiles are larger than initially anticipated, the fence must be extended.	Sediment barriers were placed around downslope side of all observed stockpiles. Maintenance was preformed if deficiencies noted.
2010	Despite proper installation, buried sediment fence edges can still be pulled out by wind, requiring consistent maintenance.	Sediment fence installed in 2020 construction projects. Fencing with wire mesh backing was effective and required little maintenance. Fencing without wire backing required frequent maintenance to remain effective.
2011	Fiber rolls are most effective when keyed into the native soil and anchored securely.	Fiber rolls and coir logs in construction areas were keyed and staked. A few occurrences of wattles not anchored, but deficiencies were corrected upon notification.
2012	Communication to all outside contractors and subcontractors to convey importance of observing and maintaining temporary BMPs around an active construction site.	Outside contractors were required complete virtual training regarding Heavenly's Water Quality program. Virtual training was used due to the 2020 pandemic.
2013	Coir logs constructed by Heavenly in-house from coir fabric and pine needles appear to be an effective alternative to typical straw wattles.	Pine needle coir logs were installed at water bar outlets on roads; and used as temporary controls at active construction sites.
2014	Pine needle coir logs constructed by Heavenly in-house can be used in erosion prone areas but usually need to be replaced annually.	Pine needle coir logs were installed in areas throughout the Mountain and maintained annually at locations Maggie's, Hellwinkel's, and Galaxy Roads.
2015	Reports from field crew supervisors can help determine effective BMPs based on material availability, labor required, and type of BMP most often utilized.	An annual project inventory list is developed with materials, staff hours, and priority by task which is extremely helpful for tracking project completion status and budgeting.
2016	Compost filter socks provide an alternative to straw wattles which decompose rapidly and sediment fence which requires near constant maintenance.	Compost filter socks were found to be ineffective for certain applications at Heavenly due to mountain conditions.

Year Added	Observations/Recommendation	2021 Responses/Actions
2017	Stockpiling wood chip or pine needle mulch in strategic locations (near active construction sites, near observed erosion) allows crews to quickly access and spread mulch for erosion resistance.	Wood chips and pine needles were stockpiled and used throughout the resort.
2018	Alternative dust control methods may be more effective to reduce fugitive dust on steep roadways.	A 4WD truck rigged with two 275-gallon water filled IBC totes and a pump successfully provides dust control for steep access roads.
2019	For stormwater dewatering methods to be effective, discharge locations must be identified in advance of the project (e.g., existing or temporary infiltration facilities, vegetated areas with no potential for discharge to surface waters, and/or using sediment control measures such as silt bags).	Dewatering alternatives used at snowmaking pond maintenance project in 2020.
2020	Reusable wattles/sediment socks perform well on pavement compared to wattles.	Used in the California Parking Lot in 2020.

Table 6. 2022 Annual Work List Projects & Related BMPs

	Location	Treatment
Priority Projects in California		
M	Upper Shop	Maintain existing waterbars, ditches, drop inlets and culverts (spring/summer and after storm events).
M	Powderbowl/Groove Chair Base	Maintain rock-lined ditches at base of Groove Lift and sediment basin at base of Powderbowl Lift (spring/summer and after storm events).
M	Maggie's Sediment Basins	Maintain and clean out sediment build up in Maggie's Road shoulder sediment basins (spring/summer and after storm events).
M	Hellwinkel's Sediment Basins	Maintain and clean out sediment build up in Hellwinkel's Road shoulder sediment basins (spring/summer and after storm events).
RM	Top of Sky Lift	Remove wooden deck-CERP BMPs.
RM	Base of Tamarack Lift	Electronic sign installation – CERP BMPs.
P	Lakeview Lodge/ Top of Tram	Deck replacement / concrete platform – CERP BMPs.
P	Lower Shop California Base	Shop removal – TRPA and CERP BMPs.
RM	NV Energy	Hazardous tree removal – CERP BMPs.
Priority Projects in Both California and Nevada		
P	NV Energy	Third-party project by NV Energy Project – Vault and Power Line Installations and stabilization – NV Energy SWPPP (3 rd year multiyear project).
Priority Projects in Nevada		
RM	Boulder Parking Lot	Continue phased approach to paving in coordination with Heavenly Base Operations (3 rd year of multi-year phased project).
M	Galaxy Road Sediment Basins	Maintain and clean out sediment in Galaxy Road shoulder sediment basins (spring/summer and after storm events).
RM	Liberty Energy	Powerline near top of Dipper Lift – CERP BMPs.
EH-NV	Orion's at Skyline Trail	Access road drainage, water bar, and erosion control BMPs, pending coordination on Tahoe Draba location.
P	North Bowl Lift Replacement	Lift removal and replacement with temporary and permanent erosion control – SWPPP.
RM	NV Energy	Hazard tree removal – CERP BMPs.
EH-NV	Upper Olympic 1	Ski trail / water bar stabilization and erosion reduction.
EH-NV	Upper Olympic 2	Ski trail / water bar stabilization and erosion reduction.
EH-NV	Summer Access below Boulder Parking Lot	Access road drainage, water bar, and sediment control BMPs, pending coordination with utilities.

M	BMP Maintenance
P	Master Plan Implementation Project
RM	Resort Maintenance Project
EH-CA	Erosion Hotspot Inventory California
EH-NV	Erosion Hotspot Inventory Nevada

Attachment B

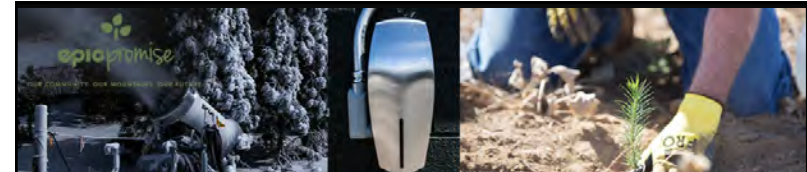
2021 BMPs, Facilities, and Watershed Awareness Training



2021 BMP's, Facilities & Watershed Awareness Training

Heavenly Operations Staff

1



Purpose/Agenda

- Review Heavenly's Watershed Protection Commitment, BMP's & Your Role
- Review the Summer Rules of the Road
- Provide Awareness & understanding
- What to do when weather is expected
- Operating and disturbance in the Tahoe Basin

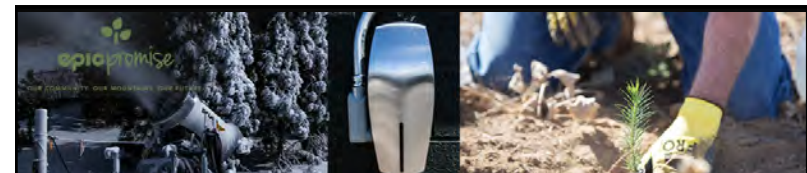
2



Our Commitment

- USDA Forest Service: Our partner in outdoor recreation & resource management
- Tahoe Regional Planning Agency: The Master Plan, Mitigation & Monitoring, Project Permit Conditions
- State of California Regional Water Quality Control Board, Lahontan Region: Waste Discharge Requirements (WDRs) & SWPPP's/Stormwater Requirements.
- NDEP (Nevada Department of Env. Protection) Stormwater requirements

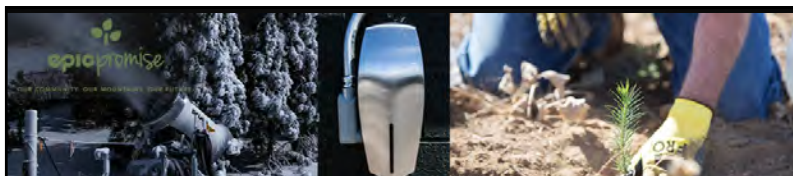
3



Agency Partners

- TRPA-Taylor Currier (BMP's, code enforcement) and Julie Roll (Senior Planner)
- Lahontan- Dale Payne (Env. Scientist) &
- Liz vanDiepen (Engineering Geologist) Consultant- Jill Sutherland (BMP's 3rd Party Inspectors, w/ RCI)
- LTBMU – Stephanie Heller, Hydrologist US Forest Service

4



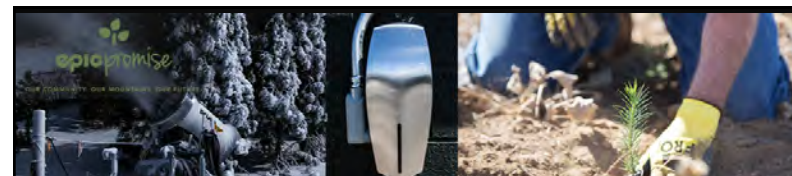
Erosion Control & BMP's

- Hellwinkel's Steeps Road Maintenance, now able to water steeper sections of road with new watering truck. 5MPH, 4WD Low Required
- Snowmaking Projects

Water Bars/Stabilization & Drainage Improvements, Cal Dam Maintenance.

- Maintain effectiveness of ski run BMP's, including maintaining water bars, Culverts and re-vegetation/cover.
- Roads Maintenance and Dust Control

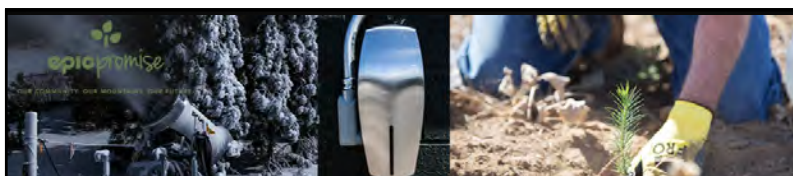
5



Hellwinkel's - Low & Slow!



6



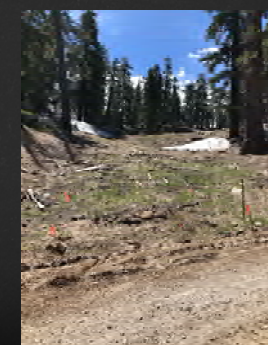
Handgrenade Restoration 2017-



7



Hand Grenade Restoration 2017 VS. 2019



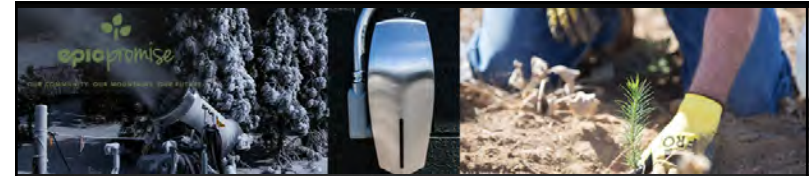
8



Major Erosion/Rilling:



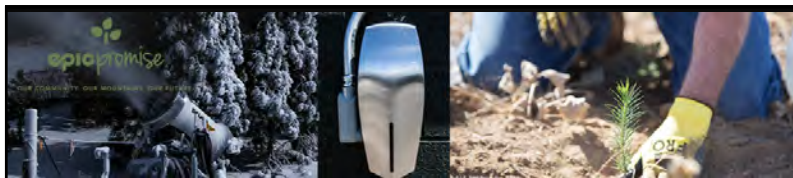
9



Restoration Work at Heavenly:



10



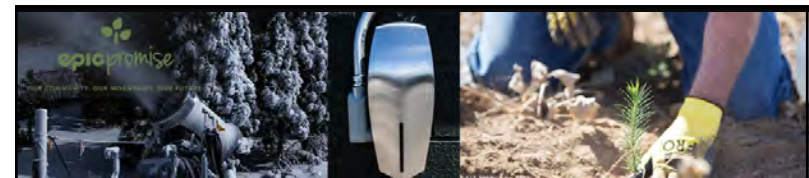
Wattles & Coir Logs

Straw wattle with silt fence

Pine Needle Wattle



11



Tahoe Draba - Sensitive Plant

Interpretive Signage at Top of
Tamarack Express

Photo of a plant from Heavenly



12



Protect Tahoe Draba Populations – Do Not Disturb

Full grown plants-Mostly grow above 9,000 Ft. Elevation

Draba like to grow in disturbed areas, & under drip lines of rocks



13



Invasive Weeds are known to exist on top of Heavenly Mountain. Siting and treatments by the USFS continue annually and Most are now eradicated. 3 remaining treatment sites.

Tall Whitetop Identification: Tall whitetop (also called perennial pepperweed) has many stems. It reproduces from rhizomes (root-like under-ground stems) and from seed. In Truckee, this species is common in many of the round-abouts, as well as, low, wet areas.



Tall Whitetop showing root connection Tall Whitetop in flower

14



Bull Thistle Canada Thistle



Bull Thistle flower

Canada Thistle flowers are smaller than most other thistle flowers

15



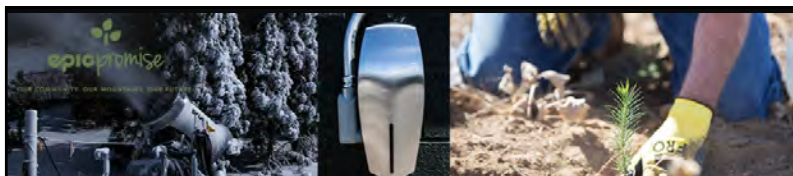
Pine Needle Wattles

Manufacturing by trails crew began in 2013! Now in Year 8

On mountain use for erosion control, and roads materials stockpiles.



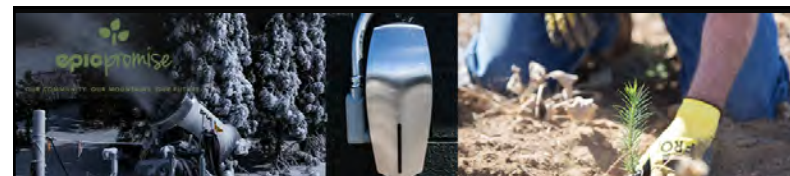
16



Important takeaways for you to ponder, with regard to BMP's:

- Is it working? (rather than “are we in trouble?”)
- Source control – we’re trying to stop the “bleeding” at the source rather than chasing it downstream.
- Water flow – its all connected, “Think like a water droplet.” Look uphill of problem areas to determine if there is a root cause of the erosion issue...
- Heavenly Prioritization – address the highest risk spot first (e/g/ nearest to creek, most erosive, problem spots)
- Keeping Turbid Stormwater out of the water ways

17

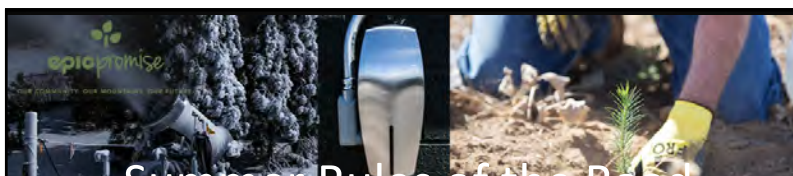


Be especially aware during Thunderstorm activity and listen to weather updates from Central Dispatch on Radio. Contact dispatch if you hear thunder. Shut downs may impacts operations, work sites, and the mountain might be shelter in place.

Major weather “Events” can cause environmental damage
If you see damage occurring Call Dispatch. 530-542-6900 Take a picture if possible.



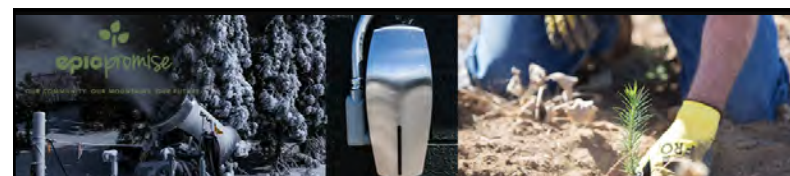
18



Summer Rules of the Road

- Drive on Designated Roads only, DO NOT Park on Vegetation
- Park only in Designated Parking Areas
- If you see someone not complying, tell your supervisor
- Just because you drive an ATV/Rhino does not mean you can drive, onto a ski slope or down a decommissioned road or Ski Trail. This will create unnecessary disturbance and erosion.
- When accessing the mountain all vehicles MUST be in 4WD to prevent erosion on the roads, and stay at or below 20 mph. Be especially aware of Fugitive Dust.
- All Vehicles must call 530-542-6900 upon entering and exiting through a mountain gates.

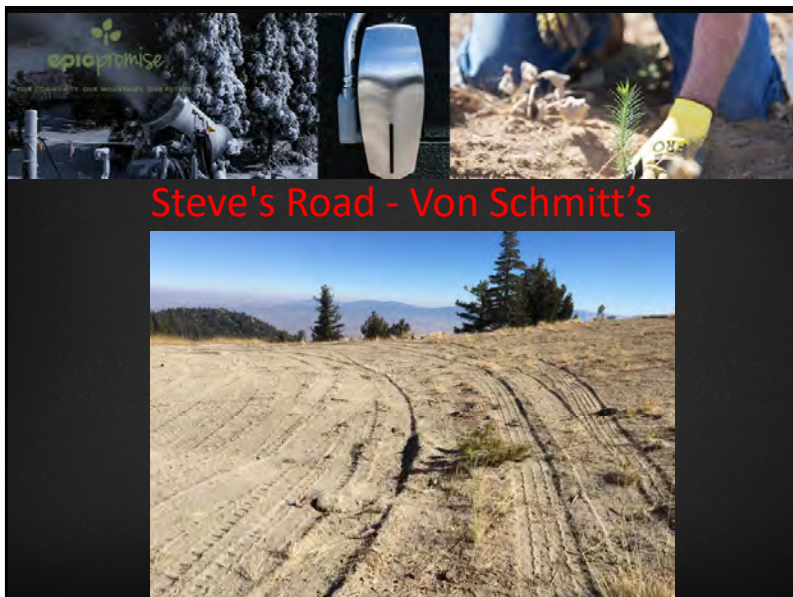
19



More Summer Rules of the Road

- Stay out of erosion control project areas
- Report anything that looks like an obvious erosion, Water Quality, or sediment problem to your supervisor.
- All outside contractors and vendors must have a Mountain Access Permit issued by the Central Dispatch Dept., except utilities.
- Prior to accessing the mountain roads anyone from outside of the Tahoe Basin will need to spray the bottom of their vehicle to prevent the spread of invasive weeds. Heavenly may require proof.
- If you don't see a mountain access permit, stop them & ask to see their permit. If you see Utility trucks Like SW Gas or Liberty, ask them if they need any guidance or direction.

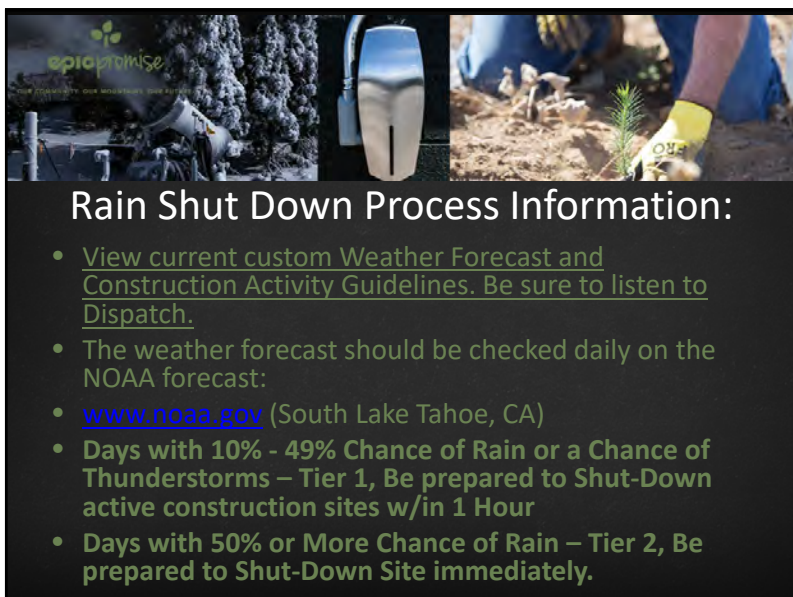
20



21



22



23



24



USFS Wildlife Trash Management and Education Program:

- As a condition of the approved EIS for the Epic Discovery Program a wildlife trash management and education plan is implemented annually and reviewed by Heavenly and the US Forest Service LTBMU. The Heavenly Mountain Resort Master Redevelopment Plan (2015) includes a number of Operations and Maintenance Measures as part of the Mitigation and Monitoring Plan. 7.5-21 BIO 8: Wildlife Trash Management and Education Program.
- A number of the activities at Heavenly Mountain Resort are located at the Top of The Gondola/Adventure Peak. As part of the Epic Discovery Project implementation the resort shall create and implement a trash management and education program. The goal of this program is for timely removal of refuse from deposit points, education of our guests and staff about proper waste management, and to keep any interactions between humans and wildlife to a minimum.
- Animal resistant “bear box” receptacles are in place @ TOG in summer.

25



Heavenly Hot Work Permit

Required for any hot work outside of a designated weld shop. Proper tools in trucks, Fire caches on hill.

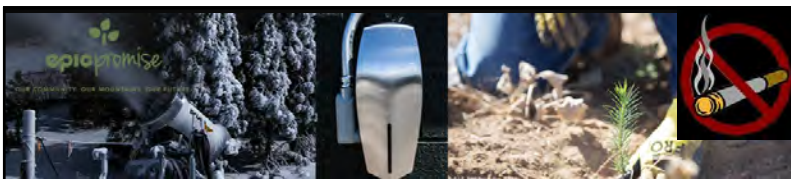
Know the PAL code for the day.

Issued by Kevin Higgins, Bryan Hickman, David Bammer, & Curtis Kezich.

Must be posted on site.



26



Absolutely NO SMOKING

- Due to EXTREME fire danger, smoking is prohibited on the mountain.
- This includes Smoking in Heavenly company or 3rd Party vehicles.

27



Wildland Fire Awareness- Be alert and aware / report any smoke to Dispatch.



28

Attachment C

2021 BMP Effectiveness Monitoring Evaluation Forms

Form HV1: Temporary BMPs for On-going Construction									
UTM Zone	11	Construction Site Name		ATC Fiber - Mombo	Survey Date	6/3/2021	ID#	818	
Easting	246825	Reviewer Name(s)		J Sutherland	Selection Code	S02			
Northing	4312109	Other (Describe)			Forest	Humbol	District		State
Construction Type	Other	Township		12N	Range	18E	Section	1	CA
Construction Foreman	Jim Ferguson	Date of Project Start		6/1/2021	Watershed		CA-1		
Project Type	New Construction	Other (Describe)		Fiber underground					
Plan Title	Heavenly ATC Hub, Fiber and Node Project SWPPP			Date	04/15/2020	Rev Date	05/12/2021	Job No.	
Specific concerns associated with project and BMP measures designed to achieve resource protection									
Maintained under the SWPPP to comply with the Lahontan Regions California's General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities for the Lake Tahoe Hydrologic Unit.									
Implementation		<input checked="" type="checkbox"/> 1) Were BMPs designed to maintain resource protection and meet water quality standards? 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs					Implementation Score: <input type="text"/>		
		<input checked="" type="checkbox"/> 2) Are BMP measures constructed according to contract design specifications/plans? 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow design specifications							
Effectiveness							Effectiveness Score: <input type="text"/>		
1) Source Control BMPs a) Are soil protection measures providing effective cover and erosion resistance? <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Are cut and fill slopes protected from surface erosion and slope failure potential? <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA									
2) Runoff Infiltration and Drainage Control System Effectiveness a) Are erosion control measures applied limiting erosion processes and sediment delivery to SEZ? <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Are constructed detention ponds stable and is site free from unexpected ponding of runoff? <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA c) Are natural or constructed infiltration zones effectively collecting and treating runoff? <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA									
3) Designation of Construction Zone and Equipment Exclusion Zones a) Are sensitive areas and construction zones adequately delineated? <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA									
4) Effectiveness of Hazardous Substance Control Measures a) Are BMPs for hazardous/toxic substances controlling chemical delivery to soils/water? <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA									
Additional Comments		Excavated to install underground fiber segment from pole to pole across Mombo. BMPs include: stay on ex roads, minimize disturbance corridor, close trench, rip, chip, seed, and mulch. No concerns.							

Form HV1: Temporary BMPs for On-going Construction									
UTM Zone	11	Construction Site Name		Tamarack Node	Survey Date	6/8/2021	ID#	819	
Easting	247750	Reviewer Name(s)		J Sutherland	Selection Code	S02			
Northing	4313818	Other (Describe)			Forest	LTBMU	District		State
Construction Type	Other	Township		12N	Range	18E	Section	1	CA
Construction Foreman	Steve Zehren	Date of Project Start		6/3/2021	Watershed		CA-1		
Project Type	New Construction	Other (Describe)							
Plan Title	Heavenly ATC Hub, Fiber and Node Project SWPPP			Date	04/15/2020	Rev Date	05/12/2021	Job No.	
Specific concerns associated with project and BMP measures designed to achieve resource protection									
Maintained under the SWPPP to comply with the Lahontan Regions California's General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities for the Lake Tahoe Hydrologic Unit.									
Implementation		<input checked="" type="checkbox"/> 1) Were BMPs designed to maintain resource protection and meet water quality standards? 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs					Implementation Score: <input type="text"/>		
		<input checked="" type="checkbox"/> 2) Are BMP measures constructed according to contract design specifications/plans? 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow design specifications							
Effectiveness							Effectiveness Score: <input type="text"/>		
1) Source Control BMPs a) Are soil protection measures providing effective cover and erosion resistance? <input type="radio"/> Meets/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Are cut and fill slopes protected from surface erosion and slope failure potential? <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA									
2) Runoff Infiltration and Drainage Control System Effectiveness a) Are erosion control measures applied limiting erosion processes and sediment delivery to SEZ? <input type="radio"/> Meets/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Are constructed detention ponds stable and is site free from unexpected ponding of runoff? <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA c) Are natural or constructed infiltration zones effectively collecting and treating runoff? <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA									
3) Designation of Construction Zone and Equipment Exclusion Zones a) Are sensitive areas and construction zones adequately delineated? <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA									
4) Effectiveness of Hazardous Substance Control Measures a) Are BMPs for hazardous/toxic substances controlling chemical delivery to soils/water? <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA									
Additional Comments		Trenching to connect power to the Tamarack Node. Temporary BMPs included fiber rolls and exclusion fence to confine trench footprint. More fiber rolls could be added on downhill side of road.							

Form HV1: Temporary BMPs for On-going Construction									
UTM Zone	11	Construction Site Name		Tamarack Node	Survey Date	6/16/2021	ID#	820	
Easting	247750	Reviewer Name(s)		J Sutherland	Selection Code	S02			
Northing	4313818	Other (Describe)			Forest	LTBMU	District	State CA	
Construction Type	Other	Date of Project Start		6/3/2021	Township	12N	Range	18E	Section 1
Construction Foreman	Steve Zehren	Watershed		CA-1					
Project Type	New Construction	Other (Describe)							
Plan Title	Heavenly ATC Hub, Fiber and Node Project SWPPP	Date	04/15/2020	Rev Date	05/12/2021	Job No.			
Specific concerns associated with project and BMP measures designed to achieve resource protection									
Maintained under the SWPPP to comply with the Lahontan Regions California's General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities for the Lake Tahoe Hydrologic Unit.									
Implementation		<input checked="" type="checkbox"/> 1) Were BMPs designed to maintain resource protection and meet water quality standards? 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs				Implementation Score:		I	
		<input checked="" type="checkbox"/> 2) Are BMP measures constructed according to contract design specifications/plans? 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow design specifications							
Effectiveness						Effectiveness Score:		E	
1) Source Control BMPs a) Are soil protection measures providing effective cover and erosion resistance? <input type="radio"/> Meets/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Are cut and fill slopes protected from surface erosion and slope failure potential? <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA									
2) Runoff Infiltration and Drainage Control System Effectiveness a) Are erosion control measures applied limiting erosion processes and sediment delivery to SEZ? <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Are constructed detention ponds stable and is site free from unexpected ponding of runoff? <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA c) Are natural or constructed infiltration zones effectively collecting and treating runoff? <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA									
3) Designation of Construction Zone and Equipment Exclusion Zones a) Are sensitive areas and construction zones adequately delineated? <input type="radio"/> Meets/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA									
4) Effectiveness of Hazardous Substance Control Measures a) Are BMPs for hazardous/toxic substances controlling chemical delivery to soils/water? <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA									
Additional Comments		Trenching to connect power to the Tamarack Node. Temporary BMPs included fiber rolls downhill side of road and exclusion fence around utility connection. Fiber roll at utility connection poorly anchored.							

Form HV1: Temporary BMPs for On-going Construction									
UTM Zone	11	Construction Site Name		Tamarack Node	Survey Date	6/22/2021	ID#	821	
Easting	247750	Reviewer Name(s)		J Sutherland	Selection Code	S02			
Northing	4313818	Other (Describe)			Forest	LTBMU	District	State CA	
Construction Type	Other	Date of Project Start		6/3/2021	Township	12N	Range	18E	Section 1
Construction Foreman	Steve Zehren	Watershed		CA-1					
Project Type	New Construction	Other (Describe)							
Plan Title	Heavenly ATC Hub, Fiber and Node Project SWPPP	Date	04/15/2020	Rev Date	05/12/2021	Job No.			
Specific concerns associated with project and BMP measures designed to achieve resource protection									
Maintained under the SWPPP to comply with the Lahontan Regions California's General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities for the Lake Tahoe Hydrologic Unit.									
Implementation		<input checked="" type="checkbox"/> 1) Were BMPs designed to maintain resource protection and meet water quality standards? 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs				Implementation Score:		I	
		<input checked="" type="checkbox"/> 2) Are BMP measures constructed according to contract design specifications/plans? 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow design specifications							
Effectiveness						Effectiveness Score:		E	
1) Source Control BMPs a) Are soil protection measures providing effective cover and erosion resistance? <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Are cut and fill slopes protected from surface erosion and slope failure potential? <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA									
2) Runoff Infiltration and Drainage Control System Effectiveness a) Are erosion control measures applied limiting erosion processes and sediment delivery to SEZ? <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Are constructed detention ponds stable and is site free from unexpected ponding of runoff? <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA c) Are natural or constructed infiltration zones effectively collecting and treating runoff? <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA									
3) Designation of Construction Zone and Equipment Exclusion Zones a) Are sensitive areas and construction zones adequately delineated? <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA									
4) Effectiveness of Hazardous Substance Control Measures a) Are BMPs for hazardous/toxic substances controlling chemical delivery to soils/water? <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA									
Additional Comments		Trenching to connect power to the Tamarack Node. Temporary BMPs included fiber rolls downhill side of road and exclusion fence around utility connection. Fiber roll at utility connection repaired.							

Form HV1: Temporary BMPs for On-going Construction										
UTM Zone	11	Construction Site Name		Comet Express - Lower Terminal	Survey Date	6/18/2021	ID#	823		
Easting	248918	Reviewer Name(s)		J Sutherland	Selection Code	S03				
Northing	4314281				Forest	Humbol	District		State	NV
Construction Type	Building Structure	Other (Describe)			Township	13N	Range	19E	Section	31
Construction Foreman		Date of Project Start			Watershed		NV-2+5			
Project Type	Maintenance	Other (Describe)		Snowmaking by lift terminal						
Plan Title					Date		Rev Date		Job No.	
Specific concerns associated with project and BMP measures designed to achieve resource protection										
CERP BMPs: Sediment barriers, delineation fence, control footprint and vehicle parking, erosion resistance treatment.										
Implementation		<input checked="" type="checkbox"/> 1) Were BMPs designed to maintain resource protection and meet water quality standards? 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs					Implementation Score:			
		<input checked="" type="checkbox"/> 1) 2) Are BMP measures constructed according to contract design specifications/plans? 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow design specifications								
Effectiveness							Effectiveness Score:			
1) Source Control BMPs										
a) Are soil protection measures providing effective cover and erosion resistance?							<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA			
b) Are cut and fill slopes protected from surface erosion and slope failure potential?							<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA			
2) Runoff Infiltration and Drainage Control System Effectiveness										
a) Are erosion control measures applied limiting erosion processes and sediment delivery to SEZ?							<input type="radio"/> Meets/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA			
b) Are constructed detention ponds stable and is site free from unexpected ponding of runoff?							<input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA			
c) Are natural or constructed infiltration zones effectively collecting and treating runoff?							<input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA			
3) Designation of Construction Zone and Equipment Exclusion Zones										
a) Are sensitive areas and construction zones adequately delineated?							<input type="radio"/> Meets/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA			
4) Effectiveness of Hazardous Substance Control Measures										
a) Are BMPs for hazardous/toxic substances controlling chemical delivery to soils/water?							<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA			
Additional Comments		Temporary BMPs in place. Straw wattles not anchored. Excavator access across slope may need follow up mulch.								

Form HV1: Temporary BMPs for On-going Construction										
UTM Zone	11	Construction Site Name		NVE - North Bowl Upper Terminal	Survey Date	6/22/2021	ID#	824		
Easting	248911	Reviewer Name(s)		J Sutherland	Selection Code	S02				
Northing	4314699				Forest		District		State	NV
Construction Type	Other	Other (Describe)			Township	13N	Range	19E	Section	31
Construction Foreman		Date of Project Start			Watershed		NV-2+5			
Project Type	New Construction	Other (Describe)		Power						
Plan Title	Heavenly Ski Resort Olympic Lift Electrical Distribution Upgrade Project				Date	05/08/2020	Rev Date		Job No.	
Specific concerns associated with project and BMP measures designed to achieve resource protection										
Maintained under SWPPP										
Implementation		<input checked="" type="checkbox"/> 1) Were BMPs designed to maintain resource protection and meet water quality standards? 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs					Implementation Score:			
		<input checked="" type="checkbox"/> 1) 2) Are BMP measures constructed according to contract design specifications/plans? 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow design specifications								
Effectiveness							Effectiveness Score:			
1) Source Control BMPs										
a) Are soil protection measures providing effective cover and erosion resistance?							<input type="radio"/> Meets/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA			
b) Are cut and fill slopes protected from surface erosion and slope failure potential?							<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA			
2) Runoff Infiltration and Drainage Control System Effectiveness										
a) Are erosion control measures applied limiting erosion processes and sediment delivery to SEZ?							<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA			
b) Are constructed detention ponds stable and is site free from unexpected ponding of runoff?							<input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA			
c) Are natural or constructed infiltration zones effectively collecting and treating runoff?							<input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA			
3) Designation of Construction Zone and Equipment Exclusion Zones										
a) Are sensitive areas and construction zones adequately delineated?							<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA			
4) Effectiveness of Hazardous Substance Control Measures										
a) Are BMPs for hazardous/toxic substances controlling chemical delivery to soils/water?							<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA			
Additional Comments		Fencing to delineate no access areas in place at staging area. Staging area soil disturbance.								

Form HV1: Temporary BMPs for On-going Construction									
UTM Zone	10	Construction Site Name		Groove - Lower Terminal	Survey Date	8/13/2021	ID#	825	
Easting	246183	Reviewer Name(s)		Heavenly	Selection Code	S03			
Northing	4312513	Other (Describe)			Forest		District		State
Construction Type	Other	Date of Project Start			Township	12N	Range	18E	Section
Construction Foreman		Watershed		CA-1					
Project Type	Maintenance	Other (Describe)		Rock-lined swales					
Plan Title		Date		Rev Date		Job No.			
Specific concerns associated with project and BMP measures designed to achieve resource protection									
CERP BMPs: Sediment barriers, control footprint, erosion resistance treatment, rock-lined swale restoration.									
Implementation <div> <input checked="" type="checkbox"/> 1) Were BMPs designed to maintain resource protection and meet water quality standards? 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs </div> <div> <input checked="" type="checkbox"/> 2) Are BMP measures constructed according to contract design specifications/plans? 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow design specifications </div> Implementation Score: <input type="text" value="I"/>									
Effectiveness Effectiveness Score: <input type="text" value="E"/>									
1) Source Control BMPs <div> a) Are soil protection measures providing effective cover and erosion resistance? <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA </div> <div> b) Are cut and fill slopes protected from surface erosion and slope failure potential? <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA </div>									
2) Runoff Infiltration and Drainage Control System Effectiveness <div> a) Are erosion control measures applied limiting erosion processes and sediment delivery to SEZ? <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA </div> <div> b) Are constructed detention ponds stable and is site free from unexpected ponding of runoff? <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA </div> <div> c) Are natural or constructed infiltration zones effectively collecting and treating runoff? <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA </div>									
3) Designation of Construction Zone and Equipment Exclusion Zones <div> a) Are sensitive areas and construction zones adequately delineated? <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA </div>									
4) Effectiveness of Hazardous Substance Control Measures <div> a) Are BMPs for hazardous/toxic substances controlling chemical delivery to soils/water? <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA </div>									
Additional Comments		No concerns							

Form HV1: Temporary BMPs for On-going Construction									
UTM Zone	10	Construction Site Name		Boulder Parking Lot	Survey Date	8/10/2021	ID#	826	
Easting	249582	Reviewer Name(s)		J Sutherland	Selection Code	S03			
Northing	4317073	Other (Describe)			Forest		District		State
Construction Type	Parking Lot	Date of Project Start			Township	13N	Range	19E	Section
Construction Foreman		Watershed		NV-3					
Project Type	Other	Other (Describe)							
Plan Title		Date		Rev Date		Job No.			
Specific concerns associated with project and BMP measures designed to achieve resource protection									
CERP BMPs: Stockpile protection, sediment removal, construction fence, waste/material management.									
Implementation <div> <input checked="" type="checkbox"/> 1) Were BMPs designed to maintain resource protection and meet water quality standards? 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs </div> <div> <input checked="" type="checkbox"/> 2) Are BMP measures constructed according to contract design specifications/plans? 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow design specifications </div> Implementation Score: <input type="text" value="I"/>									
Effectiveness Effectiveness Score: <input type="text" value="E"/>									
1) Source Control BMPs <div> a) Are soil protection measures providing effective cover and erosion resistance? <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA </div> <div> b) Are cut and fill slopes protected from surface erosion and slope failure potential? <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA </div>									
2) Runoff Infiltration and Drainage Control System Effectiveness <div> a) Are erosion control measures applied limiting erosion processes and sediment delivery to SEZ? <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA </div> <div> b) Are constructed detention ponds stable and is site free from unexpected ponding of runoff? <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA </div> <div> c) Are natural or constructed infiltration zones effectively collecting and treating runoff? <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA </div>									
3) Designation of Construction Zone and Equipment Exclusion Zones <div> a) Are sensitive areas and construction zones adequately delineated? <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA </div>									
4) Effectiveness of Hazardous Substance Control Measures <div> a) Are BMPs for hazardous/toxic substances controlling chemical delivery to soils/water? <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA </div>									
Additional Comments		Pavement in great shape and no accumulation of sediment. Coir cogs around small sediment stockpile.							

Form HV1: Temporary BMPs for On-going Construction										
UTM Zone	10	Construction Site Name		Boulder Parking Lot	Survey Date	8/10/2021	ID#	827		
Easting	249582	Reviewer Name(s)		J Sutherland	Selection Code	S03				
Northing	4317073	Forest			District		State		NV	
Construction Type	Parking Lot	Other (Describe)			Township	13N	Range	19E	Section	30
Construction Foreman		Date of Project Start			Watershed		NV-3			
Project Type	Other	Other (Describe)								
Plan Title		Date		Rev Date		Job No.				
Specific concerns associated with project and BMP measures designed to achieve resource protection										
CERP BMPs: Stockpile protection, sediment removal, construction fence, waste/material management.										
Implementation		<input checked="" type="checkbox"/> 1) Were BMPs designed to maintain resource protection and meet water quality standards? 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs				Implementation Score:				
		<input checked="" type="checkbox"/> 1) 2) Are BMP measures constructed according to contract design specifications/plans? 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow design specifications								
Effectiveness						Effectiveness Score:				
						E				
1) Source Control BMPs a) Are soil protection measures providing effective cover and erosion resistance? <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Are cut and fill slopes protected from surface erosion and slope failure potential? <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA										
2) Runoff Infiltration and Drainage Control System Effectiveness a) Are erosion control measures applied limiting erosion processes and sediment delivery to SEZ? <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Are constructed detention ponds stable and is site free from unexpected ponding of runoff? <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA c) Are natural or constructed infiltration zones effectively collecting and treating runoff? <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA										
3) Designation of Construction Zone and Equipment Exclusion Zones a) Are sensitive areas and construction zones adequately delineated? <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA										
4) Effectiveness of Hazardous Substance Control Measures a) Are BMPs for hazardous/toxic substances controlling chemical delivery to soils/water? <input type="radio"/> Meets/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA										
Additional Comments		Pavement in great shape and no accumulation of sediment. Construction fence around equipment. Staining from unknown liquid on pavement.								

Form HV1: Temporary BMPs for On-going Construction										
UTM Zone	11	Construction Site Name		TOG Tank - Power	Survey Date	10/4/2021	ID#	829		
Easting	248911	Reviewer Name(s)		E Ketchian	Selection Code	S02				
Northing	4314699	Forest			District		State		CA	
Construction Type	Other	Other (Describe)			Township	13N	Range	19E	Section	31
Construction Foreman		Date of Project Start			Watershed		CA-1			
Project Type	New Construction	Other (Describe)		Power						
Plan Title		Date		Rev Date		Job No.				
Specific concerns associated with project and BMP measures designed to achieve resource protection										
CERP BMPs										
Implementation		<input checked="" type="checkbox"/> 1) Were BMPs designed to maintain resource protection and meet water quality standards? 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs				Implementation Score:				
		<input checked="" type="checkbox"/> 4) 2) Are BMP measures constructed according to contract design specifications/plans? 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow design specifications								
Effectiveness						Effectiveness Score:				
						E				
1) Source Control BMPs a) Are soil protection measures providing effective cover and erosion resistance? <input type="radio"/> Meets/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Are cut and fill slopes protected from surface erosion and slope failure potential? <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA										
2) Runoff Infiltration and Drainage Control System Effectiveness a) Are erosion control measures applied limiting erosion processes and sediment delivery to SEZ? <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Are constructed detention ponds stable and is site free from unexpected ponding of runoff? <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA c) Are natural or constructed infiltration zones effectively collecting and treating runoff? <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA										
3) Designation of Construction Zone and Equipment Exclusion Zones a) Are sensitive areas and construction zones adequately delineated? <input type="radio"/> Meets/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA										
4) Effectiveness of Hazardous Substance Control Measures a) Are BMPs for hazardous/toxic substances controlling chemical delivery to soils/water? <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA										
Additional Comments		No erosion or sediment transport observed. No sediment barriers installed. Footprint controlled.								

Form HV1: Temporary BMPs for On-going Construction									
UTM Zone	11	Construction Site Name		NVE - North Bowl Upper Terminal	Survey Date	10/4/2021	ID#	830	
Easting	248911	Reviewer Name(s)		J Sutherland	Selection Code	S02			
Northing	4314699	Other (Describe)			Forest		District		State
Construction Type	Other	Date of Project Start			Township	13N	Range	19E	Section
Construction Foreman		Watershed		NV-2+5					
Project Type	New Construction	Other (Describe)		Power					
Plan Title	Heavenly Ski Resort Olympic Lift Electrical Distribution Upgrade Project				Date	05/08/2020	Rev Date		Job No.
Specific concerns associated with project and BMP measures designed to achieve resource protection									
Maintained under SWPPP									
Implementation <div> <input checked="" type="checkbox"/> 1) Were BMPs designed to maintain resource protection and meet water quality standards? 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs </div> <div> <input checked="" type="checkbox"/> 2) Are BMP measures constructed according to contract design specifications/plans? 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow design specifications </div> Implementation Score: <input type="text" value="I"/>									
Effectiveness Effectiveness Score: <input type="text" value="E"/>									
1) Source Control BMPs <div> a) Are soil protection measures providing effective cover and erosion resistance? <input type="radio"/> Meets/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA </div> <div> b) Are cut and fill slopes protected from surface erosion and slope failure potential? <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA </div>									
2) Runoff Infiltration and Drainage Control System Effectiveness <div> a) Are erosion control measures applied limiting erosion processes and sediment delivery to SEZ? <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA </div> <div> b) Are constructed detention ponds stable and is site free from unexpected ponding of runoff? <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA </div> <div> c) Are natural or constructed infiltration zones effectively collecting and treating runoff? <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA </div>									
3) Designation of Construction Zone and Equipment Exclusion Zones <div> a) Are sensitive areas and construction zones adequately delineated? <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA </div>									
4) Effectiveness of Hazardous Substance Control Measures <div> a) Are BMPs for hazardous/toxic substances controlling chemical delivery to soils/water? <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA </div>									
Additional Comments		No erosion or sediment transport observed.							

Form HV1: Temporary BMPs for On-going Construction									
UTM Zone	11	Construction Site Name		NVE - Crossover	Survey Date	10/4/2021	ID#	831	
Easting		Reviewer Name(s)		J Sutherland	Selection Code	S02			
Northing		Other (Describe)			Forest		District		State
Construction Type	Other	Date of Project Start			Township	13N	Range	19E	Section
Construction Foreman		Watershed		NV-2+5					
Project Type	New Construction	Other (Describe)		Power					
Plan Title	Heavenly Ski Resort Olympic Lift Electrical Distribution Upgrade Project				Date	05/08/2020	Rev Date		Job No.
Specific concerns associated with project and BMP measures designed to achieve resource protection									
Maintained under SWPPP									
Implementation <div> <input checked="" type="checkbox"/> 1) Were BMPs designed to maintain resource protection and meet water quality standards? 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs </div> <div> <input checked="" type="checkbox"/> 2) Are BMP measures constructed according to contract design specifications/plans? 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow design specifications </div> Implementation Score: <input type="text" value="I"/>									
Effectiveness Effectiveness Score: <input type="text" value="E"/>									
1) Source Control BMPs <div> a) Are soil protection measures providing effective cover and erosion resistance? <input type="radio"/> Meets/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA </div> <div> b) Are cut and fill slopes protected from surface erosion and slope failure potential? <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA </div>									
2) Runoff Infiltration and Drainage Control System Effectiveness <div> a) Are erosion control measures applied limiting erosion processes and sediment delivery to SEZ? <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA </div> <div> b) Are constructed detention ponds stable and is site free from unexpected ponding of runoff? <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA </div> <div> c) Are natural or constructed infiltration zones effectively collecting and treating runoff? <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA </div>									
3) Designation of Construction Zone and Equipment Exclusion Zones <div> a) Are sensitive areas and construction zones adequately delineated? <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA </div>									
4) Effectiveness of Hazardous Substance Control Measures <div> a) Are BMPs for hazardous/toxic substances controlling chemical delivery to soils/water? <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA </div>									
Additional Comments		Loose soils on road shoulders with no erosion resistance treatment. Temporary sediment barriers have been removed.							

UTM Zone	11	Form HV2: Permanent BMPs				ID#	760
Easting	247100	Building/Structure Name	Ridge Bowl Outlet	Survey Date	6/1/2021	Selection Code	S03
Northing	4311942	Reviewer Name(s)	E Ketchian	Township	12N	Range	18E
Date Project Start	7/6/2020	Date Project End	7/10/2020	Section	1	Watershed	CA-1
Date BMP Implementation Complete	7/10/2020	Date Last BMP Maintenance		State	CA	Job No.	
Structure Type	Other	Other (Describe)	Drainage stabilization	Storm Depth		Survey Type	1st Year Post Construction
Plan Title	WMRP Project for 2020			Plan Date		Plan Revision Date	
Specific concerns associated with construction project and BMP measures designed to achieve resource protection							
Potential for erosion and sediment transport due to flow concentration in steeply sloped existing channel adjacent to ski trail. Outlet stabilized with riprap . Rip, chip, and seed slopes. Rock was also embedded on top of the mulch and pine needles to dissipate flow energy improve infiltration.at base of slope.							
Implementation	<input type="checkbox"/> 1) 1) BMPs are designed to maintain resource protection and meet water quality standards 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs <input type="checkbox"/> 1) 2) BMPs are constructed according to contract design specifications 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow specifications						Implementation Score: <input type="text" value="I"/>
Effectiveness							Effectiveness Score: <input type="text" value="E"/>
1) Source area erosion control, protection/stabilization of site, especially erosive areas a) Soil protection measures, artificial or vegetative, eliminating erosion by runoff and rain-drop impact <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Revegetation establishment proceeding as expected, vegetative cover mitigating erosion <input checked="" type="radio"/> Meet/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA c) Cut/fill slope protection (vegetation, erosion control blankets, retention walls) preventing erosion <input type="radio"/> Meets/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA 2) Runoff infiltration and drainage control system effectiveness a) Infiltration zones (detention basins, driplines, gravel armor areas, infiltration trenches, system outlets) functioning properly with little potential for sediment and/or nutrient delivery to SEZ <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Ponding of runoff does not threaten fill slope or foundation integrity, erosion is not evident and no downstream resources are threatened <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA 3) Effectiveness of hazardous substance control measures a) Mitigation measures of hazardous/toxic substances sufficient with no potential risk to water quality <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA Additional Comments Treatment looks effective. Small area at top edge of slope has exposed soil - mulch may need to be refurbished.							

UTM Zone	11	Form HV2: Permanent BMPs				ID#	756
Easting		Building/Structure Name	ATC Fiber - Road (Sky to Comet)	Survey Date	6/8/2021	Selection Code	S02
Northing		Reviewer Name(s)	J Sutherland	Township	12N	Range	18E
Date Project Start	5/1/2020	Date Project End	7/1/2021	Section	1	Watershed	CA-1
Date BMP Implementation Complete	8/1/2020	Date Last BMP Maintenance		State	CA	Job No.	
Structure Type	Other	Other (Describe)	Fiber underground	Storm Depth	N/A	Survey Type	1st Year Post Construction
Plan Title	Heavenly ATC Hub, Fiber and Node Project SWPPP			Plan Date	4/15/2020	Plan Revision Date	5/18/2020
Specific concerns associated with construction project and BMP measures designed to achieve resource protection							
Underground fiber corridor in road. BMPs include: minimize disturbance corridor; rip, chip, seed, mulch shoulder if needed; and restore water bars.							
Implementation	<input type="checkbox"/> 1) 1) BMPs are designed to maintain resource protection and meet water quality standards 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs <input type="checkbox"/> 1) 2) BMPs are constructed according to contract design specifications 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow specifications						Implementation Score: <input type="text" value="I"/>
Effectiveness							Effectiveness Score: <input type="text" value="E"/>
1) Source area erosion control, protection/stabilization of site, especially erosive areas a) Soil protection measures, artificial or vegetative, eliminating erosion by runoff and rain-drop impact <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Revegetation establishment proceeding as expected, vegetative cover mitigating erosion <input checked="" type="radio"/> Meet/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA c) Cut/fill slope protection (vegetation, erosion control blankets, retention walls) preventing erosion <input type="radio"/> Meets/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA 2) Runoff infiltration and drainage control system effectiveness a) Infiltration zones (detention basins, driplines, gravel armor areas, infiltration trenches, system outlets) functioning properly with little potential for sediment and/or nutrient delivery to SEZ <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA b) Ponding of runoff does not threaten fill slope or foundation integrity, erosion is not evident and no downstream resources are threatened <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA 3) Effectiveness of hazardous substance control measures a) Mitigation measures of hazardous/toxic substances sufficient with no potential risk to water quality <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA Additional Comments Minor areas of exposed soil on road shoulders.							

Form HV2: Permanent BMPs										
UTM Zone	11							ID#	759	
Easting	246825	Building/Structure Name	ATC Fiber - Mombo		Survey Date	6/8/2021	Selection Code	S02		
Northing	4312109	Reviewer Name(s)	J Sutherland		Township	12N	Range	18E	Section	1
Date Project Start	6/1/2021	Date Project End	7/1/2021		Watershed	CA-1		State		CA
Date BMP Implementation Complete	6/8/2021	Date Last BMP Maintenance			Job No.		Storm Depth			
Structure Type	Other	Other (Describe)	Fiber Underground		Survey Type	Routine				
Plan Title	Heavenly ATC Hub, Fiber and Node Project SWPPP				Plan Date	04/15/2020	Plan Revision Date	05/12/2021		
Specific concerns associated with construction project and BMP measures designed to achieve resource protection										
Underground fiber corridor across Mombo Ski Trail. BMPs include: minimize disturbance corridor; rip, chip, seed, mulch.										
Implementation	<div> <input type="checkbox"/> 1) BMPs are designed to maintain resource protection and meet water quality standards 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs </div> <div> <input type="checkbox"/> 2) BMPs are constructed according to contract design specifications 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow specifications </div>								Implementation Score:	<input type="text" value="I"/>
Effectiveness									Effectiveness Score:	<input type="text" value="E"/>
1) Source area erosion control, protection/stabilization of site, especially erosive areas										
a) Soil protection measures, artificial or vegetative, eliminating erosion by runoff and rain-drop impact					<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
b) Revegetation establishment proceeding as expected, vegetative cover mitigating erosion					<input type="radio"/> Meet/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
c) Cut/fill slope protection (vegetation, erosion control blankets, retention walls) preventing erosion					<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
2) Runoff infiltration and drainage control system effectiveness										
a) Infiltration zones (detention basins, driplines, gravel armor areas, infiltration trenches, system outlets) functioning properly with little potential for sediment and/or nutrient delivery to SEZ					<input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA					
b) Ponding of runoff does not threaten fill slope or foundation integrity, erosion is not evident and no downstream resources are threatened					<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
3) Effectiveness of hazardous substance control measures										
a) Mitigation measures of hazardous/toxic substances sufficient with no potential risk to water quality					<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
Additional Comments	Compacted tire tracks existed prior to the project for maintenance access. Future vehicle traffic may affect revegetation.									

Form HV2: Permanent BMPs										
UTM Zone	11							ID#	755	
Easting	248532	Building/Structure Name	ATC Fiber - Comet Ski Trail		Survey Date	6/8/2021	Selection Code	S02		
Northing	4314042	Reviewer Name(s)	J Sutherland		Township	12N	Range	18E	Section	1
Date Project Start	8/1/2020	Date Project End	7/1/2021		Watershed	NV-2+5		State		NV
Date BMP Implementation Complete	8/14/2020	Date Last BMP Maintenance			Job No.		Storm Depth	N/A		
Structure Type	Other	Other (Describe)	Fiber underground		Survey Type	1st Year Post Construction				
Plan Title	Heavenly ATC Hub, Fiber and Node Project SWPPP				Plan Date	4/15/2020	Plan Revision Date	5/18/2020		
Specific concerns associated with construction project and BMP measures designed to achieve resource protection										
Underground fiber corridor down Comet. BMPs include: use plow, minimize disturbance corridor; rip, chip, seed, mulch; restore water bars.										
Implementation	<div> <input type="checkbox"/> 1) BMPs are designed to maintain resource protection and meet water quality standards 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs </div> <div> <input type="checkbox"/> 2) BMPs are constructed according to contract design specifications 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow specifications </div>								Implementation Score:	<input type="text" value="I"/>
Effectiveness									Effectiveness Score:	<input type="text" value="E"/>
1) Source area erosion control, protection/stabilization of site, especially erosive areas										
a) Soil protection measures, artificial or vegetative, eliminating erosion by runoff and rain-drop impact					<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
b) Revegetation establishment proceeding as expected, vegetative cover mitigating erosion					<input checked="" type="radio"/> Meet/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
c) Cut/fill slope protection (vegetation, erosion control blankets, retention walls) preventing erosion					<input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA					
2) Runoff infiltration and drainage control system effectiveness										
a) Infiltration zones (detention basins, driplines, gravel armor areas, infiltration trenches, system outlets) functioning properly with little potential for sediment and/or nutrient delivery to SEZ					<input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA					
b) Ponding of runoff does not threaten fill slope or foundation integrity, erosion is not evident and no downstream resources are threatened					<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
3) Effectiveness of hazardous substance control measures										
a) Mitigation measures of hazardous/toxic substances sufficient with no potential risk to water quality					<input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA					
Additional Comments	Corridor was minimized and treatment in a timely manner with rip, chip, seed and mulch.									

Form HV2: Permanent BMPs										
UTM Zone	11						ID#	771		
Easting	249089	Building/Structure Name	Galaxy - Upper Terminal		Survey Date	6/12/2021	Selection Code	S06		
Northing	4313744	Reviewer Name(s)	J Sutherland		Township	13N	Range	19E	Section	31
Date Project Start	6/18/2018	Date Project End	11/6/2018		Watershed	NV-2+5		State		NV
Date BMP Implementation Complete	11/6/2018	Date Last BMP Maintenance			Job No.			Storm Depth		
Structure Type	Lift-Base	Other (Describe)			Survey Type	Routine				
Plan Title	Galaxy Chair Lift Replacement				Plan Date	06/19/2018	Plan Revision Date	07/02/2018		
Specific concerns associated with construction project and BMP measures designed to achieve resource protection										
NV Watersheds WMRP Monitoring. Lift BMPs include: minimize footprint, vehicle traffic in designated areas, erosion resistance for soils.										
Implementation	<input type="checkbox"/> 1) BMPs are designed to maintain resource protection and meet water quality standards 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs <input type="checkbox"/> 2) BMPs are constructed according to contract design specifications 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow specifications					Implementation Score: <input type="text" value="I"/>				
Effectiveness						Effectiveness Score: <input type="text" value="E"/>				
1) Source area erosion control, protection/stabilization of site, especially erosive areas										
a) Soil protection measures, artificial or vegetative, eliminating erosion by runoff and rain-drop impact					<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
b) Revegetation establishment proceeding as expected, vegetative cover mitigating erosion					<input checked="" type="radio"/> Meet/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
c) Cut/fill slope protection (vegetation, erosion control blankets, retention walls) preventing erosion					<input type="radio"/> Meets/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
2) Runoff infiltration and drainage control system effectiveness										
a) Infiltration zones (detention basins, driplines, gravel armor areas, infiltration trenches, system outlets) functioning properly with little potential for sediment and/or nutrient delivery to SEZ					<input type="radio"/> Meets/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
b) Ponding of runoff does not threaten fill slope or foundation integrity, erosion is not evident and no downstream resources are threatened					<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
3) Effectiveness of hazardous substance control measures										
a) Mitigation measures of hazardous/toxic substances sufficient with no potential risk to water quality					<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
Additional Comments	Minor rilling observed at the upper terminal. Erosion resistance provided by rock fragments in soils, but no "rip and chip" treatment on cut/fill slopes. No drip line infiltration BMPs for lift shack and structure, but no large canopy on lift structure.									

Form HV2: Permanent BMPs										
UTM Zone	11						ID#	758		
Easting	247177	Building/Structure Name	Sky Deck Node		Survey Date	6/16/2021	Selection Code	S02		
Northing	4312446	Reviewer Name(s)	J Sutherland		Township	12N	Range	18E	Section	1
Date Project Start	6/5/2020	Date Project End	7/1/2021		Watershed	CA-1		State		CA
Date BMP Implementation Complete	9/4/2020	Date Last BMP Maintenance			Job No.			Storm Depth		
Structure Type	Building	Other (Describe)			Survey Type	1st Year Post Construction				
Plan Title	Heavenly ATC Hub, Fiber and Node Project SWPPP				Plan Date	4/15/2020	Plan Revision Date	5/18/2020		
Specific concerns associated with construction project and BMP measures designed to achieve resource protection										
10 by 12 building, monopine, and utility connections. BMPs include: minimize foot print, natural grade and rock replacement, infiltration trench, incorporate chips, seed and mulch.										
Implementation	<input type="checkbox"/> 1) BMPs are designed to maintain resource protection and meet water quality standards 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs <input type="checkbox"/> 2) BMPs are constructed according to contract design specifications 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow specifications					Implementation Score: <input type="text" value="I"/>				
Effectiveness						Effectiveness Score: <input type="text" value="E"/>				
1) Source area erosion control, protection/stabilization of site, especially erosive areas										
a) Soil protection measures, artificial or vegetative, eliminating erosion by runoff and rain-drop impact					<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
b) Revegetation establishment proceeding as expected, vegetative cover mitigating erosion					<input checked="" type="radio"/> Meet/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
c) Cut/fill slope protection (vegetation, erosion control blankets, retention walls) preventing erosion					<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
2) Runoff infiltration and drainage control system effectiveness										
a) Infiltration zones (detention basins, driplines, gravel armor areas, infiltration trenches, system outlets) functioning properly with little potential for sediment and/or nutrient delivery to SEZ					<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
b) Ponding of runoff does not threaten fill slope or foundation integrity, erosion is not evident and no downstream resources are threatened					<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
3) Effectiveness of hazardous substance control measures										
a) Mitigation measures of hazardous/toxic substances sufficient with no potential risk to water quality					<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
Additional Comments	No concerns.									

Form HV2: Permanent BMPs									
UTM Zone	11							ID#	763
Easting	246431	Building/Structure Name	Maggie's Sediment Basins	Survey Date	6/16/2021	Selection Code	S03		
Northing	4312687	Reviewer Name(s)	J Sutherland	Township	12N	Range	18E	Section	1
Date Project Start		Date Project End		Watershed	CA-1	State	CA		
Date BMP Implementation Complete		Date Last BMP Maintenance	7/1/2020	Job No.		Storm Depth			
Structure Type	Other	Other (Describe)	Sediment basins	Survey Type	Routine				
Plan Title	Maggie's Road and Sediment Basins			Plan Date		Plan Revision Date			
Specific concerns associated with construction project and BMP measures designed to achieve resource protection									
Road with waterbars and sediment basins adjacent to Heavenly Valley Creek. BMPs include: water bars, sediment basins, outlet reinforcement, and erosion enhancement on shoulders.									
Implementation	<div> <input type="checkbox"/> 1) BMPs are designed to maintain resource protection and meet water quality standards 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs </div> <div> <input type="checkbox"/> 1) 2) BMPs are constructed according to contract design specifications 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow specifications </div>							Implementation Score:	<input type="text" value="I"/>
Effectiveness								Effectiveness Score:	<input type="text" value="E"/>
1) Source area erosion control, protection/stabilization of site, especially erosive areas a) Soil protection measures, artificial or vegetative, eliminating erosion by runoff and rain-drop impact <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input checked="" type="radio"/> Major Concern <input type="radio"/> NA b) Revegetation establishment proceeding as expected, vegetative cover mitigating erosion <input type="radio"/> Meet/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA c) Cut/fill slope protection (vegetation, erosion control blankets, retention walls) preventing erosion <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA									
2) Runoff infiltration and drainage control system effectiveness a) Infiltration zones (detention basins, driplines, gravel armor areas, infiltration trenches, system outlets) functioning properly with little potential for sediment and/or nutrient delivery to SEZ <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Ponding of runoff does not threaten fill slope or foundation integrity, erosion is not evident and no downstream resources are threatened <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA									
3) Effectiveness of hazardous substance control measures a) Mitigation measures of hazardous/toxic substances sufficient with no potential risk to water quality <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA									
Additional Comments	Sediment basins still have adequate capacity (>50%) for proper sediment capture and retention. Inlet/outlet controls including sediment control logs and rock check dams are installed at high risk locations. Road shoulders show some vehicle traffic.								

Form HV2: Permanent BMPs									
UTM Zone	11							ID#	762
Easting	247287	Building/Structure Name	Hellwinkel's Road	Survey Date	6/16/2021	Selection Code	S05		
Northing	4312392	Reviewer Name(s)	J Sutherland	Township	12N	Range	18E	Section	1
Date Project Start		Date Project End		Watershed	CA-1	State	CA		
Date BMP Implementation Complete		Date Last BMP Maintenance	6/1/2021	Job No.		Storm Depth			
Structure Type	Other	Other (Describe)	Sediment basins	Survey Type	Routine				
Plan Title	Hellwinkel's Road and Sediment Basins			Plan Date		Plan Revision Date			
Specific concerns associated with construction project and BMP measures designed to achieve resource protection									
Steep road segment close to SEZ. Annual maintenance of roadway/drainage BMPs includes: clean and reshape sediment basins, place fiber rolls, restore water bars and surfacing.									
Implementation	<div> <input type="checkbox"/> 1) BMPs are designed to maintain resource protection and meet water quality standards 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs </div> <div> <input type="checkbox"/> 1) 2) BMPs are constructed according to contract design specifications 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow specifications </div>							Implementation Score:	<input type="text" value="I"/>
Effectiveness								Effectiveness Score:	<input type="text" value="E"/>
1) Source area erosion control, protection/stabilization of site, especially erosive areas a) Soil protection measures, artificial or vegetative, eliminating erosion by runoff and rain-drop impact <input type="radio"/> Meets/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Revegetation establishment proceeding as expected, vegetative cover mitigating erosion <input type="radio"/> Meet/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA c) Cut/fill slope protection (vegetation, erosion control blankets, retention walls) preventing erosion <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA									
2) Runoff infiltration and drainage control system effectiveness a) Infiltration zones (detention basins, driplines, gravel armor areas, infiltration trenches, system outlets) functioning properly with little potential for sediment and/or nutrient delivery to SEZ <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Ponding of runoff does not threaten fill slope or foundation integrity, erosion is not evident and no downstream resources are threatened <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA									
3) Effectiveness of hazardous substance control measures a) Mitigation measures of hazardous/toxic substances sufficient with no potential risk to water quality <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA									
Additional Comments	Water bars and basins with coir pine needle log placement are recently maintained and intact. Road surfacing intact. Minor concern - some loose soil near basins at edges of basins.								

Form HV2: Permanent BMPs										
UTM Zone	11						ID#	757		
Easting	246003	Building/Structure Name	Lakeview Node		Survey Date	6/16/2021	Selection Code	S02		
Northing	4313026	Reviewer Name(s)	J Sutherland		Township	12N	Range	18E	Section	1
Date Project Start	6/5/2020	Date Project End	7/1/2021		Watershed	CA-1	State	CA		
Date BMP Implementation Complete	10/8/2020	Date Last BMP Maintenance			Job No.		Storm Depth			
Structure Type	Building	Other (Describe)			Survey Type	1st Year Post Construction				
Plan Title	Heavenly ATC Hub, Fiber and Node Project SWPPP				Plan Date	4/15/2020	Plan Revision Date	5/18/2020		
Specific concerns associated with construction project and BMP measures designed to achieve resource protection										
10 by 12 building, monopine, and utility connections. BMPs include: minimize footprint, natural grade and rock replacement, infiltration trench, incorporate chips, mulch.										
Implementation	<div> <input checked="" type="checkbox"/> 1) BMPs are designed to maintain resource protection and meet water quality standards 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs </div> <div> <input checked="" type="checkbox"/> 2) BMPs are constructed according to contract design specifications 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow specifications </div>								Implementation Score:	I
Effectiveness									Effectiveness Score:	E
1) Source area erosion control, protection/stabilization of site, especially erosive areas										
a) Soil protection measures, artificial or vegetative, eliminating erosion by runoff and rain-drop impact					<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
b) Revegetation establishment proceeding as expected, vegetative cover mitigating erosion					<input checked="" type="radio"/> Meet/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
c) Cut/fill slope protection (vegetation, erosion control blankets, retention walls) preventing erosion					<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
2) Runoff infiltration and drainage control system effectiveness										
a) Infiltration zones (detention basins, driplines, gravel armor areas, infiltration trenches, system outlets) functioning properly with little potential for sediment and/or nutrient delivery to SEZ					<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
b) Ponding of runoff does not threaten fill slope or foundation integrity, erosion is not evident and no downstream resources are threatened					<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
3) Effectiveness of hazardous substance control measures										
a) Mitigation measures of hazardous/toxic substances sufficient with no potential risk to water quality					<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
Additional Comments	No concerns.									

Form HV2: Permanent BMPs										
UTM Zone	11						ID#	770		
Easting	250197	Building/Structure Name	Galaxy - Lower Terminal		Survey Date	6/19/2021	Selection Code	S06		
Northing	4315003	Reviewer Name(s)	J Sutherland		Township	13N	Range	19E	Section	31
Date Project Start	6/18/2018	Date Project End	11/6/2018		Watershed	NV-2+5	State	NV		
Date BMP Implementation Complete	11/6/2018	Date Last BMP Maintenance			Job No.		Storm Depth			
Structure Type	Lift-Base	Other (Describe)			Survey Type	Routine				
Plan Title	Galaxy Chair Lift Replacement				Plan Date	06/19/2018	Plan Revision Date	07/02/2018		
Specific concerns associated with construction project and BMP measures designed to achieve resource protection										
NV Watersheds WMRP Monitoring. Lift BMPs include: minimize footprint, channel reinforcement near culvert, vehicle traffic in designated areas, erosion resistance for soils.										
Implementation	<div> <input checked="" type="checkbox"/> 1) BMPs are designed to maintain resource protection and meet water quality standards 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs </div> <div> <input checked="" type="checkbox"/> 2) BMPs are constructed according to contract design specifications 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow specifications </div>								Implementation Score:	I
Effectiveness									Effectiveness Score:	E
1) Source area erosion control, protection/stabilization of site, especially erosive areas										
a) Soil protection measures, artificial or vegetative, eliminating erosion by runoff and rain-drop impact					<input type="radio"/> Meets/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
b) Revegetation establishment proceeding as expected, vegetative cover mitigating erosion					<input type="radio"/> Meet/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
c) Cut/fill slope protection (vegetation, erosion control blankets, retention walls) preventing erosion					<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
2) Runoff infiltration and drainage control system effectiveness										
a) Infiltration zones (detention basins, driplines, gravel armor areas, infiltration trenches, system outlets) functioning properly with little potential for sediment and/or nutrient delivery to SEZ					<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
b) Ponding of runoff does not threaten fill slope or foundation integrity, erosion is not evident and no downstream resources are threatened					<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
3) Effectiveness of hazardous substance control measures										
a) Mitigation measures of hazardous/toxic substances sufficient with no potential risk to water quality					<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
Additional Comments	Vegetation buffer between established between lift area and Daggett Creek. No evidence of erosion or sediment transport to the creek but some indication of rilling near terminal.									

Form HV2: Permanent BMPs									
UTM Zone	11							ID#	796
Easting	248324	Building/Structure Name	Ridge (Cal Dam Sediment Placement Loc	Survey Date	6/22/2021	Selection Code	S02		
Northing	4311423	Reviewer Name(s)	J Sutherland	Township	12N	Range	18E	Section	1
Date Project Start	8/10/2020	Date Project End	9/25/2020	Watershed	CA-1	State	CA		
Date BMP Implementation Complete	9/25/2020	Date Last BMP Maintenance	9/25/2020	Job No.		Storm Depth			
Structure Type	Other	Other (Describe)	Ski trail	Survey Type	Routine				
Plan Title	California Dam Snowmaking Pond Maintenance SWPPP				Plan Date	05/22/2020	Plan Revision Date	08/29/2020	
Specific concerns associated with construction project and BMP measures designed to achieve resource protection									
New ski trail grading with sediment removed from pond maintenance. BMPs include: no tree removal, minimize foot print, embedded rock on slope under fill, embedded rock in flowline, reestablish water bars and road maintenance, chip incorporation, seed and mulch.									
Implementation	<div> <input checked="" type="checkbox"/> 1) BMPs are designed to maintain resource protection and meet water quality standards 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs </div> <div> <input checked="" type="checkbox"/> 2) BMPs are constructed according to contract design specifications 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow specifications </div>							Implementation Score:	I
Effectiveness								Effectiveness Score:	E
1) Source area erosion control, protection/stabilization of site, especially erosive areas a) Soil protection measures, artificial or vegetative, eliminating erosion by runoff and rain-drop impact <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Revegetation establishment proceeding as expected, vegetative cover mitigating erosion <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA c) Cut/fill slope protection (vegetation, erosion control blankets, retention walls) preventing erosion <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA									
2) Runoff infiltration and drainage control system effectiveness a) Infiltration zones (detention basins, driplines, gravel armor areas, infiltration trenches, system outlets) functioning properly with little potential for sediment and/or nutrient delivery to SEZ <input type="radio"/> Meets/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Ponding of runoff does not threaten fill slope or foundation integrity, erosion is not evident and no downstream resources are threatened <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA									
3) Effectiveness of hazardous substance control measures a) Mitigation measures of hazardous/toxic substances sufficient with no potential risk to water quality <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA									
Additional Comments	Road water bars caused some erosion slope. Rills/gully repaired.								

Form HV2: Permanent BMPs									
UTM Zone	11							ID#	765
Easting	248378	Building/Structure Name	Big Dipper - Waterbars	Survey Date	6/22/2021	Selection Code	S03		
Northing	4313096	Reviewer Name(s)	J Sutherland	Township	12N	Range	18E	Section	1
Date Project Start		Date Project End		Watershed	NV-1	State	NV		
Date BMP Implementation Complete	7/20/2020	Date Last BMP Maintenance	7/20/2020	Job No.		Storm Depth			
Structure Type	Other	Other (Describe)	Ski trail	Survey Type	1st Year Post Construction				
Plan Title	WMRP Project for 2020				Plan Date		Plan Revision Date		
Specific concerns associated with construction project and BMP measures designed to achieve resource protection									
Damage to existing waterbars on ski trail and associated rilling was repaired.									
Implementation	<div> <input checked="" type="checkbox"/> 1) BMPs are designed to maintain resource protection and meet water quality standards 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs </div> <div> <input checked="" type="checkbox"/> 2) BMPs are constructed according to contract design specifications 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow specifications </div>							Implementation Score:	I
Effectiveness								Effectiveness Score:	E
1) Source area erosion control, protection/stabilization of site, especially erosive areas a) Soil protection measures, artificial or vegetative, eliminating erosion by runoff and rain-drop impact <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Revegetation establishment proceeding as expected, vegetative cover mitigating erosion <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA c) Cut/fill slope protection (vegetation, erosion control blankets, retention walls) preventing erosion <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA									
2) Runoff infiltration and drainage control system effectiveness a) Infiltration zones (detention basins, driplines, gravel armor areas, infiltration trenches, system outlets) functioning properly with little potential for sediment and/or nutrient delivery to SEZ <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Ponding of runoff does not threaten fill slope or foundation integrity, erosion is not evident and no downstream resources are threatened <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA									
3) Effectiveness of hazardous substance control measures a) Mitigation measures of hazardous/toxic substances sufficient with no potential risk to water quality <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA									
Additional Comments	This project involved reestablishing and maintaining existing water bars throughout the slope. Wood chip mulch was incorporated, then seed and mulch applied in area where rilling occurred from damaged waterbar. Waterbars intact and show evidence of reducing sediment transport.								

Form HV2: Permanent BMPs											
UTM Zone	11						ID#	766			
Easting	248351	Building/Structure Name	Orion's - Waterbars			Survey Date	6/22/2021	Selection Code	S06		
Northing	4313019	Reviewer Name(s)	J Sutherland			Township	12N	Range	18E	Section	1
Date Project Start		Date Project End				Watershed	NV-1	State	NV		
Date BMP Implementation Complete		Date Last BMP Maintenance				Job No.		Storm Depth			
Structure Type	Other	Other (Describe)	Ski trail			Survey Type	Other				
Plan Title						Plan Date		Plan Revision Date			
Specific concerns associated with construction project and BMP measures designed to achieve resource protection											
Adequate depth, grade not too steep or flat, erosion or sedimentation issues in swale, soil conditioning in swale, and outlet condition.											
Implementation	<input type="checkbox"/> 1) BMPs are designed to maintain resource protection and meet water quality standards 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs <input type="checkbox"/> 2) BMPs are constructed according to contract design specifications 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow specifications					Implementation Score: <input type="text" value="I"/>					
Effectiveness						Effectiveness Score: <input type="text" value="E"/>					
1) Source area erosion control, protection/stabilization of site, especially erosive areas a) Soil protection measures, artificial or vegetative, eliminating erosion by runoff and rain-drop impact <input type="radio"/> Meets/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Revegetation establishment proceeding as expected, vegetative cover mitigating erosion <input checked="" type="radio"/> Meet/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA c) Cut/fill slope protection (vegetation, erosion control blankets, retention walls) preventing erosion <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA											
2) Runoff infiltration and drainage control system effectiveness a) Infiltration zones (detention basins, driplines, gravel armor areas, infiltration trenches, system outlets) functioning properly with little potential for sediment and/or nutrient delivery to SEZ <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Ponding of runoff does not threaten fill slope or foundation integrity, erosion is not evident and no downstream resources are threatened <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA											
3) Effectiveness of hazardous substance control measures a) Mitigation measures of hazardous/toxic substances sufficient with no potential risk to water quality <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA											
Additional Comments		The Orion's ski trail waterbars in good shape and demonstrating runoff infiltration reducing sediment transport. In certain locations, they intercept runoff from the road. Only minor erosion observed at waterbar outlets. One water bar failed just below Skyline trail needs work.									

Form HV2: Permanent BMPs											
UTM Zone	11						ID#	767			
Easting	245320	Building/Structure Name	World Cup Node			Survey Date	6/22/2021	Selection Code	S03		
Northing	4313839	Reviewer Name(s)	J Sutherland			Township	12N	Range	18E	Section	1
Date Project Start	5/1/2020	Date Project End				Watershed	CA-6	State	CA		
Date BMP Implementation Complete	10/8/2020	Date Last BMP Maintenance				Job No.		Storm Depth			
Structure Type	Building	Other (Describe)				Survey Type	1st Year Post Construction				
Plan Title	Heavenly ATC Hub, Fiber and Node Project SWPPP					Plan Date	4/15/2020	Plan Revision Date	5/18/2020		
Specific concerns associated with construction project and BMP measures designed to achieve resource protection											
10' by 12' building, antenna on lift and utility connections. BMPs include: minimize footprint, infiltration trench, incorporate chips, seed and mulch. Heavenly wood chip staging area condition is not part of the ATC World Cup Node project.											
Implementation	<input type="checkbox"/> 1) BMPs are designed to maintain resource protection and meet water quality standards 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs <input type="checkbox"/> 2) BMPs are constructed according to contract design specifications 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow specifications					Implementation Score: <input type="text" value="I"/>					
Effectiveness						Effectiveness Score: <input type="text" value="E"/>					
1) Source area erosion control, protection/stabilization of site, especially erosive areas a) Soil protection measures, artificial or vegetative, eliminating erosion by runoff and rain-drop impact <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input checked="" type="radio"/> Major Concern <input type="radio"/> NA b) Revegetation establishment proceeding as expected, vegetative cover mitigating erosion <input checked="" type="radio"/> Meet/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA c) Cut/fill slope protection (vegetation, erosion control blankets, retention walls) preventing erosion <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA											
2) Runoff infiltration and drainage control system effectiveness a) Infiltration zones (detention basins, driplines, gravel armor areas, infiltration trenches, system outlets) functioning properly with little potential for sediment and/or nutrient delivery to SEZ <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Ponding of runoff does not threaten fill slope or foundation integrity, erosion is not evident and no downstream resources are threatened <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA											
3) Effectiveness of hazardous substance control measures a) Mitigation measures of hazardous/toxic substances sufficient with no potential risk to water quality <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA											
Additional Comments		Permanent BMPs completed and no concerns at the node building. Some continuing traffic, unrelated to the ATC project, disturbing the road access and wood chip stockpile staging area revegetation.									

Form HV2: Permanent BMPs										
UTM Zone	11						ID#	772		
Easting	249800	Building/Structure Name	Galaxy Wetland		Survey Date	7/1/2021	Selection Code	S06		
Northing	4314757	Reviewer Name(s)	J Sutherland		Township	13N	Range	19E	Section	31
Date Project Start	6/18/2018	Date Project End	11/6/2018		Watershed	NV-2+5		State		NV
Date BMP Implementation Complete	11/6/2018	Date Last BMP Maintenance	11/6/2018		Job No.		Storm Depth			
Structure Type	Other	Other (Describe)	Constructed wetland with inl		Survey Type	Routine				
Plan Title	Galaxy Ski Trail Drainage and Road Maintenance				Plan Date	05/07/2018	Plan Revision Date			
Specific concerns associated with construction project and BMP measures designed to achieve resource protection										
NV Watersheds WMRP Monitoring. Inlet and outlet stability, sediment contribution to stream flow, maintenance of wetland vegetation for trapping sediment.										
Implementation	<input checked="" type="checkbox"/> 1) BMPs are designed to maintain resource protection and meet water quality standards 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs <input type="checkbox"/> 2) BMPs are constructed according to contract design specifications 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow specifications					Implementation Score: <input type="text" value="I"/>				
Effectiveness						Effectiveness Score: <input type="text" value="E"/>				
1) Source area erosion control, protection/stabilization of site, especially erosive areas										
a) Soil protection measures, artificial or vegetative, eliminating erosion by runoff and rain-drop impact					<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
b) Revegetation establishment proceeding as expected, vegetative cover mitigating erosion					<input checked="" type="radio"/> Meet/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
c) Cut/fill slope protection (vegetation, erosion control blankets, retention walls) preventing erosion					<input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA					
2) Runoff infiltration and drainage control system effectiveness										
a) Infiltration zones (detention basins, driplines, gravel armor areas, infiltration trenches, system outlets) functioning properly with little potential for sediment and/or nutrient delivery to SEZ					<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
b) Ponding of runoff does not threaten fill slope or foundation integrity, erosion is not evident and no downstream resources are threatened					<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
3) Effectiveness of hazardous substance control measures										
a) Mitigation measures of hazardous/toxic substances sufficient with no potential risk to water quality					<input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA					
Additional Comments	No erosion or sediment deposition noted at wetland inlet or outlet. Downstream culvert under road in good condition at outlet. Well vegetated.									

Form HV2: Permanent BMPs										
UTM Zone	11						ID#	761		
Easting	248872	Building/Structure Name	Olympic Snowmaking Line		Survey Date	7/1/2021	Selection Code	S03		
Northing	4314848	Reviewer Name(s)	J Sutherland		Township	13N	Range	19E	Section	31
Date Project Start	7/2/2018	Date Project End	11/6/2018		Watershed	NV-5		State		NV
Date BMP Implementation Complete	11/6/2018	Date Last BMP Maintenance	7/1/2020		Job No.		Storm Depth			
Structure Type	Other	Other (Describe)	Ski trail		Survey Type	1st Year Post Construction				
Plan Title	WMRP Project for 2020				Plan Date		Plan Revision Date			
Specific concerns associated with construction project and BMP measures designed to achieve resource protection										
Utility corridor adjacent to drainage channel. Steep slope provides potential for high velocity runoff. BMPs include: waterbars, restricted access, and revegetation.										
Implementation	<input type="checkbox"/> 1) BMPs are designed to maintain resource protection and meet water quality standards 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs <input checked="" type="checkbox"/> 2) BMPs are constructed according to contract design specifications 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow specifications					Implementation Score: <input type="text" value="I"/>				
Effectiveness						Effectiveness Score: <input type="text" value="E"/>				
1) Source area erosion control, protection/stabilization of site, especially erosive areas										
a) Soil protection measures, artificial or vegetative, eliminating erosion by runoff and rain-drop impact					<input type="radio"/> Meets/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
b) Revegetation establishment proceeding as expected, vegetative cover mitigating erosion					<input checked="" type="radio"/> Meet/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
c) Cut/fill slope protection (vegetation, erosion control blankets, retention walls) preventing erosion					<input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA					
2) Runoff infiltration and drainage control system effectiveness										
a) Infiltration zones (detention basins, driplines, gravel armor areas, infiltration trenches, system outlets) functioning properly with little potential for sediment and/or nutrient delivery to SEZ					<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
b) Ponding of runoff does not threaten fill slope or foundation integrity, erosion is not evident and no downstream resources are threatened					<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
3) Effectiveness of hazardous substance control measures										
a) Mitigation measures of hazardous/toxic substances sufficient with no potential risk to water quality					<input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA					
Additional Comments	Establishment of vegetation progressing. New water bar at the upper elevation intact. No erosion noted from snowmelt event since 2020.									

Form HV2: Permanent BMPs									
UTM Zone	11							ID#	764
Easting	247750	Building/Structure Name	Tamarack Node	Survey Date	7/1/2021	Selection Code	S02		
Northing	4313815	Reviewer Name(s)	J Sutherland	Township	12N	Range	18E	Section	1
Date Project Start	6/5/2020	Date Project End	7/1/2022	Watershed	CA-1	State	CA		
Date BMP Implementation Complete	7/1/2021	Date Last BMP Maintenance	7/1/2021	Job No.		Storm Depth			
Structure Type	Building	Other (Describe)		Survey Type	Routine				
Plan Title	Heavenly ATC Hub, Fiber and Node Project SWPPP				Plan Date	4/15/2020	Plan Revision Date	05/12/2021	
Specific concerns associated with construction project and BMP measures designed to achieve resource protection									
10 by 12 building, monopine, and utility connections. BMPs include: minimize foot print, natural grade and rock replacement, infiltration trench, incorporate chips, mulch.									
Implementation	<div> <input checked="" type="checkbox"/> 1) BMPs are designed to maintain resource protection and meet water quality standards 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs </div> <div> <input checked="" type="checkbox"/> 2) BMPs are constructed according to contract design specifications 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow specifications </div>							Implementation Score:	I
Effectiveness								Effectiveness Score:	E
1) Source area erosion control, protection/stabilization of site, especially erosive areas									
a) Soil protection measures, artificial or vegetative, eliminating erosion by runoff and rain-drop impact				<input type="radio"/> Meets/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
b) Revegetation establishment proceeding as expected, vegetative cover mitigating erosion				<input checked="" type="radio"/> Meet/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
c) Cut/fill slope protection (vegetation, erosion control blankets, retention walls) preventing erosion				<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
2) Runoff infiltration and drainage control system effectiveness									
a) Infiltration zones (detention basins, driplines, gravel armor areas, infiltration trenches, system outlets) functioning properly with little potential for sediment and/or nutrient delivery to SEZ				<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
b) Ponding of runoff does not threaten fill slope or foundation integrity, erosion is not evident and no downstream resources are threatened				<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
3) Effectiveness of hazardous substance control measures									
a) Mitigation measures of hazardous/toxic substances sufficient with no potential risk to water quality				<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
Additional Comments	Construction of permanent BMPs for buildings completed by 10/23/2020. Power extended to the buildings from the main line in June 2021 and permanent BMPs completed by July 1, 2021. Some continuing foot traffic to buildings.								

Form HV2: Permanent BMPs									
UTM Zone	11							ID#	768
Easting	249834	Building/Structure Name	Galaxy Road	Survey Date	7/1/2021	Selection Code	S03		
Northing	4314551	Reviewer Name(s)	J Sutherland	Township	13N	Range	19E	Section	31
Date Project Start	6/18/2018	Date Project End	11/6/2018	Watershed	NV-2+5	State	NV		
Date BMP Implementation Complete	11/6/2018	Date Last BMP Maintenance	6/1/2020	Job No.		Storm Depth			
Structure Type	Other	Other (Describe)	Sediment basins	Survey Type	Routine				
Plan Title	Galaxy Ski Trail Drainage and Road Maintenance				Plan Date	05/07/2018	Plan Revision Date		
Specific concerns associated with construction project and BMP measures designed to achieve resource protection									
Close proximity to Daggett Creek, steep roadway with potential for high velocity runoff. BMPs include: water bars, sediment basins with outlet protection, road grade and surfacing.									
Implementation	<div> <input checked="" type="checkbox"/> 1) BMPs are designed to maintain resource protection and meet water quality standards 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs </div> <div> <input checked="" type="checkbox"/> 2) BMPs are constructed according to contract design specifications 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow specifications </div>							Implementation Score:	I
Effectiveness								Effectiveness Score:	E
1) Source area erosion control, protection/stabilization of site, especially erosive areas									
a) Soil protection measures, artificial or vegetative, eliminating erosion by runoff and rain-drop impact				<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
b) Revegetation establishment proceeding as expected, vegetative cover mitigating erosion				<input checked="" type="radio"/> Meet/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
c) Cut/fill slope protection (vegetation, erosion control blankets, retention walls) preventing erosion				<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
2) Runoff infiltration and drainage control system effectiveness									
a) Infiltration zones (detention basins, driplines, gravel armor areas, infiltration trenches, system outlets) functioning properly with little potential for sediment and/or nutrient delivery to SEZ				<input type="radio"/> Meets/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
b) Ponding of runoff does not threaten fill slope or foundation integrity, erosion is not evident and no downstream resources are threatened				<input type="radio"/> Meets/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
3) Effectiveness of hazardous substance control measures									
a) Mitigation measures of hazardous/toxic substances sufficient with no potential risk to water quality				<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
Additional Comments	Heavenly maintains annually. Sediment basins have <50% capacity. No signs of discharge to Daggett Creek. Waterbars intact and no sign of significant rilling or overtopping. Some drain rock and base used on road surface. Runoff toward creek intercepted by ponding area near tower continue to monitor.								

Form HV2: Permanent BMPs										
UTM Zone	11						ID#	769		
Easting	249834	Building/Structure Name	Galaxy Chair Lift Replacement		Survey Date	7/1/2021	Selection Code	S06		
Northing	4314551	Reviewer Name(s)	J Sutherland		Township	13N	Range	19E	Section	31
Date Project Start	6/18/2018	Date Project End	11/6/2018		Watershed	NV-2+5	State	NV		
Date BMP Implementation Complete	11/6/2018	Date Last BMP Maintenance			Job No.		Storm Depth			
Structure Type	Lift-Base	Other (Describe)			Survey Type	Routine				
Plan Title	Galaxy Chair Lift Replacement				Plan Date	06/19/2018	Plan Revision Date	07/02/2018		
Specific concerns associated with construction project and BMP measures designed to achieve resource protection										
NV Watersheds WMRP Monitoring. Lift BMPs include: minimize footprint, channel restoration near tower, vegetation salvage, vehicle traffic on roads only.										
Implementation	<input type="checkbox"/> 1) BMPs are designed to maintain resource protection and meet water quality standards 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs <input type="checkbox"/> 2) BMPs are constructed according to contract design specifications 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow specifications					Implementation Score: <input type="text" value="I"/>				
Effectiveness						Effectiveness Score: <input type="text" value="E"/>				
1) Source area erosion control, protection/stabilization of site, especially erosive areas										
a) Soil protection measures, artificial or vegetative, eliminating erosion by runoff and rain-drop impact					<input checked="" type="radio"/> Meets/Exceeds. <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
b) Revegetation establishment proceeding as expected, vegetative cover mitigating erosion					<input checked="" type="radio"/> Meet/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
c) Cut/fill slope protection (vegetation, erosion control blankets, retention walls) preventing erosion					<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
2) Runoff infiltration and drainage control system effectiveness										
a) Infiltration zones (detention basins, driplines, gravel armor areas, infiltration trenches, system outlets) functioning properly with little potential for sediment and/or nutrient delivery to SEZ					<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
b) Ponding of runoff does not threaten fill slope or foundation integrity, erosion is not evident and no downstream resources are threatened					<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
3) Effectiveness of hazardous substance control measures										
a) Mitigation measures of hazardous/toxic substances sufficient with no potential risk to water quality					<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
Additional Comments	Wetland area vegetation generally well established and relocated channel intact. No evidence of erosion or sediment transport in the area around towers.									

Form HV2: Permanent BMPs										
UTM Zone	11						ID#	781		
Easting	249578	Building/Structure Name	Boulder Lift - Lower Terminal		Survey Date	8/10/2021	Selection Code	S06		
Northing	4316937	Reviewer Name(s)	J Sutherland		Township	13N	Range	19E	Section	30
Date Project Start		Date Project End			Watershed	NV-3	State	NV		
Date BMP Implementation Complete		Date Last BMP Maintenance			Job No.		Storm Depth			
Structure Type		Other (Describe)			Survey Type	Routine				
Plan Title					Plan Date		Plan Revision Date			
Specific concerns associated with construction project and BMP measures designed to achieve resource protection										
NV Watersheds WMRP Monitoring. Lift area is well vegetated and flat slopes.										
Implementation	<input type="checkbox"/> 1) BMPs are designed to maintain resource protection and meet water quality standards 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs <input type="checkbox"/> 2) BMPs are constructed according to contract design specifications 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow specifications					Implementation Score: <input type="text" value="I"/>				
Effectiveness						Effectiveness Score: <input type="text" value="E"/>				
1) Source area erosion control, protection/stabilization of site, especially erosive areas										
a) Soil protection measures, artificial or vegetative, eliminating erosion by runoff and rain-drop impact					<input checked="" type="radio"/> Meets/Exceeds. <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
b) Revegetation establishment proceeding as expected, vegetative cover mitigating erosion					<input checked="" type="radio"/> Meet/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
c) Cut/fill slope protection (vegetation, erosion control blankets, retention walls) preventing erosion					<input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA					
2) Runoff infiltration and drainage control system effectiveness										
a) Infiltration zones (detention basins, driplines, gravel armor areas, infiltration trenches, system outlets) functioning properly with little potential for sediment and/or nutrient delivery to SEZ					<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
b) Ponding of runoff does not threaten fill slope or foundation integrity, erosion is not evident and no downstream resources are threatened					<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
3) Effectiveness of hazardous substance control measures										
a) Mitigation measures of hazardous/toxic substances sufficient with no potential risk to water quality					<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
Additional Comments	No concerns									

Form HV2: Permanent BMPs									
UTM Zone	11							ID#	773
Easting	249840	Building/Structure Name	Stagecoach Lower Terminal	Survey Date	8/10/2021	Selection Code	S06		
Northing	4316356	Reviewer Name(s)	J Sutherland	Township	13N	Range	19E	Section	30
Date Project Start		Date Project End		Watershed	NV-4	State	NV		
Date BMP Implementation Complete		Date Last BMP Maintenance		Job No.		Storm Depth			
Structure Type	Lift-Base	Other (Describe)		Survey Type	Routine				
Plan Title	1998 Implementation: Stagecoach Lift Erosion Control			Plan Date	08/11/1998	Plan Revision Date			
Specific concerns associated with construction project and BMP measures designed to achieve resource protection									
NV Watersheds WMRP Monitoring. Lift BMPs include minimize footprint, control vehicle traffic, stability of cut and fill slopes, drip line infiltration.									
Implementation	<input type="checkbox"/> 1) BMPs are designed to maintain resource protection and meet water quality standards 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs <input type="checkbox"/> 2) BMPs are constructed according to contract design specifications 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow specifications						Implementation Score: <input type="text" value="I"/>		
Effectiveness							Effectiveness Score: <input type="text" value="E"/>		
1) Source area erosion control, protection/stabilization of site, especially erosive areas a) Soil protection measures, artificial or vegetative, eliminating erosion by runoff and rain-drop impact <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Revegetation establishment proceeding as expected, vegetative cover mitigating erosion <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA c) Cut/fill slope protection (vegetation, erosion control blankets, retention walls) preventing erosion <input type="radio"/> Meets/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA									
2) Runoff infiltration and drainage control system effectiveness a) Infiltration zones (detention basins, driplines, gravel armor areas, infiltration trenches, system outlets) functioning properly with little potential for sediment and/or nutrient delivery to SEZ <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Ponding of runoff does not threaten fill slope or foundation integrity, erosion is not evident and no downstream resources are threatened <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA									
3) Effectiveness of hazardous substance control measures a) Mitigation measures of hazardous/toxic substances sufficient with no potential risk to water quality <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA									
Additional Comments	Steep cut slope south of lift has loose soil, continues to show signs of erosion. Well vegetated and high traffic areas covered with woodchips around terminal. Stable boulder embankment between parking lot and lift access, except small disturbed area near Quaking Aspen Drive.								

Form HV2: Permanent BMPs									
UTM Zone	11							ID#	774
Easting	249968	Building/Structure Name	Stagecoach Lodge & Parking Lot	Survey Date	8/10/2021	Selection Code	S06		
Northing	4316448	Reviewer Name(s)	J Sutherland	Township	13N	Range	19E	Section	30
Date Project Start		Date Project End		Watershed	NV-4	State	NV		
Date BMP Implementation Complete		Date Last BMP Maintenance		Job No.		Storm Depth			
Structure Type	Parking Lot	Other (Describe)		Survey Type	Routine				
Plan Title				Plan Date		Plan Revision Date			
Specific concerns associated with construction project and BMP measures designed to achieve resource protection									
NV Watersheds WMRP Monitoring. Parking lot and Lodge BMPs include drainage systems, staging area stability, cut/fill slope erosion control.									
Implementation	<input type="checkbox"/> 1) BMPs are designed to maintain resource protection and meet water quality standards 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs <input type="checkbox"/> 2) BMPs are constructed according to contract design specifications 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow specifications						Implementation Score: <input type="text" value="I"/>		
Effectiveness							Effectiveness Score: <input type="text" value="E"/>		
1) Source area erosion control, protection/stabilization of site, especially erosive areas a) Soil protection measures, artificial or vegetative, eliminating erosion by runoff and rain-drop impact <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Revegetation establishment proceeding as expected, vegetative cover mitigating erosion <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA c) Cut/fill slope protection (vegetation, erosion control blankets, retention walls) preventing erosion <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA									
2) Runoff infiltration and drainage control system effectiveness a) Infiltration zones (detention basins, driplines, gravel armor areas, infiltration trenches, system outlets) functioning properly with little potential for sediment and/or nutrient delivery to SEZ <input type="radio"/> Meets/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Ponding of runoff does not threaten fill slope or foundation integrity, erosion is not evident and no downstream resources are threatened <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA									
3) Effectiveness of hazardous substance control measures a) Mitigation measures of hazardous/toxic substances sufficient with no potential risk to water quality <input type="radio"/> Meets/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA									
Additional Comments	Pavement and drainage system (ditches and drop inlets) intact and free of debris. Cut/fill slopes look stable. Vehicle access is controlled. Minor concern due to soil staining (1' by 3' approx.) behind lodge suggest a past spill on the access road. Minor concern due to sediment/debris around perennial flow between parking lots. Sediment accumulation may be related to drainage from both Quaking Aspen Drive and parking lot.								

UTM Zone	11	Form HV2: Permanent BMPs				ID#	778
Easting	249419	Building/Structure Name	Edgewood - Summer Access	Survey Date	8/10/2021	Selection Code	S06
Northing	4317088	Reviewer Name(s)	J Sutherland	Township	13N	Range	18E
Date Project Start		Date Project End		Watershed	NV-3	State	NV
Date BMP Implementation Complete		Date Last BMP Maintenance		Job No.		Storm Depth	
Structure Type	Other	Other (Describe)	Summer Access Road	Survey Type	Routine		
Plan Title				Plan Date		Plan Revision Date	
Specific concerns associated with construction project and BMP measures designed to achieve resource protection							
NV Watersheds WMRP Monitoring. Summer utility access road downstream of Boulder parking lot.							
Implementation	<input type="checkbox"/> 1) BMPs are designed to maintain resource protection and meet water quality standards 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs <input type="checkbox"/> 1) 2) BMPs are constructed according to contract design specifications 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow specifications						Implementation Score: <input type="text" value="I"/>
Effectiveness							Effectiveness Score: <input type="text" value="X"/>
1) Source area erosion control, protection/stabilization of site, especially erosive areas a) Soil protection measures, artificial or vegetative, eliminating erosion by runoff and rain-drop impact <input type="radio"/> Meets/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Revegetation establishment proceeding as expected, vegetative cover mitigating erosion <input type="radio"/> Meet/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA c) Cut/fill slope protection (vegetation, erosion control blankets, retention walls) preventing erosion <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA							
2) Runoff infiltration and drainage control system effectiveness a) Infiltration zones (detention basins, driplines, gravel armor areas, infiltration trenches, system outlets) functioning properly with little potential for sediment and/or nutrient delivery to SEZ <input type="radio"/> Meets/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Ponding of runoff does not threaten fill slope or foundation integrity, erosion is not evident and no downstream resources are threatened <input type="radio"/> Meets/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA							
3) Effectiveness of hazardous substance control measures a) Mitigation measures of hazardous/toxic substances sufficient with no potential risk to water quality <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA							
Additional Comments	Offsite drainage (does not appear to come from Boulder parking lot) crosses road and sediment accumulated on the downhill side. Vegetation provides a buffer between the creek and the road. Drainage across the road could be stabilized and sediment capture BMPs improved. Additional investigation needed in 2022.						

UTM Zone	11	Form HV2: Permanent BMPs				ID#	779
Easting	249582	Building/Structure Name	Boulder Parking Lot	Survey Date	8/10/2021	Selection Code	S02
Northing	4317073	Reviewer Name(s)	J Sutherland	Township	13N	Range	19E
Date Project Start		Date Project End		Watershed	NV-3	State	NV
Date BMP Implementation Complete		Date Last BMP Maintenance		Job No.		Storm Depth	
Structure Type	Parking Lot	Other (Describe)		Survey Type	Routine		
Plan Title				Plan Date		Plan Revision Date	
Specific concerns associated with construction project and BMP measures designed to achieve resource protection							
3-year paving project completed in 2021. BMPs include: K-Rail to protect creek from sediment and snow storage, sediment barriers in summer around drop inlets and culvert inlets, and sediment basins with risers.							
Implementation	<input type="checkbox"/> 1) BMPs are designed to maintain resource protection and meet water quality standards 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs <input type="checkbox"/> 1) 2) BMPs are constructed according to contract design specifications 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow specifications						Implementation Score: <input type="text" value="I"/>
Effectiveness							Effectiveness Score: <input type="text" value="E"/>
1) Source area erosion control, protection/stabilization of site, especially erosive areas a) Soil protection measures, artificial or vegetative, eliminating erosion by runoff and rain-drop impact <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA b) Revegetation establishment proceeding as expected, vegetative cover mitigating erosion <input type="radio"/> Meet/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA c) Cut/fill slope protection (vegetation, erosion control blankets, retention walls) preventing erosion <input type="radio"/> Meets/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA							
2) Runoff infiltration and drainage control system effectiveness a) Infiltration zones (detention basins, driplines, gravel armor areas, infiltration trenches, system outlets) functioning properly with little potential for sediment and/or nutrient delivery to SEZ <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Ponding of runoff does not threaten fill slope or foundation integrity, erosion is not evident and no downstream resources are threatened <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA							
3) Effectiveness of hazardous substance control measures a) Mitigation measures of hazardous/toxic substances sufficient with no potential risk to water quality <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA							
Additional Comments	Parking lot pavement in good condition and the majority of K-Rail intact to protect Edgewood Creek. Sediment being removed from snow storage areas and parking lot margins - routine maintenance required to control sediment.						

UTM Zone		11		Form HV2: Permanent BMPs				ID#		780		
Easting	249506		Building/Structure Name		Boulder Lodge		Survey Date	8/10/2021		Selection Code	S06	
Northing	4316965		Reviewer Name(s)		J Sutherland		Township	13N		Range	19E	
Date Project Start				Date Project End				Watershed	NV-3		State	NV
Date BMP Implementation Complete				Date Last BMP Maintenance				Job No.			Storm Depth	
Structure Type		Lift-Base		Other (Describe)				Survey Type	Routine			
Plan Title								Plan Date			Plan Revision Date	
Specific concerns associated with construction project and BMP measures designed to achieve resource protection												
NV Watersheds WMRP Monitoring. BMPs include: drip line trenches, vegetation, curb and gutter, and retaining wall.												
Implementation		<div> <input type="checkbox"/> 1) BMPs are designed to maintain resource protection and meet water quality standards 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs </div> <div> <input type="checkbox"/> 2) BMPs are constructed according to contract design specifications 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow specifications </div>								Implementation Score:		I
Effectiveness										Effectiveness Score:		E
1) Source area erosion control, protection/stabilization of site, especially erosive areas a) Soil protection measures, artificial or vegetative, eliminating erosion by runoff and rain-drop impact <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Revegetation establishment proceeding as expected, vegetative cover mitigating erosion <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA c) Cut/fill slope protection (vegetation, erosion control blankets, retention walls) preventing erosion <input type="radio"/> Meets/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA												
2) Runoff infiltration and drainage control system effectiveness a) Infiltration zones (detention basins, driplines, gravel armor areas, infiltration trenches, system outlets) functioning properly with little potential for sediment and/or nutrient delivery to SEZ <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Ponding of runoff does not threaten fill slope or foundation integrity, erosion is not evident and no downstream resources are threatened <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA												
3) Effectiveness of hazardous substance control measures a) Mitigation measures of hazardous/toxic substances sufficient with no potential risk to water quality <input type="radio"/> Meets/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA												
Additional Comments		Pavement in good condition, some accumulation of sediment in gutter and adjacent to Lodge, small bare areas, and some confined staining on pavement near dumpster. Generally in good condition. Drain rock infiltration areas under deck intact.										

UTM Zone		11		Form HV2: Permanent BMPs				ID#		782		
Easting	245100		Building/Structure Name		ATC Fiber - Road (Cal Base)		Survey Date	8/12/2021		Selection Code	S03	
Northing	4313505		Reviewer Name(s)		J Sutherland		Township	12N		Range	18E	
Date Project Start		5/1/2020		Date Project End		7/1/2021		Watershed	CA-6		State	CA
Date BMP Implementation Complete		5/18/2020		Date Last BMP Maintenance				Job No.			Storm Depth	N/A
Structure Type		Other		Other (Describe)		Fiber underground		Survey Type	1st Year Post Construction			
Plan Title		Heavenly ATC Hub, Fiber and Node Project SWPPP						Plan Date	4/15/2020		Plan Revision Date	5/18/2020
Specific concerns associated with construction project and BMP measures designed to achieve resource protection												
Underground fiber installed . BMPs include: minimize disturbance corridor; rip, chip, seed, mulch ski trail; trench blocks; and restore water bars.												
Implementation		<div> <input type="checkbox"/> 1) BMPs are designed to maintain resource protection and meet water quality standards 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs </div> <div> <input type="checkbox"/> 2) BMPs are constructed according to contract design specifications 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow specifications </div>								Implementation Score:		I
Effectiveness										Effectiveness Score:		E
1) Source area erosion control, protection/stabilization of site, especially erosive areas a) Soil protection measures, artificial or vegetative, eliminating erosion by runoff and rain-drop impact <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Revegetation establishment proceeding as expected, vegetative cover mitigating erosion <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA c) Cut/fill slope protection (vegetation, erosion control blankets, retention walls) preventing erosion <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA												
2) Runoff infiltration and drainage control system effectiveness a) Infiltration zones (detention basins, driplines, gravel armor areas, infiltration trenches, system outlets) functioning properly with little potential for sediment and/or nutrient delivery to SEZ <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA b) Ponding of runoff does not threaten fill slope or foundation integrity, erosion is not evident and no downstream resources are threatened <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA												
3) Effectiveness of hazardous substance control measures a) Mitigation measures of hazardous/toxic substances sufficient with no potential risk to water quality <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA												
Additional Comments		First Ride corridor vegetation establishment progressing. Waterbars maintained. No erosion or sediment transport observed from the ATC project areas.										

Form HV2: Permanent BMPs									
UTM Zone	11							ID#	776
Easting	245180	Building/Structure Name	Cal Base - Summer Access	Survey Date	8/13/2021	Selection Code	S03		
Northing	4313697	Reviewer Name(s)	E Ketchian	Township	12N	Range	18E	Section	1
Date Project Start	7/10/2021	Date Project End	7/20/2021	Watershed		CA-6	State CA		
Date BMP Implementation Complete	8/1/2021	Date Last BMP Maintenance		Job No.		Storm Depth			
Structure Type	Lodge	Other (Describe)	Summer Access Road	Survey Type	Routine				
Plan Title	WMRP Project for 2021				Plan Date		Plan Revision Date		
Specific concerns associated with construction project and BMP measures designed to achieve resource protection									
Debris tracking at road entrance to pavement and water ponding in vehicle tracks. Drain rock buffer to create stable surface for vehicle access, enhance infiltration, filter debris and sediment from sheet flow runoff to pavement (parking lot and Lodge patio).									
Implementation	<div> <input type="checkbox"/> 1) BMPs are designed to maintain resource protection and meet water quality standards 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs </div> <div> <input type="checkbox"/> 2) BMPs are constructed according to contract design specifications 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow specifications </div>							Implementation Score:	<input type="text" value="1"/>
Effectiveness								Effectiveness Score:	<input type="text" value="E"/>
1) Source area erosion control, protection/stabilization of site, especially erosive areas a) Soil protection measures, artificial or vegetative, eliminating erosion by runoff and rain-drop impact <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Revegetation establishment proceeding as expected, vegetative cover mitigating erosion <input type="radio"/> Meet/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA c) Cut/fill slope protection (vegetation, erosion control blankets, retention walls) preventing erosion <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA									
2) Runoff infiltration and drainage control system effectiveness a) Infiltration zones (detention basins, driplines, gravel armor areas, infiltration trenches, system outlets) functioning properly with little potential for sediment and/or nutrient delivery to SEZ <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Ponding of runoff does not threaten fill slope or foundation integrity, erosion is not evident and no downstream resources are threatened <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA									
3) Effectiveness of hazardous substance control measures a) Mitigation measures of hazardous/toxic substances sufficient with no potential risk to water quality <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA									
Additional Comments	Cal Lodge: Small swale along the pavement/pavers, lined the ditch and about 6' out with filter fabric, and then covered with 1.5" dia drain rock. Foundation Bldg: Made 8" to 10" deep swale at the edge of the pavement, lined the area with filter fabric, and covered in with 3" to 8" dia. Rock to reduce the track off from vehicles and wood chip/dirt in runoff to pavement.								

Form HV2: Permanent BMPs									
UTM Zone	11							ID#	777
Easting	247038	Building/Structure Name	Cal Dam & Sky Meadow	Survey Date	8/13/2021	Selection Code	S03		
Northing	4312572	Reviewer Name(s)	J Sutherland	Township	12N	Range	18E	Section	1
Date Project Start	8/10/2020	Date Project End	9/25/2020	Watershed		CA-1	State CA		
Date BMP Implementation Complete	9/25/2020	Date Last BMP Maintenance	9/25/2020	Job No.		Storm Depth			
Structure Type	Other	Other (Describe)	Snowmaking Pond	Survey Type	1st Year Post Construction				
Plan Title	California Dam Snowmaking Pond Maintenance SWPPP				Plan Date	05/22/2020	Plan Revision Date	08/29/2020	
Specific concerns associated with construction project and BMP measures designed to achieve resource protection									
Sediment removal from pond and relining of interior dam face. BMPs include min. footprint, no tree removal; restore staging areas; avoid disturbance in diversion area in meadow; and restore banks (wattles, jute netting, seed and mulch treatment).									
Implementation	<div> <input type="checkbox"/> 1) BMPs are designed to maintain resource protection and meet water quality standards 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs </div> <div> <input type="checkbox"/> 2) BMPs are constructed according to contract design specifications 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow specifications </div>							Implementation Score:	<input type="text" value="1"/>
Effectiveness								Effectiveness Score:	<input type="text" value="E"/>
1) Source area erosion control, protection/stabilization of site, especially erosive areas a) Soil protection measures, artificial or vegetative, eliminating erosion by runoff and rain-drop impact <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Revegetation establishment proceeding as expected, vegetative cover mitigating erosion <input checked="" type="radio"/> Meet/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA c) Cut/fill slope protection (vegetation, erosion control blankets, retention walls) preventing erosion <input type="radio"/> Meets/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA									
2) Runoff infiltration and drainage control system effectiveness a) Infiltration zones (detention basins, driplines, gravel armor areas, infiltration trenches, system outlets) functioning properly with little potential for sediment and/or nutrient delivery to SEZ <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Ponding of runoff does not threaten fill slope or foundation integrity, erosion is not evident and no downstream resources are threatened <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA									
3) Effectiveness of hazardous substance control measures a) Mitigation measures of hazardous/toxic substances sufficient with no potential risk to water quality <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA									
Additional Comments	Additional BMP maintenance done to install willow wattles and anchor one section of fabric on pond embankment. Revegetation area fenced near pump house, meadow restored at diversion, dam liner intact, revegetation progressing near dam outlet.								

Form HV2: Permanent BMPs									
UTM Zone	11							ID#	783
Easting	249018	Building/Structure Name	East Peak Node	Survey Date	8/13/2021	Selection Code	S03		
Northing	4314365	Reviewer Name(s)	J Sutherland	Township	13N	Range	19E	Section	31
Date Project Start	6/5/2020	Date Project End	7/1/2021			Watershed	NV-2+5	State	NV
Date BMP Implementation Complete	10/8/2020	Date Last BMP Maintenance		Job No.		Storm Depth			
Structure Type	Building	Other (Describe)		Survey Type	1st Year Post Construction				
Plan Title	Heavenly ATC Hub, Fiber and Node Project SWPPP				Plan Date	4/15/2020	Plan Revision Date	5/18/2020	
Specific concerns associated with construction project and BMP measures designed to achieve resource protection									
10 by 12 building, monopine, and utility connections. BMPs include: minimize foot print, natural grade and rock replacement, infiltration trench, incorporate chips, seed and mulch.									
Implementation	<div>1) 1) BMPs are designed to maintain resource protection and meet water quality standards 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs</div> <div>1) 2) BMPs are constructed according to contract design specifications 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow specifications</div>							Implementation Score:	I
Effectiveness								Effectiveness Score:	E
1) Source area erosion control, protection/stabilization of site, especially erosive areas									
a) Soil protection measures, artificial or vegetative, eliminating erosion by runoff and rain-drop impact				<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
b) Revegetation establishment proceeding as expected, vegetative cover mitigating erosion				<input type="radio"/> Meet/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
c) Cut/fill slope protection (vegetation, erosion control blankets, retention walls) preventing erosion				<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
2) Runoff infiltration and drainage control system effectiveness									
a) Infiltration zones (detention basins, driplines, gravel armor areas, infiltration trenches, system outlets) functioning properly with little potential for sediment and/or nutrient delivery to SEZ				<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
b) Ponding of runoff does not threaten fill slope or foundation integrity, erosion is not evident and no downstream resources are threatened				<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
3) Effectiveness of hazardous substance control measures									
a) Mitigation measures of hazardous/toxic substances sufficient with no potential risk to water quality				<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
Additional Comments	Construction of permanent BMPs completed by 10/23/2020. Mulch intact with moderately good coverage. Observed some vehicle tracks between road and node. Infiltration trenches no concerns. No evidence of erosion or sediment accumulation.								

Form HV2: Permanent BMPs									
UTM Zone	11							ID#	784
Easting	249311	Building/Structure Name	East Peak Pump House & Lodge Well	Survey Date	8/19/2021	Selection Code	S03		
Northing	4314331	Reviewer Name(s)	E Ketchian	Township	13N	Range	19E	Section	31
Date Project Start		Date Project End				Watershed	NV-2+5	State	NV
Date BMP Implementation Complete		Date Last BMP Maintenance		Job No.		Storm Depth			
Structure Type	Building	Other (Describe)	and well	Survey Type	Routine				
Plan Title					Plan Date		Plan Revision Date		
Specific concerns associated with construction project and BMP measures designed to achieve resource protection									
BMPs include: infiltration trenches around Pumphouse, revegetation, restricted access to well.									
Implementation	<div>1) 1) BMPs are designed to maintain resource protection and meet water quality standards 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs</div> <div>1) 2) BMPs are constructed according to contract design specifications 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow specifications</div>							Implementation Score:	I
Effectiveness								Effectiveness Score:	E
1) Source area erosion control, protection/stabilization of site, especially erosive areas									
a) Soil protection measures, artificial or vegetative, eliminating erosion by runoff and rain-drop impact				<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
b) Revegetation establishment proceeding as expected, vegetative cover mitigating erosion				<input type="radio"/> Meet/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
c) Cut/fill slope protection (vegetation, erosion control blankets, retention walls) preventing erosion				<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
2) Runoff infiltration and drainage control system effectiveness									
a) Infiltration zones (detention basins, driplines, gravel armor areas, infiltration trenches, system outlets) functioning properly with little potential for sediment and/or nutrient delivery to SEZ				<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
b) Ponding of runoff does not threaten fill slope or foundation integrity, erosion is not evident and no downstream resources are threatened				<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
3) Effectiveness of hazardous substance control measures									
a) Mitigation measures of hazardous/toxic substances sufficient with no potential risk to water quality				<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
Additional Comments	Minor erosion observed on cut slope by the pumphouse but overall looked stable and infiltration trenches intact. Source water protection project to rebuild concrete around wellhead looks good. No mulch application in vehicle access area but limited opportunity for erosion in this location.								

Form HV2: Permanent BMPs									
UTM Zone	11							ID#	786
Easting	249246	Building/Structure Name	East Peak Dam	Survey Date	8/19/2021	Selection Code	S03		
Northing	4314246	Reviewer Name(s)	E Ketchian	Township	13N	Range	19E	Section	31
Date Project Start		Date Project End		Watershed	NV-2+5	State	NV		
Date BMP Implementation Complete		Date Last BMP Maintenance		Job No.		Storm Depth			
Structure Type	Other	Other (Describe)	Dam with Liner	Survey Type	Routine				
Plan Title				Plan Date		Plan Revision Date			
Specific concerns associated with construction project and BMP measures designed to achieve resource protection									
Adjacent to East Peak Lake and Daggett Creek.									
Implementation	<input type="checkbox"/> 1) BMPs are designed to maintain resource protection and meet water quality standards 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs <input type="checkbox"/> 2) BMPs are constructed according to contract design specifications 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow specifications							Implementation Score:	<input type="text" value="I"/>
Effectiveness								Effectiveness Score:	<input type="text" value="E"/>
1) Source area erosion control, protection/stabilization of site, especially erosive areas a) Soil protection measures, artificial or vegetative, eliminating erosion by runoff and rain-drop impact <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Revegetation establishment proceeding as expected, vegetative cover mitigating erosion <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA c) Cut/fill slope protection (vegetation, erosion control blankets, retention walls) preventing erosion <input type="radio"/> Meets/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA									
2) Runoff infiltration and drainage control system effectiveness a) Infiltration zones (detention basins, driplines, gravel armor areas, infiltration trenches, system outlets) functioning properly with little potential for sediment and/or nutrient delivery to SEZ <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Ponding of runoff does not threaten fill slope or foundation integrity, erosion is not evident and no downstream resources are threatened <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA									
3) Effectiveness of hazardous substance control measures a) Mitigation measures of hazardous/toxic substances sufficient with no potential risk to water quality <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA									
Additional Comments	Liner anchored and embankment moderately well vegetated. Old plastic fiber rolls on face no longer needed or effective.								

Form HV2: Permanent BMPs									
UTM Zone	11							ID#	785
Easting	249190	Building/Structure Name	East Peak Borrow (Staging) Area	Survey Date	8/19/2021	Selection Code	S06		
Northing	4314058	Reviewer Name(s)	E Ketchian	Township	13N	Range	19E	Section	31
Date Project Start		Date Project End		Watershed	NV-2+5	State	NV		
Date BMP Implementation Complete		Date Last BMP Maintenance		Job No.		Storm Depth			
Structure Type	Other	Other (Describe)		Survey Type	Routine				
Plan Title				Plan Date		Plan Revision Date			
Specific concerns associated with construction project and BMP measures designed to achieve resource protection									
Staging area routinely used by to park equipment and stockpile materials (woodchips, soils, etc.). Area is in a small bowl adjacent to East Peak Lake. BMPs needed to prevent soils and woodchips from being carried to the lake.									
Implementation	<input type="checkbox"/> 1) BMPs are designed to maintain resource protection and meet water quality standards 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs <input type="checkbox"/> 2) BMPs are constructed according to contract design specifications 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow specifications							Implementation Score:	<input type="text" value="m"/>
Effectiveness								Effectiveness Score:	<input type="text" value="m"/>
1) Source area erosion control, protection/stabilization of site, especially erosive areas a) Soil protection measures, artificial or vegetative, eliminating erosion by runoff and rain-drop impact <input type="radio"/> Meets/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Revegetation establishment proceeding as expected, vegetative cover mitigating erosion <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA c) Cut/fill slope protection (vegetation, erosion control blankets, retention walls) preventing erosion <input type="radio"/> Meets/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA									
2) Runoff infiltration and drainage control system effectiveness a) Infiltration zones (detention basins, driplines, gravel armor areas, infiltration trenches, system outlets) functioning properly with little potential for sediment and/or nutrient delivery to SEZ <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Ponding of runoff does not threaten fill slope or foundation integrity, erosion is not evident and no downstream resources are threatened <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA									
3) Effectiveness of hazardous substance control measures a) Mitigation measures of hazardous/toxic substances sufficient with no potential risk to water quality <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA									
Additional Comments	Loose soils and woodchips piles result from construction staging disturbance have potential to be carried in runoff to the lake. However the area is relatively flat and no erosion causing sediment transport to the lake observed.								

Form HV2: Permanent BMPs									
UTM Zone	11							ID#	787
Easting	249461	Building/Structure Name	Boulder Ski Trail	Survey Date	9/24/2021	Selection Code	S06		
Northing	4316532	Reviewer Name(s)	E Ketchian	Township	13N	Range	19E	Section	30
Date Project Start		Date Project End		Watershed	NV-3	State	NV		
Date BMP Implementation Complete		Date Last BMP Maintenance		Job No.		Storm Depth			
Structure Type	Other	Other (Describe)	Ski trail	Survey Type	Routine				
Plan Title				Plan Date		Plan Revision Date			
Specific concerns associated with construction project and BMP measures designed to achieve resource protection									
Ski trail, lift and snowmaking lines follow Edgewood Creek.									
Implementation	<input type="checkbox"/> 1) BMPs are designed to maintain resource protection and meet water quality standards 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs <input type="checkbox"/> 2) BMPs are constructed according to contract design specifications 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow specifications							Implementation Score:	I
Effectiveness								Effectiveness Score:	E
1) Source area erosion control, protection/stabilization of site, especially erosive areas a) Soil protection measures, artificial or vegetative, eliminating erosion by runoff and rain-drop impact <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Revegetation establishment proceeding as expected, vegetative cover mitigating erosion <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA c) Cut/fill slope protection (vegetation, erosion control blankets, retention walls) preventing erosion <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA									
2) Runoff infiltration and drainage control system effectiveness a) Infiltration zones (detention basins, driplines, gravel armor areas, infiltration trenches, system outlets) functioning properly with little potential for sediment and/or nutrient delivery to SEZ <input type="radio"/> Meets/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Ponding of runoff does not threaten fill slope or foundation integrity, erosion is not evident and no downstream resources are threatened <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA									
3) Effectiveness of hazardous substance control measures a) Mitigation measures of hazardous/toxic substances sufficient with no potential risk to water quality <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA									
Additional Comments	Predominantly well vegetated with no sign of vehicle traffic on the ski trail. Some foot trails. Erosion observed at one location where side drainage enters edge of meadow.								

Form HV2: Permanent BMPs									
UTM Zone	11							ID#	788
Easting	249766	Building/Structure Name	Ski-in Ski-out	Survey Date	9/27/2021	Selection Code	S06		
Northing	4316306	Reviewer Name(s)	E Ketchian	Township	13N	Range	19E	Section	30
Date Project Start	8/15/2018	Date Project End	11/15/2019	Watershed	NV-4	State	NV		
Date BMP Implementation Complete	11/15/2019	Date Last BMP Maintenance	11/15/2019	Job No.		Storm Depth			
Structure Type	Other	Other (Describe)	Ski trail	Survey Type	Routine				
Plan Title	Ridge Resort Project near Stagecoach Lift Base - maintenance by Ridge Resort.			Plan Date		Plan Revision Date			
Specific concerns associated with construction project and BMP measures designed to achieve resource protection									
NV Watersheds WMRP Monitoring. Steep ski trail slopes and near tributary to Daggett Creek. BMPs include: rock slope protection, revegetation (chip incorporation, seed and mulch).									
Implementation	<input type="checkbox"/> 1) BMPs are designed to maintain resource protection and meet water quality standards 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs <input type="checkbox"/> 2) BMPs are constructed according to contract design specifications 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow specifications							Implementation Score:	I
Effectiveness								Effectiveness Score:	E
1) Source area erosion control, protection/stabilization of site, especially erosive areas a) Soil protection measures, artificial or vegetative, eliminating erosion by runoff and rain-drop impact <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Revegetation establishment proceeding as expected, vegetative cover mitigating erosion <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA c) Cut/fill slope protection (vegetation, erosion control blankets, retention walls) preventing erosion <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA									
2) Runoff infiltration and drainage control system effectiveness a) Infiltration zones (detention basins, driplines, gravel armor areas, infiltration trenches, system outlets) functioning properly with little potential for sediment and/or nutrient delivery to SEZ <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Ponding of runoff does not threaten fill slope or foundation integrity, erosion is not evident and no downstream resources are threatened <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA									
3) Effectiveness of hazardous substance control measures a) Mitigation measures of hazardous/toxic substances sufficient with no potential risk to water quality <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA									
Additional Comments	Stable and vegetation progressing - no concerns.								

Form HV2: Permanent BMPs									
UTM Zone	11							ID#	789
Easting	248404	Building/Structure Name	Olympic Ski Trail - Site 1	Survey Date	9/27/2021	Selection Code	S06		
Northing	4314687	Reviewer Name(s)	E Ketchian	Township	13N	Range	18E	Section	36
Date Project Start		Date Project End		Watershed	NV-3	State	NV		
Date BMP Implementation Complete		Date Last BMP Maintenance		Job No.		Storm Depth			
Structure Type	Other	Other (Describe)	Ski trail	Survey Type	Routine				
Plan Title				Plan Date		Plan Revision Date			
Specific concerns associated with construction project and BMP measures designed to achieve resource protection									
NV Watersheds WMRP Monitoring. Water bar and erosion resistance									
Implementation	<div> <input checked="" type="checkbox"/> 1) BMPs are designed to maintain resource protection and meet water quality standards 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs </div> <div> <input checked="" type="checkbox"/> 2) BMPs are constructed according to contract design specifications 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow specifications </div>							Implementation Score:	1
Effectiveness								Effectiveness Score:	X
1) Source area erosion control, protection/stabilization of site, especially erosive areas									
a) Soil protection measures, artificial or vegetative, eliminating erosion by runoff and rain-drop impact				<input type="radio"/> Meets/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
b) Revegetation establishment proceeding as expected, vegetative cover mitigating erosion				<input type="radio"/> Meet/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
c) Cut/fill slope protection (vegetation, erosion control blankets, retention walls) preventing erosion				<input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA					
2) Runoff infiltration and drainage control system effectiveness									
a) Infiltration zones (detention basins, driplines, gravel armor areas, infiltration trenches, system outlets) functioning properly with little potential for sediment and/or nutrient delivery to SEZ				<input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input checked="" type="radio"/> Major Concern <input type="radio"/> NA					
b) Ponding of runoff does not threaten fill slope or foundation integrity, erosion is not evident and no downstream resources are threatened				<input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA					
3) Effectiveness of hazardous substance control measures									
a) Mitigation measures of hazardous/toxic substances sufficient with no potential risk to water quality				<input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA					
Additional Comments	Gully on ski trail and water bar failure.								

Form HV2: Permanent BMPs									
UTM Zone	11							ID#	790
Easting	248404	Building/Structure Name	Olympic Ski Trail - Site 2	Survey Date	9/27/2021	Selection Code	S06		
Northing	4314687	Reviewer Name(s)	E Ketchian	Township	13N	Range	19E	Section	31
Date Project Start		Date Project End		Watershed	NV-3	State	NV		
Date BMP Implementation Complete		Date Last BMP Maintenance		Job No.		Storm Depth			
Structure Type	Other	Other (Describe)	Ski trail	Survey Type	Routine				
Plan Title				Plan Date		Plan Revision Date			
Specific concerns associated with construction project and BMP measures designed to achieve resource protection									
NV Watersheds WMRP Monitoring. Water bar and erosion resistance									
Implementation	<div> <input checked="" type="checkbox"/> 1) BMPs are designed to maintain resource protection and meet water quality standards 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs </div> <div> <input checked="" type="checkbox"/> 2) BMPs are constructed according to contract design specifications 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow specifications </div>							Implementation Score:	1
Effectiveness								Effectiveness Score:	X
1) Source area erosion control, protection/stabilization of site, especially erosive areas									
a) Soil protection measures, artificial or vegetative, eliminating erosion by runoff and rain-drop impact				<input type="radio"/> Meets/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
b) Revegetation establishment proceeding as expected, vegetative cover mitigating erosion				<input type="radio"/> Meet/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
c) Cut/fill slope protection (vegetation, erosion control blankets, retention walls) preventing erosion				<input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA					
2) Runoff infiltration and drainage control system effectiveness									
a) Infiltration zones (detention basins, driplines, gravel armor areas, infiltration trenches, system outlets) functioning properly with little potential for sediment and/or nutrient delivery to SEZ				<input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input checked="" type="radio"/> Major Concern <input type="radio"/> NA					
b) Ponding of runoff does not threaten fill slope or foundation integrity, erosion is not evident and no downstream resources are threatened				<input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA					
3) Effectiveness of hazardous substance control measures									
a) Mitigation measures of hazardous/toxic substances sufficient with no potential risk to water quality				<input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA					
Additional Comments	Rilling on ski trail and waterbar damage.								

Form HV2: Permanent BMPs									
UTM Zone	11							ID#	793
Easting	246118	Building/Structure Name	Upper Shop	Survey Date	10/21/2021	Selection Code	S04		
Northing	4312927	Reviewer Name(s)	Heavenly	Township	12N	Range	18E	Section	1
Date Project Start	8/22/2006	Date Project End	10/15/2010	Watershed		CA-1	State CA		
Date BMP Implementation Complete		Date Last BMP Maintenance		Job No.	00-607-4	Storm Depth			
Structure Type	Maintenance Station	Other (Describe)		Survey Type	Follow-up				
Plan Title	Upper Shop Water Quality and Stream Environment Zone Improvements				Plan Date	04/25/2006	Plan Revision Date	08/31/2006	
Specific concerns associated with construction project and BMP measures designed to achieve resource protection									
Equipment shop adjacent to SEZ. BMPs include: materials storage at shop, housekeeping, drainage ditches, sediment capture in drop inlets and vault, SEZ exclusion and vegetation.									
Implementation	<div> <input type="checkbox"/> 1) BMPs are designed to maintain resource protection and meet water quality standards 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs </div> <div> <input type="checkbox"/> 2) BMPs are constructed according to contract design specifications 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow specifications </div>							Implementation Score:	<input type="text" value="I"/>
Effectiveness								Effectiveness Score:	<input type="text" value="E"/>
1) Source area erosion control, protection/stabilization of site, especially erosive areas									
a) Soil protection measures, artificial or vegetative, eliminating erosion by runoff and rain-drop impact				<input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA					
b) Revegetation establishment proceeding as expected, vegetative cover mitigating erosion				<input checked="" type="radio"/> Meet/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
c) Cut/fill slope protection (vegetation, erosion control blankets, retention walls) preventing erosion				<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
2) Runoff infiltration and drainage control system effectiveness									
a) Infiltration zones (detention basins, driplines, gravel armor areas, infiltration trenches, system outlets) functioning properly with little potential for sediment and/or nutrient delivery to SEZ				<input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input checked="" type="radio"/> Major Concern <input type="radio"/> NA					
b) Ponding of runoff does not threaten fill slope or foundation integrity, erosion is not evident and no downstream resources are threatened				<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
3) Effectiveness of hazardous substance control measures									
a) Mitigation measures of hazardous/toxic substances sufficient with no potential risk to water quality				<input type="radio"/> Meets/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
Additional Comments	Vegetation is well established and no immediate concerns for erosion potential. Ditches have been cleared/cleaned. Drop inlet catch basins and vault need maintenance. Equipment parked/stored outside parking lot area.								

Form HV2: Permanent BMPs									
UTM Zone	11							ID#	792
Easting	249072	Building/Structure Name	East Peak Snowmaking Well - Power	Survey Date	10/21/2021	Selection Code	S03		
Northing	4314387	Reviewer Name(s)	Heavenly	Township	13N	Range	19E	Section	31
Date Project Start		Date Project End		Watershed		NV-2+5	State NV		
Date BMP Implementation Complete		Date Last BMP Maintenance		Job No.		Storm Depth			
Structure Type	Building	Other (Describe)	Power	Survey Type	Follow-up				
Plan Title					Plan Date		Plan Revision Date		
Specific concerns associated with construction project and BMP measures designed to achieve resource protection									
2021 utility connection to Wellhouse. BMPs included trench restoration and soil erosion resistance.									
Implementation	<div> <input type="checkbox"/> 1) BMPs are designed to maintain resource protection and meet water quality standards 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs </div> <div> <input type="checkbox"/> 2) BMPs are constructed according to contract design specifications 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow specifications </div>							Implementation Score:	<input type="text" value="I"/>
Effectiveness								Effectiveness Score:	<input type="text" value="E"/>
1) Source area erosion control, protection/stabilization of site, especially erosive areas									
a) Soil protection measures, artificial or vegetative, eliminating erosion by runoff and rain-drop impact				<input type="radio"/> Meets/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
b) Revegetation establishment proceeding as expected, vegetative cover mitigating erosion				<input type="radio"/> Meet/Exceeds <input checked="" type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
c) Cut/fill slope protection (vegetation, erosion control blankets, retention walls) preventing erosion				<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
2) Runoff infiltration and drainage control system effectiveness									
a) Infiltration zones (detention basins, driplines, gravel armor areas, infiltration trenches, system outlets) functioning properly with little potential for sediment and/or nutrient delivery to SEZ				<input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA					
b) Ponding of runoff does not threaten fill slope or foundation integrity, erosion is not evident and no downstream resources are threatened				<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
3) Effectiveness of hazardous substance control measures									
a) Mitigation measures of hazardous/toxic substances sufficient with no potential risk to water quality				<input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA					
Additional Comments	Vehicle access area with no mulch is large.								

Form HV2: Permanent BMPs										
UTM Zone	11						ID#	791		
Easting	249070	Building/Structure Name	TOG Tank - Power		Survey Date	10/21/2021	Selection Code	S03		
Northing	4314389	Reviewer Name(s)	Heavenly		Township	13N	Range	19E	Section	31
Date Project Start		Date Project End			Watershed	CA-1	State	CA		
Date BMP Implementation Complete		Date Last BMP Maintenance			Job No.		Storm Depth			
Structure Type	Building	Other (Describe)	Power		Survey Type	Follow-up				
Plan Title					Plan Date		Plan Revision Date			
Specific concerns associated with construction project and BMP measures designed to achieve resource protection										
2021 utility connection to TOG Tank. BMPs included trench restoration and soil erosion resistance.										
Implementation	<input checked="" type="checkbox"/> 1) BMPs are designed to maintain resource protection and meet water quality standards 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs <input checked="" type="checkbox"/> 2) BMPs are constructed according to contract design specifications 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow specifications								Implementation Score: <input type="text" value="1"/>	
Effectiveness									Effectiveness Score: <input type="text" value="E"/>	
1) Source area erosion control, protection/stabilization of site, especially erosive areas a) Soil protection measures, artificial or vegetative, eliminating erosion by runoff and rain-drop impact <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Revegetation establishment proceeding as expected, vegetative cover mitigating erosion <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA c) Cut/fill slope protection (vegetation, erosion control blankets, retention walls) preventing erosion <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA										
2) Runoff infiltration and drainage control system effectiveness a) Infiltration zones (detention basins, driplines, gravel armor areas, infiltration trenches, system outlets) functioning properly with little potential for sediment and/or nutrient delivery to SEZ <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA b) Ponding of runoff does not threaten fill slope or foundation integrity, erosion is not evident and no downstream resources are threatened <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA										
3) Effectiveness of hazardous substance control measures a) Mitigation measures of hazardous/toxic substances sufficient with no potential risk to water quality <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA										
Additional Comments	No concerns									

Form HV2: Permanent BMPs										
UTM Zone	11						ID#	795		
Easting	246068	Building/Structure Name	Groove Erosion Resistance		Survey Date	10/21/2021	Selection Code	S03		
Northing	4312663	Reviewer Name(s)	Heavenly		Township	12N	Range	18E	Section	1
Date Project Start		Date Project End	10/21/2021		Watershed	CA-1	State	CA		
Date BMP Implementation Complete	10/21/2021	Date Last BMP Maintenance			Job No.		Storm Depth			
Structure Type	Other	Other (Describe)	Groove Road Shoulder		Survey Type	Routine				
Plan Title	2021 WMRP Project				Plan Date		Plan Revision Date			
Specific concerns associated with construction project and BMP measures designed to achieve resource protection										
Water bars, sediment basins and rock-lined drainage swales along the road from Groove Lift lower terminal to intersection with road to TOT. Erosion resistance treatments applied where road shoulders showed rilling.										
Implementation	<input checked="" type="checkbox"/> 1) BMPs are designed to maintain resource protection and meet water quality standards 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to address BMPs <input checked="" type="checkbox"/> 2) BMPs are constructed according to contract design specifications 1 = Meets/Exceeds 2 = Minor concerns 3 = Major concerns 4 = Failure to follow specifications								Implementation Score: <input type="text" value="1"/>	
Effectiveness									Effectiveness Score: <input type="text" value="E"/>	
1) Source area erosion control, protection/stabilization of site, especially erosive areas a) Soil protection measures, artificial or vegetative, eliminating erosion by runoff and rain-drop impact <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Revegetation establishment proceeding as expected, vegetative cover mitigating erosion <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA c) Cut/fill slope protection (vegetation, erosion control blankets, retention walls) preventing erosion <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA										
2) Runoff infiltration and drainage control system effectiveness a) Infiltration zones (detention basins, driplines, gravel armor areas, infiltration trenches, system outlets) functioning properly with little potential for sediment and/or nutrient delivery to SEZ <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA b) Ponding of runoff does not threaten fill slope or foundation integrity, erosion is not evident and no downstream resources are threatened <input checked="" type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input type="radio"/> NA										
3) Effectiveness of hazardous substance control measures a) Mitigation measures of hazardous/toxic substances sufficient with no potential risk to water quality <input type="radio"/> Meets/Exceeds <input type="radio"/> Minor Concern <input type="radio"/> Major Concern <input checked="" type="radio"/> NA										
Additional Comments	No Concerns									

Heavenly Mountain Resort
Mitigation and Monitoring Plan Annual Report
(October 2020 – September 2021)

APPENDIX



ENVIRONMENTAL MONITORING 5-YEAR
COMPREHENSIVE REPORT HEAVENLY
MOUNTAIN RESORT WYS 2017-2021
(ELECTRONIC COPY ONLY)



January 18, 2022

Mr. Rob Tucker
Senior Water Resource Control Engineer
Lahontan Regional Water Quality Control Board
2501 Lake Tahoe Boulevard
South Lake Tahoe, CA 96150

Re: Heavenly Mountain Resort 2017 through 2021 Environmental Monitoring Program Five Year Comprehensive Report

Dear Mr. Tucker:

Enclosed, please find for your review the Five Year Comprehensive Environmental Monitoring Program Report for the Water Years 2017-2021. This report is submitted in fulfillment of the monitoring and reporting requirements set forth in the California Regional Water Quality Control Board Lahontan Region Monitoring and Reporting Program No. 2015-0021 for Heavenly Ski Resort. This report also fulfills both the fourth quarter sampling and reporting, covering the months of July, August, and September, as well as the 2021 Annual Report. The annual report requirements and their location in the report are listed below:

- Water Quality Monitoring Results (Appendix A)
- Storm Vault Water Quality Monitoring Results (Appendix D)
- Facilities Maintenance Monitoring 4th Quarter of 2021 Water Year (Appendix E)
- Snow Conditioning and Snowmaking Monitoring (Appendix E)
- Deicer and Abrasives Application and Recovery (Appendix E)
- Facilities/Watershed Awareness Training (Appendix E)
- USFS Road Monitoring (Appendix F)

Pursuant to the Monitoring and Reporting Program No. 2015-0021, all BMP monitoring reports are submitted as an appendix to the Mitigation and Monitoring Annual Report in the spring of the following water year (May 1st, 2022). However, a comprehensive review of the past five water years with regards to the BMP program is included in this report as Chapter 4 for completeness. Additional trend analysis and project recommendations are also included in this report.

Should you require additional information or have questions regarding this report and its contents, please contact Chris Donley of Cardno at 208-272-9178.

Sincerely,

DocuSigned by:

4527A03B0D8A496...
Tom Fortune
Vice President & General Manager

Cc: Nicole Bringolf, USDA Forest Service LTBMU
Julie Roll, Tahoe Regional Planning Agency
Anthony D'Angelo, Western Regional Compliance Sr. Manager at Vail Resorts
Blair Davidson, Senior Administrative Assistant at Heavenly

Date: January 18, 2022

California Regional Water Quality Control Board
Lahontan Region
2501 Lake Tahoe Boulevard
South Lake Tahoe, CA 96150

Facility Name: Heavenly Mountain Resort

Address: Post Office Box 2180
Stateline, Nevada 89449

Contact Person: Tom Fortune

Job Title: Vice President & General Manager

Phone: (775) 586-2311

Email: tfortune@vailresorts.com

WDR/NPDES Order Number: R6T-2015-0021

WDID Number: 6A090033000

Type of Report (circle one): Monthly Quarterly Semi-Annual Annual Other

Month(s) (circle applicable month(s)*:

JAN FEB MAR APR MAY JUN
JUL AUG SEP OCT NOV DEC

*Annual Reports (circle the first month of the reporting period)

Year: Water Year 2022

Violation(s)? NO YES* X

(Please check one)

*If YES is marked complete a-g (Attach Additional information as necessary)

a) Brief Description of Violation:

1. Heavenly Valley Creek station 43HVC-1A, Sky Meadows site, has an annual average value exceedance of the Lahontan standards for: Total Phosphorus and Chloride.
2. Heavenly Valley Creek station 43HVC-2, Patsy's site, has an annual average value exceedance of the Lahontan standards for: Total Phosphorus and Chloride.
3. Heavenly Valley Creek station 43HVC-3, Property Line site, has an annual average value exceedance of the Lahontan standards for: Total Phosphorus and Chloride.
4. Bijou Park Creek station 43HVC-4, CA Parking Lot site, has annual average exceedances of the Lahontan standards for: Total Nitrogen, Total Phosphorus, and Chloride.
5. Bijou Park Creek station 43HVC-4, CA Parking Lot site, has 90th percentile annual average exceedances of the Lahontan standards for: Suspended

Sediment.

6. Bijou Park Creek station 43HVC-4, CA Parking Lot site, had six daily exceedances of the Lahontan standards for: Turbidity.
7. California Parking Lot Filter Vault Effluent Point station 43HVP-2, exceeded not to exceed limits of the Lahontan standards in Water Year 2021 during all three storm sampling events. Turbidity and Total Nitrogen standards were exceeded 11/18/20. Turbidity, Total Phosphorus and Total Nitrogen were exceeded on 5/16/21, and Turbidity, Total Phosphorus, Total Nitrogen and Oil and Grease were exceeded on 6/24/21.

b) **Section(s) of WDRs/
NPDES Permit Violated:**

Board Order No. R6T-2015-0021, WDID NO. 6A090033000

c) **Reported Value(s) or
Volume:**

43HVC-1A: (Annual Average)

Total Phosphorus: 0.031 mg/L

Chloride: 0.769 mg/L

43HVC-2: (Annual Average)

Total Phosphorus: 0.028 mg/L

Chloride: 1.48 mg/L

43HVC-3: (Annual Average)

Total Phosphorus: 0.027 mg/L

Chloride: 1.12 mg/L

43BPC-4: (Annual Average)

90th Percentile Suspended Sediment: 81.7 mg/L

Total Nitrogen: 0.572 mg/L

Total Phosphorus: 0.178 mg/L

Chloride: 51.7 mg/L

43BPC-4: (Turbidity Daily Exceedances > 20.0 NTU)

Turbidity (11/19/20): 123.02 NTU

Turbidity (1/13/21): 86.9NTU

Turbidity (2/17/21): 21.1 NTU

Turbidity (4/20/21): 24.0 NTU

Turbidity (5/4/21): 174.0 NTU

Turbidity (9/20/21): 21.6 NTU

43HVP-2: (Results from November 18, 2020)

Turbidity: 150 NTU

Total Nitrogen: 1.0 mg/L

43HVP-2: (Results from May 16, 2021)

Turbidity: 760 NTU

Total Phosphorus: 0.63 mg/L

Total Nitrogen: 3.2 mg/L

43HVP-2: (Results from June 24, 2021)

Turbidity: 150 NTU

Total Phosphorus: 0.27 mg/L

Total Nitrogen: 5.8 mg/L

Oil and Grease: 3.7 mg/L

d) **WDRs/NPDES
Limit/Condition:**

Maximum concentrations not to exceed for discharge to surface waters in the Lake Tahoe Hydrologic Unit (Applies to the Effluent Storm Filter Site 43HVP-2):

Turbidity: 20.0 NTU

Total Nitrogen: 0.5 mg/L

Total Phosphorus: 0.10 mg/L

Oil and Grease: 2.0 mg/L

Effluent limits for surface water runoff in the Lake Tahoe Hydrologic Unit and Additional Receiving Water Limits for Lake Tahoe (Applies to the Bijou Park Creek Site 43BPC-4):

Turbidity: 20 NTU ¹

Total Nitrogen: 0.15 mg/L

Total Phosphorus: 0.008 mg/L

Chloride: 3.0 mg/L

Total Suspended Solids: 60 mg/L ²

Maximum receiving water concentrations for discharge in the Heavenly Valley Creek watershed to Trout Creek (Applies to 43HVC-1A, 43HVC-2, 43HVC-3 and the reference site 43HDVC-5):

Total Nitrogen: 0.19 mg/L

Total Phosphorus: 0.015 mg/L

Chloride: 0.15 mg/L

Total Suspended Solids: 60 mg/L ²

¹The turbidity maximum surface water runoff effluent value is based on the average daily samples collected from a single discharge point for the Lake Tahoe Hydrologic Unit.

²Total Suspended Solids (TSS) value based on Lake Tahoe Basin 90th percentile value.

e) **Date(s) and Duration of
Violation(s):**

Water Year 2021 (October 1, 2020 – September 30, 2021)

f) **Explanation of Cause(s):**

Heavenly Valley Creek – Annual average values for total phosphorus and chloride were exceeded at each of the three sampling locations along Heavenly Valley Creek (43HVC-1A, 43HVC-2, and 43HVC-3). The annual average for total phosphorus and chloride were also exceeded at the reference reach sampling location (43HDVC-5) and it should be noted that no water quality samples were collected beyond July at the reference reach due to the Caldor fire. These reference site annual averages are truly undeveloped watershed conditions. The reference reach annual average for total phosphorus was slightly lower (0.022 mg/L) than the annual averages collected along the Heavenly Valley Creek locations. Similarly, the chloride annual average was exceeded at the reference reach for Water Year 2021 (0.37 mg/L). However, the Hidden Reference site (43HDVC-5) chloride annual average value was a fraction of the chloride exceedances along Heavenly Valley Creek locations. Since the reference reach site exceeded these state annual average standards, Heavenly Mountain Resort operations are not solely responsible for water quality exceedances reported.

Bijou Park Creek – Annual averages for total nitrogen, total phosphorus and chloride exceeded the state standard for the below California Parking Lot sampling site along Bijou Park Creek (43BPC-4). In addition, the 90th percentile suspended sediment annual value was also exceeded. As stated above, total phosphorus and chloride values were also exceeded at the reference site along Hidden Valley Creek (43HDVC-5); however, the annual averages for Bijou Park Creek (43BPC-4) are well above the reference reach exceedance values. For the second time in the past

five years, the 90th percentile suspended sediment was exceeded for Water Year 2021. This also occurred during Water Year 2019. Lastly, six of the sixteen collected daily water samples at Bijou Park Creek exceeded the daily turbidity standard for 20 NTU. This site is located adjacent to Wildwood Avenue and downstream of Heavenly Mountain Resort's California Base Parking Lot and typically experiences the highest loading of all the creek sites.

California Parking Lot Filter Vault Effluent Sampling Location (43HVP-2) -
Turbidity and total nitrogen exceeded the state standards for all three storm samples collected during Water Year 2021. These parameters were in exceedance of the standard at the two inlet locations (43HVP-1A and 43HVP-1B) for all three events as well. The storm runoff into the samples while filtered still did not meet state standards. Total Phosphorus was exceeded for both the May and June storm samples, but not the November sample. Since the November sample occurred at the beginning of the water year shortly after the filters had been replaced (typically in late summer), the new filters did their job; however, after a full winter season and filtration loading, they tend to become inoculated and are less effective at capturing and removing phosphorus. The June sampling event also reported an exceedance for oil and grease at the compliance outlet location. The northern inlet had an oil and grease detection as well, however, the outlet result is higher suggesting that oil and grease is accumulating in the system or that an oil and grease boom placed within the system had failed and released additional sheen. Another possible cause for the oil and grease exceedance could be the fact that there were parking lot pavement/asphalt improvements done over the course of the summer. As rain accumulates and starts to sheet flow across the new pavement, residual oils associated with asphalt would be transported into and through the filter system. Filter and oil boom maintenance and replacement was performed in July 2021 prior to the Caldor Fire and stationing of equipment, supplies, and firefighters during the months of August and September. Samples collected in Water Year 2022 hope to show that fire operations in the parking lot did not adversely affect the filtration system.

g) Corrective Action(s): (Specify actions taken and a schedule for actions to be taken)

For Water Year 2021, Heavenly applied 300 gallons of liquid brine prior to storms in lieu of abrasives. This effort is slightly less than the past season, but brine application is storm dependent and may also be associated with the pandemic (COVID) requiring guest reservations to ski/visit the resort. Since 2017, Heavenly has committed to the application of brine to the parking lot and main entrance roadways accessing the California Lodge/Parking Lot. Continued sampling should show a decrease in water quality constituent loading associated with cinder/salt application as the resort emphasizes the application of liquid brine.

Heavenly continues to inspect, maintain, and implement annual filter replacement as needed for the vault system. At a minimum, all sacrificial filters (14) are replaced annually, and additional filter replacement is determined based on filter media inspections. Filter and vault inspections occurred on July 15th and additional vault clean out occurred on July 30th of Water Year 2021. The filter maintenance logs are included in Appendix E. Additional parking lot improvements included the removal and replacement of 11,600 ft² of degraded and replacement of asphalt in the Upper California Parking Lot and 13,000 ft² in the Lower Parking Lot. Two drop inlets were repaired and the French drain at the toe of slope between the Upper and Lower lots was improved (July CA Maintenance Log – Appendix E).

Unfortunately, mother nature and the Caldor Fire began in August and forced the evacuation of South Lake Tahoe. Fire operations were moved to the California Parking Lot. This included the command center, sleeping quarters, restrooms, and kitchen facilities to shelter and feed the numerous firefighters. The control center and associated management brought unprecedented traffic and travel to and

through the parking lot. Time and future water quality sampling events will tell what toll the additional usage took upon both the parking lot and filtration system.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision following a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my knowledge of the person(s) who manage the system or those directly responsible for data gathering, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

If you have any questions or require additional information, please contact Tom Fortune at the number provided above.

Sincerely,

DocuSigned by:
Signature: Tom Fortune
4527A03B0D8A496...

Name: Tom Fortune

Title: Vice President & General Manager

Environmental Monitoring Program Comprehensive Report

Heavenly Mountain Resort Water
Years 2017–2021

WDID: 6A090033000

January 2022



Photo courtesy of Heavenly Mountain Resort

Contact Information

Cardno
295 Highway 50, Suite 1
P.O. Box 1533
Zephyr Cove, NV 89448
Telephone: 775.588.9069

Chris.Donley@cardno.com
www.cardno.com

Document Information

Prepared for



Heavenly Mountain Resort
224 Kingsbury Grade
P.O. Box 2180,
State Route 27 – Suite 202
Stateline, NV 89449



and



Lahontan Regional Water
Control Board & Lake Tahoe
Basin Management Unit
(USFS)

Project Name

Environmental Monitoring
Program Comprehensive
Report

File Reference

Environmental Monitoring
Program Comprehensive
Report_ie.docx

Job Reference

E321403000

Date

January 2022

© Cardno 2022. Copyright in the whole and every part of this document belongs to Cardno and may not be used, sold, transferred, copied, or reproduced in whole or in part in any manner or form or in or on any media to any person other than by agreement with Cardno.

This document is produced by Cardno solely for the benefit and use by the client in accordance with the terms of the engagement. Cardno does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by any third party on the content of this document.

This Page Intentionally Left Blank

Table of Contents

1	Executive Summary	1-1
2	Introduction and Background	2-1
2.1	Introduction	2-1
2.2	Purpose	2-1
2.3	Scope	2-1
2.4	Location	2-2
2.5	Site Geology	2-3
2.6	Site Hydrology	2-4
2.7	Heavenly Water Quality History	2-4
2.8	Monitoring Program History	2-5
2.9	Significant Projects and Watershed Changes since 2016	2-7
3	Water Quality Monitoring.....	3-1
3.1	Introduction	3-1
3.2	Monitoring Site Locations	3-1
3.3	Methods	3-4
3.4	Data Compilation	3-5
3.5	Monitoring Parameters	3-5
3.5.1	Phosphorus	3-6
3.5.2	Nitrogen	3-6
3.5.3	Chloride	3-6
3.5.4	Turbidity	3-6
3.5.5	Suspended Sediment	3-7
3.5.6	Oil and Grease	3-7
3.5.7	Specific Conductivity	3-7
3.6	Results and Discussion	3-7
3.6.1	Heavenly Valley and Hidden Valley Creek	3-7
3.6.2	Summary of Compliance at the Sky Meadows (43HVC-1A) and Patsy's (43HVC-2) Monitoring Sites	3-19
3.6.3	Bijou Park Creek	3-23
3.6.4	Edgewood Creek.....	3-27
3.6.5	Storm Filter System and Automatic Sampling	3-32
3.7	Conclusions	3-38
3.8	Water Quality Recommendations.....	3-39
3.8.1	Water Quality Sampling	3-39
3.8.2	Applicability of Reference Reach and Monitoring Site	3-40
3.8.3	Heavenly Valley Creek TMDL Designations	3-44
3.8.4	Recent 303(d) Listings	3-44
3.9	Rating Criteria for Water Quality	3-45
4	WMRP and BMP Effectiveness Monitoring.....	4-1
4.1	Introduction	4-1

4.1.1	Evaluation Criteria.....	4-1
4.1.2	Outcome-Based Watershed Management Approach.....	4-2
4.2	Response to Comprehensive Report Recommendations.....	4-3
4.2.1	Planning.....	4-3
4.2.2	Implementation.....	4-3
4.2.3	Effectiveness.....	4-4
4.2.4	Monitoring.....	4-4
4.3	Results and Discussion.....	4-5
4.3.1	Activities.....	4-5
4.3.2	Monitoring Results.....	4-8
4.4	Conclusions and Recommendations.....	4-8
4.4.1	Planning.....	4-8
4.4.2	Implementation.....	4-9
4.4.3	Effectiveness.....	4-9
4.4.4	Monitoring.....	4-9
4.5	Rating Criteria.....	4-10
5	Riparian Condition Monitoring.....	5-1
5.1	Introduction and Monitoring Objectives.....	5-1
5.1.1	Monitoring Schedule.....	5-1
5.2	Monitoring Methods.....	5-2
5.3	Monitoring Locations.....	5-2
5.4	Monitoring Results – Stable Functional Channel.....	5-6
5.5	Monitoring Results – Quality Aquatic Habitat.....	5-7
5.6	Monitoring Results – Benthic Macroinvertebrates.....	5-8
5.6.1	2018 and 2019 Benthic Macroinvertebrate Monitoring Results.....	5-9
5.7	Conclusions.....	5-12
5.7.1	Subjectivity and Variability.....	5-12
5.7.2	Heavenly Valley Creek.....	5-13
5.7.3	Sky Meadows Compared to Upper Hidden Valley Creek.....	5-13
5.7.4	Property Line Reach Compared to Lower Hidden Valley Creek.....	5-14
5.7.5	Patsy's.....	5-14
5.7.6	Edgewood Creek.....	5-15
5.7.7	Daggett Creek.....	5-15
5.8	Trend Analysis.....	5-15
5.9	Recommendations.....	5-17
5.10	Rating Criteria.....	5-18
6	Watershed Condition.....	6-1
7	Deicers/Abrasives Application and Recovery Monitoring.....	7-1
7.1	Background Information.....	7-1
7.2	Application and Monitoring.....	7-1
7.3	Recommendations.....	7-5
8	Snow Conditions/Snowmaking Enhancement Monitoring.....	8-1
8.1	Background Information.....	8-1

8.2	Application and Monitoring	8-1
8.3	Recommendations.....	8-2
9	USFS Roads Monitoring	9-1
10	Facilities Maintenance Monitoring	10-1
11	Facilities Watershed Awareness Training	11-1
12	References.....	12-1

Appendices

Appendix A	Raw Data for Water Quality Constituents: WY 2017–2021
Appendix B	Hydrology Graphs
Appendix C	Streamflow Statistical Information Tables and Graphs
Appendix D	Raw Water Quality Constituents California Filter Vaults, 2017–2021
Appendix E	Water Year 2021, Additional Annual Reporting Information
Appendix F	2021 Annual Roadway Maintenance Mapping & Work Lists
Appendix G	Water Year 2021, 4th Quarter Laboratory Analysis
Appendix H	Stream Condition Inventory (SCI) Riparian Data
Appendix I	Traction Sand Analysis – July 2021
Appendix J	Bijou Park Creek Evaluation Report
Appendix K	Comment Letter to 2018 Integrated CWA Section 303(D) & 305(B) Assessment and Draft Integrated Report

Tables

Table 1-1	Watershed CA-1 Rating Criteria Summary	1-1
Table 1-2	Watershed CA-6A Rating Criteria Summary	1-2
Table 2-1	Heavenly Valley Creek Total Maximum Daily Load Targets	2-6
Table 3-1	Heavenly Mountain Resort Monitoring Program Water Quality Sampling Stations.....	3-2
Table 3-2	Constituent/Parameter Measuring History (2006–2021)	3-5
Table 3-3	Contracted Laboratory Analysis.....	3-6
Table 3-4	Exceedances of State Effluent Standards at Property Line Monitoring Site (43HVC-3) and Reference Reach Site (43HDVC-5), WYs 2006 through 2021.....	3-8
Table 3-5	Suspended Sediment Values for Property Line Monitoring Site (43HVC-3) and the Reference Reach Site (43HDVC-5)	3-11
Table 3-6	Exceedances of State Standards at the Patsy's Monitoring Site (43HVC-2), WYs 2006 through 2021	3-21
Table 3-7	Exceedances of State Standards at Sky Meadows Monitoring Site (43HVC-1A), WYs 2006 through 2021	3-22
Table 3-8	Exceedance of State Standards at the Bijou Park Creek Monitoring Site (43BPC-4), WYs 2012 through 2021	3-27

Table 3-9	Exceedances of State Effluent Standards at the Upper Edgewood Monitoring Site (43HVE-1), WYs 2006 through 2021	3-30
Table 3-10	Exceedances of State Effluent Standards at Lower Edgewood Monitoring Site (43HVE-2), WYs 2006 through 2021	3-31
Table 3-11	Exceedances of Standards at the Storm Vault Effluent Location (43HVP-2), WYs 2017 through 2021	3-36
Table 3-12	Comparison of 5-Year Reporting Averages from the Storm Vault Effluent Location (43HVP-2).....	3-37
Table 4-1	Summary of the Annual Work List Activities during the 5-Year Monitoring Period.....	4-6
Table 4-2	Five-Year Evaluation Results (2015 WDR Evaluation Criteria)	4-8
Table 5-1	Thresholds Applicable to Eastern Sierra IBI	5-9
Table 5-2	Thresholds used to Define Condition Classes for the CSCI	5-10
Table 5-3	Bioassessment Scores for Sampling Events at Five Stream Locations near Heavenly (2006–2019) ¹	5-10
Table 5-4	Stream Condition Inventory Monitoring Metric Trend Analysis Summary	5-16
Table 5-5	Stream Condition Rating	5-19
Table 6-1	Watershed CA-1 Rating Criteria Summary	6-1
Table 6-2	Watershed CA-6A Rating Criteria Summary	6-2
Table 7-1	Deicer Application and Recovery 5-Year Totals	7-2
Table 7-2	Abrasive Results (July 2021) ¹	7-4
Table 7-3	Gradation Results ¹	7-4
Table 8-1	Annual Huck Salt Application Records (2011–2021)	8-2

Figures

Figure 2-1	Location of Heavenly Mountain Resort (Source: Parsons Harland Bartholomew and Associates, Inc. 2007).....	2-3
Figure 3-1	Approximate Locations of Water Quality Sampling Sites	3-3
Figure 3-2	Comparison of Sediment Loading (1991 to 2021)	3-13
Figure 3-3	Heavenly Creek Sediment Loading at the Property Line Monitoring Site (43HVC-3) from 1991 to 2021	3-14
Figure 3-4	Comparison of Annual Averages of TSS between the Property Line Monitoring Site and Reference Reach Site.....	3-15
Figure 3-5	Comparison of Annual Averages of Total Phosphorus between the Property Line Monitoring Site and the Reference Reach Site.....	3-16
Figure 3-6	Comparison of Annual Averages of Total Nitrogen between the Property Line Monitoring Site and the Reference Reach Site.....	3-17
Figure 3-7	Comparison of Annual Averages of Chloride between the Property Line Monitoring Site and the Reference Reach Site.....	3-18
Figure 3-8	Comparisons of Annual Averages of Turbidity between the Property Line Monitoring Site and the Reference Reach Site.....	3-18

Figure 3-9	California Base Parking Lot Storm Filter Water Quality Treatment System (Source: RCI 1/21/08)	3-33
Figure 3-10	Hidden Valley Creek Reference Reach Site (43HDVC-5) in July 2021 (Pre-Fire), Looking Upstream from Right Bank	3-41
Figure 3-13	Hidden Valley Creek Reference Reach Site (43HDVC-5) in November 2021 (Post-Fire), Looking Upstream from Left Bank	3-43
Figure 5-1	SCI Monitoring Sites in California Established in 2001	5-4
Figure 5-2	SCI Monitoring Sites in Nevada Established in 2006	5-5
Figure 5-3	BMI ESIBI Scores for 2006–2019 by Sampling Site	5-11
Figure 5-4	BMI CSCI Scores for 2006–2019 by Sampling Site	5-12
Figure 7-1	Smaller Deicer Application Truck	7-3
Figure 7-2	Dump Truck Deicer Vehicle	7-3

Acronyms

BMI	Benthic Macroinvertebrate
BMPs	Best Management Practices
CalTrans	California Department of Transportation
CEDEN	California Environmental Data Exchange Network
CERP	Construction Erosion Reduction Program
cfs	cubic feet per second
CSCI	California Stream Condition Inventory
CSLT	City of South Lake Tahoe
CWE	Cumulative Watershed Effects
cm	centimeter
EIR/EIS	Environmental Impact Report / Environmental Impact Statement
EIR/EIS	Environmental Impact Report / Environmental Impact Statement / Environmental Impact Statement
EMP	Environmental Monitoring Program
GPS	global positioning system
Heavenly	Heavenly Mountain Resort
IBI	Index of Biological Integrity
Lahontan	Lahontan Regional Water Quality Control Board (of the state of California)
LTBMU	Lake Tahoe Basin Management Unit (USDA Forest Service)
LWD	large woody debris
m	meter
mg/L	milligrams/lite
mmm	millimeter

MMP	Mitigation and Monitoring Plan
MRP	Monitoring and Reporting Program
ND	Non Detect
NTU	Nephelometric Turbidity Units
RCI	Resource Concepts, Inc.
RIVPACS	River Invertebrate Prediction and Classification System
SCI	Stream Condition Inventory
SEZ	Stream Environment Zones
SNOTEL	Snow Telemetry
SWAMP	Surface Water Ambient Monitoring Program
TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Load
TRPA	Tahoe Regional Planning Agency
TSS	Total Suspended Sediment
USFS	United States Forest Service
WDID	Waste Discharger Identification
WDR	Waste Discharge Requirement
WET Lab	Western Environmental Testing Laboratory
WMPR	Watershed Maintenance and Restoration Program
WY	Water Year

1 Executive Summary

This report is organized into three levels of detail enabling the reader to choose between a broad summary and specific areas of focus. The executive summary is a first tier, providing an overview of Heavenly Mountain Resort's (Heavenly's) watershed rating over a 5-year period (2017–2021). This tier consists of Tables 1-1 and 1-2, which provide a quick overview and summary of the rating criteria established in the Waste Discharge Requirements (WDRs) for Heavenly. The summary tables also provide a roadmap to the more detailed discussion in the report.

The second tier is the body of the Environmental Monitoring Program (EMP) Comprehensive Report (2017–2021), which contains a moderate level of detail in describing the watershed conditions and trend analysis for water quality, stream condition, and best management practice (BMP) effectiveness and the Watershed Maintenance and Restoration Program (WMRP). Additional trend analysis is discussed as are conclusions and recommendations moving forward. The body of the report also directs readers to the appendices, where the greatest level of detail is provided.

The third tier, the most detailed tier, includes the appendices at the end of the comprehensive report. The appendices contain monitoring data, graphs, statistics, as well as other annual report requirements outlined in the WDR Monitoring and Reporting Program (MRP). Discussion in the report builds upon the data supplied in the appendices.

The following tables (1-1 and 1-2) summarize the overall ratings and findings detailed in the body of this report for both Watershed CA-1 (Heavenly Valley Creek) and Watershed CA-6A (Bijou Park Creek). These tables and additional discussion can be found in Chapter 6 of this report.

Table 1-1 Watershed CA-1 Rating Criteria Summary

Watershed CA-1	Watershed Condition	Rating Criteria
Heavenly Valley Creek	Water Quality	<i>Fair</i> for Heavenly Valley Creek
Heavenly Valley Creek	Stream Condition	<i>Good</i> for 2 of the 3 reaches along Heavenly Valley Creek
Watershed CA-1	BMP Effectiveness	<i>Excellent</i> for the entire resort including Watershed CA-1
Watershed CA-1	Watershed Maintenance & Restoration Program	<i>Excellent</i> – most master plan projects are located in Watershed CA-1
Overall Rating		<i>Stable</i> – conditions have not improved substantially but have not deteriorated either.

Table 1-2 Watershed CA-6A Rating Criteria Summary

Reaches within Watershed CA-6A	Watershed Condition	Rating Criteria
Bijou Park Creek and Storm Vault Effluent monitoring site	Water Quality	<i>Fair</i> for Bijou Park Creek and vault storm samples
Bijou Park Creek and California Base Parking Lot	Stream Condition	“N/A” – Stream Condition Inventory monitoring not required along Bijou Park Creek at this time
Watershed CA-6A	BMP Effectiveness	<i>Excellent</i> for the entire resort including Watershed CA-6A
Watershed CA-6A	Watershed Maintenance & Restoration Program	“N/A” – no master plan projects are located in Watershed CA-6 (mostly maintenance-related projects)
Overall Rating		<i>Stable</i> – not all metrics are measured in this watershed

The overall rating for the Heavenly Valley Creek Watershed CA-1 is considered *stable*, seeing as how water quality and stream condition results have shown neither improvement nor degradation over the past years. Likewise, the rating for the Bijou Park Creek Watershed CA-6A is considered *stable*; however, not all metrics are measured or scored in this watershed. Water quality is the driver for Bijou Park Creek, and water quality concentrations for some parameters are decreasing.

Recommendations regarding improvements to the MRP as well as the WDR are detailed within the body of the report. For simplicity these recommendations are summarized below:

1. Although the Hidden Valley Creek reference reach site (43HDVC-5) was affected by the Caldor Fire, we recommend retaining this sampling location and note its recovery to proper functioning condition post-fire.
2. Water quality monitoring results continue to be formatted and uploaded to the California Environmental Data Exchange Network (CEDEN) database so that future decisions regarding impaired waterbodies under Section 303(d) of the Clean Water Act can be informed by these data. When completed, water quality data will span from water year 2010, providing 12 years' worth of results.
3. Heavenly has consistently met the rolling 5-year average for total suspended sediment (TSS) Total Maximum Daily Load (TMDL) at the Property Line monitoring site (43HVC-3) since 2005. The Lahontan Regional Water Quality Control Board (Lahontan) should consider delisting this constituent from the 303(d) list for this waterbody.
4. Additional recommendations for improving the StormFilter treatment vault and thus effluent water quality results were outlined in the *Bijou Park Creek Evaluation Report* (Tormey 2017, Appendix J of this report) and are summarized in Chapter 3.6.5. Heavenly should work with Lahontan to establish a new sampling station along Bijou Park Creek that would act as a reference and provide background data for water quality results. Additional vault improvements are detailed as well, in hopes of further aiding in filtration and improved water quality.
5. We recommend continuing adaptive management practices with regard to stream condition monitoring, water quality monitoring, and BMP effectiveness and WMRP monitoring and reporting. Proactive solutions for each of these monitoring matrix items improve data collection and therefore reporting. For example, as technology advances, finding applicable means and incorporating them improves data collection, saving time and money in terms of labor, compilation, and reporting.

2 Introduction and Background

2.1 Introduction

This comprehensive report presents and interprets 5 years of environmental monitoring data at Heavenly Mountain Resort (Heavenly) from 2017 through 2021. The US Forest Service (USFS) Lake Tahoe Basin Management Unit (LTBMU) prepared a comprehensive report covering data from 1991 to 2003; Cardno (formerly ENTRIX, Inc. and Cardno ENTRIX) prepared the 2001 to 2005 comprehensive report in 2006, the 2006 to 2011 comprehensive report in 2012, and the 2012 to 2016 comprehensive report in 2017. The purpose of the comprehensive report is to evaluate long-term trends and make recommendations for modifications to the monitoring program as indicated by the review. This report is composed of five trend analysis chapters: water quality monitoring, Watershed Maintenance and Restoration Program (WMRP) implementation, best management practices (BMPs) effectiveness monitoring, riparian condition monitoring, and overall watershed health. Additional chapters in this report cover annual Lahontan Regional Water Quality Control Board (Lahontan) reporting requirements for water year (WY) 2021.

2.2 Purpose

The primary purpose of this report is to present trend analysis, with respect to watershed health, as measured through data collected in WYs 2017 through 2021 at Heavenly and as defined by the Lahontan Board Order Waste Discharge Requirements (WDRs). If indicated by the trend analysis or by observations and measurements during this 5-year period, make recommendations to improve the effectiveness of the monitoring to meet the monitoring objectives.

2.3 Scope

Heavenly's first comprehensive report in 2003 covered a time period of 13 years (1991 through 2003). In accordance with the 2003 Lahontan Board Order, future comprehensive reports encompass 5 years of data to tie to the Lahontan Board's NPDES review cycle more closely. The 2006 comprehensive report covered WYs 2001 through 2005; the analyzed data overlapped the 2003 report. No new information was gathered on effective soil cover or riparian condition during this time interval, and the focus was limited to water quality, taking into consideration results dating back to 1991, which included the first 9 years of implementation of the monitoring program under the EIS and subsequent master plan. Pursuant to the amended monitoring and reporting program, the following comprehensive report covered the time frame of 2006 to 2011, covering a 6-year span due to the timing of the amended monitoring and reporting program. The most recent comprehensive report, submitted in 2017, covered WYs 2012 to 2016 and adhered to the Lahontan Board Order WDRs (Board Order R6T-2015-0021, Waste Discharge Identification [WDID] 6A090033000) signed in May 2015. Comprehensive reports are now submitted on a 5-year cycle.

The monitoring program was originally developed and implemented by the USFS as part of the Heavenly Ski Resort Master Plan Environmental Impact Statement (Parsons Harland Bartholomew and Associates, Inc. 1996) and later incorporated into the Heavenly Ski Resort Master Plan as Chapter 7 (Parsons Harland Bartholomew and Associates, Inc. 1996). In 2003, the Lahontan issued a Revised Board Order and a revised monitoring plan. In 2005, monitoring and reporting duties were transferred to ENTRIX, Inc. by Heavenly. The 2007 amendment to the Heavenly Ski Resort Master Plan, approved by the Tahoe Regional Planning Agency (TRPA) on April 25, 2007, went into effect and was implemented by Heavenly in collaboration with Lahontan, the USFS, and TRPA. Modifications resulting from the master plan amendment included incorporating data from all mitigation monitoring into a single report that is to be submitted annually in May to the TRPA, USFS, and Lahontan. The mitigation monitoring report schedule and submittal are ongoing and occur annually.

Due to proposed on-mountain expansion plans, a joint Environmental Impact Report/Environmental Impact Statement/Environmental Impact Statement (Final EIR [CEQA] and EIS [TRPA/NEPA]) was developed and approved in the spring of 2015 (Hauge Brueck Associates 2015). This document followed the formats of the Heavenly Ski Resort Master Plan EIR/EIS/EIS (Parsons Harland Bartholomew and Associates, Inc. 1996) and 2007 Heavenly Mountain Resort Master Plan Amendment (Parsons Harland Bartholomew and Associates, Inc. 2007), and where appropriate the new master plan was updated and refined.

The requirements of the annual and comprehensive water quality and BMPs monitoring reports remained the same following approval of the master plan amendment. As the California Environmental Quality Act lead agency, Lahontan is responsible for ensuring all mitigation measures are implemented in accordance with the monitoring program; additionally, “the Water Board recognizes that another agency (USFS or TRPA) has responsibilities for ensuring implementation” for monitoring mitigation measures outside of Lahontan’s authority (Lahontan 2015a:16–17). The annual BMP monitoring report is submitted with the annual mitigation and monitoring report due on May 1 of the following year; however, the 5-year comprehensive review of BMP effectiveness is included in this report.

The master plan represents a comprehensive 20-year development plan for Heavenly. Master plan and master plan amendment implementation objectives of Heavenly, TRPA, and the USFS regarding protection of the environment include (Parsons Harland Bartholomew and Associates, Inc. 2007):

- Making optimal use of the natural attributes of the site without creating a substantial impact on the environment (Heavenly);
- Restoring the health of sub-watersheds and other natural resource values disturbed by past activities (Heavenly);
- Protecting the environmental quality of the area (USFS);
- Providing a quality ski experience within the resort with ski runs and other disturbed areas stabilized to reduce the potential for soil erosion (USFS);
- Improving the visual quality of the area (USFS); and
- Providing for long-term preservation and restoration of stream environment zones (SEZs) (TRPA).

Implementation of the Collection/Monitoring Agreement between Heavenly and the USFS under the monitoring program will provide data sufficient to determine compliance with agency water quality standards and validate the efficiency of BMPs in protecting against adverse cumulative watershed effects.

2.4 Location

Heavenly lies in the southeastern corner of the Lake Tahoe Basin, on the east slope of the central Sierra Nevada in the Carson Range. Encompassing about 10,530 acres (4,800 skiable acres) in California and Nevada, the resort is one of the largest in the area operated on USFS lands. For the 2022 ski season, Heavenly has 28 ski lifts (including gondola and tram) and 122 ski trails. As of 2021, this equated to approximately 720 acres of named trails, 650 lift acres, a number of on-mountain lodge facilities, and approximately 30 miles of summer maintenance roads within the resort boundary (Figure 1-1).

The California/Nevada state line divides the USFS special use permit boundary, with approximately 60 percent of the ski area in Nevada and 40 percent in California. Approximately 60 percent of Heavenly lies within the jurisdiction of the TRPA within the Lake Tahoe Basin (Parsons Harland Bartholomew and Associates, Inc. 1996).

Heavenly has been a special-use permittee of the USFS since 1955. In 2002, Heavenly was acquired by Vail Resorts, Inc.

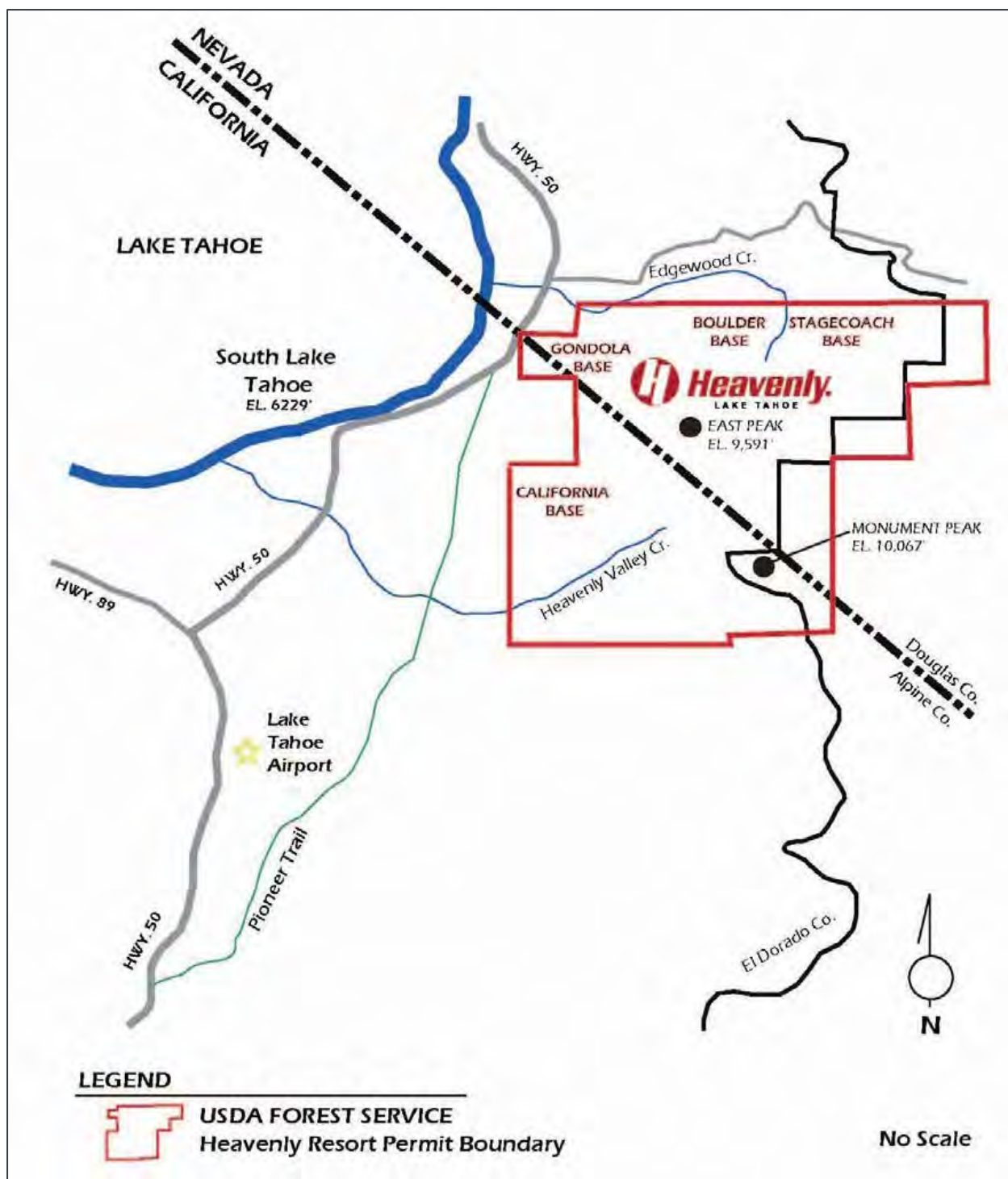


Figure 2-1 Location of Heavenly Mountain Resort (Source: Parsons Harland Bartholomew and Associates, Inc. 2007)

2.5 Site Geology

The section of the Carson Range in which Heavenly is situated is formed from a granitic batholith. Soils are derived from deposits of decomposed granite rock including quartz, monzonite, and granodiorite. The granitic rock at Heavenly ranges from rock outcrops to decomposed granitic grus. Grus is crumbled

granite that forms by physical weathering, specifically the hot-and-cold cycling of daily temperatures. Grus typically produces coarse-textured soil. Coarse-textured soils are highly permeable, have surface layers that do not absorb water readily, and are easily eroded. The decomposed materials leave residual soils on slopes and form colluvial soils from eroded materials farther downslope.

Much of the steep terrain has a thin layer of young soils that occur on actively eroding slopes. If these soils are disturbed, runoff is rapid and erosion hazard is high. Rocky outcrop areas have rapid runoff but only a slight erosion hazard. Small areas of recently formed alluvium, adjacent to streams and meadows on level to gently sloping slopes, support riparian vegetation and have a seasonal high-water table at a depth of 12 to 24 inches. Springs are commonly found near the base of steep granitic slopes in locations such as Heavenly's California Base area.

2.6 Site Hydrology

Heavenly Valley Creek is a tributary to Trout Creek, which is a tributary to the Upper Truckee River. The Heavenly Valley Creek watershed is designated as CA-1. Within the USFS permit boundary, the watershed is approximately 64,750 square miles, with approximately 3,450 feet of vertical relief. Many of the upper ski runs, lifts, and facilities on the California side of the ski resort are within the upper watershed of Heavenly Valley Creek. Heavenly Valley Creek is generally a perennial stream with peak flows from May to July. At lower elevations the stream has run dry in drought years.

The highest point in the Heavenly Valley Creek watershed is Monument Peak at 10,053 feet. The watershed contains Sky Meadows, which is approximately 8,600 feet in elevation. Below Sky Meadows, Heavenly Valley Creek flows into a 22 to 28 acre-feet capacity reservoir (Sky Meadow Reservoir) used for snowmaking and irrigation storage. Approximately 1,300 feet below the reservoir dam (California Dam), tributaries join the mainstream. Heavenly Valley Creek flows southwest for approximately 1,200 feet before exiting the developed portion of the ski resort at approximately 7,900 feet in elevation. Heavenly Valley Creek drops another 1,300 feet in the next 1.5 miles before exiting the USFS permit area and Heavenly property line at an approximate 6,600-foot elevation.

Several smaller watersheds are also contained within the California side of Heavenly. The CA-6 watershed is 412 acres and includes steep ski slopes (the Face), the California Base area, Wildwood-Keller Creek, and Bijou Park Creek. Development of the California Base area involved more than 10 acres of cut and fill to create the California Base Lodge, maintenance facilities, and parking lots. Bijou Park Creek surfaces northwest of the California Base area and drains into Lake Tahoe at the Ski Run Marina.

The CA-4 watershed is approximately 136 acres and contains one access road and Bijou Creek. Bijou Creek drains into Lake Tahoe approximately 2,000 feet west of Bijou Park Creek.

The CA-7 watershed, a portion of which is in Nevada, is approximately 284 acres and drains into the area below the gondola. It discharges into the casino core area on the Nevada side of the state line. Nearly all of the 370 acres of California land draining toward the West Fork Carson River in Nevada is in the Mott Canyon watershed (NV-1), while a few acres drain into the South Fork Daggett Creek watershed (NV-2+5).

In order to effectively monitor the entire Heavenly project area, water quality sampling occurs in Heavenly Valley Creek, Bijou Park Creek, and Edgewood Creek.

2.7 Heavenly Water Quality History

Lake Tahoe was designated as an "Outstanding National Resource Water" in the 1980s by the US Environmental Protection Agency. This designation affords strict water quality objectives for the lake and its tributaries, including those originating from Heavenly. Consequently, maintaining water quality at the resort is a high priority and has been the focus of restoration and monitoring programs. Early analysis of

water quality data collected at Heavenly Valley Creek indicated total suspended sediment (TSS) and nutrient concentrations were affected by ski resort development; however, specific causes were not identified.

Many older run surfaces were created by the preferred method of bulldozing a swathe down steep hillsides, resulting in removal of all vegetation, rocks, and woody debris and often loss of the shallow topsoil. Roads were built to install lifts, thereby interrupting drainage patterns with bare, compacted surfaces. The loss of soil cover and alteration of the topography caused accelerated erosion throughout the resort, although the relative contribution from individual sources, including those not attributable to the resort, was not identified through water quality monitoring. Similarly, beneficial effects of revegetation and other mitigation projects prior to 1991 could not be detected using the monitoring data of the time.

Heavenly's planning process was guided by a steering committee comprising members from Heavenly, the USFS, the TRPA, El Dorado County (California), the City of South Lake Tahoe (California), and Douglas County (Nevada). The steering committee agreed that quantitative data were needed to numerically judge the ecosystem health at Heavenly. The need for compliance with state standards and the ease of obtaining water samples have been the primary reasons for emphasis on measuring water quality. The USFS was tasked with preparing a watershed monitoring program that would track the progress of past and future restoration and mitigation, as well as that of new development.

2.8 Monitoring Program History

Heavenly has been subject to water quality regulation by Lahontan since 1970. The original monitoring program was developed by the USFS as part of the Heavenly Master Plan Draft Environmental Impact Statement in 1996, prepared pursuant to the TRPA Code of Ordinances. It was later incorporated into the Heavenly Ski Resort Master Plan as Chapter 7 of that document. The master plan allows annual reviews and permits the Collection and Monitoring Agreement to be updated as necessary.

The monitoring program was revised in 2003 in Lahontan Board Order R6T-2003-0032. The 2003 revisions were to acknowledge new facilities, uses, and the Total Maximum Daily Load (TMDL) Program for Heavenly Valley Creek. The master plan amendment was approved on April 25, 2007; the amended master plan built on the original master plan and was updated with future on-mountain improvements proposed by the new owners (Vail Resorts, Inc.).

The monitoring program was revised again in May of 2011 by Lahontan (Program Number 2003-0032A1, WDID number 6A090033000) to incorporate monitoring of the newly installed filter vaults in the California Base Parking Lot. In 2015, a joint EIR/EIS/EIS was completed, addressing environmental concerns with newly proposed on-mountain improvements. This document also updated the 2007 master plan amendment. To be consistent with the revised master plan and EIR/EIS/EIS, Lahontan incorporated these changes into a new WDR permit (Board Order R6T-2015-0021, WDID 6A090033000). The new WDRs govern this report and employ the updated TMDL targets included in Table 2-1.

Table 2-1 Heavenly Valley Creek Total Maximum Daily Load Targets

Parameter	Heavenly Valley Creek TMDL Target
Instream sediment load	Maximum of 58 tons/year as a 5-year rolling average, as measured at the HVC-3 monitoring location
Stream condition index	Rating of <i>Good</i> or better
Benthic macroinvertebrate health	Improving trends in community metrics with stable conditions comparable to Hidden Valley Creek (reference reach)
BMP effectiveness	Rating of <i>Good</i> or better
Watershed Maintenance and Restoration Program	Rating of <i>Good</i> or better

Much of the information collected prior to 1991 provides a generalized baseline for understanding physical, chemical, and biological impacts of ski area development on ecosystem resources, against which future management activities may be measured. The monitoring program combines as many physical, chemical, and biological parameters as feasible to gain a comprehensive view of watershed processes. Soil cover, BMPs, and riparian conditions are three areas impacting water quality at Heavenly that were selected for additional monitoring. Each of these areas affects others; a comprehensive condition and trend analysis in 2003 attempted to tie all of the individual parts together to show interactions and opportunities for adaptive management.

In 2003, the first comprehensive report was completed by the USFS and included data from 1991 through 2003. In general, the 2003 report determined most of Heavenly's watersheds to be in good condition and improved from the before-treatment period. The 2003 report did not provide statistical analysis due to an insufficient number of WYs to represent the after-treatment period. Specifically, the before-treatment period was generally high flow (wet years), while the after-treatment period had generally low flow conditions (dry years). WY 2005 represented the first wet year since many of the watershed treatments and was comparable to conditions in the pre-treatment period. That report focused on a more in-depth analysis of before- and after-treatment WYs.

Recommendations from this comprehensive report resulted in a shift away from ground- and aerial-truthing of vegetation establishment (i.e., effective soil cover); additionally, water quality monitoring results at the Sky Meadows monitoring site (43HVC-1A) showed improvement that resulted in temporarily suspending additional sampling at this location. Benthic macroinvertebrate (BMI) sampling associated with the EIR/EIS/EIS document and revisions to the waste discharge Monitoring and Reporting Program (MRP) No. 2015-0021 reinstated the requirement for water quality monitoring at Sky Meadows. Water quality sampling began in the fourth quarter of WY 2015, after nearly 9 years. Similarly, the 2006 to 2011 and 2012 to 2016 comprehensive reports revisited cumulative watershed health over the next years of data collection. Recommendations from these reports have included monthly monitoring of deicer and on-mountain salt application to help improve data collection and long-term reporting.

This comprehensive report is focused on the period after treatment covering WYs 2017 through 2021. It focuses on water quality monitoring and data reporting, watershed maintenance and restoration, BMP effectiveness, riparian condition, and watershed health as governed by the WDRs. Additionally, deicers and abrasives application/recovery monitoring, snow conditioning and snowmaking enhancement monitoring, USFS roads monitoring, facilities maintenance monitoring, and awareness training are described in this report to meet the requirements of the annual report. Each of these topics is discussed to support adaptive management decisions.

2.9 Significant Projects and Watershed Changes since 2016

Annual reports document master plan projects and completions in detail; however, these projects and natural disasters are summarized below for completeness and to provide context to the 5-year analysis. These specific projects either required Clean Water Act Section 404 permitting (i.e., working within a waterway or SEZ), or in case of the wildfire will likely alter monitoring results moving forward.

- Galaxy Chair Replacement (2017–2018)

The Galaxy Chair Replacement project required new foundations for chairlift tower supports that were placed within the SEZ and Daggett Creek drainage. While extreme care was taken regarding construction techniques, dewatering, and BMP placement, some changes in stream condition inventory (SCI) monitoring results at XS-1 were observed.

- Upper Edgewood Watershed Prescribed Burn (September 2019)

A prescribed burn was conducted in a portion of the Upper Edgewood Creek watershed by Tahoe Douglas Fire Protection District in September 2019. The prescribed fire was conducted on lands outside of the Heavenly boundary, but on lands directly above the Upper Edgewood monitoring site (43HVE-1). The prescribed fire is correlated with poor water quality samples collected on September 18, 2019, and exceedances of Nevada Division of Environmental Protection state standards when active burning was observed. For example, TSS spiked from 16 milligrams per liter (mg/L) in August 2019 to 844 mg/L in September 2019 (5,275 percent increase). These single value exceedances were the primary driver for annual average exceedances at the Upper Edgewood monitoring site (43HVE-1) in 2019. It is possible that the prescribed fire continued to affect water quality results following September 2019.

- California Dam Sediment Removal (2020)

The California Dam and impounded reservoir had lost capacity (acre-feet of water) over the years due to sediment deposition over time. Located directly downstream from the Sky Meadows water quality monitoring site and SCI monitoring reach (43HVC-1A and HVC-1) and upstream of the Patsy's water quality monitoring site and SCI monitoring reach (43HVC-2 and HVC-2), the reservoir was dewatered and dredged in late summer 2020. Construction techniques and BMPs were implemented so that Heavenly Valley Creek was minimally impacted. Sedimentation within the reservoir decreases the reservoir's capacity and could potentially be causing backwatering within the Sky Meadows monitoring reach.

- Caldor Fire (August 2021)

The Caldor Fire started on August 14, 2021, and burned west of Lake Tahoe. The rapid ascent of the fire along both Highways 50 and 89 caused evacuations in the Lake Tahoe Basin, forest closures, and smoky conditions. The fire reached Echo Summit and entered the Lake Tahoe Basin on August 30, 2021. Ultimately, firefighters were able to stop the fire's progression; however, the fire did burn through the Hidden Valley Creek watershed, including the reference site and reach for water quality monitoring and SCI monitoring (43HDVC-5 and HDVC-2).

Because of the fire, no water quality samples or monitoring were performed during the month of August 2021. The active fire funneled smoke into the basin, causing unhealthy air quality. Particulate matter (PM_{2.5}), defined as "fine inhalable particles, with diameters that are generally 2.5 micrometers and smaller" (US Environmental Protection Agency 2021), was reflected in an air quality index reading of more than 200 for an extended period leading up to the fire reaching the basin and while the fire was burning in the basin, indicating generally poor air quality and suspended particulate matter throughout the basin. This fine material as well as visible ash fell from the sky. Additionally, samples were not collected at the Property Line monitoring site (43HVC-3) or the reference reach site (43HDVC-5) in September 2021 due to forest closures

associated with unsafe conditions post-fire. It should also be noted that the fire boundary encompassed the reference reach site (43HDVC-5) and much of the reach. Firefighting operations were active at/near the stream sampling site. The Upper Hidden Valley Creek SCI monitoring reach (HDVC-1) appears to have been unaffected based on fire extent mapping, but the site has yet to be visually verified due to forest closures in the fall of 2021. Since the fire occurred late in the WY (quarter four) at baseflow conditions, the long-term impacts of the fire and fire suppression operations remain to be seen. The reference reach is likely to exhibit alterations associated with the fire that Heavenly Valley Creek did not experience. In addition, the California Base Parking Lot at Heavenly was used as the operations base (e.g. for logistics, planning, staging, and housing and feeding of fire crews) that increased traffic and usage to the parking lot. Off road vehicles used in fire operations were likely transporting additional fine sediment on-site and it should be noted that the fire and firefighting operations occurred after routine annual maintenance of the filters and vaults.

3 Water Quality Monitoring

3.1 Introduction

The main compounds of concern originate as non-point sources of sediment and dissolved solids, chloride, and nitrogen and phosphorus. Nitrogen and phosphorus compounds are considered nutrients because they promote primary production. Natural sources of these compounds include erosion and breakdown of soils that may contain large quantities of nutrients. Anthropogenic sources include increased erosion from recreation and construction, development, and atmospheric deposition (Sparks 2003). When analyzing nutrient impacts to ground and surface waters, many interactions must be considered, including land use and management practices, geology, topography, soils, climate, and atmospheric inputs.

Several agencies enforce regulations developed to protect the water quality of Lake Tahoe. They include the TRPA, Lahontan, and the Nevada Division of Environmental Protection. The current standards with which water quality must comply are contained in Lahontan Program No. R6T-2015-0021 (updated in 2015), TRPA's 208 Water Quality Management Plan, and *Standards for Truckee Region: Edgewood Creek at Palisades Drive* as listed by the Nevada Division of Environmental Protection. Lahontan has established a TMDL for TSS to protect the clarity of Lake Tahoe. Data are reported to Lahontan on a quarterly and annual basis. Comprehensive analysis is completed on a 5-year cycle (2017–2021 for this report).

3.2 Monitoring Site Locations

Sky Meadows (43HVC-1A), Patsy's (43HVC-2), and Property Line (43HVC-3) water quality monitoring sites are all located at various points along Heavenly Valley Creek in California (CA-1). The Hidden Valley Creek monitoring site (43HDVC-5), which is unaffected by resort operations, serves as the reference reach site for samples collected from Heavenly Valley Creek. The Bijou Park Creek monitoring site (43BPC-4) is located down-gradient from the California Base Parking Lot near an outlet pipe and stream origination. The three vault sampling locations are located near the northwestern corner of the lower parking lot at the California Base Lodge. The northernmost influent site, Storm Vault Influent North (43HVP-1A), collects runoff water from the lower parking lot and tram area. The southernmost influent site, Storm Vault Influent South (43HVP-1B), collects runoff from the upper parking lot (adjacent to the California Base Lodge), while the Storm Vault Effluent monitoring site (43HVP-2) lies west between the two influent sites. Upper Edgewood (43HVE-1) and Lower Edgewood (43HVE-2) are both located on Edgewood Creek. The Edgewood Creek sites are located in Nevada and are not under Lahontan jurisdiction. However, they are included in this report for completeness. The sampling station identification number and sampling rationale are presented in Table 3-1, which includes the required filter vault sampling stations. Figure 3-1 shows the monitoring sites and their respective watershed boundaries.

Table 3-1 Heavenly Mountain Resort Monitoring Program Water Quality Sampling Stations

Sampling Station ID	Sampling Station Description	Sampling Station Name¹	Rationale
43HVC-1A	Heavenly Valley Creek at Sky Meadows, above Snowmaking Pond	Sky Meadows	Characterized water quality in Heavenly Valley Creek drainage from the developed ski area
43HVC-2	Heavenly Valley Creek below Patsy's and Groove Chairlifts	Patsy's	Characterized water quality in Heavenly Valley Creek drainage from the developed ski area
43HVC-3	Heavenly Valley Creek located at the USFS Property Line	Property Line	Characterized water quality in Heavenly Valley Creek leaving National Forest System land below Heavenly
43BPC-4	Bijou Park Creek located below the California Base Parking Lot	Bijou Park Creek	Characterized water quality in Bijou Park Creek below the California Base Lodge and parking area
43HDVC-5	Hidden Valley Creek baseline/reference station	Hidden Valley Creek	Characterized water quality in stream draining a similar, mostly undeveloped watershed
43HVE-1	Edgewood Creek above Boulder Parking Lot	Upper Edgewood Creek	Characterized water quality in Edgewood Creek above the Boulder Parking Lot and below the ski runs
43HVE-2	Edgewood Creek below Boulder Parking Lot	Lower Edgewood Creek	Characterized water quality in Edgewood Creek below the Boulder Parking Lot
43HVP-1A	North manhole influent pipe into the filter system	Storm Vault Influent North	Characterized water quality inflow from the lower parking lot into the filter system
43HVP-1B	South manhole influent pipe into the filter system	Storm Vault Influent South	Characterized water quality inflow from the upper parking lot into the filter system
43HVP-2	West manhole effluent pipe out of the filter system	Storm Vault Effluent	Characterized water quality exiting the filter system

¹ In the text of the document, these sampling stations are referred to by their abbreviated names.

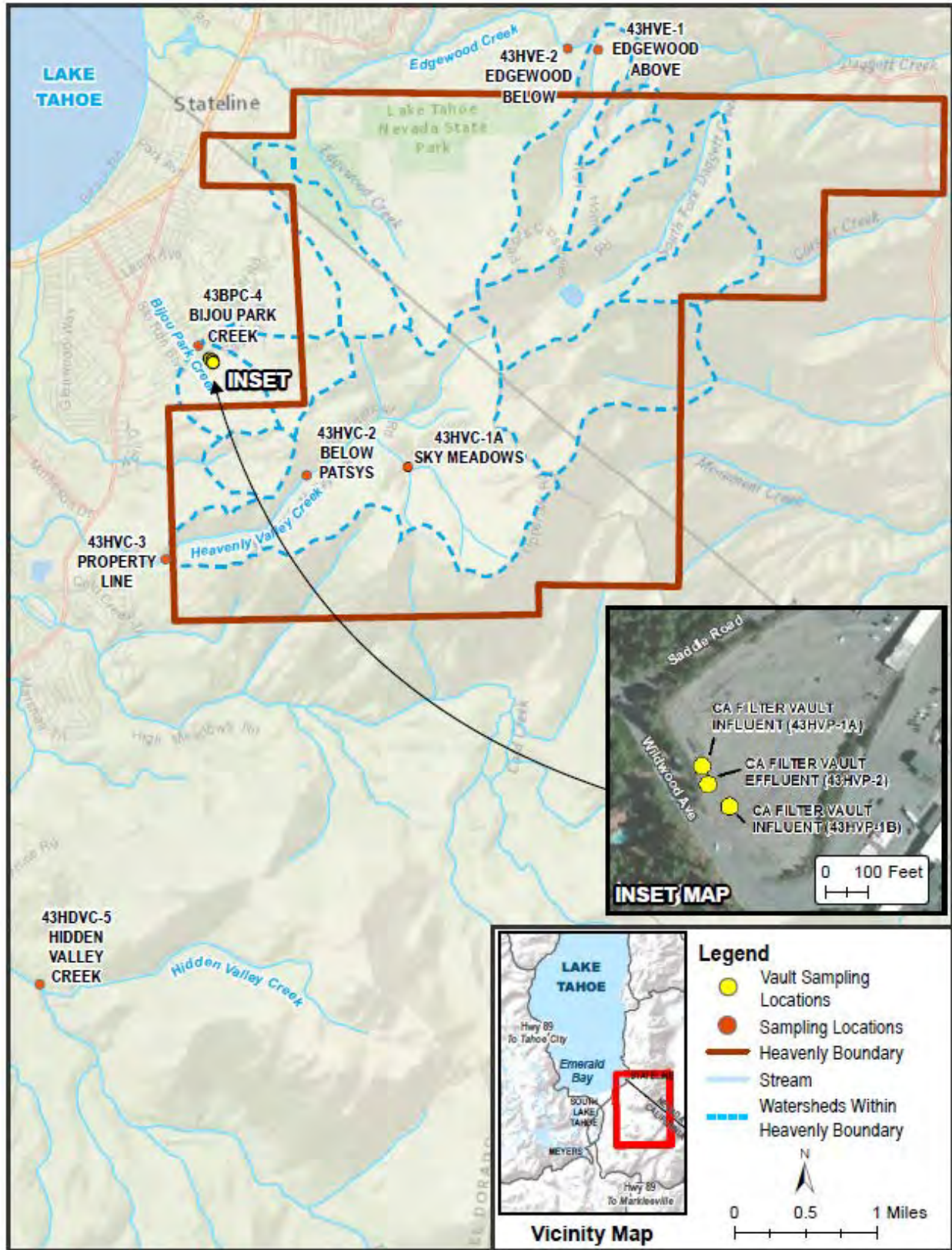


Figure 3-1 Approximate Locations of Water Quality Sampling Sites

3.3 Methods

The USFS monitored water quality at Heavenly Valley Creek from 1980 to 1987. Resource Concepts, Incorporated (RCI) was contracted by Heavenly to perform water quality monitoring from 1987 through 1995. The USFS monitored Heavenly Valley Creek, Hidden Valley Creek, Bijou Park Creek (California Base Parking Lot), and Edgewood Creek from 1995 through mid-2005. Cardno (formerly ENTRIX, Inc. and Cardno ENTRIX) has been contracted to perform monitoring and reporting since May 31, 2005.

Cardno has followed the US Geological Survey protocol to maintain consistency in data collection. Data collection involves using the flume at the Patsy's monitoring site to measure discharge. A Marsh-McBirney meter is used to measure discharge at all other sites. The Sky Meadows monitoring site (43HVC-1A) was previously gaged by the exiting flume; however, the streambanks around the flume have eroded, allowing for partial flows to circumnavigate around the flume. The Marsh-McBirney meter was used to measure discharge upstream of the flume at Sky Meadows, except in the winter, when the cross-section is fully covered with snow. During the winter, the flume is used to determine the approximate flow. Grab samples are taken at every site and sent to certified laboratories for analysis.

Cardno uses High Sierra Water Lab (formerly of Tahoe City, California, and now of Sutherlin, Oregon) to test for low-level constituents. Cardno previously used Western Environmental Testing Laboratory (WET Lab) of Reno, Nevada, to test for chloride during WYs 2017 to 2019. However, in 2019, the US Environmental Protection Agency made changes to definitions and procedures for determining the method detection limit for certified analytical laboratories. The revised method detection limit procedure helped address laboratory blank contamination and better accounted for intra-laboratory variability. As such, WET Lab's reporting limit, which is related to method detection limits, for chloride was raised from 0.10 mg/L to 0.25 mg/L, which is greater than the Lahontan not-to-exceed standard (0.15 mg/L). As a result, any non-detect (ND) results may have been above the state standard, but undetectable according to the new method detection limit procedures for the given analytical equipment utilized. Starting in WY 2020, samples were sent to Excelchem Laboratories, Inc. in Sacramento, California, whose equipment meets a reporting limit of 0.15 mg/L for chloride. WET Lab analyzes all of the stormwater constituents collected from the California filter vault locations due to the hold times and pickup service during storm events. All analysis methods and reporting limits have remained the same and are in accordance with the most current edition of *Standard Methods for the Examination of Water and Wastewater* (Baird and Bridgewater 2017). See the *Draft Heavenly Mountain Resort Standard Operating Procedures / Water Quality Sampling Quality Assurance Project Plan* (Cardno 2021) for additional information regarding standard and protocols for water quality sampling.

Consistency in sampling frequency has improved over the years. The data set from 2001 through 2015 had similar numbers of samples taken during runoff and baseflow periods for Heavenly Valley Creek and Edgewood Creek. However, the new WDR no longer requires weekly runoff sampling and instead focuses on biweekly sampling of the annual runoff hydrograph. Biweekly sampling, with a greater frequency (five additional dates) of sampling during the runoff period, began in WY 2016 and has continued through WY 2021. Frequency variances also occur based on the precipitation accumulations, the amount of snowpack, and duration of runoff. As past annual reports have stated, WY 2017 was a very wet year, with accumulated precipitation and snow water equivalent approximately double the 1991 to 2020 average. WYs 2018 and 2019 were considered approximately average, with 2018 slightly below and 2019 slightly above average. WYs 2020 and 2021 were both well below average and are considered drought years. Refer to Figure B-1 in Appendix B for WY data.

Storm sampling is only required under the new WDR permit for the California filter vault sampling locations and is discussed in further detail in Chapter 3.6.5.

3.4 Data Compilation

Annual master spreadsheets are maintained to facilitate comprehensive reporting. Starting in 2020 Cardno's water quality analysis and field results for stream sampling locations in California have been reported to the California Environmental Data Exchange Network (CEDEN). CEDEN is a central database designed to share information regarding California surface waters using a standardized, integrated data-sharing network. Sampling constituent results are reported using the Chemistry Data Submission Guidance Document and Template, and flow discharge measurements as well as all other field results are reported using the Field Collection and Results Data Submission Guidance Document and Template. Past years' water quality data (2009–2019) are undergoing digitizing, summarizing, and quality assurance/quality control in accordance with the CEDEN template and format and will be uploaded and submitted soon. Where reported laboratory analysis values were less than or equal to a detection limit, half of the numeric value of the detection limit is used for annual calculations, and actual values would therefore be lower than the annual calculated values. However, for CEDEN reporting, all non-detect values are reported as less than the detection limit, with no specific value assigned.

3.5 Monitoring Parameters

The following sections give an overview of each monitoring parameter (constituent), what affects its concentrations, and its relation to Heavenly sampling. Table 3-2 describes the history of the analysis groups as well as the parameters sampled and analyzed from 2006 through 2021.

Table 3-2 Constituent/Parameter Measuring History (2006–2021)

Years	2006–2010	2011–2016	2017–2021
Sampling Group	ENTRIX, Inc.	Cardno, Inc. (formerly ENTRIX, Inc.)	Cardno, Inc.
Analysis Group	ENTRIX, Inc. High Sierra Water Lab WET Lab	Cardno, Inc. High Sierra Water Lab WET Lab	Cardno, Inc. High Sierra Water Lab WET Lab ExcelChem Laboratories, Inc.
Parameters Measured	Discharge Conductivity Turbidity TSS Total nitrite/nitrate Total Kjeldahl nitrogen (TKN) Soluble reactive phosphorus–dissolved orthophosphorus Total phosphorus Chloride Iron Lead (for California Base Parking Lot only) Oil & Grease (for California Base Parking Lot only) TPH (for California Base Parking Lot only) Ammonia (for California Base Parking Lot only)	Discharge Turbidity TSS Total nitrite/nitrate TKN Total nitrogen Total phosphorus Chloride Oil and grease (for California Base Parking Lot Filter Vault locations only) Specific conductivity, soluble reactive phosphorus, and dissolved phosphorus (for Edgewood Creek monitoring sites only)	Same as the 2011–2016 time frame.

As of WY 2021, laboratory analysis by parameter is as noted in Table 3-3.

Table 3-3 Contracted Laboratory Analysis

Laboratory	Contracted Analysis
ExcelChem Laboratories, Inc.	Chloride (associated with stream sampling)
High Sierra Water Lab	Nitrate + nitrite, total phosphorus, TKN, TSS, turbidity, soluble reactive phosphorus, dissolved phosphorus, conductivity (associated with stream sampling)
WET Lab	Nitrate + nitrite, total phosphorus, TKN, total suspended solids, turbidity, chloride, oil and grease (associated with stormwater discharge sampling)

3.5.1 Phosphorus

Phosphorus has a large role in lake eutrophication. The microbiota in Lake Tahoe is phosphorus limited, meaning that more phosphorus added to the lake results in faster algal growth. Phosphorus is firmly held by soils and usually does not leach into a soluble bio-available form measured as soluble reactive phosphorus. Phosphorus leaching can occur in sandy soils with no clay, aluminum oxides, iron oxides, or organic matter (Sparks 2003), which can be found in some of decomposed granite soils at Heavenly. Soluble reactive phosphorus values are no longer required by the WDR at the California stream monitoring and filter vault sites.

3.5.2 Nitrogen

Nitrogen can often be a limiting nutrient to algal growth. Although it is not currently the limiting nutrient in Lake Tahoe, it is still an important measure of water quality as low nitrogen and low phosphorus levels are key to reduced algal growth (Horne and Goldman 1994). Nitrogen is a nutrient and occurs in many forms including ammonia, organic, nitrate, and nitrite. Nitrogen is measured as nitrate/nitrite and total Kjeldahl nitrogen (TKN); both values add up to total nitrogen. Nitrate is usually the most abundant form of nitrogen in lakes. The partially reduced form of nitrate is nitrite, which is usually present in much smaller quantities. Nitrate sources are often fertilizers, animal waste, or sewage, but it can also exist naturally though leaching soils. TKN is the sum of organic nitrogen and ammonia nitrogen in a waterbody. The presence of high concentrations of ammonia in a stream or lake can create a large oxygen demand. This demand is caused by the oxidation of ammonia to nitrate. All monitoring sites at Heavenly are tested for nitrogen. BMP treatment is geared toward nitrogen reduction by plant uptake.

3.5.3 Chloride

The chloride ion is required for essential cell processes and is a benign constituent in water. Chloride is monitored to determine if applications of deicers to parking lots and salts to ski runs and terrain parks have an effect on the chloride concentration in streams in the drainage area.

3.5.4 Turbidity

Turbidity is the measure of how much light can pass through a water sample. It refers to the cloudiness, haziness, or murkiness of a fluid. Turbidity gives a general sense of particle content and color by visually measuring the clarity of the water. It is measured in nephelometric turbidity units (NTUs). The greater the turbidity value, the cloudier the water. In rivers, turbidity can normally be attributed to abiotic substances such as sediment. Lake turbidity is related to biotic and abiotic substances. Turbidity is a concern because it measures clarity or the aesthetic value of the water.

3.5.5 Suspended Sediment

TSS are particles greater than 0.1 micron (μm) in diameter that are suspended in solution. These particles not only aid in the scattering of light, which decreases clarity, but can also be carriers of phosphorus, metals, and other polluting substances. TSS is measured at all stream monitoring sites at Heavenly. Quantities of TSS give a good indication of erosion in a watershed and are therefore important in the trend analysis at Heavenly.

3.5.6 Oil and Grease

Oil and grease are petroleum-based products. Their source is automobiles and other equipment. Oil and grease are contaminants and are metabolized by aquatic microbiota. The latest WDR permit conditions only require oil and grease sampling at the influent and effluent locations at the storm filter vault system at the California Base Parking Lot.

3.5.7 Specific Conductivity

Specific conductivity is a measure of the ability of a substance to conduct electric current. Therefore, specific conductivity correlates with ions in a solution. Studies have shown that specific conductivity has a direct relation to constituents such as total dissolved solids, chloride, and sulfate, and to hardness. Statistical relations can be quantified between these constituents and specific conductivity using several years of correlating data. After a relation is quantified, specific conductivity can be used as a surrogate for these other constituents. Specific conductivity is only measured at the Edgewood Creek monitoring sites located in Nevada.

3.6 Results and Discussion

In the following discussion, results are presented for Heavenly Valley and Hidden Valley Creeks, followed by Bijou Park Creek and Edgewood Creek. Edgewood Creek is located in Nevada and is therefore not under the jurisdiction of Lahontan but is included in this report for completeness. For each stream, compliance with water quality standards is presented first, along with a comparison to the reference reach site that is outside the area affected by Heavenly's operations. Following this presentation, an analysis of water quality trends is presented for each stream. The California Base Parking Lot filter vault information can be found in Chapter 3.6.5.

3.6.1 Heavenly Valley and Hidden Valley Creek

3.6.1.1 *Summary of Compliance at the Property Line Monitoring Site*

The Property Line monitoring site represents water quality conditions where water leaves Heavenly and is the point for measuring compliance with the TSS TMDL. Graphs showing constituents versus flow for all sites from 2006 through 2021 are included in Appendix C. Annual means and standard deviations for the Heavenly Valley and Hidden Valley Creek sites, WYs 2017 through 2021, are also included in Appendix C. Values that have exceeded the applicable annual average standard (non-compliance) are in bold text. Table 3-4 summarizes annual non-compliance frequency from 2006 to 2021 at the Property Line monitoring site (43HVC-3) versus the Hidden Valley Creek reference reach site (43HDVC-5). The California annual state standards for TSS, total phosphorus, total nitrogen, and chloride are included in Table 3-4. The total number of samples collected over the 16 WYs are reported below. Values that exceed the state standard are in bold. The non-compliance percentages were totaled by dividing by the total number of annual exceedances by the 16-year period of record.

Table 3-4 Exceedances of State Effluent Standards at Property Line Monitoring Site (43HVC-3) and Reference Reach Site (43HDVC-5), WYs 2006 through 2021

	Discharge (cfs)	Turbidity (NTU)	Suspended Sediment (mg/L) ¹	Nitrite/ Nitrate (mg/L)	Total Phosphorus (mg/L)	TKN (mg/L)	Total Nitrogen (mg/L)	Chloride (mg/L)
California State Standard	-	-	60 ¹	-	0.015	-	0.19	0.15
<i>43HVC-3 Property Line Monitoring Site Annual Averages</i>								
2006	4.30	3.24	27.7	0.012	0.032	0.114	0.121	2.47
2007	0.760	1.95	3.56	0.005	0.023	0.080	0.084	1.29
2008	0.550	0.94	2.32	0.005	0.018	0.086	0.091	1.95
2009	0.460	0.79	3.60	0.003	0.021	0.061	0.060	1.27
2010	1.31	7.71	11.4	0.013	0.089	0.351	0.387	0.97
2011	5.47	9.14	34.0	0.026	0.042	0.129	0.154	0.66
2012	1.09	1.16	8.04	0.005	0.020	0.085	0.090	0.94
2013	0.722	1.37	7.08	0.003	0.020	0.103	0.106	1.08
2014	0.526	0.83	4.48	0.003	0.022	0.128	0.131	1.06
2015	0.495	0.70	5.60	0.003	0.022	0.099	0.102	1.25
2016	3.29	2.40	23.1	0.027	0.026	0.117	0.143	0.81
2017	7.36	7.52	74.2	0.015	0.053	0.136	0.151	0.66
2018	1.85	1.61	5.50	0.007	0.020	0.078	0.085	0.58
2019	2.42	2.91	13.4	0.009	0.027	0.085	0.095	0.65
2020	0.631	1.14	5.70	0.003	0.021	0.081	0.080	1.06
2021	0.331	1.09	6.50	0.004	0.027	0.144	0.148	1.12
# Samples	256	258	258	256	258	258	257	183
# Noncompliance	-	-	1	-	16	-	1	16
% Noncompliance	-	-	6.3%	-	100.0%	-	6.3%	100.0%
Maximum Daily	31.6	102	506	0.097	1.05	4.25	4.31	5.90
Minimum Daily	0.002	0.07	0.27	0.001	0.009	0.018	0.019	0.31
Mean Daily	2.15	2.96	7.35 ²	0.009	0.030	0.116	0.125	0.99
Std Error Daily	4.32	9.63	35.2	0.013	0.068	0.268	0.273	0.62
<i>43HDVC-5 Hidden Valley Creek Reference Reach Site Annual Averages</i>								
2006	4.41	1.94	9.44	0.004	0.032	0.13	0.134	0.84
2007	1.18	1.24	12.5	0.007	0.026	0.095	0.102	0.49
2008	1.11	1.19	3.84	0.013	0.025	0.112	0.126	0.99
2009	0.805	1.42	8.80	0.008	0.029	0.112	0.12	0.82
2010	2.34	2.58	35.1	0.008	0.043	0.217	0.225	0.40
2011	7.05	3.27	32.2	0.004	0.032	0.162	0.167	0.24
2012	1.67	1.31	5.08	0.009	0.025	0.133	0.141	0.31
2013	1.42	1.35	5.76	0.009	0.026	0.108	0.117	0.28
2014	0.974	1.11	4.24	0.011	0.026	0.147	0.158	0.29
2015	0.659	1.20	5.80	0.008	0.025	0.107	0.115	0.24
2016	2.96	2.62	19.2	0.018	0.031	0.151	0.169	0.24
2017	7.44	5.71	21.6	0.004	0.030	0.136	0.140	0.26
2018	2.49	1.17	2.60	0.007	0.020	0.082	0.088	0.22
2019	3.53	2.06	5.40	0.006	0.024	0.094	0.100	0.22
2020	1.22	0.94	4.00	0.004	0.022	0.085	0.089	0.42
2021	0.751	1.04	3.75	0.005	0.022	0.092	0.097	0.37
# Samples	289	288	288	288	288	288	288	213
# Noncompliance	-	-	0	-	16	-	1	16
% Noncompliance	-	-	0.0%	-	100.0%	-	6.3%	100.0%
Maximum Daily	31.9	47.2	70.0	0.041	0.200	0.971	0.973	2.40
Minimum Daily	0.09	0.09	0.40	0.001	0.011	0.023	0.031	0.10
Mean Daily	2.55	1.88	3.95 ²	0.008	0.027	0.124	0.132	0.32
Std Error Daily	4.36	3.30	7.59	0.007	0.016	0.100	0.101	0.26

¹ TSS values shown are 90th percentile values. The recalculated values using a weighted average based on the days between sample collection are shown in Table 3-5.

² Value shown is the mean daily value.

Total Phosphorus

Every year for the past 16 years, annual average values have exceeded the standard for total phosphorus at the Property Line monitoring site (43HVC-3) along Heavenly Valley Creek. However, the same standards were also exceeded at the reference reach site (43HDVC-5) indicating these conditions are part of the system and not related to Heavenly. Between WYs 2012 and 2016, the annual average exceedance values for total phosphorus at the reference reach site (43HDVC-5) were higher than recorded exceedances at the Property Line monitoring site (43HVC-3). This correlation was not observed between WYs 2017 and 2021; three out of five of the total phosphorus annual exceedance values during the 5-year period (2017–2021) were higher at the Property Line monitoring site (43HVC-3) compared to the reference reach site (43HDVC-5). The annual average values for total phosphorus were the same at both locations in 2018 (0.020 mg/L), while the 2020 annual average was slightly lower at Property Line (43HVC-3) compared to the reference reach site (43HDVC-5). The correlation from WYs 2012 to 2016 was likely due to the fact that WYs 2012 to 2015 were considered drought conditions in which the Property Line monitoring site went dry on occasion. Drought conditions improved from WY 2016 through WY 2019, only for below-average precipitation to return in WYs 2020 and 2021. The correlation could also indicate that prescribed on-mountain treatments are beneficial to the Heavenly Valley Creek watershed as they often meet or exceed total phosphorus results at the reference reach site (43HDVC-5). Therefore, total phosphorus values at the Property Line monitoring site (43HVC-3) should continue to be monitored along with the reference reach (43HDVC-5) as the trend analysis for both of these sites track similar and there is not a significant difference with regards to total phosphorus.

Total Nitrogen

Over the past 16 years (2006–2021), the annual average standard for total nitrogen was exceeded once in 2010 at the Property Line monitoring site (0.387 mg/L). The total nitrogen annual average exceedance value of 0.387 mg/L is 0.197 mg/L above the 0.19 mg/L state standard. The annual average for total nitrogen at the reference reach site (43HDVC-5) in 2010 was 0.225 mg/L—also above the state standard. The total nitrogen annual average for the 5-year period from 2017 to 2021 was not exceeded at either the Property Line monitoring site (43HVC-3) or the reference reach site (43HDVC-5). Total nitrogen values at the Property Line monitoring site (43HVC-3) and reference reach (43HDVC-5) are trending positive with regards to water quality improvement.

Chloride

For the 5-year period (2017–2021), chloride levels are over the annual standard at both the Property Line monitoring site (43HVC-3) and the reference reach site (43HDVC-5), indicating that chloride levels over the standard are a watershed wide condition and not solely due to Heavenly operations. However, chloride annual average exceedance values at Property Line (43HVC-3) were higher than at the reference reach site (43HDVC-5) for each year of the 5-year period from 2017 to 2021. Annual chloride average values at Property Line (43HVC-3) were initially much lower from 2017 to 2019 compared to the 2012 to 2016 years; however, chloride value exceedances during WYs 2020 and 2021 increased to levels comparable to those of 2012 to 2016. A similar trend also occurred at the reference reach site (43HDVC-5), where chloride values in WYs 2020 and 2021 were much higher than in years past. WYs 2017, 2018, and 2019 were all above- or near-average precipitation years, which likely accounts for the lower chloride annual average values reported at Property Line (43HVC-3).

Overall elevated chloride levels in the watershed are likely due to salt usage. During higher precipitation and snowfall years, less salt is needed to keep the snowpack from melting. Huck salt is applied late in the ski season on the terrain park features (ramps and jumps) to lower the freezing point of the top surface. The top layer's interaction with the snow below causes it to refreeze, which causes the ramp/jump surfaces to harden and last longer. The WY 2018 annual average for chloride at the Property Line monitoring site (43HVC-3) was the lowest value in the past 16 years (0.58 mg/L). This value followed the largest precipitation/snowpack recorded over the 16-year time period as well. While some chloride

exceedance values can be linked to the WY and precipitation levels, in recent years Heavenly has been actively tracking and limiting the application of huck salt at the on-mountain terrain park locations. Neglecting precipitation and WY information, the 5-year rolling annual average (2017–2021) for chloride at the Property Line monitoring site (43HVC-3) was 0.814 mg/L. This value is lower than the previous 5-year (2012–2016) rolling average (1.03 mg/L). The fluctuation of chloride results at the reference reach site (43HDVC-5) is not as easily understood. The extreme wet years do not correlate to increased or decreased chloride readings, and nor do drought cycles correlate well with chloride variations. Chloride findings remain high and troublesome in terms of water quality at both the Property Line monitoring site (43HVC-3) and reference reach (43HDVC-5). Chloride constituent monitoring should continue at both sites moving forward to better understand increased background levels as they relate to Heavenly operation and reduction in chloride usage.

TMDL for Suspended Sediment

Prior to the erosion control measures implemented by Heavenly in the 1990s and early 2000s, Heavenly Valley Creek has had historically high sediment loading. In 1999, these values ultimately led Heavenly Valley Creek to be listed on the 303(d) list as impaired for sediment loading and a TMDL being established for TSS. The TMDL for TSS at Heavenly Valley Creek was established in 2000 at 58 tons/year (based on a 5-year rolling average). This value is calculated by weighting the number of days between sample collections and multiplying this value with the discharge value recorded. This new value represents the calculated weighted flow. Laboratory values for TSS are multiplied by the weighted flow numbers and summed. Final unit conversion is applied, and the total is reported in tons per year. This methodology is accepted by Lahontan and has been used in past reports.

Since 2005, Heavenly has consistently had water quality that is better than the TMDL-required levels for TSS. Table 3-5 summarizes TSS loading for the Property Line monitoring site (43HVC-3) and the reference reach site (43HDVC-5). The 2010 *TMDL Implementation Tracking Status Report* (Lahontan 2010) noted that Heavenly Valley Creek met the TSS target. The measured annual sediment loads for 16 WYs (2006–2021) were all below the TMDL standard, with the exception of WYs 2010, 2011, and 2017, which had annual loading values above the TMDL standard of 58 tons/year (70.5, 118.6, and 161.8 tons/year, respectively). Over the past 5 years, the measured loadings for WYs 2017 to 2021 were all below the TMDL standard, with the exception of WY 2017, which had an all-time high annual loading of 161.8 tons/year. It is important to note that these annual calculation exceedances also correlated with above-average precipitation years and that the rolling 5-year average value of 58 tons/year has not been exceeded in 16 years as shown in Table 3-5. Since the higher precipitation/wet year sediment loading values are averaged with lower precipitation and drought conditions, the total maximum daily load rolling 5-year average has not exceeded the state standard.

Table 3-5 Suspended Sediment Values for Property Line Monitoring Site (43HVC-3) and the Reference Reach Site (43HDVC-5)

Year	Heavenly Valley Creek Property Line (43HVC-3) Suspended Sediment (tons/year)	Rolling 5-year Average Suspended Sediment (tons/year)	Hidden Valley Creek Reference Reach Site (43HDVC-5) Suspended Sediment (tons/year)	Rolling 5-year Average Suspended Sediment (tons/year)
2001	6.60	-	1.41	-
2002	9.10	-	5.06	-
2003	20.4	-	52.4	-
2004	5.20	-	3.66	-
2005	36.9	15.6	27.9	18.1
2006	42.6	22.8	37.2	25.2
2007	1.30	21.3	3.40	24.9
2008	0.60	17.3	1.90	14.8
2009	0.50	16.4	1.90	14.5
2010	70.5	23.1	18.6	12.6
2011	118.6	38.3	60.9	17.3
2012	1.70	38.4	3.40	17.3
2013	1.00	38.5	3.53	17.7
2014	0.24	38.4	1.51	17.6
2015	0.16	24.3	1.44	14.2
2016	6.63	1.95	18.8	5.73
2017	161.8	34.0	50.5	15.2
2018	2.47	34.3	2.50	14.9
2019	12.2	36.7	7.09	16.1
2020	0.94	36.8	2.34	16.2
2021	0.10	35.5	0.83	12.6

Figure 3-2 compares annual weighted sediment loading at the Property Line monitoring site (43HVC-3) and the reference reach site (43HDVC-5) between 1991 and 2021. Superimposed on the sediment loading data are the total calculated flows per year in cubic meters (divided by 10,000) at each site. Five-year rolling TSS averages for each site and the Lahontan TMDL 5-year rolling standard value of 58 tons/year are also shown on the figure.

Figure 3-2 shows a large TSS increase in 2011 and 2017, consistent with the trends seen in other above-average WYs; as streamflow increases, total sediment loading increases. WYs 2012 to 2015 saw lower TSS values in correlation to lower water flows (drought conditions), while the 2016 average-precipitation year had increased TSS at both the Property Line monitoring site (43HVC-3) and the reference reach site (43HDVC-5). As the graph clearly shows, TSS is linked to WY and streamflow totals and TSS values at the Property Line monitoring site (43HVC-3) and reference reach (43HDVC-5) are trending positive with regards to water quality improvement.

3.6.1.2 Graphical Comparison to the Reference Reach Site

Figures B.2-1 and B.2-2 in Appendix B show the straight annual average values for total nitrogen and total phosphorus for both the Property Line monitoring site (43HVC-3) and the reference reach site (43HDVC-5) since 1991. Total nitrogen values at the Property Line monitoring site (43HVC-3) were lower than at the reference reach site (43HDVC-5) for 3 of the past 5 years (2018–2020). However, the total nitrogen annual average values for 2017 and 2021 were both higher. The higher 2017 annual average for total nitrogen is likely associated with increased precipitation and runoff entering the stream; however, the 2021 result is considerably higher (0.148 mg/L compared to 0.098 mg/L). Only nine samples were collected at the Property Line monitoring site (43HVC-3) during WY 2021. While the site was monitored monthly and biweekly during runoff season, seven of the sixteen sampling events found that the stream was dry, and no measurements or water quality analysis was performed. This resulted in only nine events being used to calculate both the TSS TMDL as well as annual average values. These nine samples occurred primarily during spring runoff, with the capture of a single low-flow condition in July (0.009 cubic feet per second). This phenomenon occurred previously during the drought conditions of WYs 2014, 2015, and 2016, when only 15, 10, and 10 events were sampled (respectively) due to no flow conditions. For the first time since 2014, the rolling 5-year total nitrogen annual average values at the Property Line monitoring site (43HVC-3) exceeded the values at the reference reach site (43HDVC-5). This correlates with the small number of samples collected at the Property Line monitoring site (43HVC-3) due to little or no flow conditions being present. However, during no flow events, total nitrogen is not moving downstream through the tributaries; therefore, the rolling average is an accurate reflection of water quality contributions during these drought years. Total nitrogen values may increase once flows resume, potentially acting as a flush of the system following a period of no flows.

Total phosphorus results over the past 5 years have varied between Property Line monitoring site (43HVC-3) and the reference reach site (43HDVC-5) as shown in Figure C.10-6 (Appendix C). During drought conditions, total phosphorus values appear higher at the reference reach site (43HDVC-5), as is seen for WYs 2012 through 2015; however, wet years skew this in the other direction as shown in the peaks in both 2011 and 2017 where the Property Line monitoring site (43HVC-3) total phosphorus annual average values exceeded the reference reach sites. Yet since the 2017 wet year and in the preceding 5 years, only the WY 2020 total phosphorus annual average was lower at the Property Line monitoring site (43HVC-3) compared to the reference reach site (43HDVC-5). WY 2020 was considered a drought year, which would correlate to this result; however, WY 2021 was also considered a below-average precipitation year, yet the total phosphorus annual averages were higher at the Property Line monitoring site (43HVC-3) versus the reference reach site (43HDVC-5). As discussed above, the annual average values in 2021 were calculated using only nine mostly runoff sampling events due to low flow. This tends to skew the data toward higher values, as there were no early WY results collected (October through March). These early-season high-elevation results are typically low-flow conditions as water is stored in the snowpack. Due to the collection of runoff samples, the data skew toward higher readings for all constituents. Continual monitoring over both wet and dry conditions is needed to validate this trend.

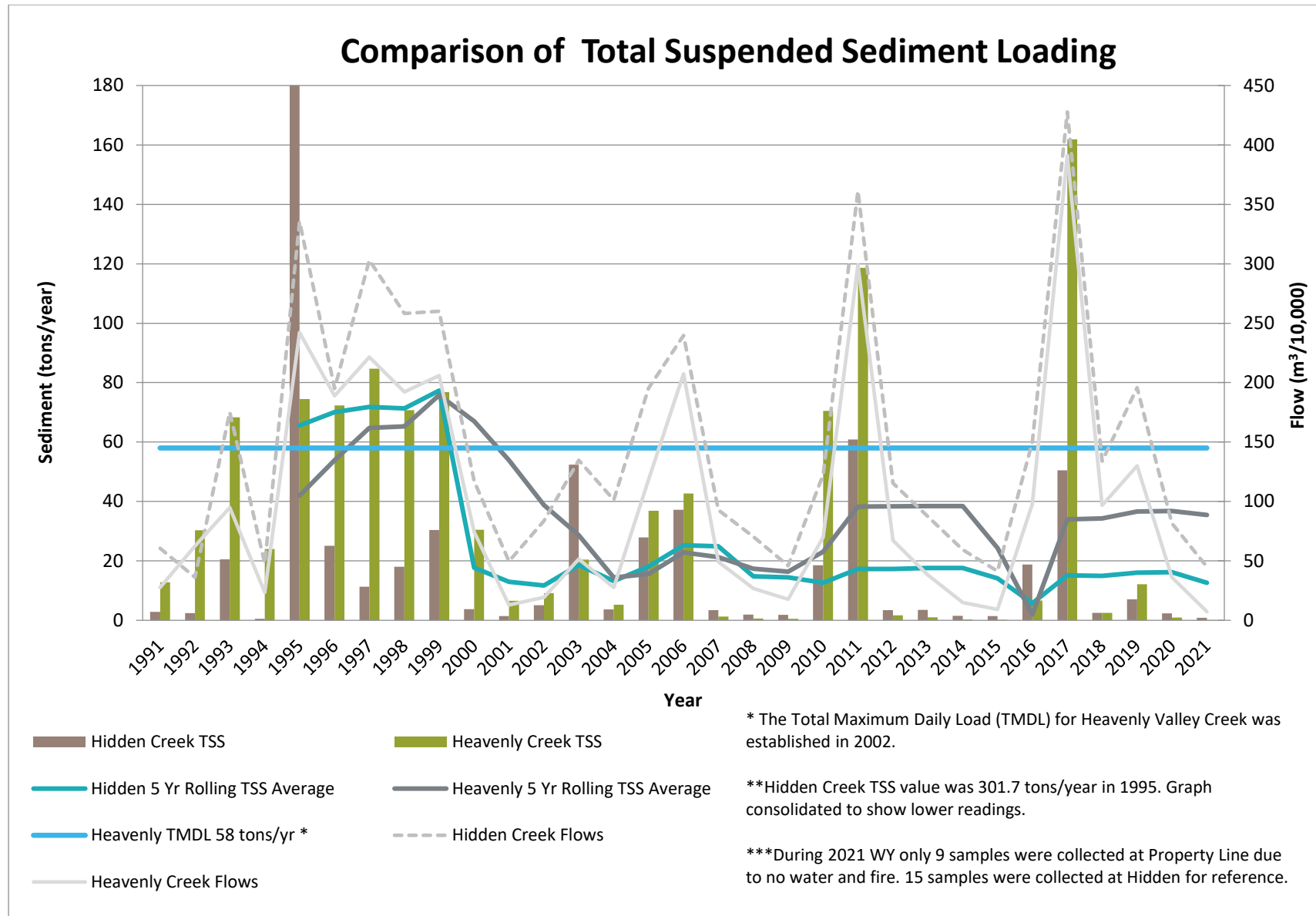


Figure 3-2 Comparison of Sediment Loading (1991 to 2021)

Figure 3-3 illustrates sediment loading at the Property Line monitoring site (43HVC-3) for WYs 1991 through 2021. Again, superimposed on the sediment load is the total calculated flow per year in cubic meters (divided by 10,000) at the Property Line monitoring site. When the whole period of record is considered, the 2011 and 2017 spikes in sediment loading are associated with high streamflows in wet years. In addition, streamflow data from 2007 through 2009 and 2012 to 2015 compare to the drought conditions in 2020 and 2021. During drought conditions, decreased streamflow, depth, and velocity provide minimal sediment loading. Extreme wet years and increased streamflow tend to increase sediment loading; however, average to slightly above-average WYs, such as 2016, 2018, and 2019, only have a slight increase in TSS. Compared to the 1993 and 2005 streamflow data, which are the closest comparisons to the 2016, 2018, and 2019 streamflow values, TSS (tons/year) is considerably lower. Moderate- to average-precipitation WYs and their associated streamflow have increased TSS loading, but this is not nearly as prevalent and high as the 1990s and early 2000s total TSS loading. The minimal increase in sediment loading for an average precipitation year may be attributed to prescribed on-mountain treatment and BMP improvement/maintenance limiting and preventing sediment from entering the streams.

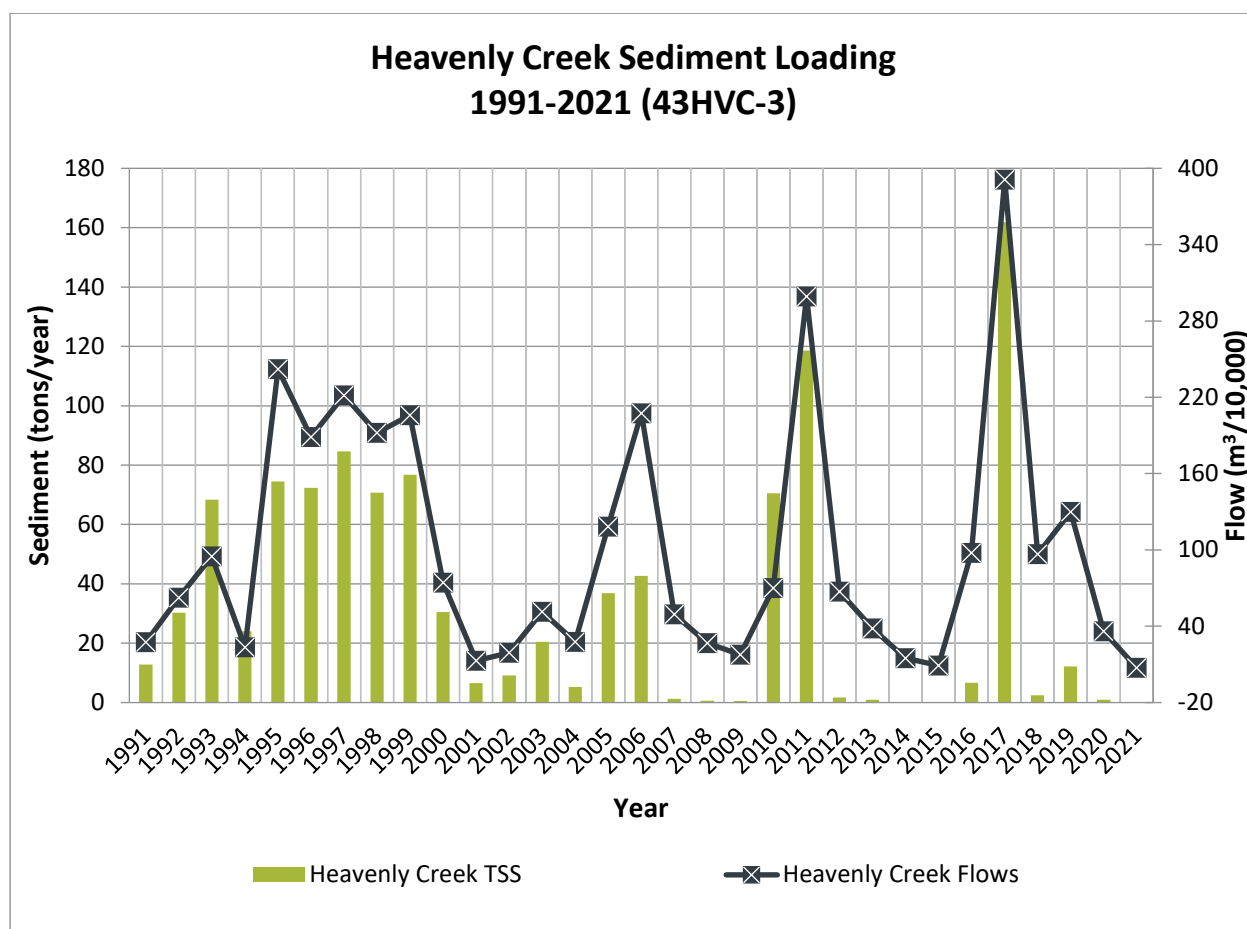


Figure 3-3 Heavenly Creek Sediment Loading at the Property Line Monitoring Site (43HVC-3) from 1991 to 2021

Figures 3-4 through 3-6 are graphical comparisons of annual averages (means) for the Property Line monitoring site (43HVC-3) and the reference reach site (43HDVC-5) for TSS, total nitrogen, total phosphorus, turbidity, and chloride. Consistent data are available for total phosphorus, total nitrogen, and turbidity since 1993, and for TSS since 1995. Chloride began to be sampled on a quarterly basis in 2006 and was not included in regular monthly sampling until 2012. Quarterly chloride sampling did not provide

enough data to show any trends; therefore, only data since 2012 are shown here. This data comparison shows that annual averages of TSS, total phosphorus, total nitrogen, and turbidity at the Property Line monitoring site (43HVC-3) have approximately returned to baseline conditions. Annual averages of chloride at the Property Line monitoring site (43HVC-3) remain problematic, compared to the reference reach site (43HDVC-5).

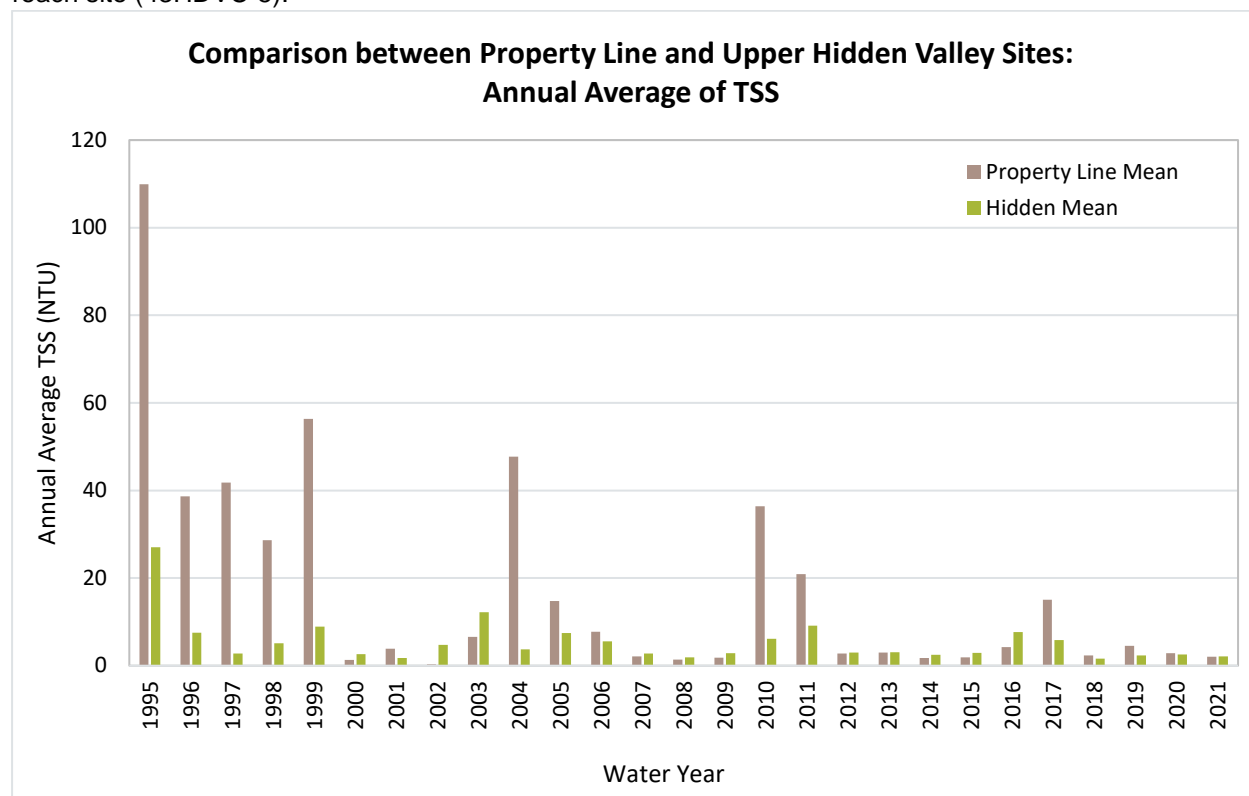


Figure 3-4 Comparison of Annual Averages of TSS between the Property Line Monitoring Site and Reference Reach Site

In several instances, individual observations (such as an TSS observation of 1,032 mg/L on June 16, 2004, at the Property Line monitoring site [43HVC-3]) contribute to very high means despite the remainder of year experiencing low TSS values. In the 5-year reporting period, the Property Line monitoring site (43HVC-3) had substantially greater annual average TSS compared to the reference reach site (43HDVC-5) in 2017 and 2019. These were both above-average precipitation years. During average or below-average precipitation years, TSS at both sites were similar. During the previous 5-year reporting period, there were several years when the reference reach site (43HDVC-5) had higher annual averages compared to the Property Line monitoring site (43HVC-3); these years were either well-below average or average precipitation years. This data comparison shows that the annual average of TSS at the Property Line monitoring site (43HVC-3) have approximately returned to baseline conditions.

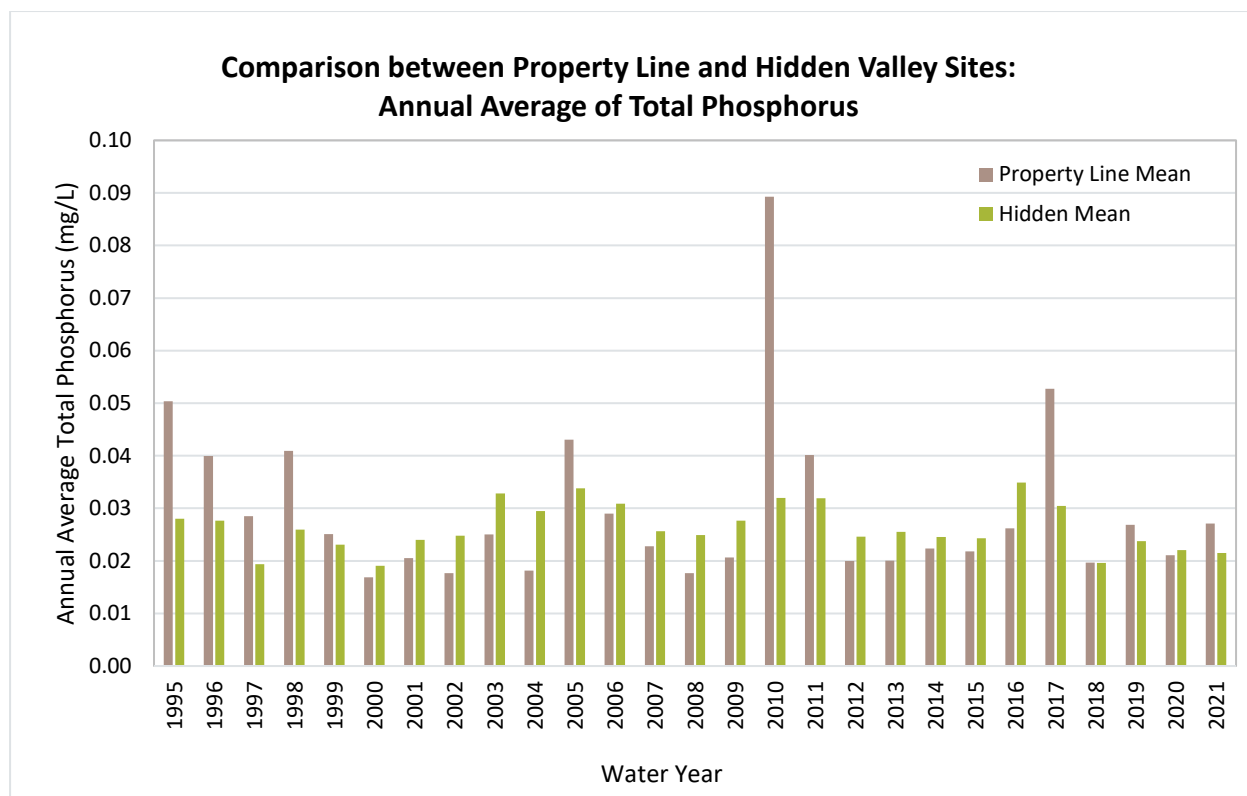


Figure 3-5 Comparison of Annual Averages of Total Phosphorus between the Property Line Monitoring Site and the Reference Reach Site

Comparisons of total phosphorus between the Property Line monitoring site (43HVC-3) and the reference reach site (43HDVC-5) showed relationships that correlated highly with WY (Figure 3-5). In drought years (2000–2004, 2007–2009, 2012–2015, 2020), annual averages of samples from the reference reach site (43HDVC-5) exceeded those of the Property Line monitoring site (43HVC-3), sometimes significantly so. However, during average precipitation WYs, especially those with precipitation well above average (2011 and 2017), the Property Line monitoring site (43HVC-3) had annual averages of total phosphorus higher than those at the reference reach site (43HDVC-5). Some anomalies are present, such as the 2010 annual average mean at the Property Line monitoring site (43HVC-3), which was nearly double the mean observed over the entire reporting period, despite it being an average-precipitation year. This data comparison shows annual averages of total phosphorus at the Property Line monitoring site (43HVC-3) have approximately returned to baseline conditions.

Similar trends were observed for total nitrogen. In drought years, the reference reach site (43HDVC-5) had more instances of higher annual averages than the Property Line monitoring site (43HVC-3), but in wetter years, the latter's averages for total nitrogen were typically higher (Figure 3-6). Over the 26 years of analyzed data, the annual average of total nitrogen was higher at the reference reach site (43HDVC-5) in 18 years and higher at the Property Line monitoring site (43HVC-3) in 7 years (and equal in one year: 2020). Again, this comparison shows annual averages of total nitrogen at the Property Line monitoring site (43HVC-3) have approximately returned to baseline conditions.

As mentioned above, chloride was first sampled at the sites in 2006, and it was sampled on a quarterly basis between 2006 and 2011. In 2012, sampling began on a monthly basis (and more frequently during the runoff period, on the same sampling schedule as all other constituents). In all years, annual average for chloride at the Property Line monitoring site (43HVC-3) was higher than at the reference reach site (43HDVC-5), although not significantly so until after sampling became more frequent in 2012 (Figure 3-7).

Either small sample sizes or lack of data at valuable times of the year (such as during runoff season) likely contributed to values that were considered not significantly different, more so than actual differences over the course of the year, despite annual averages of chloride being typically smaller at both sites once more regular sampling was initiated. This highlights the importance of sampling on a monthly (or greater) frequency in order to collect representative data. Annual averages of chloride at the Property Line monitoring site (43HVC-3) remain problematic compared to the reference reach site (43HDVC-5), although the reference reach site consistently exceeded state standards as well, as discussed in Chapter 3.6.1.1.

In most years, the Property Line monitoring site (43HVC-3) had higher annual average turbidity compared to the reference reach site, although in several drought years the latter had higher annual averages (2002–2004, 2012–2016; Figure 3-8), similar to the trends observed for total phosphorus and total nitrogen (Figures 3-5 and 3-6). Similarly, in above-average WYs, while both sites experienced higher annual turbidity averages, the Property Line monitoring site (43HVC-3) did so exceedingly. This data comparison shows annual averages of turbidity at the Property Line monitoring site (43HVC-3) have approximately returned to baseline conditions.

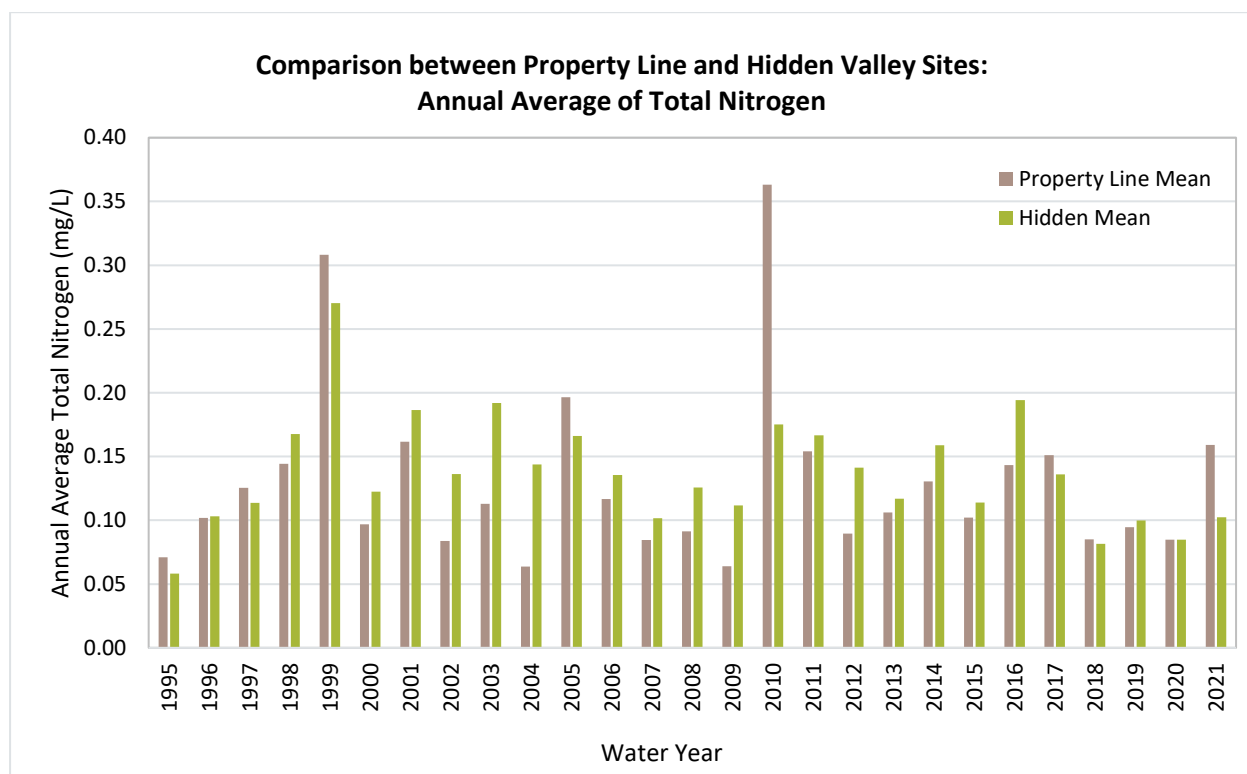


Figure 3-6 Comparison of Annual Averages of Total Nitrogen between the Property Line Monitoring Site and the Reference Reach Site

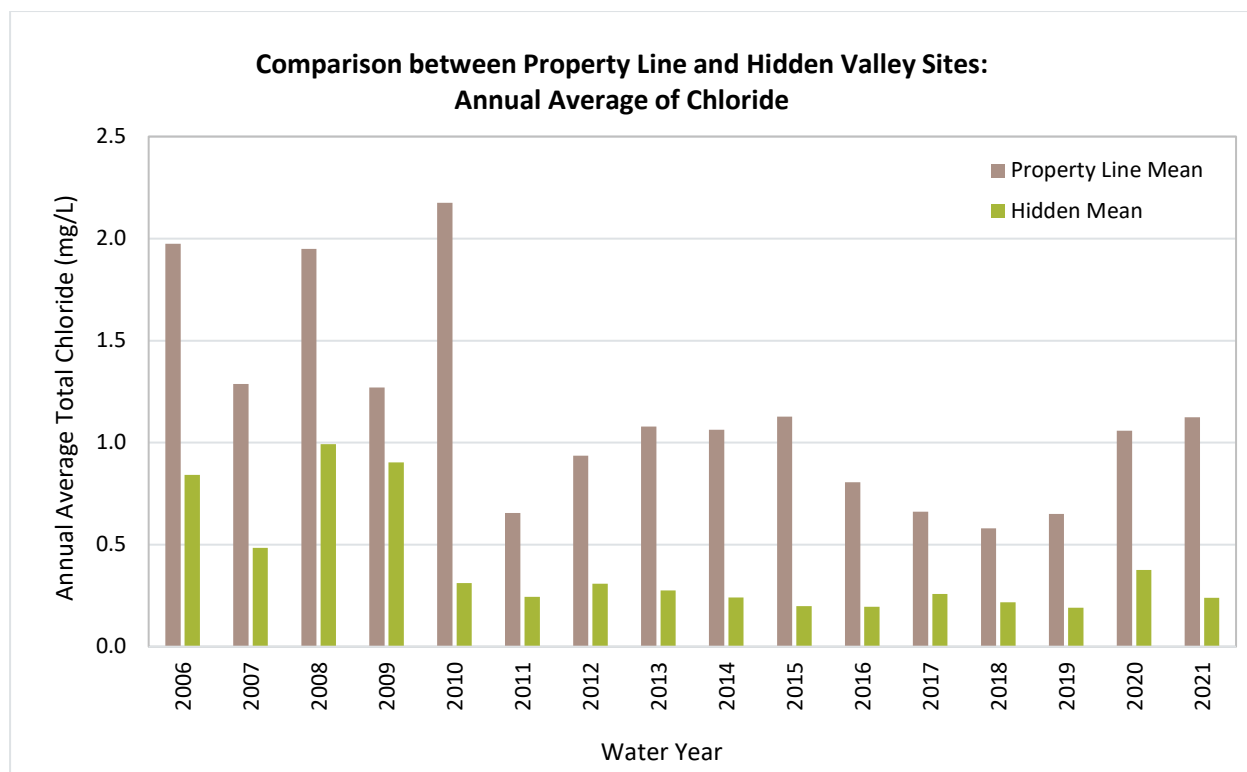


Figure 3-7 Comparison of Annual Averages of Chloride between the Property Line Monitoring Site and the Reference Reach Site

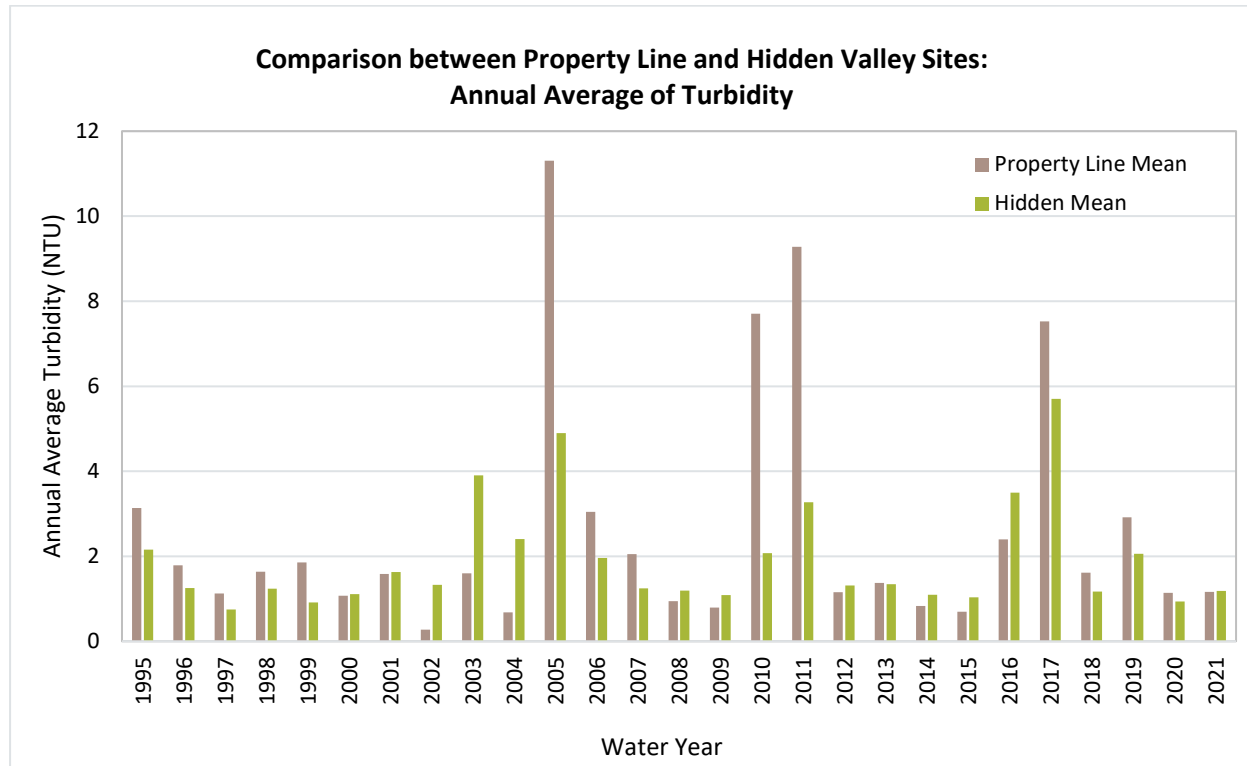


Figure 3-8 Comparisons of Annual Averages of Turbidity between the Property Line Monitoring Site and the Reference Reach Site

Box and whisker graphs of the variance between the Property Line monitoring site (43HVC-3) and the reference reach site (43HDVC-5) data for these constituents are included in Appendix C (Figures C.12-1 to C.12-6). The box represents the upper and lower quartile difference between the annual average values, with the line representing the median. The whiskers represent the upper and lower differences outside of the middle 50 percent. Figure C.12-1 in Appendix C is a legend for the graphs. The graphs include a line overlay connecting and representing the annual median values. Similar to the trend analysis completed for the 2016 comprehensive report, box and whisker graphs were completed to show the difference between the Property Line monitoring site (43HVC-3) and the reference reach site (43HDVC-5). Comparing the difference at each station provides results that are less affected by wet and dry WY variation, as the sites experience similar weather and increases/decreases in flow conditions on any given sampling date. The comparison shown is the variance between the two constituent results. Over time, as water quality conditions have improved at the Property Line monitoring site (43HVC-3), the variance analysis provided by box and whisker graphs has become less relevant to understanding water quality trends at both sites, as the reference reach site (43HDVC-5) has exhibited higher values than the Property Line monitoring site (43HVC-3) on occasion.

3.6.2 Summary of Compliance at the Sky Meadows (43HVC-1A) and Patsy's (43HVC-2) Monitoring Sites

Raw water quality data (WY 2017 through WY 2021) for the Sky Meadows and Patsy's monitoring sites are provided in Appendix A. Means and standard deviations for the Patsy's monitoring site (43HVC-2) and the Sky Meadows monitoring site (43HVC-1A) for WYs 2017 through 2021 are included in Appendix C, and values that have exceeded the applicable annual average standard (non-compliance) are in bold. Graphs showing constituents versus flow for WYs 2006 through 2021 are also included in Appendix C. The tables and graphs show a drastic increase in turbidity and TSS in 2010 and 2011 and reduction and stabilization following those years. In general, increases in constituent concentrations are associated with above-average precipitation years and increased runoff. Table 3-6 summarizes non-compliance frequency at the Patsy's monitoring site (43HVC-2). Table 3-7 summarizes non-compliance frequency at the Sky Meadows monitoring site (43HVC-1A). The data shown in the table for the Sky Meadows monitoring site (43HVC-1A) reflect WYs 2006 and 2015 through 2021, as sampling was not required during the period from 2007 to 2015. The California annual state standards are given in the table, and the total number of samples collected over the 16 WYs are reported below. Non-compliance values are in bold and italicized font, indicating when the annual average was above the state standard. The non-compliance percentages were totaled by dividing by the total number of annual exceedances by the 16- and 8-year periods of record for the Patsy's monitoring site (43HVC-2) and the Sky Meadows monitoring site (43HVC-1A), respectively.

BMP placement and approved dewatering activities associated with the dredging of California Dam, which occurred in the late summer/early fall of 2020, ensured that no turbid or poor water quality releases occurred into Heavenly Valley Creek (as discussed in Chapter 2.9). Monthly sampling during the dredging operation did not show an uptick in constituent loading.

Total Phosphorus

Total phosphorus annual average values at the Patsy's monitoring site (43HVC-2) have exceeded the annual average since 2006. Total phosphorus annual values have also been exceeded at the reference reach site (43HDVC-5) over the period of record. This indicates that high phosphorus is a characteristic of the both the reference watershed as well as Heavenly Valley Creek suggesting that on-mountain operations at Heavenly are not solely responsible for these excess levels. Drought conditions tend to lower the annual average value (WYs 2012–2015 and 2020), while increased precipitation and average to above-average precipitation WYs are correlated with higher total phosphorus annual averages (WYs 2016, 2017, and 2019). However, like TSS in drought conditions in WY 2021, the total phosphorus values also increased during this drought year. The annual average total phosphorus value in 2020 was 0.021

mg/L compared to the 2021 value of 0.028 mg/L at Patsy's (43HVC-2). The September 20, 2021, sample collected at the Patsy's monitoring site (43HVC-2) recorded a total phosphorus value of 0.127 mg/L, which was the second highest reading of total phosphorus at this site over the past 5 years. The highest value of 0.137 mg/L was recorded at the Patsy's monitoring site (43HVC-2) during a flood flow on June 22, 2017, and associated wet year. The Caldor Fire likely contributed to this higher total phosphorus value in 2021 and skewed the results such that they do not align with those of similar drought-stricken years.

While the period of record at the Sky Meadows monitoring site (43HVC-1A) is not as long, the total phosphorus discussion mimics the downstream discussion at the Patsy's monitoring site (43HVC-3). The drought and lower precipitation WYs tend to show lower total phosphorus annual average values, while average and above-average WYs show higher total phosphorus values. WYs 2016 through 2019 have higher total phosphorus annual averages at the Sky Meadows monitoring site (43HVC-1A), while the drought conditions of 2015 and 2020 resulted in much lower annual averages. The post-fire sample in September 2021 recorded a higher total phosphorus value at the Sky Meadows monitoring site (43HVC-1A); however, earlier in the WY the November 19, 2020, sampling event recorded a daily value of 0.147 mg/L for total phosphorus, increasing the annual average above values typical during a drought year. The exact cause of this spike is unknown, though it is known that the fire increased constituent levels for the September samples collected.

Total phosphorus values at the Patsy's monitoring site (43HVC-2) and Sky Meadows monitoring site (43HVC-1A) should continue to be monitored as water quality exceedances continue annually. The trend analysis for these sites, along with the reference reach (43HDVC-5), track similar and there is not a significant difference with regards to total phosphorus.

Total Nitrogen

Like total nitrogen results at the Property Line monitoring site (43HVC-3), the Patsy's (43HVC-2) and Sky Meadows (43HVC-1A) monitoring sites rarely exceed total nitrogen annual average values. The Patsy's monitoring site (43HVC-2) exceeded the annual average only four times in the past 16 years and not once in the past 5-year period (2017–2021). While the data set is not as long at the Sky Meadows (43HVC-1A) monitoring site, the total nitrogen annual average was exceeded only once in the 8-year record (0.301 mg/L in 2016). Occasional daily peaks are collected that are above the total nitrogen standard; however, when averaged with the results from the rest of the WY the annual average total nitrogen value is in compliance. For example, for WY 2021 samples collected at the Sky Meadows monitoring site (43HVC-1A) on November 19, 2020 (0.435 mg/L), as well as on May 20, 2021 (0.023 mg/L), and April 4, 2021 (0.227 mg/L), exceeded the total nitrogen value of 0.19 mg/L. However, when averaged with the other 16 annual samples, the total nitrogen annual average for WY 2021 was 0.152 mg/L. Total nitrogen value collected along Heavenly Valley Creek as well as the reference site along Hidden Valley Creek meet compliance levels and are trending positive with regard to water quality.

Table 3-6 Exceedances of State Standards at the Patsy's Monitoring Site (43HVC-2), WYs 2006 through 2021

	Discharge (cfs)	Turbidity (NTU)	Suspended Sediment (mg/L) ¹	Nitrite/ Nitrate (mg/L)	Total Phosphorus (mg/L)	TKN (mg/L)	Total Nitrogen (mg/L)	Chloride (mg/L)
California State Standard			60¹		0.015		0.19	0.15
<u>43HVC-2 Patsy's Monitoring Site Annual Averages</u>								
2006	2.98	1.95	8.10	0.059	0.031	0.094	0.144	1.34
2007	0.60	2.77	5.68	0.042	0.025	0.092	0.134	1.36
2008	0.51	1.22	3.76	0.059	0.020	0.100	0.159	1.93
2009	0.70	1.12	5.12	0.047	0.023	0.099	0.146	1.25
2010	1.22	15.2	26.0	0.064	0.125	0.341	0.405	1.34
2011	4.12	14.8	19.2	0.059	0.135	0.216	0.275	0.680
2012	0.655	2.00	9.80	0.039	0.020	0.109	0.148	1.04
2013	0.487	2.02	8.40	0.030	0.020	0.149	0.179	1.18
2014	0.307	3.86	11.5	0.035	0.028	0.193	0.228	1.26
2015	0.226	1.93	6.40	0.043	0.022	0.115	0.157	1.62
2016	2.19	3.87	15.6	0.100	0.032	0.158	0.258	1.01
2017	5.81	4.43	29.1	0.059	0.036	0.110	0.169	0.679
2018	1.46	4.05	13.4	0.033	0.025	0.092	0.126	0.731
2019	2.22	3.50	13.8	0.032	0.027	0.088	0.121	0.847
2020	0.590	2.14	7.50	0.022	0.021	0.090	0.105	0.886
2021	0.275	3.95	21.1	0.026	0.028	0.125	0.151	1.48
# Samples	277	277	277	277	277	277	277	203
# Noncompliance	-	-	0	-	16	-	4	16
% Noncompliance	-	-	0.0%	-	100.0%	-	25.0%	100.0%
Maximum Daily	29.2	228	831	0.252	2.08	3.22	3.30	4.20
Minimum Daily	0.005	0.05	0.27	0.001	0.007	0.018	0.024	0.350
Mean Daily	1.58	4.25	9.27 ²	0.047	0.039	0.136	0.182	1.10
Std Error Daily	3.45	16.6	59.3	0.034	0.142	0.225	0.229	0.565

¹ TSS values shown are 90th percentile values.

² Value shown is the mean daily value.

Table 3-7 Exceedances of State Standards at Sky Meadows Monitoring Site (43HVC-1A), WYs 2006 through 2021

	Discharge (cfs)	Turbidity (NTU)	Suspended Sediment (mg/L) ¹	Nitrite/ Nitrate (mg/L)	Total Phosphorus (mg/L)	TKN (mg/L)	Total Nitrogen (mg/L)	Chloride (mg/L)
California State Standard			60¹		0.015		0.19	0.15
<u>43HVC-1A Sky Meadows Annual Averages²</u>								
2006	2.11	1.55	6.60	0.040	0.025	0.10	0.142	1.02
2007–2014	No Sampling Data Collected per Report Recommendations							
2015	0.107	1.08	- ³	0.039	0.018	0.094	0.133	0.813
2016	1.72	3.70	26.6	0.119	0.037	0.181	0.301	0.692
2017	1.87	5.37	46.3	0.040	0.048	0.142	0.182	0.391
2018	1.19	2.72	7.95	0.030	0.022	0.103	0.132	0.335
2019	1.47	3.86	22.6	0.022	0.030	0.104	0.126	0.367
2020	0.481	1.86	11.7	0.016	0.018	0.097	0.113	0.546
2021	0.270	4.83	17.4	0.021	0.031	0.131	0.152	0.769
# Samples	117	124	125	125	125	125	125	103
# Noncompliance	-	-	0	-	8	-	1	8
% Noncompliance	-	-	0.0%	-	100.0%	-	12.5%	100.0%
Maximum Daily	9.75	40.3	93.5	0.248	0.271	0.460	0.586	1.60
Minimum Daily	0.003	0.50	0.53	0.002	0.010	0.039	0.051	0.21
Mean Daily	1.21	3.22	5.74 ⁴	0.042	0.030	0.122	0.164	0.54
Std Error Daily	1.95	4.90	10.2	0.042	0.031	0.079	0.106	0.27

¹ TSS values shown are 90th percentile values.

² Samples were not collected from 2007 to 2014 per permit conditions. Samples for WY 2015 were only collected during the 4th quarter.

³ There were not enough numbers in the range to interpolate a value for the 90th percentile for WY 2015.

⁴ Value shown is the mean daily value.

Chloride

All 16 annual average values for chloride exceeded the annual average state standard for chloride of 0.15 mg/L at the Patsy's monitoring site (43HVC-2), as did all eight annual average values for chloride at the Sky Meadows monitoring site (43HVC-1A). For the 5-year period from 2017 to 2021, the lowest minimum daily chloride reading recorded at the Patsy's monitoring site (43HVC-2) was 0.35 mg/L on June 22, 2017. This value was obtained near peak runoff conditions during the wettest period since 2005. This lowest single daily value still exceeded the state standard by more than double as well. Similarly, the lowest minimum daily chloride reading at the Sky Meadows monitoring site (43HVC-1A) for the 5-year period in question was 0.20 mg/L on January 1, 2020. This daily value is still above the Lahontan state standard annual average for chloride. Chloride levels remain high at both monitoring sites along Heavenly Valley Creek as well as the monitoring site downstream (Property Line monitoring site [43HVC-3]). Salt application occurs at the terrain parks within the Heavenly Valley Creek watershed upslope of both the Patsy's monitoring site (43HVC-2) and the Sky Meadows monitoring site (4HVC-1A); application operations have been previously discussed in Chapter 3.6.1.1. Also, as previously discussed, chloride levels remain high at the reference reach site (43HDVC-5) as well indicating that Heavenly is not solely responsible for these elevated readings. Heavenly operations track huck salt (and thus chloride) and limit application for maximum efficiency (lowering the freezing point to limit melt during spring conditions). There is not a prominent trend showing a decline in chloride annual averages along Heavenly Valley Creek. However, annual averages of chloride have become less variable over time, and although high

precipitation years are associated with higher chloride values, these spikes are lower in value overall compared to the earlier period. Chapter 8 includes discussion regarding huck salt application. Application has decreased over the 5-year monitoring period at the terrain park location, which is upstream of the Patsy's monitoring site (43HVC-2), likely reducing the annual average concentration of chloride at that location.

As discussed previously for the Property Line monitoring site (43HVC-3), chloride findings remain high and troublesome in terms of water quality at both the Patsy's monitoring site (43HVC-2), Sky Meadows monitoring site (43HVC-1A) and reference reach (43HDVC-5). Chloride constituent monitoring along Heavenly Valley Creek should continue moving forward to better understand increased background levels as they relate to Heavenly operation and reduction in chloride usage.

Suspended Sediment

At the Patsy's monitoring site (43HVC-2), the 90th percentile standard for TSS has not been exceeded over the 16-year monitoring period. The 4-year drought conditions (2012–2015) and annual 90th percentile average values for TSS are similar to WY 2020 (which was also a drought year) annual TSS average (7.50 mg/L). However, the drought conditions prevalent during WY 2021 had a higher TSS 90th percentile value (21.1 mg/L) compared to the 2012 to 2015 and 2020 drought year values. TSS values of samples taken prior to the Caldor Fire (August 2021) in WY 2021 were all below 11 mg/L; however, the post-fire September sample (September 20, 2021) recorded a TSS value of 29.5 mg/L at the Patsy's monitoring site (43HVC-2). This peak skewed the 90th percentile total higher, which in turn prevents the WY 2021 TSS 90th percentile value from following similar drought year results. This trend is not as prevalent at the Sky Meadows monitoring site (43HVC-1A), since the data set is for fewer years; however, when comparing the TSS 90th percentile values between the two drought condition years of WYs 2020 and 2021, the 2021 90th percentile value is higher than the 2020 value. The post-fire sample in September recorded a higher TSS reading at the Sky Meadows monitoring site as well; however, earlier in the WY, the November sampling event (November 19, 2020) recorded a daily value of 38 mg/L for TSS, increasing the annual 90th percentile value. The November 2020 samples at both the Sky Meadows monitoring site (43HVC-1A) and the Patsy's monitoring site (43HVC-2) occurred over early season snow during a storm event. Unfortunately, the Property Line monitoring site (43HVC-3) was dry during this November sample and the reference reach site (43HDVC-5) only showed a bump in turbidity, total nitrogen, and chloride results. Total phosphorus and TSS did not appear to increase at the reference reach site (43HDVC-5) during the November storm sample. While the November storm sample spike was unusually high for constituents, the post-fire sample also aided in increased annual constituent levels.

While the Caldor Fire did not burn within Heavenly boundaries, September sampling event data at both the Sky Meadows monitoring site (43HVC-1A) and Patsy's monitoring site (43HVC-2) exhibited increased turbidity and TSS that is likely associated with the fire and poor air quality.

For the past 5-year period (2017–2021) the 90th percentile annual average values for TSS are well below the state standard of 60 mg/L at the Patsy's monitoring site (43HVC-3) and for the Sky Meadows monitoring site (43HVC-1A). TSS is a concerning constituent for Lahontan since many other nutrients (phosphorus and nitrogen) are often transported attached to TSS particles. Although TSS annual average values are not concerning at this time with regard to the state standard, monitoring should continue to be tracked due to the correlation with other constituents of concern.

3.6.3 Bijou Park Creek

Raw water quality data (WY 16 through WY 21) for the Bijou Park Creek monitoring site (43BPC-4, below the California Base Parking Lot) are provided in Appendix A. This monitoring reach is closely tied to the Storm Filter Effluent monitoring site (43HVP-2) discussed in Chapter 3.6.5. Additional discussion regarding the Bijou Park Creek watershed can be found in the *Bijou Park Creek Evaluation Report* (Tormey 2017, Appendix J). Graphs showing constituents versus flow for all sites including the Bijou Park

Creek monitoring site (43BPC-4) are included in Appendix C, and Table 3-8 summarizes the annual frequency of non-compliance at the Bijou Park Creek monitoring site (43BPC-4) for WYs 2006 through 2021. It is important to note that effective November 30, 2008, standards for discharges to Bijou Park Creek from the California Base area changed from those for discharges to land treatment to those for discharges to surface waters. Prior to November 30, 2008, effluent limits for discharge at this site were regulated under the permit as maximum concentrations for discharge to land treatment. Proposed, constructed, and implemented improvements to the California Base Parking Lot dictated by the Lahontan permit triggered these more stringent objectives. Table 3-8 shows the standards for each of the permit requirements. Standards for turbidity, total phosphorus, total nitrogen, and oil and grease all decreased by a factor of ten or more. TSS annual average limits remained the same, 60 mg/L based on the 90th percentile of receiving waters to Lake Tahoe (Lahontan Board Order R6T-2003-0032). The chloride state standard increased from a value that was previously set in the 1996 Heavenly Master Plan Collection and Monitoring Agreement at 0.3 mg/L. The annual average for chloride was changed in November 2008 to 3.0 mg/L for Lake Tahoe receiving water limits (Table 3 of Lahontan Board Order R6T-2003-0032). All these state standards remain in the new permit (Board Order No. R6T-2015-0021) signed into effect in May 2015.

As discussed in previous 5-year comprehensive reports (Cardno ENTRIX 2012), prior to 2009, the annual average turbidity standard at Bijou Park Creek monitoring site (43BPC-3) was 200 NTUs, and samples did not exceed this standard. WY 2009 marked the issuance of the new standard of 20 NTU in the permit, and samples at Bijou Park Creek monitoring site consistently exceeded this lower standard, despite a continued trend of declining turbidity samples over time. Turbidity annual average values have declined substantially, so the collection of storm samples at the Bijou Park Creek monitoring site (43BPC-4) is no longer required. Storm samples typically reflect higher turbidity results, data which are currently captured through storm sampling at the California Base Parking Lot filter vaults, as discussed in detail in Chapter 3.6.5. Early season snow or rainstorms that result in elevated runoff prior to development of winter snowpack are often correlated with high turbidity values (such as results from samples in November 2020, following a high-elevation snowstorm that led to increased runoff downstream).

Total Phosphorus

Total phosphorus annual average values collected have lowered substantially since WY 2010. This coincides with the installation of the California Base Parking Lot vault and filtration system installed in 2009. Unfortunately, these lower total phosphorus results still do not meet the WDR standards which were lowered to the state standard of 0.008 mg/L in 2012. All annual average total phosphorus values for the past 5 WYs are in exceedance of the state standard. The lowest annual average for total phosphorus at the Bijou Park Creek monitoring site (43BPC-4) over the past 5 WYs was calculated during the 2020 drought year at 0.100 mg/L. WY 2021 also had below-average precipitation, yet the total phosphorus annual average was higher than in 2020 (0.178 mg/L versus 0.100 mg/L). The storm sample collected in November (0.378 mg/L on November 19, 2020) as well as a high results in January (0.304 mg/L on January 13, 2021) and near peak runoff in March (1.302 mg/L on March 5, 2021) increased the total phosphorus annual average value to 0.178 mg/L for WY 2021 and atypical for drought condition WYs.

Since phosphorus nutrients tend to adhere to larger sediment particles, TSS and turbidity results are often tied to total phosphorus results. The upstream stormwater filter system and phosphorus-absorbing media have helped in removing and limiting total phosphorus exceedance; however, the media are not designed to meet the state standards, and additional inputs above the monitoring location (roadway particulate/deicer) are likely contributing to these exceedances. As mentioned prior with the Heavenly Valley Creek monitoring stations, total phosphorus values were also exceeded at the reference reach site (43HDVC-5) over the 5-year and record period shown (11 years) indicating that these conditions are part of the system and not related to Heavenly.

Total phosphorus values at Bijou Park Creek monitoring site (43BPC-4) continue to exceed the lower threshold standard and should continue to be monitored and compared with the reference reach (43HDVC-5) as the water quality trend for total phosphorus is nowhere near meeting the standard.

Total Nitrogen

Total nitrogen annual average state standard values have continued to decrease over the eleven years of record. The current standard for total nitrogen at the Bijou Park Creek monitoring site (43BPC-4) is 0.15 mg/L. All 5 WYs in question (2017–2021) exceeded the state standard and the annual average value for the past 16 WYs has not been below 0.516 mg/L in 2020. This value is 3.4 times higher than the state standard. The total phosphorus discussion regarding the dissimilarities between WYs 2020 and 2021 results, even though both years in question saw below-average precipitation, applies to the total nitrogen annual averages as well. Likewise, the storm sample in November and runoff sample in March (both above 1 mg/L for total nitrogen) skewed the annual average higher. Like total phosphorus, total nitrogen particles adhere to sediment particles. Likewise, the trend is evident that total nitrogen values correlate with the annual average turbidity and TSS values. As turbidity and TSS increase so does total nitrogen (and total phosphorus). Improvements are needed for Heavenly to meet the Bijou Park Creek monitoring site (43BPC-4) water quality total nitrogen annual average stated standard. Moving forward, total nitrogen monitoring should continue at the Bijou Park Creek monitoring site (43BPC-4).

Chloride

Over the 16-year record shown in Table 3-8, chloride annual average values did not meet the state standard. See Appendix A for all the monitoring site data over the 5 WYs in question. Chloride concentrations continued to be high at all monitoring locations including the reference reach site (43HDVC-5). Chloride concentrations at the Bijou Park Creek monitoring site (43BPC-4) continued to be magnitudes higher than those on Heavenly Valley Creek and Hidden Valley Creek. In part the background condition is aiding in the exceedances of the threshold, but it appears that Heavenly is adding to that background condition. The proximity of the stream sampling point to the roadway network and connection to the California Base Parking Lot, where deicer application is necessary for safe travel of Heavenly's guests, is likely the source of these elevated readings.

Deicers are applied to the plowed roadway to lower the freezing point and prevent ice on the roadway. The sand/salt mixture also provides traction on the steep roadways leading to the California Base Parking Lot. However, chloride concentrations observed at the Bijou Park Creek monitoring site (43BPC-4) have both declined and stabilized (i.e., exhibiting smaller annual average fluctuations due to WY), over the past 5-year reporting period, compared to previous years (Table 3-8). Similar results were observed at the storm filter system effluent location at the California Base Parking Lot, even though the filters do not explicitly treat or capture chloride. However, the StormFilter treatment vaults capture sediment and particulate, some of which may contain chloride anions. Additionally, these reductions may be in part due to improved operations of the California Base Parking Lot, as discussed further in Chapter 3.6.5.

Despite a chloride trend reduction, chloride remains above the state standard at this location and continues to be problematic at Bijou Park Creek. Potential future improvement plans regarding chloride were discussed in the *Bijou Park Creek Evaluation Report* (Tormey 2017, Appendix J) and should be initiated. Chloride constituent monitoring should continue to not only analyze the effectiveness of the proposed improvements but to also compare with background levels.

Suspended Sediment

The 90th percentile calculation means that 90 percent of the values obtained during the WY are equal to or lower than the score calculated. The 90th percentile annual TSS levels have exceeded the state standard of 60 mg/L four times in the past 10 years and twice in the last 5 years. Results from WYs 2013, 2016, 2019, and 2021 all exceeded the TSS 90th percentile state standard (101.3 mg/L, 156 mg/L, 81.2

mg/L, and 81.7 mg/L, respectively). The completion of the filter and treatment system, as well as annual sweeping, debris collection, and vault maintenance and filter replacement have likely led to the decreased TSS annual values. Drought conditions from 2012 to 2015 do not appear to correlate with a decrease in the amount of deicer applied in the parking lot and nearby vicinities (see Chapter 7). Instead, storm patterns and duration correlate with application amounts; however, additional training, new equipment, and the switch to Washoe sand have lowered application amounts in recent years (see more detail in Chapter 7). Data from the past 10 WYs show improvement in the annual 90th percentile TSS results over the 2006 to 2009 results, implying improvement based on operational decisions. The 10-year average of the 90th percentile values from 2012 to 2021 is approximately 59 mg/L, while the 2006 to 2011 average is 168 mg/L.

WY 2020 and 2021 data and results for TSS at the Bijou Park Creek monitoring site (43BPC-4) are not particularly similar, despite both years being considered below average in terms of precipitation. While this site was sampled after the Caldor Fire in September (September 20, 2021), the constituent results across the board are higher than during low flows in July and past WYs; the annual average and 90th percentile totals are skewed higher due to two sampling events in November (November 19, 2020) and March (March 5, 2021). The November sample was collected during a storm event and recorded the highest flow (discharge) for the entire WY. The March sampling date correlates to the receding limb of discharge runoff. Increased streamflow often equates to increased constituent readings.

While the overall water quality trend regarding TSS is showing improvements, the annual 90th percentile values are still not meeting the state standard at the Bijou Park Creek monitoring site (43BPC-4). TSS should continue to be monitored at this site moving forward.

Table 3-8 Exceedance of State Standards at the Bijou Park Creek Monitoring Site (43BPC-4), WYs 2012 through 2021

	Discharge (cfs)	Turbidity (NTU)	Suspended Sediment (mg/L) ¹	Nitrite/ Nitrate (mg/L)	Total Phosphorus (mg/L)	TKN (mg/L)	Total Nitrogen (mg/L)	Chloride (mg/L)
43BPC-4 Bijou Park Creek Annual Averages								
California State Standard		200.0	60¹	-	1.00	-	5.00	0.20
2006	0.520	59.4	457	0.277	0.516	0.818	1.10	98.0
2007	0.257	83.1	157	0.270	0.390	1.20	1.47	82.0
2008	0.333	79.9	120	0.490	0.830	1.39	1.88	145
California State Standard²		20	60	-	0.10	-	0.50	3.0
2009	0.198	88.8	168	0.332	0.307	0.546	0.878	120
2010	0.151	15.4	63.6	0.466	0.120	0.268	0.733	94.9
2011	0.456	18.7	41.7	0.316	0.088	0.342	0.657	76.3
California State Standard³		20	60	-	0.008	-	0.15	3.0
2012	0.244	15.8	29.5	0.305	0.096	0.306	0.610	94.0
2013	0.220	21.2	101	0.392	0.105	0.351	0.742	74.0
2014	0.139	9.52	12.3	0.269	0.063	0.269	0.538	56.3
2015	0.109	12.4	8.40	0.277	0.070	0.264	0.541	45.9
2016	0.116	41.2	156	0.407	0.140	0.316	0.686	87.2
2017	0.387	22.8	39.2	0.249	0.113	0.322	0.570	61.1
2018	0.211	27.6	55.2	0.199	0.147	0.372	0.539	50.8
2019	0.271	38.1	81.2	0.189	0.166	0.358	0.547	58.5
2020	0.170	16.9	26.1	0.249	0.100	0.267	0.516	56.2
2021	0.136	36.0	81.7	0.229	0.178	0.343	0.572	51.7
# Samples	292	292	292	292	292	292	292	292
# Noncompliance	-	7	9	-	12	-	13	16
% Noncompliance	-	43.8%	56.3%	-	75.0%	-	81.3%	100.0%
Maximum Daily	3.04	978	2,796	1.44	10.1	15.6	16.2	960
Minimum Daily	0.010	3.1	2.00	0.005	0.02	0.014	0.268	0.44
Mean Daily	0.247	34.3	52.06 ⁴	0.307	0.22	0.46543	0.769	77.5
Std Error Daily	0.317	101.6	256.1	0.167	0.73	1.18	1.18	100.3

¹ TSS values shown are 90th percentile values.

² California Annual State Standards for Bijou Park Creek are based on surface runoff effluent limits (Lahontan Discharge Permit)

³ California annual state standards for Bijou Park Creek are based on Lake Tahoe receiving water limits (Amended Lahontan Discharge Permit)

⁴ Value shown is the mean daily value.

3.6.4 Edgewood Creek

Edgewood Creek is located in Nevada and is not subject to Lahontan WDRs. However, this analysis has been included for completeness. Raw data for both Edgewood Creek sites are provided in Appendix A. Graphs showing the 2021 hydrograph are included in Appendix B. Sixteen-year constituents versus flow data for both Edgewood Creek sites are included in Appendix C.

The purpose of the Upper Edgewood (43HVE-1) and Lower Edgewood (43HVE-2) monitoring sites is to show the relative effect of resort activities as well as the influence of the Boulder Parking Lot (located between the two monitoring locations) on water quality. The Upper Edgewood monitoring site (43HVE-1) also serves as a good indicator of the effects of resort operation in the Edgewood Creek watershed. Water quality constituent concentrations have typically been higher at the Lower Edgewood monitoring site (43HVE-2) than those measured at the Upper Edgewood monitoring site (43HVE-1); however, in the latest 5-year reporting period, turbidity, TSS, and phosphorus have been higher at the Upper Edgewood monitoring site (43HVE-1). While this may be related to changes in water quality and Boulder Parking Lot improvements influencing results at the Lower Edgewood monitoring site (43HVE-2), it may also be a result of collection of fewer samples at the Upper Edgewood monitoring site (43HVE-1) over the last several years. Samples can only be collected at the Upper Edgewood monitoring site during runoff season (which typically exhibits higher concentrations of water quality constituents), as there is full ice

and snow cover across the channel in the winter and the stream often runs dry (or only has stagnant water present at the cross-section) during the late summer months. Heavenly implemented the BMP retrofit project at the Boulder Parking Lot and Lodge to address the water quality issue at the Lower Edgewood monitoring site, and construction was completed in 2005. Continued parking lot improvements included paving of the entire Boulder Parking Lot (previously a dirt lot) in 2020. Linear K-rail was installed at the west end of the parking lot to prevent snow storage and melt from directly running onto the slope adjacent to Edgewood Creek.

As mentioned above, Edgewood Creek is now subject to Nevada state standards including single value and annual average exceedances for total nitrogen and total phosphorus and annual average exceedances for total nitrogen and TSS (see Appendix A for annual and daily records at both Edgewood Creek monitoring sites). Tables 3-9 and 3-10 show compliance for the Upper Edgewood monitoring site (43HVE-1) and Lower Edgewood monitoring site (43HVE-2) for the 5-year period of this report (2017–2021) as well as the 16-year historical period of record (2006–2021). It is important to note that more samples are collected at the Lower Edgewood monitoring site (43HVE-2) due to low flow, no flow, full snow cover, and resort activities (skiing/grooming) at the Upper Edgewood monitoring site (43HVE-1).

Total Phosphorus

Total phosphorus daily values were exceeded at the Upper Edgewood monitoring site (43HVE-1) 13 times during the 5-year record (2017–2021). Following the 2019 change in standards, total phosphorus annual average values recorded in 2019 through 2021 exceeded the state standard. This same trend is present at the Lower Edgewood monitoring site (43HVE-2) as well following state standard changes. Total phosphorus values at the Edgewood Creek monitoring sites are trending negative in terms of water quality.

Total Nitrogen

For the Upper Edgewood monitoring site (43HVE-1), only one daily value of total nitrogen exceeded the single value state standard for the 5-year period of record. This daily exceedance solely contributed to the annual average exceedance in that year; this exceedance occurred on September 19, 2019, and as mentioned above, was associated with upstream prescribed fire. It did not appear that the prescribed burning in September 2019 had as much effect on the Lower Edgewood monitoring site (43HVE-2) as it appears to have had on the Upper Edgewood monitoring site (with the exception of phosphorus), potentially due to greater distance from the fire. For the Lower Edgewood monitoring site (43HVE-2) annual averages for total nitrogen were not exceeded in any years; however, two single value exceedances occurred during the winter of 2019. In addition, as a preemptive measure during the Caldor Fire, vegetation clearing along powerlines was conducted across Edgewood Creek below the water quality monitoring station. This may affect SCI monitoring results in the future, but is not likely to directly affect water quality results.

Overall, water quality appears to be declining at both Edgewood Creek sites. This may be related to changes in the Nevada state standard to include both single value and annual average standards for nitrogen and phosphorus; however, individual spikes have tended to be higher, and it appears that more occurred during the 5-year reporting period compared to the previous 5 years. A decline in the viability of sampling at the Upper Edgewood monitoring site has caused most samples to be collected during the runoff season, which typically exhibits poorer water quality. The September 2019 prescribed fire event in the Upper Edgewood Creek watershed drastically skewed results but does not necessarily explain exceedance in the following years.

Turbidity

The Upper Edgewood monitoring site (43HVE-1) did not exceed the annual average turbidity standard between 2006 and 2018. However, the standard was exceeded recently, both in 2019 and 2021. This may be due to fewer number of samples being collected overall, as described above. Additionally, the samples that were collected were often collected during the runoff season, when water quality constituents are generally higher. The Lower Edgewood monitoring site (43HVE-2) exceeded the state annual standard for turbidity from 2019 through 2021 during the 5-year reporting period, with the exceedance values associated with runoff season. Turbidity values at the Edgewood Creek monitoring sites are trending negative in terms of water quality.

Suspended Sediment

The only year annual average values for TSS exceeded the state standard was in 2019. Annual average exceedance values in 2019 at the Upper Edgewood monitoring site (43HVE-1) are primarily driven by a single exceedance sampling event (September 18, 2019). This sample date coincided with a prescribed burn conducted by Tahoe Douglas Fire Protection District on the slope above the sampling site, which was correlated with a substantial spike in all constituents. There were no TSS exceedances occurred during the reporting period at the Lower Edgewood monitoring site (43HVE-2). TSS compliance values collected along Edgewood Creek vary between the two sites. TSS values should continue to be monitored to better understand the difference between the two monitoring locations as well as exceedances.

Specific Conductivity

Sampling data regarding specific conductivity for both the Upper Edgewood monitoring site (43HVE-1) and the Lower Edgewood monitoring site (43HVE-2) are included in Table 3-9 and Table 3-10 below. Statistical tables as well as graphical representation for specific conductivity are included in Appendix C. Annual average values for specific conductivity do not vary much over the period of record though specific conductivity results are consistently higher at the Lower Edgewood monitoring site (43HVE-2) compared to the Upper Edgewood monitoring site (43HVE-1). Increased sediment from the Boulder Parking Lot likely is the cause for higher values downstream. Fine sediment and constituents associated with the parking lot carry ions that make their way into the stream, increasing specific conductivity. There is no standard for specific conductivity; therefore, there are no exceedances for either the Lower Edgewood (43HVE-2) or Upper Edgewood (43HVE-1) monitoring sites. The trend analysis for these sites track similar, and there is not a significant difference with regard to specific conductivity.

Table 3-9 Exceedances of State Effluent Standards at the Upper Edgewood Monitoring Site (43HVE-1), WYs 2006 through 2021

	Discharge (cfs)	Turbidity (NTU)	Suspended Sediment (mg/L)	Specific Conductivity (mmhos)	Total Phosphorus (mg/L)	Soluble Reactive Phosphorus (mg/L)	Nitrate/ Nitrite (mg/L)	TKN (mg/L)	Total Nitrogen (mg/L)
Nevada State Standard		10¹	25¹		0.1¹				0.6²
<i>43HVE-1 Upper Edgewood Monitoring Site (2006–2021)</i>									
2006	0.66	3.9	4.4	71	0.040	0.009	0.001	0.164	0.165
2007	0.32	3.9	6.4	66	0.062	0.007	0.001	0.195	0.196
2008	0.57	6.0	11.5	64	0.087	0.004	0.003	0.302	0.304
2009	0.35	3.1	8.0	66	0.056	0.003	0.002	0.134	0.136
2010	0.19	2.3	5.5	69	0.030	0.004	0.002	0.150	0.152
2011	0.38	9.8	23.5	80	0.053	0.005	0.002	0.233	0.235
2012	0.31	5.1	11.3	98	0.064	0.002	0.002	0.185	0.188
2013	0.22	4.5	11.1	90	0.066	0.004	0.001	0.235	0.237
2014	0.18	3.9	7.2	88	0.046	0.005	0.009	0.187	0.196
2015	0.01	1.3	5.3	57	0.042	0.010	0.003	0.174	0.176
2016	0.15	0.7	1.1	64	0.031	0.014	0.003	0.184	0.187
2017	0.76	3.7	3.1	75	0.038	0.012	0.003	0.188	0.191
2018	0.19	5.1	6.0	74	0.047	0.007	0.002	0.137	0.139
Nevada State Standard		10¹	25¹		0.1¹/0.05²				0.6¹/0.6²
2019	0.31	31.7	76.8	73	0.381	0.008	0.003	0.937	0.940
2020	0.15	8.5	13.8	75	0.099	0.005	0.004	0.243	0.247
2021	0.12	13.4	12.5	61	0.083	0.005	0.002	0.218	0.220
# Samples	157	157	157	157	157	157	157	157	157
# Noncompliance	-	17	14	-	26	-	-	-	2
% Noncompliance	-	11%	9%	-	17%	-	-	-	1%
Maximum Daily	3.24	160	308	844	0.09	9.34	9.34	3.82	0.02
Minimum Daily	0.001	14.3	0.3	0.4	0.001	0.054	0.057	0.015	0.001
Mean Daily	0.330	75.9	7.3	14.2	0.003	0.252	0.255	0.081	0.006
Std Error Daily	0.449	20.0	25.7	69.1	0.007	0.741	0.741	0.305	0.004

¹ Not to exceed standard for a single value.

² Not to exceed standard for the annual average.

Table 3-10 Exceedances of State Effluent Standards at Lower Edgewood Monitoring Site (43HVE-2), WYs 2006 through 2021

	Discharge (cfs)	Turbidity (NTU)	Suspended Sediment (mg/L)	Specific Conductivity (mmhos)	Total Phosphorus (mg/L)	Soluble Reactive Phosphorus (mg/L)	Nitrate/ Nitrite (mg/L)	TKN (mg/L)	Total Nitrogen (mg/L)
Nevada State Standard		10¹	25¹		0.1¹				0.6²
<u>43HVE-2 Lower Edgewood Monitoring Site (2006–2021)</u>									
2006	0.69	12.7	18.6	153	0.093	0.009	0.031	0.232	0.263
2007	0.36	7.0	10.8	93	0.060	0.008	0.025	0.196	0.221
2008	0.42	13.4	23.5	97	0.131	0.005	0.018	0.319	0.337
2009	0.22	6.2	16.5	114	0.048	0.003	0.041	0.187	0.228
2010	0.27	6.4	14.1	113	0.035	0.005	0.028	0.182	0.210
2011	0.52	6.0	7.4	151	0.039	0.004	0.031	0.210	0.240
2012	0.32	5.4	9.1	134	0.044	0.003	0.037	0.252	0.289
2013	0.19	6.7	8.7	153	0.053	0.004	0.035	0.228	0.263
2014	0.13	4.3	6.4	133	0.040	0.005	0.042	0.236	0.278
2015	0.03	2.5	3.8	143	0.025	0.005	0.055	0.153	0.208
2016	0.12	5.8	7.5	142	0.039	0.005	0.085	0.200	0.284
2017	0.75	8.7	9.0	120	0.053	0.008	0.043	0.206	0.249
2018	0.34	15.1	11.3	105	0.051	0.007	0.043	0.178	0.221
Nevada State Standard		10¹	25¹		0.1¹/0.05²				0.6¹/0.6²
2019	0.50	52.4	22.2	197	0.145	0.008	0.042	0.315	0.356
2020	0.21	11.0	9.8	117	0.069	0.006	0.056	0.187	0.242
2021	0.13	13.4	8.1	121	0.051	0.007	0.053	0.202	0.255
# Samples	244	248	248	248	248	248	248	248	248
# Noncompliance	-	46	26	-	28	-	-	-	2
% Noncompliance	-	19%	10%	-	11%	-	-	-	1%
Max	4.17	1407	340	188	0.151	1.42	1.48	0.76	0.01
Min	0.01	18.0	0.5	0.5	0.001	0.06	0.08	0.01	0.00
Mean	0.32	135.5	11.1	10.9	0.043	0.22	0.26	0.06	0.01
Std Err	0.46	94.7	32.0	20.6	0.026	0.15	0.15	0.09	0.00

¹ Not to exceed standard for a single value.

² Not to exceed standard for the annual average.

3.6.5 Storm Filter System and Automatic Sampling

3.6.5.1 *Introduction*

The California Base Parking Lot filter vaults were constructed in 2007, and the stormwater filters were installed the following spring (April 2008), prior to the runoff season, when improved filter media were available. In total, there are 455 storm filters located under the northwest corner of the parking lot and roadways. The goal of the storm filter system is to collect and treat surface and sump water prior to discharge into Bijou Park Creek. See Figure 3-9 for RCI's schematic of the filter system. Automatic sampling locations are located at Locations 1, 7 and 14. Location 1 is the southernmost influent location on the figure, Storm Vault Influent South (43HVP-1B). Location 7 is the northernmost influent sampling location, Storm Vault Influent North (43HVP-1A), and Location 14 is the Storm Vault Effluent monitoring site (43HVP-2), prior to discharge to surface water. An additional vault and filter system is located on Wildwood Avenue, below the intersection with Saddle Road (not shown in Figure 3-9). This filter vault collects and treats runoff along Saddle Road downslope from the parking lot. Bijou Park Creek and the monitoring site (43BPC-4) located downstream is formed by the combination of the Storm Vault Effluent monitoring site (43HVP-2) water, the parking lot drainage, as well as the Wildwood Avenue Storm Vault Effluent water, Saddle Road drainage.

Across the six underground vaults, there are 14 filters with PhosphoSorb™ media (also referred to as sacrificial filters throughout past reports), intended to specifically capture total phosphorus and TSS, and 441 ZPG™ media filters, intended to treat a range of water quality constituents. The underground vaults in the California Base Parking Lot also include an oil and grease separator.

Stormwater sampling began in October 2008 (WY 2009); however, some troubleshooting was required to collect viable samples, and therefore samples collected were not required to be submitted to Lahontan at that time. Preliminary data for WY 2009 were summarized and submitted in a memorandum to Lahontan in November 2009. Stormwater is sampled at two influent locations and one effluent location, with the intention being to better understand the effectiveness of the storm filters across the vault system. The Amended MRP that was issued in May 2011 (2003-0032A1) required the collection and reporting of 10 storm/runoff samples each WY. In WY 2012, storm samples were taken, and results were officially reported to Lahontan. The new WDR and Reporting Program (No. R6T-2015-0021) only requires five samples to be collected and reported per WY. As with past WY samples, infrequent storm cycles, the timing of storm sampling, and equipment failure have been problems and have limited the collection at all three sampling locations per the reporting program requirements. During the ski season and winter months the parking lot is used extensively for customer and employee parking. Parking in addition to snow removal storage and ice over prevent sampling for numerous months (November through March). For the reason listed above, fewer than five samples have been collected in some WYs.

Maintenance of the system was sporadic during the early years of vault installation and operation. The PhosphoSorb™ filters were replaced in the fall of 2009; however, these filters were not replaced again for 2 years, until the fall of 2011. In 2011, Heavenly committed to an annual filter replacement cycle in which all filters (both PhosphoSorb™ and ZPG™) were to be replaced over a 4-year cycle. The replacement of 221 ZPG™ cartridges in June 2014 marked the first time that ZPG filters were replaced since installation. Since that time, at a minimum, the 14 PhosphoSorb™ filters are replaced annually, and ZPG™ filters are replaced as needed during the annual inspection and maintenance event, until all ZPG filters are replaced during the 4-year full replacement cycle.

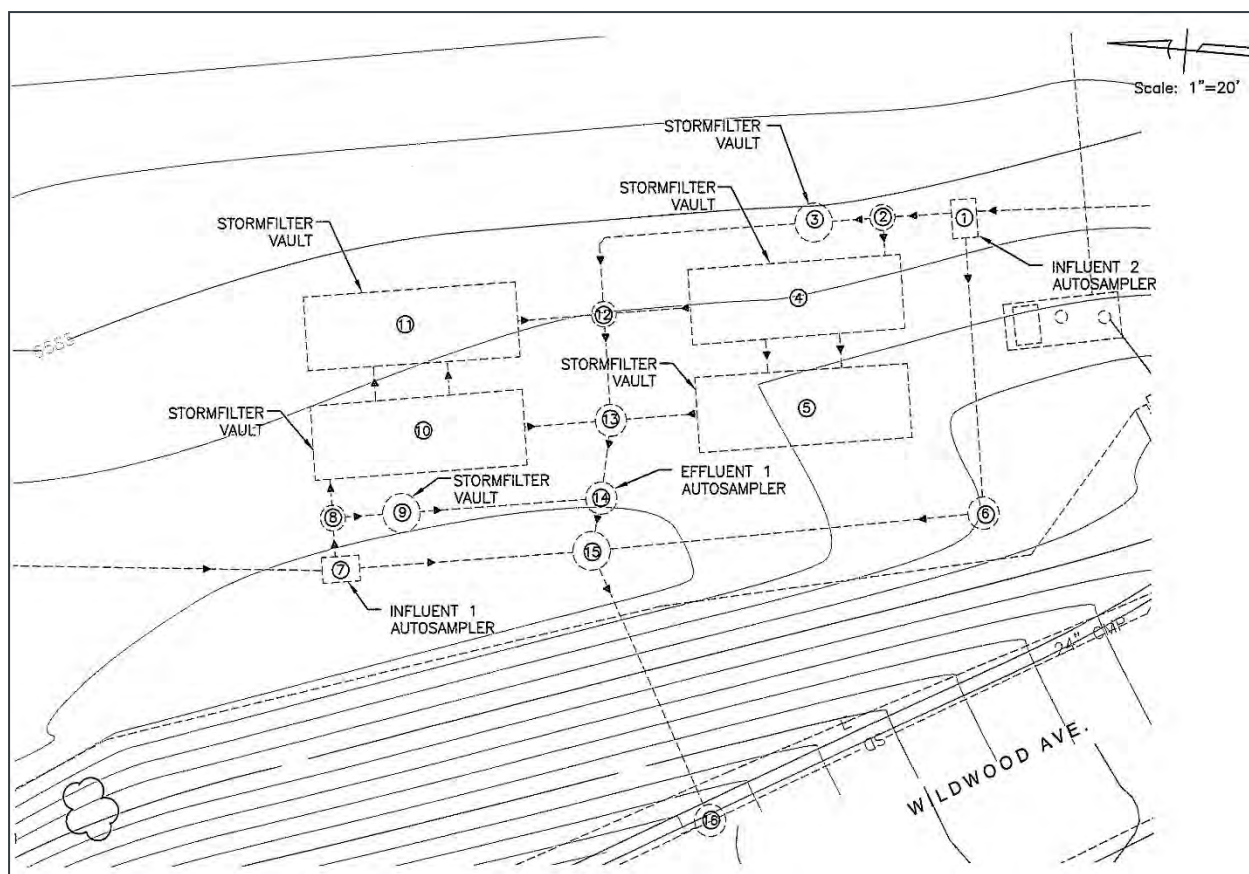


Figure 3-9 California Base Parking Lot Storm Filter Water Quality Treatment System (Source: RCI 1/21/08)

Since installation, various technical issues have prevented the consistent collection of reliable samples for analysis. When in place and functioning properly, the Teledyne ISCO auto-samplers will automatically obtain storm event samples after being powered on. If the auto-samplers are not operational, samples may be collected manually, using both an extension rod and bottles or by manually selecting the pump feature on the system to collect samples within the vaults where the auto-samples would be generated. Details of the auto-sampler procedure are included in the *Draft Heavenly Mountain Resort Water Quality QAPP* (Cardno 2021). Storm events tend to trigger one or two of the automatic samplers, but not always all three. On occasion, the effluent results contained higher levels of analyzed constituents than the influent samples; however, this trend has become less prevalent since maintenance of the systems has resumed. In some cases where an incomplete sample is obtained, grab samples were collected to complete the storm sampling round. In these cases, the results do not adequately represent filtration since the grab sample timing differs from the automated sampling collection time. Corrective actions have been listed in the past and are summarized in the *Bijou Park Creek Evaluation Report* (Tormey 2017, Appendix J). Additionally, this report recommends improvements to the system and sampling collection methodology to gain more useful data for better information and future decision-making.

3.6.5.2 Storm Sampling Water Quality Results and Discussion

Water quality data for both the influent and effluent locations for the most recent 5-year period (2017–2021) are included in Appendix D. Table 3-11 summarizes the Storm Vault Effluent monitoring site (43HVP-2) data between 2017 and 2021. Bold values in the table reflect exceedances of the not-to-exceed state standards for discharge to surface waters. Unlike the California stream sampling standards, the effluent standards are single point not-to-exceed standards instead of annual averages.

As noted in Table 3-11, only 15 samples were collected during the past 5-year period. The only year when it was possible to collect all five required samples was a well-above average precipitation year (2017). Collecting the required storm samples annually has been problematic (see Chapter 3.6.5.3 for more details).

Total Phosphorus and Total Nitrogen

From 2017 to 2021 period, total phosphorus was in exceedance in 27 percent of samples collected, compared to 68 percent during the prior 5 years (2012–2016).

Total nitrogen and turbidity storm samples exceeded the standard on 60 percent and 93 percent of the sample dates (respectively), compared to 88 percent and 91 percent during the 2012 through 2016 period. Table 3-12 shows the comparison of maximum and mean values for the sampled constituents for the 5-year reporting periods of 2012 to 2016 and 2017 to 2021. Total nitrogen single event exceedances occur regularly with 9 of the 15 samples exceeding the standard over the 5-year period. Maximum and mean values for total nitrogen remain high.

While fewer samples have exceeded the standard for total nitrogen and total phosphorus during this 5-year period compared to the previous 5-year period, turbidity exceedances have remained common. Table 3-12 compares maximum and mean values for the sampled constituents for the 5-year reporting periods of 2012 to 2016 and 2017 to 2021. Mean values of total phosphorus have improved across the two reporting periods, although the mean maximum value was nearly double in 2017 to 2021 compared to 2012 to 2016. The PhosphoSorb™ filters appear to be improving the water quality though the system (when comparing the combined influent values to the effluent values—see Appendix D) and improving results over time.

While the trend shows water quality improvement in terms of total phosphorus and total nitrogen through the filter system, additional samples are needed annually to better analyze the effectiveness of the system as well as proposed system improvements. Water quality standards are not being met consistently for either of these constituents.

Chloride

Comparing the two 5-year reporting periods, chloride concentrations show water quality improvement. While there is no standard at the Storm Vault Effluent monitoring site (43HVP-2), there is a reduction of over 50 percent of the maximum and mean chloride values. Also, the reduction in chloride values at the Storm Vault Effluent monitoring site (43HVP-2) aid the downstream compliance water quality at the Bijou Park Creek monitoring site (43BPC-4, below the California Base Parking Lot). Heavenly has made a concerted effort to reduce chloride application: switching to a 5:1 Washoe sand to salt mixture, educating staff and requiring documentation of deicer application around the lodge and tram entrances, switching from the dump truck roadway application to the truck bed and automated application, and use of liquid brine instead of sand/salt roadway deicer, when possible, all discussed in Chapter 7. Since the Storm Vault Effluent monitoring site (43HVP-2) is a portion of the headwaters to Bijou Park Creek, chloride should continue to be monitored throughout the filter vault system as it is constituent of concern for Lahontan.

Suspended Sediment and Turbidity

As discussed with the stream samples, total phosphorus and total nitrogen are tied to TSS as these constituents attach to larger particulate matter. TSS analysis is not required by the permit; however, TSS and turbidity are closely related (higher TSS values typically equate to higher turbidity values), and higher turbidity tends to lead to higher phosphorus and nitrogen. This is evident in the May 16, 2021, Storm Vault Effluent monitoring site (43HVP-2) sample, as the turbidity reading was 760 NTUs and both the total phosphorus (0.63 mg/L) and total nitrogen (3.2 mg/L) values were near the highest reported values obtained over the 5-year period. Daily, maximum, and mean stormwater values for turbidity remain high and should continue to be monitored and analyzed for all water quality samples collected.

Oil and Grease

Five of the 15 samples collected over the 5-year monitoring period exceeded the oil and grease standard. The laboratory reporting limit for oil and grease is the same value as the not-to-exceed standard (2.0 mg/L); therefore, any value lower than the standard is ND. For the purposes of calculating the mean oil and grease value over the 5-year period, all ND samples are considered one half of the reporting limit, since these samples are not likely to be a true “0” value. Comparing the past two 5-year reporting periods, oil and grease results show improvement, with a reduction of over 50 percent of the maximum and mean. Reductions in oil and grease may be related to annual maintenance and replacement of oil and grease booms within the vault system. Spikes of oil and grease appear to occur prior to annual oil and grease boom maintenance, or directly coincide with asphalt paving and maintenance, as occurred just before the June 24, 2021, sample date. However, these parking lot improvements fixing deteriorating pavement should have long-term benefits to effluent water quality, by reducing fine sediment and gravels associated with potholing that was occurring across the parking lot and increasing loading to the vaults. Due to the limited data set, additional oil and grease samples should be collected in order to determine the effectiveness of the filter vaults, maintenance and annual oil boom replacement.

Table 3-11 Exceedances of Standards at the Storm Vault Effluent Location (43HVP-2), WYs 2017 through 2021

Notes	Time	Total Phosphorus as P (mg/L)	Chloride (mg/L)	Nitrate Nitrogen (mg/L)	Nitrite Nitrogen (mg/L)	TKN (mg/L)	Total Nitrogen Calc. (mg/L) ³	Turbidity (NTU)	Oil & Grease (mg/L)	
Lahontan Standards ^{1, 2}		0.10	N/A	N/A	N/A	N/A	0.5	20	2.0	
2017										
10/14/2016	^{6,7}	13:34	0.08	9.2	0.24	0.02	1.40	1.66	59	ND
10/27/2016	^{4,7}	14:17	0.03	5.4	0.04	ND	ND	0.15	44	ND
12/15/2016	⁷	15:03	0.07	12	0.06	0.02	0.35	0.43	72	ND
5/4/2017	⁸	15:04	0.10	33	0.17	ND	0.27	0.45	30	2.2
9/21/2017	⁹	18:21	0.11	11	0.11	ND	0.24	0.36	26	ND
2018										
11/15/2017	⁹	12:52	0.07	14	0.05	0.01	0.43	0.49	7	ND
5/24/2018	^{5,10}	14:02	0.04	33	0.22	0.01	0.76	0.99	91	3.3
7/22/2018	⁶	19:18	0.09	36	0.21	ND	1.90	2.12	100	3.3
2019										
11/27/2018		17:09	0.06	11	0.15	ND	0.34	0.50	28	2.4
5/16/2019		7:09	0.03	70	0.14	ND	0.50	0.65	77	ND
9/5/2019	¹⁰	15:45	0.19	78	0.38	ND	2.30	2.69	270	ND
2020										
5/18/2020		7:20	0.03	45	0.13	ND	0.46	0.60	49	ND
2021										
11/18/2020		12:21	0.08	32	0.12	ND	0.90	1.03	150	ND
5/16/2021		22:02	0.63	120	0.29	ND	2.90	3.20	760	ND
6/24/2021	⁶	13:30	0.27	84	ND	ND	5.80	5.81	150	3.7
Statistical Summary										
# Samples		15	15	15	15	15	15	15	15	
# Noncompliance		4	-	-	-	-	9	14	5	
% Noncompliance		27%	-	-	-	-	60%	93%	33%	
Max		0.63	120	0	0	6	6	760	4	
Min		0.03	5.40	0.04	0.01	0.24	0.15	7	ND	
Mean		0.12	39.57	0.17	0.02	1.33	1.41	128	1.7	
Std Error		0.15	33.98	0.10	0.01	1.54	1.53	187.32	1.00	

¹ Standards are maximum concentration for discharge to surface waters, effective November 30, 2008. TSS limits based on the 90th percentile of constituent allowed in receiving waters to Lake Tahoe. Constituent exceedance values are shown in bold.

² Where values are reported as < values or ND (less than the minimum detection limit or reporting limit), for purposes of calculating the mean or calculating total nitrogen, half the detection limit was used.

³ Where a nitrogen component of the calculation is missing, total nitrogen is calculated in cases where it is exceeding the standard, despite the missing value.

⁴ Reported total phosphorus value is an estimate; the sample matrix interfered with the analysis.

⁵ Reported nitrate and nitrite as nitrogen values are an estimate; sample was held beyond acceptable hold time.

⁶ Reported oil and grease is an estimate; the sample matrix interfered with the analysis.

⁷ The sample collected was a grab sample. Visual inspection showed stormwater entering both the sacrificial and large filter bays.

⁸ The sample collected was a snowmelt runoff grab sample. Visual inspection showed runoff entering both the sacrificial and large filter bay (ID4) from the south inlet and runoff only entering the sacrificial unit from the north inlet. No runoff was entering the large filter vault from the north (ID10). Sacrificial vault inspections showed water over the filters, which appeared to be functioning correctly.

⁹ Sample collected was triggered by the flow sensors collecting composite samples over an approximate 1-hour time period. The outlet sample was collected approximately 15 minutes after the inlet locations, providing residence time for filtration through the storm filter system.

¹⁰ There was insufficient sample available to perform a spike and/or duplicate on the oil and grease analytical batch.

Table 3-12 Comparison of 5-Year Reporting Averages from the Storm Vault Effluent Location (43HVP-2)

		Total Phosphorus as P (mg/L)	Chloride (mg/L)	Nitrate Nitrogen (mg/L)	Nitrite Nitrogen (mg/L)	TKN (mg/L)	Total Nitrogen Calc. (mg/L) ³	Turbidity (NTU)	Oil & Grease (mg/L)
Lahontan Standards^{1, 2}		0.10	N/A	N/A	N/A	N/A	0.5	20	2.0
Five-year reporting period averages: 2012–2016	Max	0.32	600	0.83	0.11	4.40	4.40	290	11.0
	Min	0.03	4	0.02	0.01	0.32	0.42	6	1.0
	Mean	0.15	89	0.24	0.03	1.05	1.24	74	5.4
	Std Error	0.08	120	0.20	0.03	0.86	0.89	73	4.0
Five-year reporting period averages: 2017–2021	Max	0.63	120	0.38	0.02	5.80	5.81	760	3.7
	Min	0.03	5	0.04	0.01	0.24	0.15	7	ND
	Mean	0.12	40	0.17	0.02	1.33	1.41	128	1.7
	Std Error	0.15	34	0.10	0.01	1.54	1.53	187	1.0

¹ Standards are maximum concentration for discharge to surface waters, effective November 30, 2008. TSS limits based on the 90th percentile of constituent allowed in receiving waters to Lake Tahoe. Constituent exceedance values are shown in bold.

² Where values are reported as < values or ND (less than the minimum detection limit or reporting limit), for purposes of calculating the mean or calculating total nitrogen, half the detection limit was used.

³ Where a nitrogen component of the calculation is missing, total nitrogen is calculated in cases where it is exceeding the standard, despite the missing value.

3.6.5.3 Storm Filter System Recommendations for Improving Water Quality

Since the effluent water quality from the filter vaults has not been meeting state standards and directly contributes to the downstream stream monitoring location at Bijou Park Creek (43BPC-4), Lahontan required that an additional evaluation be conducted to assess the site and site conditions. The resulting *Bijou Park Creek Evaluation Report* (Tormey 2017, Appendix J) included the following recommendations regarding the storm filter system and automatic sampling:

- Minor structural improvements include:
 - Replace manhole covers (watertight seals in the effluent treatment train);
 - Grout (existing) sumps;
 - Re-establish downhill gradient in Manholes 12, 13, and 14;
 - Plug sacrificial PhosphoSorb™ filter outlet riser (preventing system bypass/non-treatment of stormwater);
 - Eliminate imperfect seal in cartridges.
- Continue regular maintenance program.
- Water quality sampling improvements include:
 - Staggering water quality sampling times;
 - Continued collection of continuous flow rate data; and
 - Characterization of sediment collected in the system.

Since the release of the report, the regular maintenance program has continued. Vaults and filters are inspected on an annual basis, the 14 PhosphoSorb™ sacrificial filters are replaced annually, and all ZPG filters are inspected and replaced as needed or within a 4-year period. Additionally, water quality sampling

times have been staggered, so that the effluent location is sampled approximately 30 minutes after the influent locations, allowing adequate time for water to move through the system in an attempt to capture filtration results.

The success of these improvements should be apparent in the water quality sampling results at the effluent location. However, since the *Bijou Park Creek Evaluation Report* was submitted, not all recommendations have been addressed by Heavenly. Those items are italicized in the list above. No structural improvements within the vault system have been completed since issuance of the report.

One additional observation regarding the storm filter system water quality results is the lack of the number of samples and the collection of these samples. As mentioned previously, samples are not collected while the ski resort is operation during the winter months. This leaves only the months of April through October/November for collecting storm samples. Summer storms are very infrequent, and the timing of these storms must align with working days as well as laboratory hours and hold times for constituents. This leaves Sunday to Thursday as optimum sampling days for analysis, which does not always align with a rain or runoff event.

Another issue with the storm filter vault system and water quality results is the seasonal timing of the samples. Looking at the past 5 years, samples are often collected in the fall after late summer maintenance and filter replacement. The fall sample is typically a first flush phenomenon in which any trapped sediment (and constituents) within the vault system is passed through the new filters. While sediment buildup is removed through the vaults, the piping networks leading into the vaults and located throughout both the upper and lower California Base Parking Lot are not cleaned. Additionally, residual and trapped sediment (and constituents) that have been collecting within the parking lot since the previous storm or spring runoff is flushed through the filters. This is evident in the October 14, 2016, sample results.

Comparison of the results of the past 5 years of effluent data with the timing of vault maintenance and filter replacement indicates that the regular maintenance program appears to have substantially improved effluent results, but only for a short duration. For example, water quality samples collected in spring or early summer tend to show decreased filtration and water quality improvement. In this case, filter media are more likely to be spent and inoculated with debris/fine sediment after treating stormwater all winter (including snowmelt runoff). This is evident in Table 3-11 and the Storm Vault Effluent location (43HVP-2) results for WYs 2018, 2019, and 2021. Total nitrogen results in these 3 years progressively get worse later in the WY. The data suggest that there is potential for improving Storm Vault Effluent water quality by switching the timing of filter maintenance and replacement to spring. Additional recommendations for improvement of the storm filter vaults are included in Chapter 3.8.

3.7 Conclusions

Holistically looking at the water quality data over the past 5 years at each of the monitoring site locations, water quality has remained similar to the previous 5-year period. Declines of individual constituent values at Heavenly Valley Creek and Bijou Creek can be attributed to high precipitation years in 2017 and 2019. Water quality at Edgewood Creek appears to have declined slightly compared to the previous 5-year period, although that may be related to sampling frequency, upslope prescribed fire, and/or changes in state standards. Additional data are needed at both Edgewood Creek monitoring sites to determine trends and directionality. Annual averages for each of the stream monitoring sites are provided in previous chapters, and values that are bold and italicized are above the annual state standard. While exceedances are prevalent at the reference reach site (43HDVC-5), the data show that there are higher exceedances recorded for chloride along Heavenly Valley Creek, as well as total phosphorus for most sites. Therefore, these exceedances are likely not attributable solely to Heavenly operations and management activities, but resort activities are likely increasing the constituent annual average values. For the 5-year reporting period (2017–2021), the Patsy's monitoring site (43HVC-2) had no annual average exceedances for total

nitrogen, unlike the previous two 5-year reporting periods (2006–2011, 2012–2016), which both had two annual average exceedances.

Exceedances and values of some water quality constituents (total nitrogen and TSS) at the Bijou Park Creek monitoring site (43BPC-4) located below the California Base Parking Lot site have improved since the previous comprehensive monitoring period, although most constituent values were either similar or slightly higher. This can likely be attributed to two well above-average precipitation years (2017 and 2019) in the most recent 5-year period, compared to 4 years of drought and one above-average precipitation year during the previous 5-year period.

Storm sampling results from the effluent storm filter vaults tend to exceed water quality standards for total phosphorus, total nitrogen, and turbidity. Increased maintenance and filter replacement have improved water quality results from the initial installation of the vaults, particularly when comparing effluent results; however, storm sampling exceedances are still prevalent. Recommended improvements to the filter system and monitoring program are documented in the Catalyst Environmental Solutions report found in Appendix J (*Bijou Park Creek Evaluation Report*) and are summarized in Chapter 3.6.5.3 of this report. With respect to both the storm filter vaults and Bijou Park Creek, Heavenly continues to limit the amount of deicer applied on the parking lot and roadways leading to the California Base Lodge and is working with Lahontan to further reduce source controls and future exceedances. While additional maintenance of the filter vaults is recommended, challenges of biannual maintenance include access to the vaults during times of year when the parking lot is snow covered; maintenance would need to be scheduled opportunistically and could only be minimally planned in advance.

3.8 Water Quality Recommendations

3.8.1 Water Quality Sampling

No adaptive management changes with regard to water quality stream sampling frequency or protocol along Heavenly Valley, Hidden Valley, or Edgewood Creeks are recommended at this time. However, assessments and replacement of the flumes at the Sky Meadows and Patsy's monitoring sites should be conducted. The outlet of the flume at the Sky Meadows monitoring site (43HVC-1A) has become submerged over time, thus reducing the accuracy of the stage-discharge relationship. Flow is typically also measured with the Marsh-McBirney meter at the Sky Meadows monitoring site when conditions permit. During the winter months, the flume is the only viable option for estimating flow due to substantial snow depths and ice cover that can make accessing the stream very difficult and unsafe. The outfall of the flume at the Patsy's monitoring site has shifted to the right over time, thus skewing the stage-discharge relationship. Additionally, the outfall has scoured the section of stream downstream of the flume and may cause undercut at some point. Assessment and replacement of both flumes should be considered in the near future.

As discussed in the Catalyst Environmental Solutions January 2017 report *Bijou Park Creek Evaluation Report* (Appendix J, Sections 5 and 6) and previously recommended in the last 5-year comprehensive report, Heavenly has implemented various BMPs and installed active treatment systems to improve water quality in the stormwater runoff from the California Base area, including construction and operation of the stormwater management system in the California Base Parking Lot to treat the runoff, additional improvements to enhance the effectiveness of the stormwater management system, and improved management of traction sand and brine application to substantially reduce the annual volume used. However, despite implementation of these BMPs, chloride concentrations in the effluent from the Heavenly stormwater management system remain elevated above the water quality objective of 3 mg/L specified in the WDR.

In addition, the findings of the *Bijou Park Creek Evaluation Report* indicate the presence of additional downstream sources of chloride that are higher in concentration and chemically distinct from Heavenly's discharge. These other discharges lead to a stream-wide background condition of elevated levels of

chloride, most likely due to the pervasive use of deicers in the area (by the City of South Lake Tahoe, California Department of Transportation (CalTrans), and area residents) to ensure public safety during the winter months. CalTrans and Nevada Department of Transportation have programs that focus on source reduction, but we have not seen other area-wide studies of chloride in urban-affected waters of the basin. The *Bijou Park Creek Evaluation Report* suggests that the issue is watershed-wide, and perhaps basin-wide within developed areas.

The current water quality objective for chloride at Bijou Park Creek of 3 mg/L is based on the anti-degradation standard for Lake Tahoe rather than potential impacts to aquatic life. Lake Tahoe and tributary waters are not listed by the California State Water Resources Control Board as impaired for chloride, and levels safe for aquatic life are greater than 150 mg/L. The data in the *Bijou Park Creek Evaluation Report* suggest that elevated chloride levels could be an area-wide issue within the more developed, populated portions of the Lake Tahoe Basin. Accordingly, the *Bijou Park Creek Evaluation Report* recommends establishing an alternate background water quality sampling site that is more reflective of the level of development within the Bijou Park Creek watershed. In this context, the word “background” is not meant as “unimpaired.” Rather, background is meant as “a general chemical characteristic of the receiving waters.” Hypothetically, were Heavenly to achieve a chloride discharge concentration of 3 mg/L, then the background condition from other sources of greater than 100 mg/L downstream would still cause Bijou Park Creek to, overall, be well above 3 mg/L. Establishing an alternate background station would ensure that the California Base Parking Lot does not further contribute to water quality degradation, and that Heavenly is not held to a standard that would constitute a concentration higher than background.

The continued recommendation is to establish a background station along Bijou Park Creek in the vicinity of sampling points designated BPC-C7, BPC-B8, and BPC-W9 in the *Bijou Park Creek Evaluation Report*. These locations yielded water quality samples that best represent the general chemical characteristics of the receiving water (i.e., background) because they clearly include a geochemical fingerprint of other sources that contribute chloride concentrations in excess of 100 mg/L. Heavenly anticipates working further with Lahontan to further establish the rationale for establishing an alternate background location and in site selection.

A few additional improvements to the storm filter vaults and stormwater quality sampling timing are recommended and discussed in Chapter 3.6.5.3. More detailed information regarding the StormFilter vault recommendations can be found in the *Bijou Park Creek Evaluation Report* (Appendix J). These improvements will slowly be incorporated in the future.

3.8.2 Applicability of Reference Reach and Monitoring Site

The reference reach site (43HVDC-5) (which is within the Lower Hidden Valley reference reach, HDVC-2) was burned during the 2021 Caldor Fire. Figure 3-11 includes a map of Burn Area Emergency Response burn severity of the Caldor Fire within the vicinity of Heavenly. The Lower Hidden Valley reference reach (HDVC-2) is mapped primarily as “moderate” burn severity. The majority of the immediate upstream area is also mapped as “moderate” with some patches of “high” burn severity on the steepest slopes. The Upper Hidden Valley Creek SCI monitoring reach (HDVC-1) appears to have been largely unaffected based on fire extent mapping, although the downstream section of the Upper Hidden reference reach (HDVC-1) is mapped as “low” burn severity. The condition of the site has yet to be visually verified due to forest closures during the fall of 2021 and early season snowpack starting in November 2021. The next scheduled visit to the HDVC-1 is scheduled for the summer of 2022 for BMI sampling.

The Hidden Valley Creek reference reach site (43HDVC-5) could not be sampled in August (due to the active fire) or September (due to forest closures). A photo documenting the site conditions prior to the fire (July 2021) is shown in Figure 3-10. The site was visited and sampled in October 2021, ending WY 2021. The conifer forest surrounding the site was burned, although most of the larger conifer trees still held needles and only exhibited lower trunk charring. All understory conifer trees and brush had burned, as

had the extensive volume of downed wood on the forest floor. The riparian corridor was largely intact, with leaves of alder and currant still present in October 2021. The rebar and plastic rebar caps marking the water quality cross-section did not burn. A bulldozer fire line had been laid across the forest floor and crossed the stream approximately 20 feet below the cross-section. It appeared that the volume of woody material and rocks at the crossing location allowed the heavy machinery to remain above the water surface. Subsequent sampling events in WY 2022 (not part of this report, but relevant to discuss in term of post-fire observations) have shown substantial sediment mobilization during the fall of 2021, in part due to a substantial storm event in late October (the storm event between October 24 and 26 delivered 7 inches of precipitation), as shown in Figures 3-12 to 3-13.

As Heavenly Valley Creek and the monitoring sites/reaches did not burn, the current conditions at the reference reach are no longer representative of an unimpaired reach for comparison. However, no other more appropriate reaches are present in the nearby vicinity. Close monitoring during the next 5-year period is recommended, and reconsideration of the site for continued use as a reference reach should be weighed, based on the site's recovery to pre-fire conditions, availability of an alternative reference reach, and implications of changing the reference reach for a project that has a long-term data set (more than 30 years). During the next 5-year period, determinations of "background" values for comparison to project values should be made based on previous correlations between streamflow and chemical characteristics at Hidden Valley Creek from past (pre-fire) monitoring.



Figure 3-10 Hidden Valley Creek Reference Reach Site (43HDVC-5) in July 2021 (Pre-Fire), Looking Upstream from Right Bank

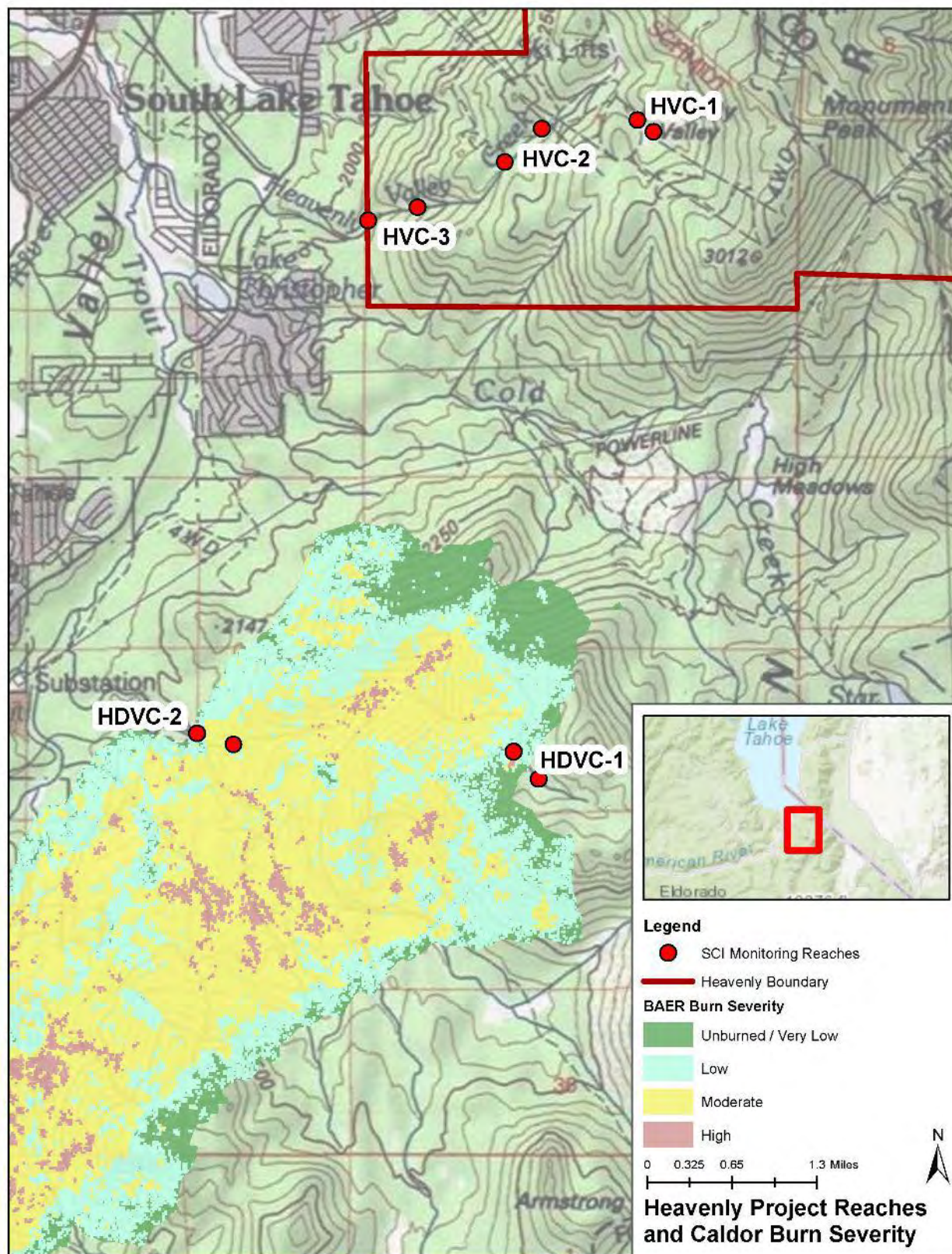


Figure 3-11 Heavenly Project Reaches and Caldor Fire Burn Severity (USFS 2021)



Figure 3-12 Hidden Valley Creek Reference Reach Site (43HDVC-5) in October 2021 (Post-Fire), Looking Upstream from Left Bank



Figure 3-13 Hidden Valley Creek Reference Reach Site (43HDVC-5) in November 2021 (Post-Fire), Looking Upstream from Left Bank

3.8.3 Heavenly Valley Creek TMDL Designations

The TMDL for TSS at Heavenly Valley Creek was established in 2000 at 58 tons/year (based on a 5-year rolling average). While the 5-year rolling average for TSS at the Heavenly Valley Creek Property Line monitoring site (43HVC-3) was above the TMDL in the late 1990s, Heavenly Valley Creek has been in compliance with the TMDL since 2005 (Figure 3-2). Years with high sediment (2010, 2011, and 2017) have all been associated with very high precipitation and runoff, and even these very high values have not contributed to an exceedance of the 5-year rolling average. Additionally, BMI results at the Sky Meadows monitoring site have improved over time (from *very poor* to *fair*; see Chapter 5.6.1 for details), suggesting improved aquatic habitat conditions upstream. Delisting the TSS TMDL at Heavenly Valley Creek at the Property Line monitoring site (43HVC-3) is reasonable based on the improvement seen over the reporting period.

3.8.4 Recent 303(d) Listings

Heavenly reviewed the *2018 Clean Water Act Sections 303(D) and 305(B) Assessment* issued June 2019 in preparation for submittal of the final “Integrated Report” to Lahontan and provided comments (included in Appendix K). The primary concern was that extensive amount of data collected as part of NPDES compliance sampling was not included in the 303(d) considerations because the data were not in the CEDEN database. Heavenly and Cardno have worked with the Lahontan Board over the last 2 years to convert these data to a format suitable for uploading to CEDEN and have uploaded portions of the data. The goal is to have some of the 303(d) listings revisited in light of the more comprehensive data that is available through this and past summary and annual reports.

Overall, comments included the request to review more recent data than were considered. Documents reviewed included “fact sheets” and lines of evidence provided by Lahontan in support of the *Draft California 2018 Integrated Report (303(d) List/305(b) Report)*. Moving forward, Heavenly anticipates working with Lahontan to review the TSS TMDL annual values and certify the recent 5-year data so that this information is included in the next Integrated Report (303(d) List/305(b) update).

3.8.4.1 *Bijou Park Creek, New Listing: Iron (Category 5A, Completion Year 2028)*

The fact sheet states “that this creek has naturally high levels of iron. Though this creek has naturally high levels of iron, ambient concentrations for this creek have not been established at this time.” In the 2012 fact sheet, Lahontan used these same lines of evidence to recommend that Bijou Park Creek not be listed for iron. Therefore, Heavenly requests Lahontan return to its 2012 conclusion that the lines of evidence do not support placing Bijou Park Creek on the Section 303(d) list for iron.

3.8.4.2 *Bijou Park Creek, New Listing: Oil and Grease (Category 5A, Completion Year 2028)*

The fact sheet utilized monitoring data from October 2007 to October 2009 to reach a conclusion. The data from this time period were collected during the optimization of the below-ground stormwater treatment system and the automated sampler system for Heavenly’s California Base Parking Lot. At Lahontan’s request, Heavenly worked closely with Lahontan on the design, installation, and optimization of these systems because Heavenly was the first discharger in the basin to install an automated sampling system for the treatment unit. There was a long period of troubleshooting this first-in-the-basin system (as discussed in Chapter 3.6.5), and both Lahontan and Heavenly agreed that the data from this time period were not reliable for decision-making purposes. Oil and grease results have since improved at Storm Vault Effluent monitoring site (43HVP-2) and mean annual averages of oil and grease have remained at or below the state standard of 2.0 mg/L for the past 5 years (Table 3-11 in Chapter 3.6.5.2). The discharges from the system, however, are well below levels that produce visible films or coatings on the water surface. The Lahontan limit is at the detection limit for this constituent; minor exceedances (less than 3.3 mg/L) are within the 30 percent uncertainty that certified laboratories must meet. Therefore,

Heavenly has requested Lahontan to consider using updated data to make TMDL listing determinations for oil and grease at Bijou Park Creek.

3.8.4.3 Heavenly Creek (source to USFS Boundary), Benthic Community Effects (Category 5A, Completion Year 2031)

Based on this recent and thorough analysis by Lahontan, the data presented in this report, and a finding of uncertainty regarding an appropriate decision, Heavenly agrees that listing to Category 3 may be appropriate. Heavenly requests that Lahontan clarify the listing category, presumably to listing Category 3, based on this information.

3.8.4.4 Heavenly Creek (source to USFS Boundary), Chloride, Do Not Delist (Category 5A Completion Year 2028)

The amount of data available, using Category 3 Criteria, “is insufficient to determine an appropriate decision recommendation, but the available data and information that does exist indicate beneficial uses may be potentially threatened.” This statement is supported by the fact sheet statement that “a minimum of 26 samples is needed for application of Table 3.1. The placeholder LOEs [lines of evidence] used for the original listing based on protection of REC [recreation] are still valid and the recommendation is Do Not Delist.” Based on this information, Heavenly respectfully requests that Lahontan modify the listing of Heavenly Valley Creek as a Category 3.

3.9 Rating Criteria for Water Quality

The latest WDRs list the watershed and TMDL target evaluation criteria (found in Appendix C of the WDR). The water quality rating criteria are as follows (Lahontan 2015b: Appendix C):

- *Excellent: All water quality parameters meet State and Tahoe Basin standards; water quality concentrations for all parameters are decreasing.*
- *Good: Most water quality parameters meet State and Tahoe Basin standards; water quality concentrations for most parameters are decreasing compared to baselined data, while others are stable.*
- *Fair: Some water quality parameters meet State and Tahoe Basin standards; water quality concentrations for some parameters are decreasing compared to baseline, while others are stable.*
- *Poor: No water quality parameters meet State and Tahoe Basin standards; water quality concentrations are increasing for some parameters.*

Applying the WDR comprehensive review and rating criteria for the water quality data associated with Heavenly over the past 5 years (2017–2021), Heavenly Valley Creek water quality data exhibit *fair* condition. Daily exceedance occurs on many effluent storm filter samples collected during the 5-year record, and three of the four state standards (total phosphorus, total nitrogen, and chloride) exceed the annual state standards most WYs for the stream sampling sites. Many of these exceedances appear to have been driven by high precipitation in high runoff years (WYs 2017 and 2019), both of which were higher than any WY experienced during the previous 5-year reporting period (2012–2016). Additional water quality constituent improvement or sustained improvement in high-precipitation years is needed for the rating to increase to *good* in terms of water quality.

This Page Intentionally Left Blank

4 WMRP and BMP Effectiveness Monitoring

4.1 Introduction

The following chapter summarizes the results of the combined Watershed Maintenance and Restoration Program (WMRP) and BMP effectiveness monitoring results for Heavenly from 2017 through 2021. It has been prepared by RCI, contracted by Cardno, to comply with Lahontan WDRs (Board Order R6T-2015-0021, WDID No. 6A090033000), which require submittal of a comprehensive review every 5 years.

4.1.1 Evaluation Criteria

The summary of activities and monitoring provided by the annual report addresses the requirements in Section C of the 2015 WDRs:

1. *Track and report the status of mitigation/restoration projects included in the WMRP.*
2. *Complete an annual erosion assessment of the ski area and identify restoration projects to be completed.*
3. *Develop an Annual Work List with maintenance and restoration projects to be completed during the summer construction season, including mitigation projects required from previous Master Plan commitments and projects identified by BMP monitoring and erosion assessments.*
4. *Implement and report the results of the Construction Erosion Reduction Program, including the review of the temporary and permanent construction BMPs implemented at the Facility (BMP maintenance and effectiveness).*

Rating criteria are provided in the WDR, Section I.A.D, Table 3 “Heavenly Valley Creek TMDL Targets” for both WMRP implementation and BMP effectiveness scoring or monitoring results. Heavenly Valley Creek must have a rating of good or better.

WMRP Implementation Criteria

- Excellent: All WMRP projects implemented and maintained according to Annual Work List timeline*
- Good: All WMRP projects implemented according to Annual Work List; but some project components need reestablishing (for example, reseeding is necessary on some revegetation sites)*
- Fair: Only partial implementation of Annual Work List projects has been achieved according to timeline; or Annual Work List projects are one year behind schedule*
- Poor: No Annual Work List projects have been implemented, or Annual Work List projects are two years or more behind schedule*

BMP Effectiveness Scoring Criteria

- Excellent: 90% of BMPs implemented correctly and functioning effectively; no evidence of sediment leaving the site and entering the stream channel*
- Good: 75% to 90% of BMPs implemented correctly and functioning effectively; some evidence of sediment leaving the site, but no sediment reaching the stream channel*
- Fair: 50% to 75% of BMPs implemented correctly and functioning effectively; some evidence of sediment leaving the site, some sediment reaching the stream channel*
- Poor: Less than 50% of BMPs implemented correctly and functioning correctly; evidence of sediment leaving the site, excessive sediment reaching the stream channel*

For the purposes of the WMRP implementation criteria, “WMRP Projects” and “Annual Work List Projects” are those projects designated as EH-CA or EH-NV on the Annual Work List, whose primary purpose is watershed maintenance and restoration. Other capital projects (P) or Resort Maintenance Projects (RM or M) are primarily infrastructure construction and maintenance projects. While these projects utilize construction BMPs (Construction Erosion Reduction Program [CERP] requirements) and are subject to BMP effectiveness monitoring, the implementation does not satisfy a watershed restoration objective.

4.1.2 Outcome-Based Watershed Management Approach

Watershed maintenance and restoration is an ongoing long-term commitment throughout the Lake Tahoe Basin with an actively managed program at Heavenly. For the last 10 years, Heavenly has been utilizing an outcome-based watershed management system that both meets compliance standards and assesses actual performance of BMPs. Integrated Environmental Restoration Services pioneered this outcome-based watershed approach in the *Watershed Management Guidebook* prepared for the California State Water Resources Control Board (IERS 2013). This management style acknowledges the complexities of a watershed and allows for collection of useful information to make decisions that result in measurable sediment control. Outcome-based management provides a framework to encourage innovative ideas and methods that achieve quantifiable results. The *Watershed Management Guidebook* outlines five steps that drive the outcome-based management process used at Heavenly:

AIMING: articulating goals and objectives, defining success criteria, and identifying known and unknown information.

GAINING UNDERSTANDING: gathering on-the-ground information at the site/project and watershed and assessing strategies for a site-specific implementation plan. Monitoring results from past projects are used as the basis for developing treatment strategies for new projects that are most likely to achieve project objectives and success criteria. Often this step includes small-scale development plots to test different treatment approaches.

DOING: the part of the process where the plan is understood, implemented, and documented to support monitoring and continual improvement.

ACHIEVING: directly assessing project performance/effectiveness relative to goals and success criteria and reporting this information annually.

IMPROVING: embracing unexpected project outcomes, sharing project successes and failures with others, making adjustments to projects that did not achieve their intended outcome(s), and integrating lessons learned into future projects.

One of the results of this outcome-based watershed management approach is the shift from “effective soil cover” based heavily on vegetative cover to “erosion resistance.” Erosion resistance combines a wide range of factors including mulch, rock, soil density, infiltration, slope, and surface roughness as well as vegetation. The WMRP has helped Heavenly to shift efforts away from watershed restoration projects that require temporary irrigation and repeated reseeding of disturbed areas. By emphasizing soil edaphic factors (i.e., the physical, chemical, and biologic conditions of the soil), projects have become more successful over time since plant cover is not the only contributor to erosion resistance.

Heavenly’s program continues to be one of the most successful, multi-year examples of adaptive management applied to erosion and sediment control in the Lake Tahoe Basin. The following fundamental goals are guiding these efforts (Integrated Environmental Restoration Services 2016).

- Treatment Goals
 - To implement projects that result in no net increase in runoff or sediment transport;

- *To implement sediment source control treatments that are either self-sustaining OR are accompanied by a plan for ongoing maintenance and management to maintain erosion resistance; and*
- *To develop and demonstrate an applied adaptive management program for development, management, and maintenance activities in upper watersheds.*
- **Monitoring Goals**
 - *To quantitatively assess whether projects result in no net increase in runoff or sediment transport;*
 - *To identify and quantify indices of long-term ecosystem sustainability to the greatest extent possible;*
 - *To use monitoring data to determine the cost-effectiveness of restoration techniques; and*
 - *To use monitoring data to improve effectiveness of future treatments.*

Adaptive management principles have been similarly applied to Heavenly's CERP through BMP effectiveness monitoring. The CERP and *Watershed Management Guidebook* (IERS 2013) provide guidelines for the temporary and permanent BMPs incorporated into all construction projects at Heavenly. Since 2004, monitoring results and recommendations have been used by Heavenly to improve structural and non-structural BMPs. Nonstructural practices range from longstanding traffic management on summer access roads to new communication technology for allocating resources during the hectic summer construction season. BMP effectiveness monitoring provides a framework within the WMRP to track performance and meet compliance standards.

4.2 Response to Comprehensive Report Recommendations

Heavenly has maintained a commitment to the adaptive management method by incorporating past recommendations into planning, implementation, effectiveness and monitoring. The following section reviews the recommendations made in the previous comprehensive report for the period 2012 through 2016, and describes Heavenly's responses to those recommendations in 2017 through 2021.

4.2.1 Planning

The following recommendations were developed during the previous 5-year period and incorporated into the planning process from 2017 through 2021.

- Heavenly has continued to look for partnership opportunities for training and new technologies and product information to share with staff and agency partners. Examples include partnering with Northstar to share hydro-mulching equipment, requiring third-party contractors/utilities to obtain and implement project-level Stormwater Pollution Prevention Plans, and developing virtual BMP training during the 2020–2021 pandemic.
- The Annual Work List format was updated to include a completion status column to easily track project phase completion and projected schedule, as well as project categories to track implementation.
- The WMRP has incorporated BMP effectiveness monitoring for consistency with the 2015 WDR evaluation criteria and the Mitigation and Monitoring Plan (MMP) requirements from the 2015 master plan update.

4.2.2 Implementation

Successful implementation of watershed maintenance and restoration and Heavenly's CERP require ongoing communication of planning efforts and resource protection goals. Continuing these efforts is

crucial for successful implementation. The following recommendations from the previous 5-year period emphasized fostering communication from 2017 through 2021:

- The environmental manager position was incorporated into the Vail Resorts, Inc. regional management structure, but continued to function as the intermediary between Heavenly operations managers and field crews to convey WMRP goals, implement effective “hotspot” treatments, and ensure maintenance of BMPs at base areas and throughout the resort.
- Heavenly operations managers initiated more comprehensive tracking of project elements such as materials used, workforce required, and installation challenges. This information enhances the annual WMRP/BMP monitoring.

4.2.3 Effectiveness

Heavenly’s responses to the recommendations from the 2012 to 2016 period for improving effectiveness through the WMRP and CERP during the 2017 to 2021 period are outlined below:

- Innovative approaches and technology were explored to improve infiltration and enhance erosion resistance included testing hydro-mulch treatments, utilizing a four-wheel drive truck for dust control on steep roads, and fiber installation use in plowing technology rather than traditional trenching to reduce surface disturbance.
- Temporary and permanent access routes and staging areas were identified by Heavenly managers and third-party contractors during project development and delineated through exclusion zones and construction limits.
- The WMRP risk ranking criteria emphasizes proximity to SEZ for prioritizing both facility/road BMP maintenance and “hotspot” projects.
- Road maintenance objectives and methods are coordinated through the road maintenance agreement between Heavenly and the USFS. Maintenance of water bars, water bar outlet structures, roadside ditches, and sediment were added to the summer Work List. Road surfacing stability continues to improve through targeted application of aggregate base that reduces erosion and sediment transport.

4.2.4 Monitoring

Monitoring continued to provide useful results and incorporated the following recommendations from 2012 to 2016 into the 2017 to 2021 monitoring period.

- Prior BMP effectiveness and WMRP monitoring methods were streamlined by merging the monitoring and reporting processes yet remaining consistent with both the 2015 WDR and MMP criteria.
- To Heavenly’s knowledge the USFS did not release a final monitoring protocol for its National Core BMP Program. In addition, the road component of the original environmental monitoring program is no longer used by the LTBMU.
- The USFS National Core BMP Program was reviewed for applicability to the monitoring requirements at Heavenly, especially roads. In lieu of using a separate protocol for roads, maintenance of key roadside drainages/sediment basins has been incorporated into the summer Work List (at Powderbowl/Groove, Upper Shop, Maggie’s, Hellwinkels, and Galaxy). These key locations near drainages/SEZ were added to the BMP/WMRP monitoring. Heavenly managers have improved coordination directly with the USFS on effective road maintenance BMPs, recognizing there are limited opportunities to reconstruct existing summer access roads to current USFS design standards.

4.3 Results and Discussion

Results of the monitoring period from 2017 to 2021 are summarized and evaluated annually. Recommendations are updated and referenced to guide the planning process and to improve Heavenly's WMRP consistent with the adaptive management process.

4.3.1 Activities

The construction season typically begins in June and ends in November at Heavenly. Annually in the spring, an Annual Work List is developed that reflects work proposed by watershed during the construction season. The Annual Work List, categorized by "source code," indicates the type and status of projects.

- WMRP Projects ("Erosion Hotspot California" EH-CA and "Erosion Hotspot Nevada" EH-NV) are identified by the prior year watershed assessments for erosion hotspots. Treatments are based on site conditions and may require diverse levels ranging from mulch only to the "full restoration."
- BMP Maintenance Projects (M) regularly consist of routine maintenance of erosion reduction and sediment capture BMPs, resort-wide vehicle barriers, vegetation, and drainage structures.
- Master Plan Implementation Projects (P) typically include key utility projects or capital improvement projects identified through the master plan.
- Resort Maintenance Projects (RM) regularly consist of routine infrastructure maintenance, periodic equipment upgrade/replacement, and preparation of the Top of Gondola (Adventure Peak) area for summer guest access.

A summary of the completed summer activities for the 2017 to 2021 monitoring period is included in Table 4-1. During the 2017 to 2021 period, 18 summer Work List activities for WMRP projects were completed: 16 in California watersheds and 3 in Nevada watersheds. There were six development projects that implemented as outlined in the master plan. Resort-wide BMP maintenance and infrastructure maintenance projects were conducted annually for 19 different work areas.

Table 4-1 Summary of the Annual Work List Activities during the 5-Year Monitoring Period

Source*	Location	Treatment	Watershed
EH-CA	Hand Grenade Chute/Run of Middle Roundabout	Hotspot #1: Rock armor gully, restore water bar above switchback to function properly or convert to infiltration swale, rip and chip slope, install 12-inch culvert at the road crossing.	CA-1 Heavenly Valley Creek
EH-CA	Hellwinkel's Road	Hotspots 45 & 46: Continue monitoring and maintaining treatments annually.	CA-1 Heavenly Valley Creek
EH-CA	Middle Maggie's below summer road before switchback with culverts	Hotspot #5: Minor reshaping of "Basin" area and chip and rip treatment to maximize infiltration and reduce overtopping and runoff to the stream.	CA-1 Heavenly Valley Creek
EH-CA	Remove water bar and add mulch to Middle Maggie's Run	Hotspot #3: This area is located uphill of the culvert crossing where Maggie's Run intercepts the summer road below the switchback at the aspens. Mulch application and removal/re-grade of 1-2 water bars into infiltration spreading areas.	CA-1 Heavenly Valley Creek
EH-CA	Sedimentation area between the face patrol facility and Groove Chair	Hotspot #9: Stabilize bare soil areas with full restoration treatment and/or rip and chip; mulch filter berm or pine needle wattles needed.	CA-1 Heavenly Valley Creek
EH-CA	Small gully connecting road runoff to stream below California Dam	Hotspot #4: Chip and rip road shoulder (to spread and infiltrate runoff) and add pine needle wattles as a sediment barrier. This is the area near the first water bar below California Dam.	CA-1 Heavenly Valley Creek
EH-CA	Maggie's sediment basins	Hotspot #25: Maintain and clean out sediment build-up in Maggie's road shoulder sediment basins.	CA-1 Heavenly Valley Creek
EH-CA	Ridge Bowl	Stabilize gully in Ridge Bowl above Canyon Express Lift, remove and replace degraded geotextile fabric, place rock check dams or riprap.	CA-1 Heavenly Valley Creek
EH-CA	Ridge Run above test plots	Hotspot #7: Repair, loosen, and restore gully above and below summer road near snowmaking vault.	CA-1 Heavenly Valley Creek
EH-CA	Ridge Bowl check dams	Enhance drainage features to withstand and infiltrate concentrated flow.	CA-1 Heavenly Valley Creek
EH-CA	Groove erosion resistance	Improve erosion resistance and drainage stability near summer access road and Groove ski trail.	CA-1 Heavenly Valley Creek
EH-CA	First Ride	Stabilize gully on First Ride Run, reestablish water bar, and manage sediment moving toward lift terminal.	CA-6 Bijou Creek
EH-CA	World Cup	Stabilize gully on World Cup Run and protect existing drop inlets.	CA-6 Bijou Creek
EH-CA	Top of Tram	Stabilize gully on slope between Tram Top Station and Lakeview Lodge.	CA-6 Bijou Creek
EH-CA	California Base summer access	Stabilize summer access road at parking lot entrance and improve erosion resistance behind lodge.	CA-6 Bijou Creek
EH-CA	Blue Angel Chute convert incised gully to infiltration swale at top	Hotspot #6: Create infiltration spreading area by loosening deep gully and restoring it as in an infiltration swale.	CA-1 Heavenly Valley Creek
EH-NV	Galaxy road sediment basins	Maintain and clean out sediment in Galaxy road shoulder sediment basins.	NV-1 Mott Canyon Creek NV-2 + 5 Daggett Creek
EH-NV	Big Dipper Run Water bars	Repair water bars and outlet energy dissipaters; stabilize rilling.	NV-2 + 5 Daggett Creek
EH-NV	Lower Olympic	Improve erosion resistance and rill/gully stabilization.	NV-2 + 5 Daggett Creek
M	Powderbowl/Groove Chair Base	Maintain rock-lined ditches at base of Groove Lift and sediment basin at base of Powderbowl Lift.	CA-1 Heavenly Valley Creek
M	Upper Shop	Maintain existing water bars, ditches, drop inlets, and culverts.	CA-1 Heavenly Valley Creek

Source*	Location	Treatment	Watershed
M	Hellwinkel's sediment basins	Maintain and clean out sediment in Hellwinkel's road shoulder sediment basins.	CA-1 Heavenly Valley Creek
M	Maggie's sediment basins	Maintain and clean out sediment in Maggie's road shoulder sediment basins.	CA-1 Heavenly Valley Creek
M	Galaxy road sediment basins	Maintain and clean out sediment in Galaxy road shoulder sediment basins.	NV-1 Mott Canyon Creek NV-2 + 5 Daggett Creek
M	Rock-lined drainage basins at the bottom of Comet and Dipper Chair	Mechanical removal of sediment buildup from the T-shaped drainage/rock-lined areas. Maintenance is between the bottom of Comet and Dipper Chairlift Terminals.	NV-2 + 5 Daggett Creek
M	Resort-wide	Inspect and restore all areas damaged or affected by winter resort operations, including hydrants and pipe failures, and areas affected by snowcat operations; document treatment.	Resort-wide
M	Resort-wide	Erect and maintain vehicle barriers and/or fences to prevent unauthorized vehicle access off of designated summer roads and facility parking areas.	Resort-wide
M	Resort-wide	Inspect and maintain all drainage structures.	Resort-wide
M	Base areas	Maintain all BMPs and drainage structures. Erect and maintain vehicle barriers and/or fences to prevent unauthorized vehicle access from base areas.	Resort-wide
P	Adventure Peak/Epic Discovery	Landscaping around the Tamarack Lodge Meadow, add new shade umbrellas, add kids' tubing lane, and finish three approved hiking trails not completed in 2016.	CA-1 Heavenly Valley Creek
P	American Tower Company Cell Tower & Fiber Optic Line Replacement	Third-party project to install cable, several monopine towers, and small buildings at lodges and at the Top of the Gondola.	CA-1 Heavenly Valley Creek NV-2 + 5 Daggett Creek
P	NV Energy	Third-party project by NV Energy Project – vault and power line installations.	CA-1, NV-2 + 5, and NV-
P	Galaxy Lift	Replace existing Galaxy Lift in its current alignment. Improve specific summer road segments to allow lift construction and ongoing maintenance access. Daggett Creek realignment and stabilization.	NV-2 + 5 Daggett Creek
P	Olympic Downhill	Replace 3,000 feet of 8-inch waterline and Way Home snowmaking vault. Stabilize disturbed areas following construction.	NV-2 + 5 Daggett Creek
P	East Peak Snowmaking Well	Resort connection to new NV Energy transformer.	NV-2 + 5 Daggett Creek
RM	Heavenly Valley Creek Culvert	Repair existing gate valve.	CA-1 Heavenly Valley Creek
RM	Top of Gondola Snowmaking/Electrical Infrastructure	Upgrade water metering capability in existing snowmaking valve vault known as "Malcolm's Vault."	CA-1 Heavenly Valley Creek
RM	Crossover Waterline Replacement	Replacement of 3,000 feet of 6-inch waterline on Crossover in existing roadway.	CA-1 Heavenly Valley Creek
RM	Top of Gondola Water Tank Power	Underground power extension Top of Gondola water tank.	CA-1 Heavenly Valley Creek
RM	Cal Dam Snowmaking Pond	Sediment removal and placement at low location at Liz's/Ridge Run, stabilization BMPs, and dam face relining for safety.	CA-1 Heavenly Valley Creek
RM	Tram Deck	Replace Tram Top Station Deck and associated permanent BMPs.	CA-6 Bijou Creek
RM	East Peak Dam Liner Replacement	Expose and repair existing liner of dam face.	NV-2 + 5 Daggett Creek
RM	East Peak Lodge Well	Resort maintenance around wellhead for public water system	NV-2 + 5 Daggett Creek
RM	Boulder Parking Lot	Continue phased approach to parking lot repairs in coordination with Heavenly Base Ops.	NV-3 Edgewood Creek

4.3.2 **Monitoring Results**

Monitoring includes both observations and quantitative scoring protocols. Observations capture successful management activities necessary to implement the WMRP through the outcome-based management approach. Quantitative methods include the protocols for scoring treatment outcomes at erosion hotspots developed by Integrated Environmental Restoration Services (Hauge Brueck Associates 2014, 2015), as well as the protocol used by RCI (Parsons Harland Bartholomew and Associates, Inc. 2006) to score BMP implementation and effectiveness.

Heavenly continued to prioritize reducing erosion and increasing soil resistance for maintenance, construction, and restoration projects during the 5-year period. Results of the monitoring conducted by RCI include BMP effectiveness scoring used for inspections, as well as observations of WMRP treatment implementation and outcomes. As shown in Table 4-2, Heavenly received overall scores of *excellent* in all 5 years for WMRP implementation and in 4 out 5 years for BMP effectiveness.

Table 4-2 Five-Year Evaluation Results (2015 WDR Evaluation Criteria)

Construction Season	WMRP Implementation	BMP Effectiveness
2017	Excellent	Excellent
2018	Excellent	Excellent
2019	Excellent	Good
2020	Excellent	Excellent
2021	Excellent	Excellent ¹

¹ Based on preliminary review of 2021 data evaluations.

Over more than a decade, monitoring programs at Heavenly have been using protocols that quantify erosion reductions and indicators of erosion resistance. Supplemental guidance for applying effective treatments and techniques for achieving WMRP goals is updated annually. The information is available for reference by inspectors, design professionals, and Heavenly staff. Hotspots are evaluated before and after treatment to observe the effectiveness of treatment outcomes.

The annual monitoring includes active construction monitoring, post-construction monitoring (1 year), and follow-up visits after maintenance activities. Temporary BMPs are evaluated at active construction sites on 2-week intervals, unless covered separately under a California or Nevada permit for construction stormwater discharges (Stormwater Pollution Prevention Plan). Average annual results for the BMP scoring over the 5-year monitoring period:

- Temporary BMPs scored “fully implemented” at 95% and effective at 94% of the evaluations conducted.
- Permanent BMPs scored “fully implemented” at 97% and effective at 93% of the evaluations conducted.

4.4 **Conclusions and Recommendations**

The adaptive management approach uses the results of the implementation and effectiveness monitoring to identify issues and develop solutions during planning process. Results of BMP effectiveness monitoring during the period from 2017 through 2020 produced the following conclusions and recommendations.

4.4.1 **Planning**

Heavenly continued to incorporate and improve WMRP and implementation of the CERP in maintenance activity and project planning for the 2017 through 2021 period.

- Continuous training for managers, staff, and contractors is critical in conveying the importance of BMP implementation and maintenance to achieve watershed maintenance and restoration goals. Staff changes and impacts from the pandemic in the past 2 years make planning critical for success.
- The summer activities Work List guides and tracks completion of projects.
- Watershed assessments to identify and rank erosion hotspots continue to be an important planning tool to achieve WMRP goals.
- The CERP continues to be a valuable tool for identifying appropriate temporary and permanent BMPs, particularly for projects without detailed sets of plans and specifications.
- Heavenly manager tracking and sharing of program elements (such as materials used, workforce required, and installation challenges) documents activities and allows managers to allocate resources for critical summer activities.

4.4.2 Implementation

Successful implementation of BMPs requires ongoing communication of planning efforts and resource protection goals.

- The Heavenly team's approach makes communication a priority. Ongoing coordination between Heavenly staff, design professionals, resource specialists, contractors, utilities, and agency representatives ensures project plans/specifications and, where required, Stormwater Pollution Prevention Plans incorporate successful temporary and permanent BMPs.
- A Heavenly staff position designated as the primary contact with responsibility for implementing the WMP for the past 5 years has been a substantial asset. Knowledge sharing and experienced field team members improve the success of BMP implementation.
- Annual training for all personnel with "mountain access" including staff and contractors is essential to maintain high-quality BMP implementation.

4.4.3 Effectiveness

Heavenly has a long-term commitment to environmental improvement through both effective planning and regulatory compliance.

- Heavenly has improved the effectiveness of watershed maintenance and restoration techniques by testing new techniques.
- Routinely removing sediment from catchment areas, mountain-wide wood chipping and mulch tilling, and erecting barriers to traffic outside designated roadways and parking areas continue to be critical erosion BMPs.
- Prioritizing treatments and maintenance at locations connecting directly to SEZs and storm drains is the most effective method for reducing water quality threats.

4.4.4 Monitoring

The WMRP and BMP effectiveness monitoring program continues to address the 2015 WDR and MMP requirements and inform WMRP planning through the adaptive management process. The monitoring and reporting program has also been enhanced by incorporating recent technology (e.g., geographic information system–based data management, mapping/viewing tools, phone/tablet applications) and annual project/maintenance resources tracking data supplied by Heavenly.

4.5 Rating Criteria

Based on the WDR BMP effectiveness rating criteria (found in Appendix C of the WDR and summarized in Chapter 4.1.1) and the data presented in this section, Heavenly's BMP effectiveness rating criteria score is *excellent* for 4 of the 5 years in question. The remaining year, the 2019 construction season, had a rating of *good*. WMRP implementation for all 5 years in question was rated *excellent*. All criteria ratings are summarized in Table 4-2 above. Over the past 5 years, Heavenly has over 95 percent implementation of both permanent and temporary BMPs. In addition, the effectiveness of both permanent and temporary BMPs scored greater than 93 percent over the past 5-year period. Heavenly prioritizes BMP installation, maintenance, and annual monitoring during the facility's watershed awareness training, ensuring that minor and basic BMP repairs are addressed prior to the BMP failing. Education and increased awareness of the importance of BMP implementation and maintenance in terms of water quality as it relates to stream and lake clarity continues to push BMP effectiveness scores over 90 percent and *excellent* range.

5 Riparian Condition Monitoring

5.1 Introduction and Monitoring Objectives

Riparian areas function as transition zones between uplands and stream channels, linking terrestrial and aquatic ecosystem processes. Their position in the landscape often results in immediate and measurable effects from changes on either side. It is this sensitivity that makes riparian areas ideal for interpreting management effects on the ecosystem over both short and long temporal scales.

Past riparian condition monitoring at Heavenly followed Pfankuch's *Stream Reach Inventory and Channel Stability Evaluation* (Pfankuch 1975) protocols and Rosgen's *Applied River Morphology* stream classification framework (Rosgen 1996). This methodology for riparian condition monitoring last occurred in 2003, and the data were presented by the USFS. Analysis of that data set is therefore not included in this report. All riparian condition monitoring events that occurred after 2003 followed the SCI protocols described in *United States Department of Agriculture Forest Service (USFS) Stream Condition Inventory (SCI) Technical Guide: Pacific Northwest Region, Version 5.0* (Frazier et al. 2005).

This chapter summarizes the stream channel monitoring activities conducted in the last 5-year reporting period and compares these results to past results since 2006. These stream channel monitoring activities are conducted in accordance with the Lahontan Board Order No. R6T-2015-0021 and MRP No. 2015-0021. BMI sampling, which is a component of stream channel monitoring, follows protocols and collection frequency in the *Heavenly Valley BMI QAPP*, which includes standard operating procedures for California's surface water ambient monitoring program (SWAMP). This chapter also reviews the SCI protocols for other components of stream channel monitoring, reflects on the recommendations from the previous 5-year comprehensive report (2012–2016), and makes additional recommendations based on the most recent monitoring and data.

The objective of this long-term monitoring is to assess the effectiveness of erosion control measures, BMPs, and restoration activities on stream and BMI health. Monitoring is conducted to characterize stream and riparian conditions along selected stream reaches within the Heavenly area and along reference reaches unaffected by resort activity. The evaluation and comparison of monitoring data assesses changes in stream and riparian conditions and, if changes are encountered, helps to determine whether they are associated with operations at the resort.

5.1.1 Monitoring Schedule

In accordance with the EIR/EIS/EIS and subsequent TMDL from the MRP, Heavenly is required to monitor and survey SCI at least once every 4 years, corresponding with the second year of BMI sampling on Heavenly Valley and Hidden Valley Creeks (Lahontan 2015b: 3–4). The 2019 season marked the second year of BMI collection, followed later in the year by SCI surveys. Although Edgewood and Daggett Creeks are not sampled for BMI, these streams are included in SCI. The next round of required BMI sampling will occur in 2022 and 2023, while the next SCI surveys will occur in 2023. The required sampling sites and monitoring schedule are documented in Lahontan's MRP No. 2015-0021 (WDID No. 6A090033000).

Past SCI monitoring was conducted once every 3 years (in 2006, 2009, 2011, and 2015) at three sites on Heavenly Valley Creek and two sites on Hidden Valley Creek. Monitoring also occurred at two sites on Daggett Creek (in 2006, 2009, and 2015) and a single site on Mott Creek (in 2006 and 2009). The 3-year schedule was modified after 2011 to align monitoring with the latest amended Lahontan permit and reporting requirements; thus, all sites (with the exception of Mott Creek, which was dropped from sampling requirements) were sampled in 2015 and again in 2019. The new schedule requires that SCI data be collected during the second year of BMI collection.

During the investigation and reporting phase of the EIR/EIS/EIS, 2014 and 2015 BMI sampling and results at the Sky Meadows monitoring site (43HVC-1A) found limited BMI presence and thus low scoring. Continued BMI sampling and renewed water quality monitoring at the Sky Meadows monitoring site are now required by the WDR and MRP. Additional discussion regarding the Sky Meadows monitoring site can be found in the WDR (Board Order No. R6T-2015-0021). Because the Sky Meadows monitoring site is an alpine meadow, Upper Hidden Valley Creek (HDVC-1) is used as the reference SCI reach; however, BMI samples were not collected at Upper Hidden Valley Creek until 2015. BMI samples were also collected at Upper Hidden Valley Creek in 2016, and then again in 2018 and 2019, following the revised monitoring schedule.

5.2 Monitoring Methods

Riparian condition monitoring activities are conducted to collect geomorphology and riparian data in accordance with the *United States Department of Agriculture Forest Service (USFS) Stream Condition Inventory (SCI) Technical Guide: Pacific Northwest Region, Version 5.0* (Frazier et al. 2005). The USFS SCI method was developed to collect intensive and repeatable data from stream reaches to monitor conditions over time. SCI monitoring last occurred on Heavenly Valley, Hidden Valley, Edgewood, and Daggett Creeks following the second year of BMI sampling in the summer of 2019.

The SCI methodology also includes BMI sampling, which was conducted on a 2-year on, 2-year off consecutive schedule in 2006–2007, 2010–2011, 2014–2015, and 2018–2019 on Heavenly Valley and Hidden Valley Creeks in support of monitoring required by the 2003 *Heavenly Valley Creek Total Maximum Daily Load (TMDL) Bioassessment Monitoring Plan* (USFS 2003), which was updated in the Lahontan MRP (2015b). In order to collect two consecutive years of BMI data at the Upper Hidden Valley Creek reference reach, BMI data were collected in 2016 at the Upper Hidden Valley Creek and Sky Meadows reaches. Discussion of BMI protocols, monitoring, and results is presented in Chapter 5.6.

5.3 Monitoring Locations

The project monitoring locations consist of three project reaches along Heavenly Valley Creek (HVC-1, HVC-2, and HVC-3), two project reaches on Edgewood Creek (EC-1 and EC-2), two project reaches on Daggett Creek (DC-1 and DC-2), and, in the past, one project reach on Mott Creek (MC-1). Two reference reaches are on Hidden Valley Creek (HDVC-1 and HDVC-2). These locations are shown in Figures 5-1 and 5-2.

The project reaches on Heavenly Valley Creek are in California and were established by the USFS in 2001. The Sky Meadows reach (HVC-1) is situated in the vicinity of Sky Meadows between the snowmaking pond and the 90-degree bend in the stream immediately downstream of the Sky Express Chair. Patsy's reach (HVC-2) extends downstream of the culverts near Patsy's Chair to immediately upstream of the steep boulder field situated beyond the ski area boundary. Property Line reach (HVC-3) extends downstream from the USFS boundary to immediately upstream of Powerline Trail.

The project reaches on Edgewood Creek, Daggett Creek, and Mott Creek are located in Nevada and were established by Cardno (formerly ENTRIX, Inc. and Cardno ENTRIX), and the USFS in 2006. Upper Edgewood reach (EC-1) on Edgewood Creek is located in the upstream section of a stream restoration project completed in 2006 along the proposed alignment for the new North Bowl Express Lift and is used to monitor the restoration project in that area. Lower Edgewood reach (EC-2) extends downstream from the Boulder Parking Lot and past the Lower Edgewood monitoring site (43HVE-2); it is used to monitor the stream restoration project completed in 2007. Along Daggett Creek, Upper Daggett reach (DC-1) is located downstream of the dam outlet culvert and Lower Daggett reach (DC-2) is located downstream of DC-1 under the Galaxy chairlift. The monitoring reach MC-1 on Mott Creek is located downstream of the Tahoe Rim Trail creek crossing. Based on feedback from the LTBMU following the submittal and review of the 2015 EIR/EIS/EIS, no additional surveys were recommended at the Mott Creek location. The

boulder-dominated channel is inherently stable and resistant to change and is unlikely to be affected by ongoing and proposed management activities proposed in the contributing watershed (Norman 2015), and thus was dropped from subsequent monitoring.

The two reference reaches are located on Hidden Valley Creek in California and were established by the USFS in 2001. These two reference reaches are used for comparison with the project reaches on Heavenly Valley Creek. The Upper Hidden Valley Creek reach (HDVC-1) is located near the headwaters in the Upper Hidden Valley Creek watershed and is used as a reference site for the Sky Meadows reach (HVC-1). Lower Hidden Valley Creek reach (HDVC-2) extends approximately 270 meters (m) upstream from the Trout Creek confluence and is used as a reference site for the Heavenly Valley Creek Property Line reach (HVC-3).

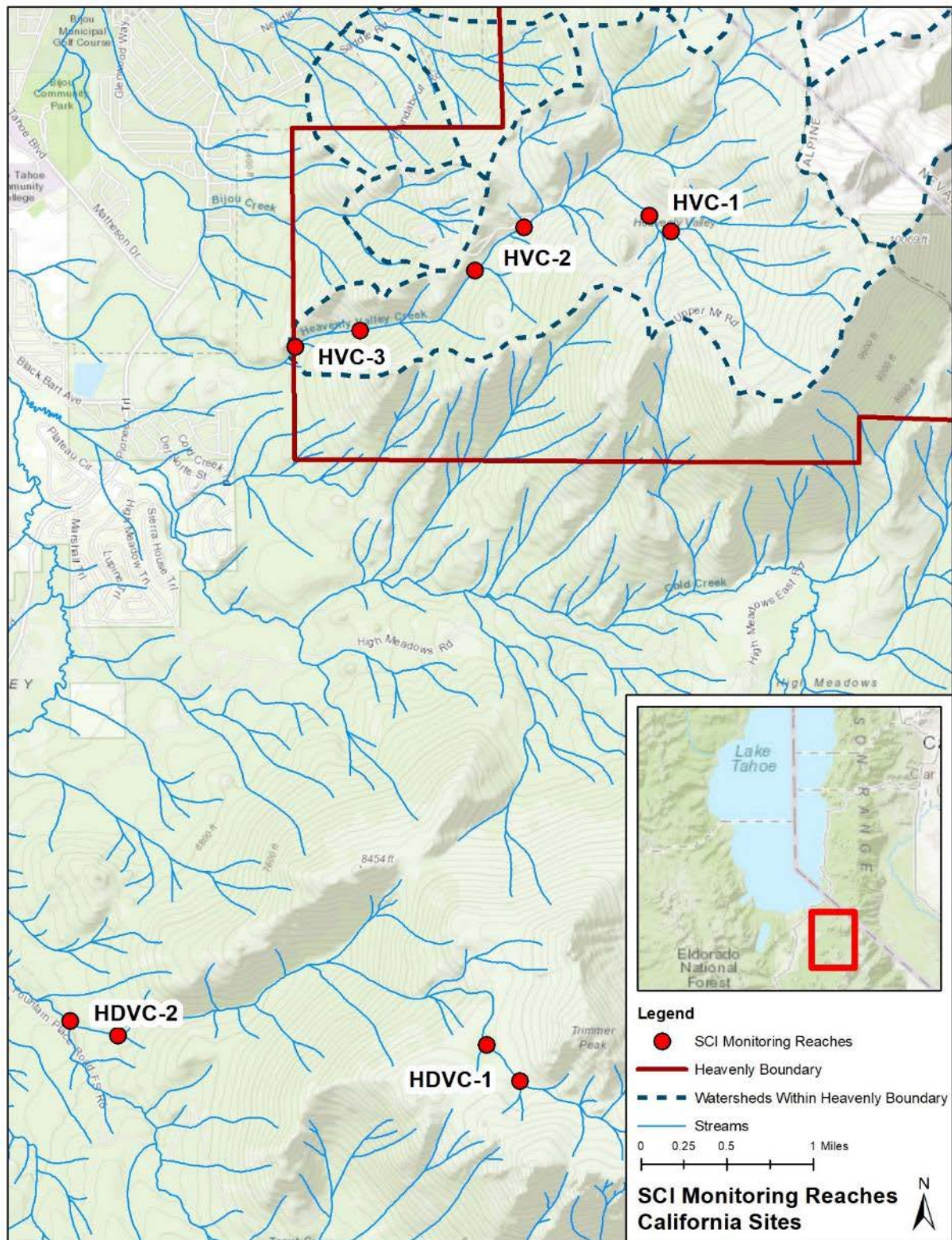


Figure 55-1 SCI Monitoring Sites in California Established in 2001

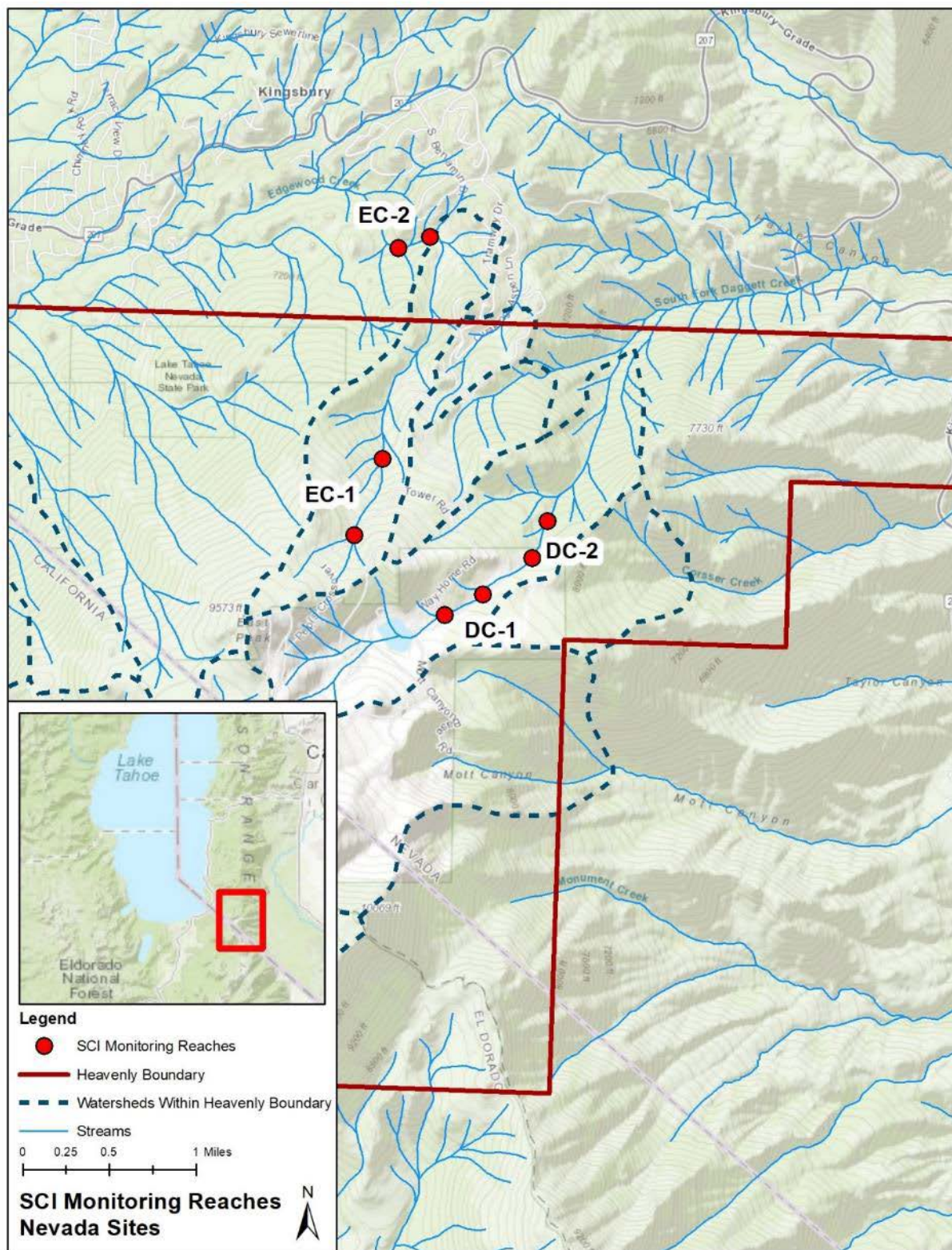


Figure 55-2 SCI Monitoring Sites in Nevada Established in 2006

5.4 Monitoring Results – Stable Functional Channel

SCI monitoring measures channel stability and functionality through measurement of channel type, bank and cross-section geometry, channel gradient, and streambank stability. The permanent monumented cross-sections at each monitoring reach provide a consistent location to evaluate the functionality of a channel and to evaluate changes over time. Along with longitudinal profiles and streambank stability assessments, comparisons of these data over time can help assess channel stability. Three cross-sections were established within each of the 10 monitoring reaches prior to 2006 and continue to be used. Where monumented pins cannot be located, a new pin is established using global positioning system (GPS) points and photographs to best replicate the previous location. The cross-sections were located in fast-water habitats and were oriented perpendicular to flow. At each cross-section, headpins were established along the left and right streambanks (viewed in the downstream direction) and a measuring tape was run horizontally across the channel from the left bank monument to the right bank monument. Tables, graphs, description of metrics and methods, and discussion of channel stability and channel functionality at each site are included in Appendix H, and a summary of each measurement is included below.

Rosgen stream classifications (Rogen 1996) were determined in 2006 by USFS, and these channel type characteristics have not changed for any of the reaches.

Bankfull stage was identified in the field to determine the associated channel characteristics such as bankfull width, bankfull depth, and bankfull width-to-depth ratio, and as input to the entrenchment ratio. Overall, bankfull widths have remained generally consistent at each site over the full monitoring period (2006–2019).

Another characterization of bankfull channel geometry is the width-to-depth ratio, which is the ratio of bankfull channel width to the mean bankfull channel depth. The width-to-depth ratio describes the distribution of available energy within a channel and the ability of discharge events to move sediment. It also describes channel cross-section shape, and comparing changes in width-to-depth ratios over time can be used to interpret shifts in channel stability. Overall, bankfull width-to-depth ratios have remained consistent over time, with a few exceptions. Floodplain sediment deposition at Sky Meadows XS-3 covered headpins after 2006, and this section of stream appears to be morphing into a wide, braided channel that encompasses a larger portion of the meadow, resulting in large changes of channel geometry. While these changes show the system is not necessarily stable, flow is spreading out and accessing a larger portion of the meadow, which is overall a positive change, as discussed in more detail in Chapter 5.7.

One more characterization of bankfull channel geometry is the entrenchment ratio, which is calculated as the ratio of the floodprone width (measured in the field at twice the maximum bankfull depth) to bankfull width. The objective of this measurement is to measure the degree of likely connection between the channel and floodplain. Overall, the entrenchment ratio at cross-sections at the monitoring reaches have remained stable or improved over time.

The channel cross-section area and net scour/fill measurement quantifies the change in channel shape and changes in deposition and/or scour. Overall, the channel cross-section area monitoring showed minimal changes over time, although any changes were specific to an individual cross-section and not indicative of changes at all cross-sections at a given reach. The most upstream cross-sections at both Sky Meadows and Upper Hidden Valley Creek reaches both experienced deposition over time, as discussed in more detail in Chapter 5.7. Lower Edgewood reach has continued to experience deposition, likely as a result of the 2007 restoration project within the reach.

The channel gradient surveys measured the water surface slope, if flow was present, or streambed slope (along the thalweg), if the channel was dry. Minor differences from year to year at some cross-sections may reflect changes in the start/end locations of the profiles and whether the channel was dry at the time

of survey. The channel gradients in all of the Heavenly Valley Creek and Hidden Valley Creek monitoring reaches have remained consistent over the monitoring period, within the same range of gradient across the entire reporting period. No profile steepening from net down-cutting, knickpoint establishment, or knickpoint migration is apparent, and in all instances, the profile change was equal or less than 1 percent since 2006. The gradient at Upper Edgewood Creek has remained stable over time while the gradient at Lower Edgewood Creek has fluctuated more drastically, between 9.1 percent and 4.9 percent, likely as a result of deposition associated with the 2007 restoration project. The gradient at the Daggett Creek reaches has fluctuated over time but may be due to comparing the bed surface slope to water surface slope, as the creek has sometimes been dry during sampling.

Streambank stability is a measure of the vulnerability of streambanks to erosion. Stable streambanks were identified as having 75 percent or more cover of living plants and/or other stability components that are not easily eroded (such as binding roots, rocks, and logs). Stable banks show no indicator of instability (e.g., erosion). Vulnerable banks have 75 percent or more cover but have one or more instability indicators. Unstable banks have less than 75 percent cover and have instability indicators. Unstable streambanks are often bare, or nearly bare, composed of particle sizes too small or non-cohesive to resist erosion at high flows. The percent of stable banks has been variable in most reaches since 2006, with a similar pattern from year to year. Stability improvements may be due to increased vegetation growth, which typically occurs during wetter than normal years; however, flows during those years may also be higher and contribute to increased scouring. Drought conditions from 2012 to 2015 resulted in decreased flows and in some instances no flow conditions (Property Line reach at Heavenly Valley Creek). Changes in stability may also be related to volume of large woody debris (LWD) within the channel, particularly directly adjacent to banks. LWD in the majority of monitoring reaches has increased since 2006, and LWD continues to be redistributed by high flow events.

5.5 Monitoring Results – Quality Aquatic Habitat

SCI monitoring also measures the quality of aquatic habitat based on channel characteristics. Quality of aquatic habitat can be an indicator of overall watershed health and water quality. Improvements in measures of aquatic habitats often have correlations with improvements in water quality.

Habitat types were classified along entire monitoring reaches to describe the spatial distribution of fast and slow-water habitat units. Fast water (riffles and runs) and slow water (pools) are important core attributes because they are the base stratification of physical habitats that support aquatic life. All the monitoring reaches are dominated by fast water habitats, with the highest percentages of fast water typically in the higher gradient reaches. Observations of slow water increased at nearly all monitoring reaches in 2019. Increases of slow water may be due to sediment deposition or increases in LWD across the reach. Slow water at Sky Meadows has been increasing over time, which is consistent with other observations of meadow sediment deposition and channel braiding.

Pool measurements included quantifying the number of pools in each survey reach, determining the range of residual pool depths within the survey segment, and documenting whether wood is a factor in pool formation. Surveys completed in 2019, following an above average precipitation year, generally documented a greater number of pools, and increased mean lengths and depths, and correlated with greater percentages of slow water. The data trends suggest that surveys done following dry WYs and the lack of sediment transport are typically correlated with fewer pool observations, while surveys done following above average precipitation winters was correlated with more pool observations and greater mean lengths and depths.

Pool tail surface fine sediment is measured along with the residual pool depths at each identified pool in each reach. The variability of the pool tail fines data is somewhat consistent with the changes in hydrology and associated sediment transportation/deposition patterns from year-to-year: greater observations of fines following dry years (2009, 2015) and fewer observations of fines following wet years

(2006, 2011, 2019). It is possible that fines are mobilized in wet years, thus distributing fines across the entire reach more evenly, and during dry years, lower flows concentrate fines at the tails of pools.

Particle size distribution surveys have changed over time, as discussed in detail in Appendix H, which may account for some changes in median particle size over time. However, the median particle diameter varies somewhat at the sites from year to year, but not usually by more than a few millimeters.

LWD characterizes the abundance of woody debris that can influence channel morphology and stability. In general, woody debris is considered beneficial, as LWD can enhance channel stability and habitat complexity. In general, lower elevation, forested sites exhibited higher volumes of LWD (e.g., Property Line, Lower Hidden Valley, and Lower Edgewood), whereas high-elevation, meadow sites (e.g., Sky Meadows, Upper Hidden Valley Creek) had lower volumes of LWD.

Stream shading measures the average canopy cover in each monitoring reach. The percent mean stream shading has remained relatively consistent by site and reach over the years, with the exception of Daggett Creek, which experienced the large increase of downed trees between 2006 and 2009. This may be a result of trees along the project reach being downed due to natural causes during this time (high wind events). Lower Daggett has remained consistent since that time but shading at Upper Daggett has increased over time to near 2006 levels.

Streambank angle measures the dominant angle of the streambank between the bottom of the bank and the bankfull stage. These measurements are only made for streams with gradient less than 2 percent. Therefore, only observation at Sky Meadows and Upper Hidden Valley reaches were recorded. No substantial changes in streambank angle were noted at these reaches from year to year; however, Sky Meadows reach has experienced a slight increasing trend in streambank angle since 2009.

Streamshore water depth was measured at each of the 50 equally spaced transects along the entire channel reach, on each bank, as described in detail in Appendix H. Greater streamshore depths are indicative of undercut banks. Like streambank angle, these measurements are only made for streams with gradients less than 2 percent (Sky Meadows and Upper Hidden Valley Creek). The streamshore depth at Upper Hidden Valley has remained constant over the years, and slight increases were correlated with an increase in the number of pools throughout the reach, which are likely to have greater streamshore depth.

As recommended in the last comprehensive report, due to a lack of consistent methods and varied observers from year to year and the fact that the aquatic fauna observations are not considered useful or reliable, data for this metric have not been collected and reported.

5.6 Monitoring Results – Benthic Macroinvertebrates

Pursuant to MRP No. 2015-0021, WDID No. 6A06003300 issued by Lahontan in 2015, Environmental Monitoring Program BMI sampling is performed at five sampling sites on a 2-year-on, 2-year-off cycle, as required by the TMDL. The 2015 MRP requires the use of the BMI standard operating procedures described in the California Regional Water Quality Control Board's SWAMP protocol (Ode et al. 2016), and sampling protocols, frequency, and data submission are provided in the *Heavenly Mountain Resort QAPP* (Cardno 2018), approved by Lahontan in 2018. The reach-wide benthos (multi-habitat) procedure in the SWAMP protocol is to be used for BMI sampling. The SWAMP procedure allows for electronic submittal of BMI data into an automated system, which automatically calculates both an O/E score (from multivariate River Invertebrate Prediction and Classification System [RIVPACS]-type model/s) and an index of biological integrity (IBI) score, based on the region from which the samples were collected (i.e., a Lahontan IBI for this study). The new WDR and Monitoring Program require additional pebble counts and cobble embeddedness measurements, as described in the SWAMP protocols, concurrent with BMI sampling. Since the WDR (and additional metrics) were not in place prior to scoping and budgeting for BMI sampling in 2015, these protocols were put into place in 2016. BMI data have been submitted to

CEDEN for all past sample events, according to protocols in the *Heavenly Mountain Resort QAPP* and will continue to be submitted in the future using the Taxonomy Data Template.

Four original sampling sites have remained the same since 2006, and include three locations on Heavenly Valley Creek (Sky Meadows [HVC-1], Patsy's [HVC-2], and Property Line [HVC-3]) and a lower elevation reference site on Hidden Valley Creek (LHC-1). An additional control site on Hidden Valley Creek (UHC-1) was added in 2015, to provide an upper elevation meadow reach as a reference for the Sky Meadows site. UHC-1 was surveyed again in 2016 to provide 2 years of consecutive data, as specified in the protocols. The BMI sampling sites are nested within the SCI monitoring reaches at each stream. During the timeframe of this 5-year report, BMI surveys were collected in 2018 and in 2019. The next round of BMI surveys will occur in 2022 and 2023.

Permit and protocol dictate that BMI sampling must occur within the index period for the area (between July 1 and August 31). The exact date is dependent on flow conditions; sampling should occur earlier during the index period in dry years and later in wet years. Sampling occurred in early to mid-July in 2018, following an approximately average-precipitation winter and in mid to late-July in 2019, following a slightly higher-than-average-precipitation winter. Streamflow was present at all sites during the sampling events.

5.6.1 **2018 and 2019 Benthic Macroinvertebrate Monitoring Results**

Laboratory results from the 2018 and 2019 sampling were submitted and scored by Lahontan. As discussed in the EIR/EIS/EIS, BMI results through WY 2011 are inconclusive (Suk 2014). Additional data collected in 2014 were reported in April 2015, and annual classification scores were noted for each of the sampling reaches (Suk 2015). However, “due to the relatively low number of samples, and variability in results over the years, upward trends in biotic condition at the Heavenly Valley Creek sites cannot be confirmed” (Suk 2015). Future surveys along Heavenly Valley Creek will include collecting particle size and stream embeddedness values (added in the new WDR and Monitoring Program). Along with BMI results, particle size and embeddedness results will contribute to clarifying the invertebrate and stream health trend analysis.

Tables 5-1 and 5-2 list the scoring threshold for both the Eastern Sierra IBI (ESIBI) California Stream Condition Inventory (CSCI). Survey and scoring results from the 2006 to 2019 sampling years are shown below in Table 5-3. These values differ slightly from the previous data and scores shown in the 2014 and 2015 internal memoranda submitted to Tom Suk. The previously posted scores for the CSCI were lower due to the original tool not processing the BMI taxonomy results properly (Sigala 2016). The 2018 and 2019 sampling results were included in past annual reports. Graphical representations of both the Eastern Sierra IBI and CSCI BMI data are presented in Figures 5-3 and 5-4.

Table 5-1 Thresholds Applicable to Eastern Sierra IBI

Supporting (Unimpaired)			Impaired	
Acceptable		Intermediate Supporting but Uncertain	Partially Supporting	Not Supporting
>89.7	89.7–80.4	80.4–63.2	63.2–42.2	<42.2
A	B	C	D	F
Very Good	Good	Fair	Poor	Very Poor
Good		Fair	Poor	

Source: Herbst and Silldorff 2009

Table 5-2 Thresholds used to Define Condition Classes for the CSCI

Index	Very Likely Intact (≥0.50)	Likely Intact (0.30 to 0.50)	Possibly Altered (0.10 to 0.30)	Likely Altered (0.01 to 0.10)	Very Likely Altered (< 0.01)
CSCI	> 1.0	1.00–0.92	0.91–0.79	0.78–0.63	0.62–0.00

Source: Suk 2014

Table 5-3 Bioassessment Scores for Sampling Events at Five Stream Locations near Heavenly (2006–2019)¹

Sample Year	Sample Dates	Sky Meadows (HVC-1)		Patsy's (HVC-2)		Property Line (HVC-3)		Lower Hidden Valley Creek (LHC-1)		Upper Hidden Valley Creek (UHC-1) ²	
		ESIBI	CSCI	ESIBI	CSCI	ESIBI	CSCI	ESIBI	CSCI	ESIBI	CSCI
2006	9/6 & 9/7	55.3	0.93	52.2	0.92	69.1	0.95	80.6	1.21	-	-
2007	8/29 & 8/30	23.6	0.41	67	0.96	74.7	0.98	93.3	1.15	-	-
2010	8/10 & 8/11	36.8	0.67	55.2	0.86	80.7	1.04	94.6	1.11	-	-
2011	8/29	49.8	0.61	75	0.75	83.5	1.01	87.8	0.90	-	-
2014	7/28 & 7/29	13.5	0.26	52.7	0.75	72.7	0.82	80.5	0.88	-	-
2015	6/8 & 6/11	55.2	0.93	39.5	0.77	72.2	0.87	91.6	0.92	32.1	0.58
2016	7/21 & 7/22	56.0	0.88	--	--	--	--	--	--	44.8	0.73
2018	7/9–7/11	61.2	0.85	43.6	0.77	66.9	0.85	99.3	1.14	57.0	0.78
2019	7/23–7/25	67.5	0.85	82.0	0.88	76.4	0.91	93.3	1.16	68.0	0.72

Notes: ESIBI – Eastern Sierra Index of Biological Integrity; CSCI – California Stream Condition Index

¹ Scoring calculated using ESIBI, 9-point metric values, and the CSCI.

² 2015 marked the first time BMI data were collected at Upper Hidden Valley Creek.

As stated above, annual scores can be assigned a rating; however, definitive long-term positive trend analysis could not be made in 2015 during the issuance of the updated WDR, due to the small number of samples collected (Suk 2015). While the new scores have varied from the first collected scores, the assessments have only minimally changed. Using the tables below and the parameters established in the *Heavenly Valley Creek – Bioassessment Site Scores for 2014* (Suk 2015) memorandum, the 2019 scores indicate the following biotic conditions:

- Sky Meadows (HVC-1) – Biotic conditions have improved over time, and the 2019 biotic condition was *fair/supporting* according to the ESIBI and *possibly altered* according to CSCI. The ESIBI scores since 2015 show improvement over time, reaching into the *supporting (unimpaired)* category for the first time since monitoring began. The 2019 CSCI scores were similar to the 2018 scores and have remained in the *possibly altered* classification since 2016.
- Patsy's (HVC-2) – Biotic conditions have improved dramatically over the 2018 results, according to both ESIBI and CSCI. In previous years, conditions at the Patsy's site consistently scored in the *poor/impaired* biotic condition according to the ESIBI but scored in the *good/supporting* condition in 2019. The CSCI score also improved from a *likely altered* classification to *possibility altered* between 2018 and 2019, although better results were observed when monitoring was first initiated.

- Property Line (HVC-3) – Biotic conditions are *fair/supporting* according to the ESIBI and are considered *possibility altered* according to CSCI, with both of the numerical scores improving slightly over the 2018 scores, while still keeping the site within the same condition classification.
- Lower Hidden Valley Creek reference site (LHC-1) – Biotic conditions are *very good/supporting* according to ESIBI and *very likely intact* according to CSCI. The ESIBI score dropped slightly from 2018, although overall scores have improved since 2011. This site has been classified as being in *good/supporting* biotic condition and as either *very likely intact* or *likely intact* since BMI sampling began in 2006.
- Upper Hidden Valley Creek reference site (LHC-2) – Biotic conditions improved from the 2018 scores to the *fair/supporting* conditions according to the ESIBI, although they are still considered *likely altered* according to the CSCI. Both threshold scores have improved over time, with a slight drop in CSCI scores in 2019, although sampling at this site only began in 2015.

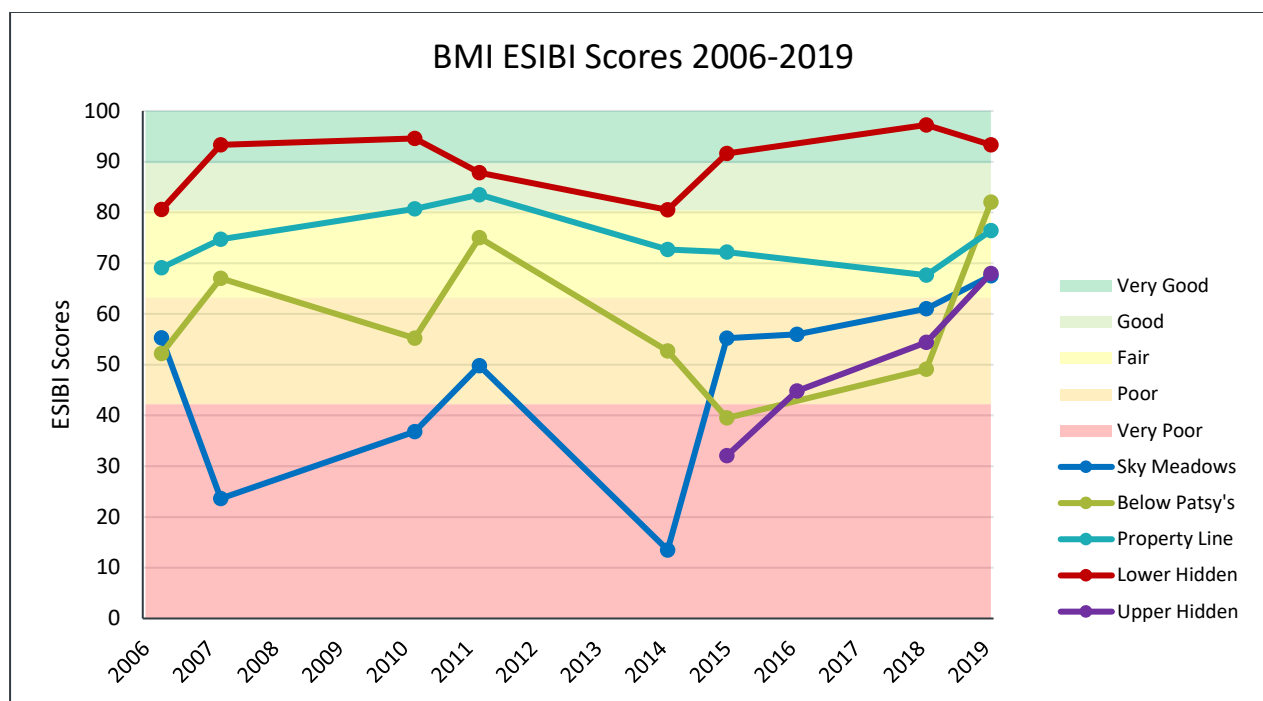


Figure 5-3 BMI ESIBI Scores for 2006–2019 by Sampling Site

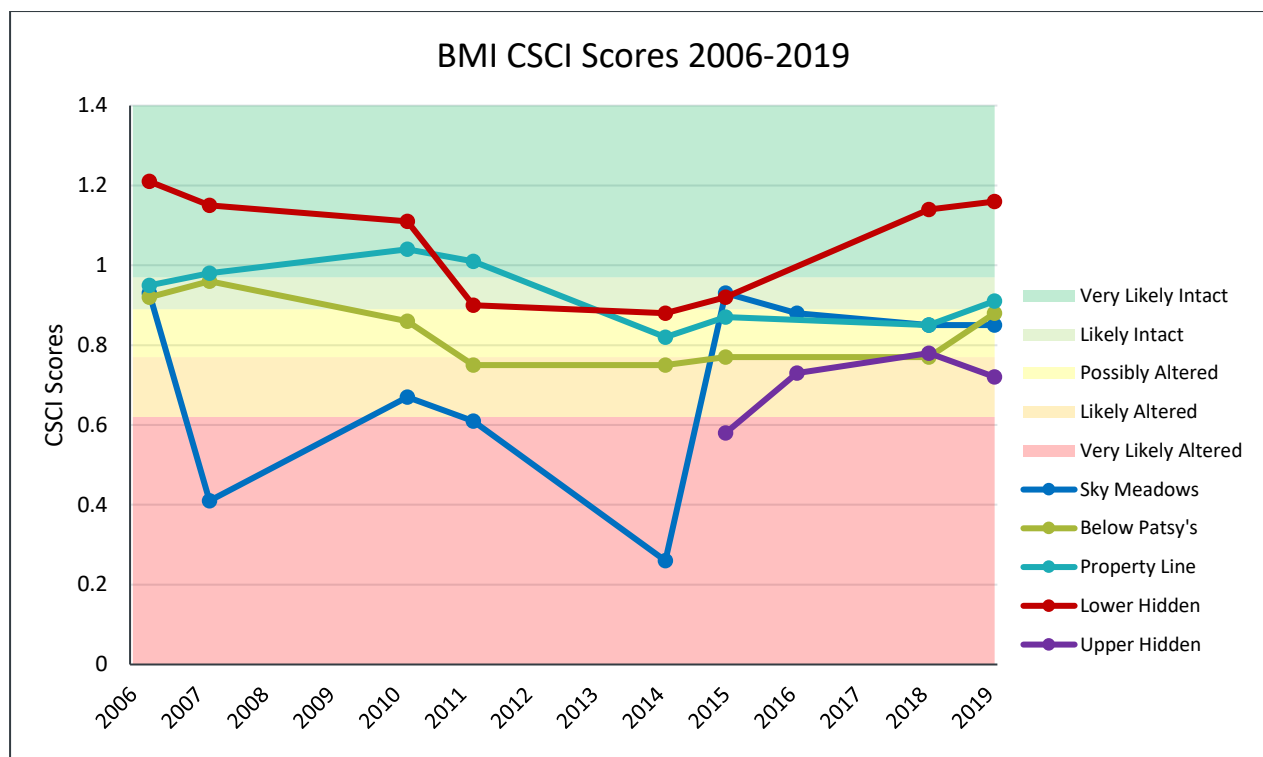


Figure 5-4 BMI CSCI Scores for 2006–2019 by Sampling Site

The 2019 BMI data show an improvement over the 2014 and 2015 data at all sites, with all sites categorized as *fair* or better according to the ESIBI scoring matrix and all sites categorized as *possibly altered* or better, with the exception of the Upper Hidden Valley Creek reference reach site (LHC-2), under the CSCI scoring methodology. The Upper Hidden Valley Creek undisturbed reference site (LHC-2) had the lowest CSCI score in 2019, though the scoring trend for ESIBI at this site is in the positive direction.

5.7 Conclusions

5.7.1 Subjectivity and Variability

One aspect of analyzing and interpreting repeated field observations from several years collected by different personnel is the inherent subjective variability. Despite standard protocols and training of personnel, there are several parameters that are fairly sensitive to subjective interpretations, particularly under different streamflow and water stage conditions. A very sensitive parameter is the bankfull stage, which can be difficult to decipher at many locations and which directly impacts calculations of bankfull area, width-to-depth ratio, and entrenchment ratio. Additionally, field identification of bankfull stage controls other field measurements (e.g., floodprone width), which cannot be easily adjusted in retrospect during data analysis. Parameters such as LWD and bank stability are also subjective in requiring visual estimates of sizes and spatial percentages by field teams. Parameters such as the number of pools may also be affected by streamflow and stage differences. Observer subjectivity and flow differences primarily contribute to variability from year-to-year rather than between sites, as the field teams in a given year observe all sites under similar conditions.

Some variability in the data is expected given fluctuations in precipitation, snowpack, runoff, and watershed sediment yield as a result of year-to-year variation in weather patterns (which can vary by sub-basin for some intense storms) and differences between sub-basin snowmaking, which can increase potential snowmelt over background. The Snow Telemetry (SNOTEL) precipitation data show that snow

water content ranged from well above average in 2006 to well below average in 2007 and was below average in 2008, 2009, and 2010. WY 2011 marked an above-average snow water content year in the period of record, but was followed by conditions that were well below average in 2012, 2013, 2014, and 2015. The 2015 precipitation and snow water content were the lowest values recorded over the monitoring period. In WY 2016, conditions rebounded to above-average snow water content conditions, followed by a well above-average WY in 2017. WYs 2018 and 2019 were both above average, rounding out four consecutive years of average or above-average snow water content. See Appendix B for hydrograph and snow water content information.

Relative discharges on both Heavenly Valley and Hidden Valley Creeks correlate with the SNOTEL precipitation pattern closely (see Chapter 3, Figure 3-2). Edgewood Creek differed in having relatively higher discharge in 2008 compared to 2007 and 2009 (see Appendix B, pages B-21 through B-30). This is likely due to less frequent sampling and earlier runoff hydrograph information being missing from the data set.

5.7.2 Heavenly Valley Creek

Discharge in lower sections of Heavenly Valley Creek is influenced by the Sky Meadows Dam, which is located downstream of the Sky Meadows monitoring reach (HVC-1). Examination of three permanent cross-sections in the Patsy's reach (HVC-2) shows that the channel morphology has remained similar between 2006 and 2019. The slight moderation of flow by the dam could affect channel morphology since the dam regulates high flow discharges as well as likely provides more streamflow during drought conditions. However, the data indicate that any effects of the dam are minor.

5.7.3 Sky Meadows Compared to Upper Hidden Valley Creek

The Upper Hidden Valley Creek reference reach (HDVC-1) is used for comparison with Sky Meadows (HVC-1). Both channels exhibit characteristics of a "C" type channel and are located in a low-gradient meadow environment. However, the reaches are dissimilar in that the project reach is known to be a perennial reach while the reference reach is thought to be non-perennial or subsurface, which could be due to its close proximity to the headwaters. Since there are no known discharge data available for the reference reach (due to the remoteness of the site), the flow regime is also unknown. No water was present in the channel during the 2006 survey, but flow has been present in all subsequent monitoring events.

The Sky Meadows and Upper Hidden Valley Creek reaches have similar and consistent bankfull channel widths and width-to-depth ratios, although the Upper Hidden Valley Creek reference reach appears to be a smaller system (smaller bankfull widths and depths), which is consistent with meadows closer to headwaters with lower flow. Both systems are similar in that upstream cross-sections tend to have greater widths and width-to-depth ratios, and cross-sections became smaller toward the downstream section. Entrenchment ratios at the Sky Meadows reach were much higher and variable during the 2019 monitoring period, following years of similar and consistent entrenchment ratios. The Upper Hidden Valley Creek reference reach also experienced an increase in entrenchment ratios, although not as drastically. The Sky Meadows reach has experienced substantial scour at XS-1 over time, and minor deposition at XS-3 (the most upstream cross-section). This deposition appears to be related to a widening and braiding of the channel, resulting in a greater bankfull area. The Upper Hidden Valley Creek reference reach has experienced similar scour at XS-1 over time but has also experienced minor scour at the other two cross-sections and does not appear to be experiencing widening and braiding of the channel at the upstream section. The California Dam and backwater associated with decreased reservoir capacity would cause slower water velocities within the meadow causing sediment deposition and the cross-sectional changes at XS-3. However, deposition at the most upstream cross-sections could also be due to the channel profile grade break going from a steeper reach to gentler meadow environment.

Overall, the channels have experienced similar magnitude and percent changes in channel areas over the sampling years and similar trends over time, with some lateral and vertical changes in channel position at most (but not all) of the cross-sections at both sites. These observations are consistent with normal dynamics of a stable meadow channel. Additionally, the streambank stability and streambank angles are similar for both sites and display similar trends. Both reaches have displayed a decline in bank stability since 2009, and banks were recorded as 56 percent stable in 2019 (average of 72 percent stable over entire monitoring period) at Sky Meadows versus 33 percent stable in 2019 (average of 53 percent stable over entire monitoring period) at the Upper Hidden Valley reference reach. Slow water has increased at both reaches over the monitoring period, and the traits of pools have remained consistent, apart from a greater increase in the number of pools at the Upper Hidden Valley Creek reference reach in 2019. Both reaches have similar aquatic habitat distributions and changes by year. LWD and particle sizes are similar across both reaches. Stream shading has consistently been higher at the Upper Hidden Valley Creek reference reach, although within each reach, shading has remained constant over the monitoring period.

5.7.4 Property Line Reach Compared to Lower Hidden Valley Creek

The Lower Hidden Valley Creek reference reach (HDVC-2) is a reference reach for comparison with the Property Line reach (HVC-3). The Lower Hidden Valley Creek reference reach has an average water surface gradient of nearly 9 percent, while the Property Line reach has an average water surface gradient of approximately 5 percent, which could lead to differences in channel characteristics. Both reaches are classified as Rosgen A type channels, with both having high energy to transport sediment and relatively low in-channel sediment storage capacity.

The Property Line and Lower Hidden Valley Creek reaches have similar and consistent bankfull channel widths and width-to-depth ratios, although there are differences between cross-sections. Both reaches have cross-sections with similar ranges, and the trends are similar. The entrenchment ratios are also similar; the reference reach ratios have been lower across the monitoring period (more entrenched), which may be linked to the steeper slope of that reach. The scour and fill data show that the channels have had similar magnitude and percent changes in channel areas over the sampling years, with similar scour volumes at some cross-sections and similar fill volumes at the other cross-section. There are some minor vertical and lateral changes at some (but not all) of the cross-sections at both reaches. The streambank stability ratings have had nearly identical patterns from year to year at both reaches, although the decrease in stability that was observed at both reaches in 2011 was greater at the Property Line reach. Aquatic habitats are somewhat similar, although more slow water has been observed at the Property Line reach during most years. This may be due to either variable survey reach distance at the Property Line reach (until the reach distance was standardized in 2011). The number and dimensions of pools have similar trends over time at the project and reference reach, and both appear stable. Pool tail fines have not necessarily been comparable at the reaches over time, largely due to uncorrelated variability from year to year at both reaches. Comparisons of LWD across the reaches was variable during the first half of the reporting period; however, both reaches appear to have stabilized at similar numbers during the second half of the reporting period. Changes at the Lower Hidden Valley Creek reference reach are expected to be observed during the next SCI monitoring event (2023) due to impacts of the Caldor Fire, particularly in relation to sediment and LWD movement, which can affect many aspects of channel geometry and aquatic habitats. Sediment deposition has already been observed at the Lower Hidden Valley Creek reference reach (Figure 3-12 and Figure 3-13). These changes may make comparison to the Property Line reach less relevant, as discussed more extensively in Chapter 2.9.

5.7.5 Patsy's

There is no reference reach associated with the Patsy's reach (HVC-2) on Heavenly Valley Creek, but the bankfull channel widths, width-to-depth ratio, and entrenchment ratio measurements at this reach are all consistent over time. The scour and fill values appear to be minor with the same pattern from year to year as at other reaches. Similarly, the bank stability ratings are good; they compare predictably to the other

reaches on Heavenly Valley Creek and have a similar year-to-year trend. The habitat types and pool numbers and dimensions are stable, and stream shading is good. Some variation in pool tail fines and LWD abundance from year to year occurred and may be related to changes in transport and storage.

5.7.6 Edgewood Creek

5.7.6.1 *Upper Edgewood Creek*

After undergoing extensive stream restoration efforts, the Upper Edgewood Creek reach (EC-1) shows no increase in degradation from previous resort management activities. The cross-section and longitudinal profile surveys show that elevations in the reach are largely unchanged since completion of the restoration projects. The restoration projects completed in 2006 and 2007 appear to have prevented further down-cutting and widening of the channel. Very little change is observable in all three cross-sections. Restoration in 2007 repaired the largest headcuts within the reach. Some of the step pool morphology was retained from pre-restoration through the construction of rock gabion weirs that created steps in the channel profile. The gabions and downed logs in the restored reach provide hard points that should resist down-cutting at the most vulnerable points. To date the North Bowl Stream Environment Restoration Project is meeting its long-term goals and objectives.

5.7.6.2 *Lower Edgewood Creek*

After undergoing extensive restoration efforts, the Lower Edgewood Creek reach (EC-2) shows no increase in degradation from previous resort management activities. This reach shows either unchanged or slightly improved conditions. Recovery at this reach has slowly progressed since the restoration in 2007. Lower Edgewood Creek's channel morphology is highly influenced by dense riparian vegetation that supplies a large amount of wood to the channel, which creates complex channel morphology. The reach continues to see reduced bankfull areas and increased deposition over time, suggesting that problematic scouring forces have been addressed with the restoration project. It appears that continued observations have verified that the Lower Edgewood Creek Stream Environment Restoration Project and Edgewood Vault in the Boulder Parking Lot are meeting their long-term goals and objectives.

5.7.7 Daggett Creek

Although channel width, gradient, sediment size, and bank stability on Daggett Creek have remained consistent, there are variations across the years in the channel geometry at both Upper and Lower Daggett Creek that are uncertain in their trend. The habitat at Lower Daggett Creek appears to be improving overall, and past declines observed at Upper Daggett Creek appear to have improved or stabilized.

5.8 Trend Analysis

SCI metrics collected and discussed in the sections above were rated to better understand trends across each watershed and monitoring reach. Ratings were created for each metric based on qualitative assumptions regarding the trend analysis of the metric. Trend analysis of each metric is only completed on the 2006 to 2019 data, as data prior to 2006 were collected using a different set of protocols and should not be used in comparison. Metric ratings of each stream reach and cross-sections are included in Table 5-4. A rating of *improving* (+), *stable* (✓), or *declining* (-) was recorded for each monitoring metric in each cross-section location. The assessment for each metric uses varied units and a qualitative comparison of conditions rather than a particular percent change or absolute value threshold to determine *improving* vs *stable* or *declining*. These definitions are customized to reflect the range of past and present conditions at the site, and the project goals and objectives; they should not be extrapolated to other sites or projects.

Table 5-4 Stream Condition Inventory Monitoring Metric Trend Analysis Summary

Monitoring Metric	Trend Definitions ¹	Sky Meadows			Below Patsy's			Property Line			Upper Hidden Creek			Lower Hidden Creek			Lower Edgewood			Upper Daggett			Lower Daggett		
	Improving (+) Stable (✓) Declining (-)	XS-1	XS-2	XS-3	XS-1	XS-2	XS-3	XS-1	XS-2	XS-3	XS-1	XS-2	XS-3	XS-1	XS-2	XS-3	XS-1	XS-2	XS-3	XS-1	XS-2	XS-3	XS-1	XS-2	XS-3
Bankful Width	Improving: Decrease in width Stable: Little or no change in width Declining: Increase in width	✓	—	✓	✓	+	+	+	✓	+	+	—	✓	+	+	✓	+	+	+	✓	✓	+	+	+	+
Bankful Width/Depth Ratio	Improving: decrease in width/depth ratio Stable: Little or no change in width/depth ratio Declining: increase in width/depth ratio	✓	✓	—	+	—	+	+	+	+	✓	—	✓	+	✓	+	✓	✓	+	—	✓	+	✓	+	+
Entrenchment Ratio	Improving: Increase in entrenchment ratio Stable: Little or no change in entrenchment ratio Declining: Decrease in entrenchment ratio	+	+	+	+	✓	+	+	✓	✓	✓	+	+	✓	✓	✓	✓	✓	✓	+	—	+	✓	+	+
Channel Cross Section Area	Improving: n/a Stable: No change or slight change in area Declining: Increase in area	✓	—	✓	✓	✓	✓	✓	—	✓	✓	✓	✓	—	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bank Stability	Improving: Increase in % stable banks Stable: Little or no change in % stable banks Declining: Decrease in % stable banks	—			—			—			✓			—			✓			—			—		
Habitat Type	Improving: Increase in slow water Stable: No change or slight change in slow water habitat Declining: Decrease in slow water habitat	+			+			+			+			✓			—			+			✓		
Pools	Improving: Increase in number and/or size of pools Stable: Little or no change in number and/or size of pools Declining: Decrease in number and/or size of pools	+			+			✓			+			✓			—			+					
Particle Class Size	Improving: n/a Stable: Little or no shift in size distribution or median diameter Declining: Shift in size distribution and/or median class	✓			✓			✓			✓			✓			✓			—			✓		
Stream Shading	Improving: Increase in shading percent Stable: Little or no change in shading percent Declining: Decrease in shading percent	✓			✓			✓			✓			✓			✓			✓			✓		
BMI Results (ESIBI Scores) ²	Refer to BMI Section	Fair (+)			Good (+)			Fair (+)			Fair (+)			Very Good (✓)			n/a			n/a			n/a		

¹ Ratings based on period of record data (2006–2019). The assessment for each metric uses varied units and a qualitative comparison of conditions rather than a particular percent change or absolute value threshold to determine *improving* vs. *stable* or *declining*. These definitions are customized to reflect the range of past and present conditions at the site, and the project goals and objectives; they should not be extrapolated to other sites or projects.

² 2019 BMI results reported, followed by trend in parenthesis

5.9 Recommendations

While the Work Plan for Riparian Condition Monitoring (ENTRIX 2005) and the *USFS Stream Condition Inventory Technical Guide: Pacific Northwest Region, Version 5* (Frazier et al. 2005) are guidelines for gathering field data, some of the data collected have limited use for assessing stream health through repeated observations.

For future monitoring, we continue to offer the following recommendations:

1. Continue to replace or add headpins, where necessary, that are secured far enough away from the bank laterally and vertically (outside of the expected floodprone width) to allow for normal channel dynamics to occur without eliminating survey control. For reaches that have headpins now located within the active channel (such as Property Line XS-2 and Upper Hidden Valley Creek XS-2), new headpins farther up the bank should be added. Some replacement of headpins occurred in 2019.
2. Add one or two valley pins at each cross-section well outside of the floodplain acting as an additional reference point (floodplain placement). These new pin placements will be located in areas where little to no change from the channel will occur. They also can be used in future surveys if the original pin is lost or damaged to ensure control. This recommendation is particularly relevant for meadow reaches, such as Sky Meadows and Upper Hidden Valley Creek.
3. Take advantage of recent improvements in available field technology options to collect data using tablet computers that have data dictionaries and electronic formats that will reduce quality assurance/quality control needs and provide more efficient data processing and reporting. Consider using GPS survey-grade equipment to collect topographic data if site conditions allow.
4. Modify the linear profile metric, removing cross-section profiles, relative elevations, and average slope calculations (for each cross-section). Instead pins at the downstream and upstream reach will be placed and an entire linear profile (from start to finish) will be collected. This will require a few turning points with the auto level or total station in order to survey the entire reach; however, the profile will be more accurate by removing the average values and relative elevations. In addition, this profile will be easier to compare and contrast slopes over time as the start and ending locations will not change.
5. Consider removal of the Upper Edgewood reach from further SCI monitoring, unless construction has occurred in the near vicinity. Due to the lack of water, high gradient nature of the channel, and the unreliability of bankfull indicators because of the restoration project, very limited data (longitudinal profile and cross-section topographic surveys) are currently collected at this site. The data that have been collected show the channel is very stable. Continued monitoring may be required in the near future as Heavenly is in the planning stages of replacing the North Bowl Chairlift. Construction in the vicinity of the stream and upper watershed may have future impacts.

The following recommendations have previously been reported and are in implementation, but for completion they are documented here in the 5-year comprehensive report:

6. Photo document all bankfull stage indicators and ensure that bankfull stage is also noted on the cross-section surveys and field-checked for consistency on both banks and upstream/downstream locations prior to field survey of the floodprone width.
7. Collect streambed profiles and water surface profile data simultaneously so that comparisons to data from years without streamflow are more reliable.
8. BMI sampling at Upper Hidden Valley Creek was collected in both 2018 and 2019. Continued BMI sampling at this reach will commence in alignment with the monitoring schedule presented in the WDR (2 years on and 2 years off). Collecting samples at this reach continues to provide a high-elevation meadow reference reach for comparison with Sky Meadows instead of the Lower Hidden Valley Creek

reference reach, which is a steeper riffle pool stream channel segment. The next round of BMI stream sampling will occur in 2022 for all five reaches.

5.10 Rating Criteria

The latest permit WDRs define the watershed and TMDL target evaluation criteria (found in Appendix C of the WDRs). As documented by Lahontan, the stream condition rating criteria are as follows (Lahontan 2015b: Appendix C):

- *Excellent: All channel conditions are stable or improving*
- *Good: Most channel conditions are stable or improving*
- *Fair: Some channel conditions are stable or improving*
- *Poor: Most channel conditions are not stable or improving*

Table 5-5 summarizes the ratings and scores of each reach based on the criteria set forth in the WDR. Lower Hidden Valley Creek received an *excellent* rating during the prior 5-year comprehensive report. However, declines in bank stability and increases in cross-sectional area in more recent years warrant an updated rating of *good* according to the specific criteria set forth. Only Upper Edgewood Creek received a rating of *excellent*, which is likely related both to the limited amount of data collected at this location and the inherently stable conditions created by the restoration project. No reach was rated as being in *poor* condition, in which most of the channel conditions are not stable or are not showing signs of improvement. Instead, the remaining monitoring reaches received a *good* or *fair* score based on the monitoring data collected. Improved BMI scores at most locations helped to improve the ratings of reaches that had mostly stable channel conditions.

Table 5-5 Stream Condition Rating

Monitoring Reach	Rating (Excellent, Good, Fair, or Poor)	Rationale
Heavenly Valley Creek at Sky Meadows (HVC-1)	Fair	While most channel conditions are stable, bankfull widths at all cross-sections have increased over time, and bank stability has declined. Entrenchment improved across all cross-sections, and the numbers of pools increased, as did the percentage of slow water. While BMI metrics have improved over time, they are currently rated <i>fair</i> .
Heavenly Valley Creek at Patsy's (HVC-2)	Good	Nearly all channel conditions are stable or improving, including continued improvement of BMI scores to a current rating of <i>good</i> .
Heavenly Valley Creek at Property Line (HVC-3)	Good	Nearly all channel conditions are stable or improving, with the exception of a <i>fair</i> BMI score.
Hidden Valley Creek at Lower Hidden (LHC-1)	Good	Nearly all channel conditions are stable or improving; the BMI score <i>very good</i> has remained stable over the last several monitoring periods. 2019 observations included a decline in bank stability and an increase in channel cross-sectional area; thus, the prior rating of <i>excellent</i> has been reduced to <i>good</i> .
Hidden Valley Creek at Upper Hidden (LHC-2)	Fair	Most channel conditions are stable or improving, with the exception of continued scouring at cross-section 1 and a BMI rating of <i>fair</i> .
Edgewood Creek at Upper Edgewood (EC-1)	Excellent	Minimal data are collected at this reach, but the data collected indicated excellent stability across the reach, likely as a result of the restoration project.
Edgewood Creek at Lower Edgewood (EC-2)	Good	Most channel conditions are stable or improving, with all cross-sections experiencing some level of deposition over time and improved entrenchment ratios.
Daggett Creek at Upper Daggett (DC-1)	Fair	Some conditions are stable or improving; trends are uncertain.
Daggett Creek at Lower Daggett (DC-2)	Fair	Some conditions are stable or improving; trends are uncertain.

This Page Intentionally Left Blank

6 Watershed Condition

As required in the WDRs, an overall watershed condition “rating” is warranted during the 5-year comprehensive report. Each of the watershed condition ratings are defined in the WDR and summarized below as the “overall watershed condition is a qualitative evaluation that considers water quality, erosion monitoring, channel condition and BMI scores. The trend evaluations gauge the overall watershed condition to determine if ski area management activities are improving or degrading water quality and ecological health. The ratings are as follows:

- **Much Improved:** Watershed condition (as measured by water quality, effective soil cover, channel condition, and BMP and CWE project implementation) greatly improved compared to 2005 conditions; all watershed components have improved.
- **Improved:** Watershed condition improved compared to 2005 conditions; most watershed components have improved.
- **Stable:** Watershed condition has remained more or less static as compared to 2005 conditions; some watershed components may have improved while others may have degraded.
- **Degenerating:** Watershed conditions have degraded; several watershed components have degraded while none have improved as compared to 2005 conditions.” (Lahontan 2015b: Appendix C).

Individual watershed conditions such as water quality, stream condition, BMP effectiveness, and WMRP are discussed in previous chapters of the report. Table 6-1 summarizes the condition metrics for Watershed CA-1. Watershed CA-1 includes all three monitoring locations along Heavenly Valley Creek: Sky Meadows, Patsy’s, and Property Line. The overall score of Watershed CA-1 would be *stable*, seeing as how water quality, stream condition, and the scores for the watershed condition components have shown neither improvement nor degradation over the past years.

Table 6-1 Watershed CA-1 Rating Criteria Summary

Watershed CA-1	Watershed Condition	Rating Criteria
Heavenly Valley Creek	Water Quality	<i>Fair</i> for Heavenly Valley Creek
Heavenly Valley Creek	Stream Condition	<i>Good</i> for 2 of the 3 reaches along Heavenly Valley Creek
Watershed CA-1	BMP Effectiveness	<i>Excellent</i> for the entire resort including Watershed CA-1
Watershed CA-1	Watershed Maintenance & Restoration Program	<i>Excellent</i> – most master plan projects are located in Watershed CA-1
Overall Rating		<i>Stable</i> – conditions have not improved substantially but have not deteriorated either.

Likewise, Table 6-2 summarizes the metric conditions for Watershed CA-6A. This watershed includes the contributing areas around the California Base Lodge, parking lots, and filter vaults, which all drain into Bijou Park Creek. Stream condition monitoring is not conducted along Bijou Park Creek at this time; hence no score is given for this metric. Also, no master plan projects were completed from 2017 to 2021 in Watershed CA-6A. Thus, no score was rated for the WMRP for this watershed. Annual BMP maintenance projects along with asphalt repairs and vault cleaning and filter replacement are completed each year, but these practices are not accounted for in the criteria ranking. Despite improvements in water quality results at Bijou Park Creek, constituent levels are still exceeding state standards. Thus, the ranking of Watershed CA-6A is rated *stable*; however, not all metrics were measured or scored leading to this ranking.

Table 6-2 Watershed CA-6A Rating Criteria Summary

Reaches within Watershed CA-6A	Watershed Condition	Rating Criteria
Bijou Park Creek and Storm Vault Effluent monitoring site	Water Quality	<i>Fair</i> for Bijou Park Creek and vault storm samples
Bijou Park Creek and California Base Parking Lot	Stream Condition	“N/A” – SCI monitoring not required along Bijou Park Creek at this time
Watershed CA-6A	BMP Effectiveness	<i>Excellent</i> for the entire resort including Watershed CA-6A
Watershed CA-6A	Watershed Maintenance & Restoration Program	“N/A” – no master plan projects are located in Watershed CA-6 (mostly maintenance-related projects)
Overall Rating		<i>Stable</i> – not all metrics are measured in this watershed

7 Deicers/Abrasives Application and Recovery Monitoring

7.1 Background Information

Deicer and abrasive application are safety measures that Heavenly employs to provide a safe route to and from the resort. While the City of South Lake Tahoe (CSLT) is responsible for snow removal and deicing application to allow access to the California Base Parking Lot and Lodge, Heavenly augments this service by providing additional plowing and application of deicer/abrasives to the roadway leading up to the entrance and parking lots. These roadways include the following streets: Ski Run Blvd., Needle Peak Road, Wildwood Avenue, and Saddle Road). As required by permit conditions (Lahontan MRP No. 2015-0021), daily and monthly logs record the following information:

- The location and dates of application, including street names if applied within the CSLT.
- The rate and amount of each material applied daily, with subtotals for Heavenly property and CSLT streets.

Additional coverage by Heavenly's plow/spreader truck allows for increased frequency and continual snow and deicer removal during treacherous driving conditions. While beneficial to travel and public safety, the application of deicer and abrasives is likely linked to water quality exceedances at the Storm Vault Effluent monitoring site (43HVP-2) within the California Base Parking Lot and Bijou Park Creek (43BPC-4) monitoring site. Both locations collect runoff from the parking lot and roadways leading to Heavenly.

Once the ski season commences and weather permits, Heavenly collects excess roadway materials from the parking lot and roadways leading up to the California Base Lodge. Permit conditions require that the following information be collected:

- Location and dates of maintenance, including street names if within CSLT.
- Amounts of material recovered by maintenance activities.
- Location of disposal facilities.

Typically, collection of the roadway and parking lot debris material occurs in the summer months. The roadway material is collected by a subcontracted sweeper vehicle (vector truck); in some instances, excess material in the parking lot can be collected with the use of a backhoe. All collected material is placed into rented 10-cubic-yard drop boxes. When these boxes are full, or when recovery is completed, the boxes are weighed and disposed of at the South Lake Tahoe Refuse transfer station located at 2140 Ruth Avenue in South Lake Tahoe. The boxes are weighed when they are both full and empty. Dispatch tickets that show the amount of material disposed are returned to Heavenly operations. No material was recovered during the fourth quarter of WY 2021. The earlier 2021 collection and weight tickets were previously provided in both the second and third quarter monitoring reports.

7.2 Application and Monitoring

During the 2017 winter months, 230,644 pounds of deicer were applied on the roadway. This amount substantially decreased in both 2018 and 2019 to 76,543 and 28,982 pounds, respectively. These lower application amounts can be attributed to less snow and precipitation in these years relative to 2017. Deicer application increased in 2020 to 115,925 pounds, which correlates to the increase in average precipitation and snowfall during WY 2020. Deicer application decreased during 2021 to 71,292 pounds. In total, 523,386 pounds of deicer was applied between 2017 and 2021; this is significantly less than the amount applied between 2012 and 2016 (1,008,362 pounds). A total of 559,960 pounds of deicer was

recovered between 2017 and 2021, which is a removal percentage of 107 percent. In several years, Heavenly has recovered a greater volume of deicer and abrasives than it has applied. This may be due to removal of deicer that CSLT has applied on the roads leading to Heavenly, removal of portions of deteriorated parking lot, or removal of natural sediment that has built up on the roadway.

In the past, Heavenly has investigated alternatives to deicer and deicer application and storage practices. Alternative deicer methods did not provide enough traction and cause more detrimental environmental effects. In 2016, Heavenly switched from a volcanic cinder-based abrasive to Washoe sand in accordance with the new WDRs (2015-0021). From 2012 to 2016, Heavenly switched from a 1:1 ratio (half cinder/half salt) to a 3:1 ratio (Washoe sand/salt). In 2016, Heavenly began using a 5:1 ratio of Washoe sand to salt deicer mixture on the parking lot and nearby roadways leading to the resort entrance to limit the amount of salt applied to the roadways. In 2017, Heavenly began using a liquid brine composed of dissolved magnesium and sodium chloride to pre-treat roadways before storms. Heavenly subcontracts a vendor to apply brine prior to storm events to prevent icing. Unlike deicer, sprayed application of the liquid (brine) does not bounce or roll (like rounded sand particles) off the asphalt roadway surface and provides more complete coverage in cracks, helping to melt snow and prevent ice build-up. Annual deicer application, recovery, and liquid brine application amounts for the past five seasons are shown in Table 7-1.

Table 7-1 Deicer Application and Recovery 5-Year Totals

Water Year	Total Amount of Deicer and Abrasives Applied (lbs)	Total Amount of Deicer and Abrasives Recovered (lbs)	Total Amount of Liquid Brine Applied (gallons)
2017	230,644	171,620	150
2018	76,543	127,180	550
2019	28,982	120,080	0
2020	115,925	39,040	495
2021	71,292	102,040	300
Total	523,386	559,960	1,495

Removal percentage = 107%

In addition to a decreased ratio of salt (chloride) application to the parking lots and roadways and the use of liquid brine as an alternative to deicer application, Heavenly has invested in a smaller plow truck. The use of this smaller truck and attached digital tracker provided a more reliable method for accounting of deicer application. See Figure 7-1 for a picture of the smaller truck and Figure 7-2 for the older, larger truck. Since WY 2015, the smaller truck has been the primary deicer application vehicle.



Figure 7-1 Smaller Deicer Application Truck



Figure 7-2 Dump Truck Deicer Vehicle

Laboratory analysis of the 5:1 Washoe sand deicer mixture was first performed on the material during the first quarter of WY 2015. Results were previously reported in the second quarter report (May 1, 2015). Laboratory analysis of the 5:1 Washoe sand deicer mixture has also been performed during WYs 2017, 2018, and 2020; results are included in each respective annual report. The abrasives passed all of the Tahoe Basin Specifications listed in MRP No. 2015-0021.

Heavenly received a new stockpile of abrasives in March 2021. Samples of this material were delivered to WET Lab in Reno, Nevada, for analysis. In the past Heavenly has worked in conjunction with El Dorado County Department of Transportation, who also uses the same “spec H aggregate” Washoe sand from Cinderlite, for analysis using their in-house laboratory. Due to staff turnover at both Heavenly and WET Lab, analysis was delayed. In addition, we were not able to find a certified laboratory to perform the required testing methodology prescribed in the WDR. Black Eagle Consulting, Inc. was able to perform most of the analysis, though it should be noted that they are no longer certified in the methodologies requested and performed. Results from this analysis are included in Appendix I and summarized below. Laboratory analysis was performed in July 2021 on the Washoe sand sample and the results are presented below in Tables 7-2 and 7-3. Due to the lack of Nevada laboratory certifications, moving forward future cinder samples will be sent to El Dorado County Department of Transportation for certified analysis.

Table 7-2 Abrasive Results (July 2021)¹

Parameter	Method of Test	Minimum Reporting Limit	Results
Sand Equivalent	CTM 217	80 min	96% (passing)
Durability	CTM 229	55 min	82% (passing)
Moisture Content	CTM 226	< 5%	0.2%
Gradation	CTM 202	NA	Not to Specification – See Below for Details
Turbidity ²	CalTrans 6	NA	Not Tested

¹ Results provided by Black Eagle Consulting, Inc.

² Turbidity testing was not performed as no Nevada laboratory could perform CalTrans turbidity methodology.

Table 7-3 Gradation Results¹

Sieve Size	Percentage Passing (Requirements)	Percentage Passing (Results)	Meets WDR Requirements
¾ inch	100%	100%	✓
¼ inch	95–100%	Not Supplied	N/A
#8	40–60%	65%	No
#16	10–30%	29%	✓
#50	0–5%	6%	No
#200	0–1%	2.1%	No

¹ Results provided by Black Eagle Consulting, Inc. performing CTM 202

MRP No. 2015-0021 lists the parameters and method for testing required for abrasive usage. The testing methodology provided in Table 7-2 denotes Lahontan’s preferred testing methods. Only turbidity testing was not provided at this time; however, future analysis will request this information. Sand equivalent, durability, and moisture content results met the WDR specifications; however, the gradation results did not meet the standards specified especially at the smaller sieve sizes. Heavenly and El Dorado County Department of Transportation continue to use the same material for deicer usage, and moving forward, Heavenly will work solely with El Dorado County for joint testing efforts. Future laboratory analysis will be conducted again at a minimum annually when either the abrasive sample is delivered, derived from a new source, or from a new vendor.

7.3 Recommendations

As discussed in the *Bijou Park Creek Evaluation Report* (Tormey 2017, Appendix J) chloride levels continue to be problematic, in that chloride levels at the Bijou Park Creek monitoring site (43BPC-4), adjacent to the California Base Parking Lot, continue to exceed the state standards. Chloride levels at the Storm Vault Effluent monitoring site (43HVP-2) within the California Base Parking Lot have improved dramatically when comparing the maximum and mean values of the 5-year reporting periods of 2012 to 2016 and 2017 to 2021 (Table 3-11 in Chapter 3.6.5), although there is no state standard for chloride at this location. Deicer (which includes salt/chloride) is needed to provide employees and guests safer access to the resort. Heavenly has made a concerted effort to reduce chloride application: switching to a 5:1 Washoe sand to salt mixture, educating staff and requiring documentation of deicer application around the lodge and tram entrances, switching from the dump truck roadway application to the truck bed and automated application, and use of liquid brine instead of sand/salt roadway deicer when possible. Beginning in the 2016–2017 ski season, Heavenly has contracted with an outside vendor to apply brine (a liquid salt mixture) to parking lots prior to predicted storm events and after the parking lot has been plowed in an effort to decrease downstream chloride levels. Liquid brine is similarly used by the transportation districts in the basin (Nevada Department of Transportation and CalTrans) for the same reason. By pre-treating the roadways, it aids in limiting snow accumulation and icing, and ultimately brine application limits the amount of additional deicer/salt application needed. Deicer (sand/cinder and rock salt) tends to bounce on application and is not 100 percent effective in covering the vehicular travel lanes, requiring additional application and passes for the intended treatment. Since this application and treatment is relatively new, additional monitoring is needed to determine the effectiveness of brine application and to compare application amounts with future water quality chloride sampling results. As previously recommended, the following information is being collected:

- The dates and times brine is applied to the parking lots.
- The amount of brine applied.

Additional information that should be collected moving forward to assist in the determination of brine effectiveness and chloride limitations should be:

- Application rate (quantity over time).
- The number of passes across the parking lot and/or location of brine application (if not the entire lot).
- The mixture ratio and chemical makeup of brine (ensuring that magnesium chloride is not used due to its highly corrosive properties and addition of magnesium to the environment).
- Post-storm monitoring, noting the effectiveness of the treatment. This will also help application amounts and passes for future storms.

While actively working with Lahontan, Heavenly is attempting to reduce chloride application and monitored chloride levels within Bijou Park Creek. The reduction in deicer usage, lowered chloride mixture percentage, and use of brine are all to actively limit chloride exceedance readings in the stream while maintaining public safety and access to the resort. Data collection in the future will help to determine the effectiveness of brine application while limiting deicer usage and instream chloride levels.

Continued maintenance and improved operations of the filters vaults should continue to improve chloride results at the Storm Vault Effluent monitoring site (43HVP-2), which in turn influences the results at the Bijou Park Creek monitoring site (43BPC-4). Additionally, educating staff on the importance of water quality and limitation of deicer/chloride in the streams aids in their participation in properly applying and documenting deicer usage.

This Page Intentionally Left Blank

8 Snow Conditions/Snowmaking Enhancement Monitoring

8.1 Background Information

Snow conditioning and snowmaking enhancement monitoring is reported monthly with the monitoring checklists. These reports are attached and included in the Lahontan quarterly reports submitted throughout the year. Four sites were initially monitored in 2011, and monitoring has expanded to include additional sites over time. Huck salt application at the Adventure Peak Tubing Area ceased in WY 2014 due to procedural changes, and this originally monitored site is no longer included in annual summaries of huck salt. The California Base Parking Lot location began to be monitored in WY 2015. Beginning in WY 2017, monitoring began at three additional sites: Tamarack Lodge, Tram Base, and World Cup Foundation Building. These sites have been added to better track all salt (deicer) applied in and around Heavenly during winter operations. The fourth quarter monitoring reports for WY 2021 are included in Appendix E. No salt application occurred during the fourth quarter because the resort is closed during the fall and snow/ice management is not an issue. No on-mountain snow operations or snowmaking occurred during the fourth quarter (July, August, and September), as these months are typically the warmest and driest of the WY. Heavenly does not add any additional snowmaking enhancement chemicals during snowmaking. If in the future chemical additives are added for the snowmaking operation, this information will be provided in future reports.

Snow conditioning typically entails the addition of huck salt to areas throughout the resort. Salt application is often used in the spring and during long periods of above average temperatures to lower the freezing point of water/ice/snow. The application of salt to the runs and areas around the terrain park lowers the temperature of the surface snow to prevent melting at night when temperatures do not reach freezing. This helps to maintain snow in areas of high traffic and usage (ramps, rails, boxes and landing areas). Snow and ice melt products are also applied to heavily used pedestrian areas including parking lots, walkways, and tram egress locations to provide safer guest access during the ski/snowboarding season. Application amounts are tracked to compare, contrast and limit salt (chloride) usage. As discussed above, the application of brine in the parking lots beginning during the 2016–2017 ski season was implemented to help to lower the application amount of salt and deicer usage.

8.2 Application and Monitoring

As stated above, no additional salt was applied during the fourth quarter of WY 2021. The fourth quarter monthly maintenance and applications logs are included in Appendix E along with the annual summary tables (Tables E-1 and E-2). A summary of each of the past 11 years of salt application is provided in Table 8-1 (WYs 2011–2021). Huck salt application values decreased across the mountain from 2013 to 2015. Total salt usage increased during 2016 and 2017, which were both years of above-average winter snowfall. Due to higher chloride levels recorded at the stream monitoring locations, salt application has been limited. Huck salt is stored in sealed bags, and approval by Mountain Operations managers is required prior to on-mountain application. As mentioned above, salt application at the Adventure Peak Tubing Area ceased in 2014 due to procedural changes. As discussed in past reports, snow and ice melt is applied to the upper parking lot walkways providing safer guest access to the main lodge from the parking areas. A hand spreader, or similar, is used to apply snowmelt in and around the lodge area. WY 2015 marked the first year huck salt (deicer) was tracked and reported at the California Base Lodge. The total use of huck salt at the California Base Lodge has varied since monitoring began in 2015. The highest recorded value for salt application at the California Base Lodge occurred in 2017, which can be attributed to the well-above-average precipitation and snowfall totals during WY 2017. Salt application at the California Base Lodge decreased substantially the following year but has steadily increased since

2018. Total salt application usage was below average during WY 2020, likely related to the below-average winter snowfall and resort closure due to COVID-19 concerns. Employee training and required approval of salt application by managers have been implemented over the years, helping to limit salt usage and correlated chloride levels in water samples.

8.3 Recommendations

Monthly and quarterly monitoring of deicer application should continue into the next 5-year comprehensive period. Results over the past 10 years generally show a decreasing trend in on-mountain salt application amounts, with some variation that may be correlated to precipitation and snowfall. Heavenly will continue to monitor and limit applied amounts of snowmelt (salt) to the access points in and around the California Base Lodge, providing safer means of preventing slip and fall occurrences. In theory, decreased salt application amounts and improvement associated with brine application (see Chapter 7), should correlate with lower chloride levels in Bijou Park Creek and Heavenly Valley Creek. Additional monitoring records over a longer period, and over varying precipitation years, will help to verify the application relationship with WY precipitation (snowfall) totals.

Table 8-1 Annual Huck Salt Application Records (2011–2021)

Water Year	Top of the Gondola (lbs)	World Cup Race Course (lbs)	Terrain Park (lbs)	Adventure Peak – Tubing Area (lbs)	California Base Parking Lot Application (lbs)	Tamarack Lodge Deck (lbs)	Tram Base Decks (lbs)	World Cup Foundation Building (lbs)	Total Salt Usage (lbs)
2011	250	900	3,360	3,400	-	-	-	-	7,910
2012	300	800	1,962	100	-	-	-	-	3,162
2013	450	1,680	4,160	400	-	-	-	-	6,690
2014	80	60	2,840	0	-	-	-	-	2,980
2015 ¹	16	50	418	0	544	-	-	-	1,028
2016	38	240	0	0	2,982	-	-	-	3,260
2017 ²	0	0	555	0	3,295	463	1,050	31	5,394
2018	0	0	370	0	675	200	641	0	1,886
2019	40	0	1,580	0	1,737	359	380	0	4,096
2020	6	0	700	0	1,900	125	285	0	3,016
2021	10	0	705	0	2,626	10	55	0	3,406
Totals	1,190	3,730	16,650	3,900	13,759	1,157	2,411	31	42,828

¹ WY 2015 marked the first year that deicer/salt application near and around the California Base Lodge was tracked on a monthly basis. Application is needed to provide safer walkability during the ski season (preventing slips/falls). Application has occurred in the past WYs; however, the amounts were not recorded.

² WY 2017 was the first year that deicer/salt application monitoring occurred near and around the following locations: Tamarack Lodge, Tram Base and World Cup Foundation Building. Application was tracked on a monthly basis. Application likely occurred in the past WYs; however, the amounts were not recorded.

9 USFS Roads Monitoring

The latest MRP requires monitoring of USFS roads within Heavenly's boundary (Lahontan 2015b: 9). In March 2015, Vail Resorts, Inc. (Heavenly) and the LTBMU (USFS) entered a roads maintenance and reporting agreement to coordinate and cooperate on future maintenance and monitoring of the on-mountain roadway network (USFS 2015). This agreement lays out the framework for roadway maintenance, new roadway construction, annual meetings, and annual reporting activities.

The Heavenly Roads Maintenance Report for 2021 was submitted to the USFS in November 2021. The 2021 roads maintenance summary tables are included in this report as Appendix F. During the 2021 construction season, 14.03 miles of the on-mountain roadway network were maintained. No roadway improvements occurred in 2021. Effectiveness of road BMPs were evaluated in 2017, fulfilling a separate monitoring requirement. Results of this report were included as part of the BMP Effectiveness Annual Report submitted in May 2018. In lieu of using a separate/new protocol for roads, additional maintenance of key roadside drainages/sediment basins have been added annually into the Annual Work List (Powderbowl/Groove, Upper Shop, Maggie's, Hellwinkel's, and Galaxy). Heavenly continues to coordinate directly with the USFS on road maintenance activities, which has facilitated the additional monitoring of these key locations near drainages in association with continual BMP effectiveness/WMRP monitoring. The annual 2021 monitoring was limited in the summer and fall by the Caldor Fire. Unhealthy air quality (smoke) conditions, and National Forest closures resulted in a long period without reasonable on-mountain access.

In addition to implementing the new MRP, USFS Region 5 has phased out the Regional BMP Evaluation Program. In the past, this program provided additional roadway maintenance and monitoring. Moving forward, the USFS will require the new National USFS BMP Monitoring Program, which will address roadways, ski runs, and facilities. The program and protocol are still in draft form at the time of this report's preparation; however, the agency has actively been using these protocols over the past few years. A final version of the technical guide is not currently available to the public. The new National BMP Monitoring Program protocols programmatically assess BMP implementation and effectiveness for roadways and other land management practices (facilities and ski runs for example). All management practices associated with Heavenly will be included in the sample pool for random selection and annual monitoring conducted and reported on USFS staff.

Due to the small number of sites selected and random monitoring associated with the National BMP Monitoring Program targets (approximately six evaluations per forest per year), Heavenly and its consultants will continue to identify and address erosion and BMP effectiveness on resort roadways, ski runs, and facilities annually.

This Page Intentionally Left Blank

10 Facilities Maintenance Monitoring

Additional required documentation for on-mountain monitoring can be found in Appendix E. Appendix E includes facilities monitoring checklists for the months of July and August of WY 2021; an August checklist was not completed due to the Caldor Fire, associated USFS forest closures, and use of the California Base Parking Lot for firefighting personnel and staging, as discussed in Chapter 2.9. Past quarterly monitoring report logs for WY 2021 can be found in the previously submitted quarterly reports. Appendix E also includes the salt application table for WY 2021, facilities watershed awareness training information, and stormwater maintenance reports. In July 2021, Pacific Stormwater inspected, cleaned, and maintained the stormwater vaults at the main lodge. All units were found to be in good working condition. The next maintenance is recommended for spring 2022.

This Page Intentionally Left Blank

11 Facilities Watershed Awareness Training

As required by the MRP, Appendix E also includes a sign-in sheet documenting attendance at the facilities watershed awareness training, which was held on June 1, 7, and 14, 2021. A total of 47 employees attended the June 1 training, 50 employees attended the June 7 training, and 48 employees attended the June 14 training. In addition to the sign-in sheet, Appendix E also includes the slideshow presentation viewed during the training. Training topics included BMPs, weeds, fire danger, summer rules of the road, and rain shutdown.

This Page Intentionally Left Blank

12 References

- Baird, R. and L. Bridgewater. 2017. *Standard Methods for the Examination of Water and Wastewater*. Twenty-third Edition. American Public Health Association, Washington, DC.
- California Regional Water Quality Control Board – Lahontan Region. 2010. TMDL Implementation Status. TMDL Heavenly Valley Creek Sediment.
- California Regional Water Quality Control Board – Lahontan Region. 2015a. Board Order No. R6T-2015-0021. WDID No. 6A090033000. Waste Discharge Requirements for Heavenly Mountain Resort.
- California Regional Water Quality Control Board – Lahontan Region. 2015b. Monitoring and Reporting Program No. 2015-0021. WDID No. 6A090033000.
- Cardno. 2017. Environmental Monitoring Program Comprehensive Report, Heavenly Mountain Resort, Water Years 2012-2016. Cardno. Zephyr Cove, Nevada.
- Cardno. 2018. *Environmental Monitoring Program Annual Report, Heavenly Mountain Resort, Water Year 2017*. Cardno. Zephyr Cove, Nevada.
- Cardno. 2018. *Heavenly Mountain Resort Quality Assurance Project Plan (QAPP)*. Cardno. Zephyr Cove, Nevada.
- Cardno. 2019. *Environmental Monitoring Program Annual Report, Heavenly Mountain Resort, Water Year 2018*. Cardno. Zephyr Cove, Nevada.
- Cardno. 2020. *Environmental Monitoring Program Annual Report, Heavenly Mountain Resort, Water Year 2019*. Cardno. Zephyr Cove, Nevada.
- Cardno. 2021. *Environmental Monitoring Program Annual Report, Heavenly Mountain Resort, Water Year 2020*. Cardno. Zephyr Cove, Nevada.
- Cardno. 2021 *Draft Heavenly Mountain Resort Standard Operating Procedures/Water Quality Sampling Quality Assurance Project Plan*. Cardno. Zephyr Cove, Nevada.
- Cardno ENTRIX. 2012. *Environmental Monitoring Program Comprehensive Report FINAL Heavenly Mountain Resort Water Years 2006-2012*. Revised December 2013. Cardno. Zephyr Cove, Nevada.
- ENTRIX. 2005. *Work Plan for Riparian Condition Monitoring*. ENTRIX. Zephyr Cove, Nevada.
- ENTRIX Inc. and Resource Concepts, Inc. 2007. Heavenly Valley Water Quality Environmental Monitoring Program Annual Report 2006. ENTRIX Inc., South Lake Tahoe California.
- Frazier, J.W., K.B. Roby, J.A. Boberg, K. Kenfield, J.B. Reiner, D.L. Azuma, J.L. Furnish, B.P. Staab, and S.L. Grant. 2005. *Stream Channel Inventory (SCI) Technical Guide*. USDA Forest Service, Pacific Southwest Region, Ecosystem Conservation Staff, Vallejo, California.
- Hauge Brueck Associates. 2014. *Heavenly Mountain Resort Epic Discovery Project Final EIR (CEQA) and Environmental Impact Statement (TRPA/NEPA)*. SCH # 2013112051.
- Hauge Brueck Associates. 2015. *Heavenly Mountain Resort Epic Discovery Project - Final Environmental Impact Report (CEQA) and Environmental Impact Statement (TRPA/NEPA)*. SCH # 2013112051.
- Herbst, David B. and E. Silldorff. 2009. *Development of a Benthic Macroinvertebrate Index of Biological Integrity (IBI) for Stream Assessments in the Eastern Sierra Nevada of California*.
- Horne, A.J. and C.R. Goldman. 1994. *Limnology*. McGraw-Hill, New York.
- Integrated Environmental Restoration Services, Inc. (IERS). 2013. *Watershed Management Guidebook: An Outcome-Based Guide to Watershed Management*. Prepared for the California State Water Resources Control Board.

- Integrated Environmental Restoration Services, Inc. (IERS). 2016. *Heavenly Mountain Resort Outcome-Based Watershed Management Program. 2016 Restoration and Monitoring Annual Report*.
- Norman, Sue. 2015. Lake Tahoe Basin Management Unit LTBMU. "Re: Mott Canyon Field Data." Email to: Chris Donley, Cardno. May 28, 2015.
- Ode, P.R., E. Fetscher, and L.B. Busse. 2016. *Standard Operating Procedures (SOP) for the Collection of Field Data for Bioassessments of California Wadeable Streams: Benthic Macroinvertebrates, Algae, and Physical Habitat*. California State Water Resources Control Board.
- Parsons Harland Bartholomew and Associates, Inc. 1996. *Heavenly Ski Resort Master Plan EIR/EIS/EIS*. Parsons Harland Bartholomew and Associates, Inc., Sacramento California.
- Parsons Harland Bartholomew and Associates, Inc. 2006. *Heavenly Mountain Resort Master Plan Amendment 2005 Draft EIR/EIS/EIS*. Parsons Harland Bartholomew and Associates, Inc., Sacramento California
- Parsons Harland Bartholomew and Associates, Inc. 2007. *Heavenly Mountain Resort Master Plan Amendment*. Adopted by TRPA April 25, 2007. Parsons HBA, Sacramento California.
- Pfankuch, D.J. 1975. *Stream Reach Inventory and Channel Stability Evaluation*. USDA Forest Service, Northern Region.
- Rosgen, Dave. 1996. *Applied River Morphology*. Wildland Hydrology, Pagosa Springs, Colorado.
- Sigala, Marco. 2016. "Re: Heavenly Creek Bioassessment Data." Email to: Chris Donley, Cardno. December 12, 2016.
- Sparks, D.L. 2003. *Environmental Soil Chemistry*. Elsevier Science, California.
- Suk, Thomas. 2014. Heavenly Valley Creek – Analysis of results from a decade of bioassessment monitoring (2001-2011), and recommendations for future monitoring. Unpublished internal memorandum, Lahontan Regional Water Quality Control Board, South Lake Tahoe, California. June 29, 2014.
- Suk, Thomas. 2015. Heavenly Valley Creek – Bioassessment site scores for 2014. Unpublished internal memorandum, Lahontan Regional Water Quality Control Board, South Lake Tahoe, California. April 2, 2015.
- Swanson Hydrology and Geomorphology. 2006. *Final Edgewood Watershed Assessment and Enhancement Plan: Upper Edgewood Creek*.
- Tormey, Daniel. 2017. *Bijou Park Creek Evaluation Report*. Catalyst Environmental Solutions, California.
- US Forest Service. 2001. *Environmental Monitoring Program 2001 Annual Report: Chapter 5*. USDA Forest Service, Pacific Southwest Region.
- US Forest Service. 2003. *Heavenly Valley Creek Total Daily Maximum Load (TMDL) Bioassessment Monitoring Plan*. USDA Forest Service-Region 5, Lake Tahoe Basin Management Unit.
- US Forest Service. 2015. *Forest Road Maintenance and Reporting Agreement between the USDA USFS LTBMU and Heavenly Mountain Resort*. March 23, 2015.
- US Forest Service. 2021. *2021 Caldor Fire Burned Area Emergency Response (BAER) Assessment Report Summary*. Eldorado National Forest and Lake Tahoe Basin Management Unit. Pacific Southwest Region.
- US Environmental Protection Agency. 2021. Particulate Matter (PM_{2.5}) Trends. Available at: <https://www.epa.gov/air-trends/particulate-matter-pm25-trends>. Accessed January 5, 2021.

Heavenly Mountain Resort
Water Years 2017–2021

APPENDIX

A

RAW WATER QUALITY
CONSTITUENTS: WY 2017–2021

Appendix A

Raw Data for Water Quality Constituents: WY 2017–2021

A.1 Water Quality Tables

Table A-1: Water Quality Data for 43HVC-1A (WY 2017–2021)

Table A-2: Water Quality Data for 43HVC-2 (WY 2017–2021)

Table A-3: Water Quality Data for 43HVC-3 (WY 2017–2021)

Table A-4: Water Quality Data for 43BPC-4 (WY 2017–2021)

Table A-5: Water Quality Data for 43HDVC-5 (WY 2017–2021)

Table A-6: Water Quality Data for 43HVE-1 (WY 2017–2021)

Table A-7: Water Quality Data for 43HVE-2 (WY 2017–2021)

This Page Intentionally Left Blank

Heavenly Valley Creek -Sky Meadows
(43HVC-1A)

Table A-1:		Heavenly Mountain Resort water year 2016/2017 water quality monitoring data from station 43HVC-1A, Heavenly Valley Creek at Sky Meadows. This station is located above the snowmaking pond at an elevation of 8,525 feet.									
Date	Time	Discharge (cfs)	Turbidity (ntu)	Suspended Sediment ² (mg/L)	Total Nitrite/Nitrate (mg/L)	Total Kjeldahl N (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	Chloride (mg/L)	Average Temperature (Deg C)	Precipitation (in)
Lahontan Standards ¹		N/A	N/A	60	N/A	N/A	0.190	0.015	0.15	N/A	N/A
First Quarter WY 2016-2017											
10/13/16	14:00	0.211	1.36	4.0	0.046	0.064	0.110	0.024	0.46	7.78	0
11/15/16	13:45	0.243	1.06	2.5	0.034	0.102	0.136	0.017	0.57	6.67	0
12/20/16	14:45	0.202	2.19	6.0	0.029	0.145	0.174	0.026	0.56	1.11	0.1
Second Quarter WY 2016-2017											
1/17/17	15:15	0.229	1.21	1.5	0.037	0.053	0.090	0.013	0.47	1.67	0
2/23/17	14:30	0.173	1.86	3.0	0.040	0.090	0.130	0.013	0.45	-8.89	0.1
3/16/17	14:05	0.173	3.74	3.5	0.038	0.096	0.134	0.020	0.42	5.00	0
Third Quarter WY 2016-2017											
4/4/17	14:00	0.244	2.87	5.0	0.033	0.140	0.173	0.024	0.38	2.78	0
4/19/17	13:50	0.215	4.25	5.0	0.034	0.157	0.191	0.027	0.40	2.78	0
5/4/17	13:30	0.939	4.48	8.0	0.064	0.241	0.305	0.034	0.36	10.56	0
5/18/17	13:35	1.58	2.40	4.0	0.035	0.117	0.152	0.023	0.36	3.33	0
6/1/17 ³	14:30	5.75	5.48	13.0	0.035	0.186	0.221	0.069	0.36	6.11	0
6/8/17 ³	14:00	6.45	5.18	13.5	0.057	0.151	0.208	0.058	0.36	6.11	0
6/22/17 ⁴	15:10	-	40.3	93.5	0.083	0.460	0.543	0.271	0.30	16.11	0
6/29/2017 ³	14:30	6.69	9.33	34.5	0.059	0.167	0.226	0.143	0.32	11.67	0
Fourth Quarter WY 2016-2017											
7/13/17	14:05	4.980	1.44	3.0	0.026	0.083	0.109	0.021	0.30	15.00	0
8/23/17	13:30	1.306	2.12	2.0	0.018	0.084	0.102	0.018	0.27	11.67	0.1
9/14/17	14:05	0.593	2.06	1.0	0.016	0.077	0.093	0.017	0.30	8.33	0
Annual Summary	Minimum	0.173	1.060	1.00	0.016	0.053	0.090	0.013	0.27	-8.9	-
	Maximum	6.690	40.300	93.50	0.083	0.460	0.543	0.271	0.57	16.1	-
	Average	1.874	5.372	11.94	0.040	0.142	0.182	0.048	0.39	6.3	-
	90th Percentile	-	-	46.30	-	-	-	-	-	-	-

¹ Standards are annual averages for the receiving waters of Trout Creek.

² Standards are for receiving waters of Trout Creek, 90th Percentile.

³ Flow is approximate due to flume being overtopped

⁴ Unable to measure flow/depth at flume due to unsafe access at flood stage (Overtopping Flume and Stream Banks).

Heavenly Valley Creek -Sky Meadows
(43HVC-1A)

Table A-1:		Heavenly Mountain Resort water year 2017/2018 water quality monitoring data from station 43HVC-1A, Heavenly Valley Creek at Sky Meadows. This station is located above the snowmaking pond at an elevation of 8,525 feet.									
Date	Time	Discharge (cfs)	Turbidity (ntu)	Suspended Sediment ² (mg/L)	Total Nitrite/Nitrate (mg/L)	Total Kjeldahl N (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	Chloride (mg/L)	Average Temperature (Deg C)	Precipitation (in)
Lahontan Standards ¹		N/A	N/A	60	N/A	N/A	0.190	0.015	0.15	N/A	N/A
First Quarter WY 2017-2018											
10/18/17	14:00	0.361	0.88	1.0	0.012	0.074	0.086	0.014	0.31	7.22	0
11/14/17	***UNABLE TO SAMPLE DUE TO ACCESS ISSUES ON MOUNTAIN									0.56	0.3
12/21/17 ³	13:50	-	0.92	1.0	0.027	0.071	0.098	0.010	0.40	-6.11	0.2
Second Quarter WY 2017-2018											
1/17/18	13:30	0.187	1.30	1.5	0.009	0.093	0.102	0.013	0.38	3.89	0
2/14/18	14:25	0.135	2.73	1.5	0.020	0.062	0.082	0.015	0.36	-5.56	0
3/20/18	14:15	0.100	1.92	1.5	0.032	0.057	0.089	0.013	0.35	0.00	0.1
Third Quarter WY 2017-2018											
4/4/18	14:25	0.187	3.49	4.5	0.036	0.099	0.135	0.019	0.34	4.44	0
4/18/18	13:35	0.340	1.93	2.5	0.036	0.089	0.125	0.015	0.38	-1.11	0
5/3/18	13:50	0.753	4.88	6.0	0.036	0.201	0.237	0.041	0.33	5.00	0
5/17/18	14:15	1.462	7.03	9.0	0.037	0.174	0.211	0.042	0.31	4.44	0.7
5/23/18	13:45	1.904	4.38	6.0	0.044	0.149	0.193	0.032	0.31	6.67	0.2
5/30/18	14:00	2.554	2.36	5.0	0.038	0.128	0.166	0.027	0.31	9.44	0
6/6/18 ⁴	13:30	3.489	5.85	7.5	0.063	0.171	0.234	0.038	0.35	8.89	0
6/20/18	13:20	1.904	1.39	2.5	0.030	0.073	0.103	0.020	0.35	13.33	0
Fourth Quarter WY 2017-2018											
7/19/18	13:20	0.868	1.37	2.5	0.020	0.073	0.093	0.020	0.30	16.67	0
8/16/18	14:05	0.340	1.54	2.0	0.018	0.066	0.084	0.013	0.28	13.89	0
9/12/18	14:00	0.244	1.52	2.5	0.016	0.060	0.076	0.019	0.30	7.78	0
Annual Summary	Minimum	0.10	0.88	1.00	0.009	0.057	0.076	0.010	0.28	-6.1	-
	Maximum	3.49	7.03	9.00	0.063	0.201	0.237	0.042	0.40	16.7	-
	Average	1.19	2.72	3.53	0.030	0.103	0.132	0.022	0.34	5.3	-
	90th Percentile	-	-	7.95	-	-	-	-	-	-	-

¹ Standards are annual averages for the receiving waters of Trout Creek.

² Standards are for receiving waters of Trout Creek, 90th Percentile.

³ Unable to measure flow due to ice on 12/21; however, water quality samples collected

⁴ Unable to measure flow/depth at the flume due to flood stage (overtopping flume). Flow was measured using the Marsh Mcbirney flow meter.

Heavenly Valley Creek - Sky Meadows
(43HVC-1A)

Table A-1:		Heavenly Mountain Resort water year 2018/2019 water quality monitoring data from station 43HVC-1A, Heavenly Valley Creek at Sky Meadows. This station is located above the snowmaking pond at an elevation of 8,525 feet.									
Date	Time	Discharge (cfs)	Turbidity (ntu)	Suspended Sediment ² (mg/L)	Total Nitrite/Nitrate (mg/L)	Total Kjeldahl N (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	Chloride (mg/L)	Average Temperature (Deg C)	Precipitation (in)
Lahontan Standards¹		N/A	N/A	60	N/A	N/A	0.190	0.015	0.15	N/A	N/A
First Quarter WY 2018-2019											
10/17/18	13:35	0.187	0.72	1.0	0.011	0.055	0.066	0.014	0.38	5.00	0
11/15/18	13:25	0.135	0.83	1.5	0.011	0.043	0.054	0.011	0.31	3.33	0
12/12/18	14:00	0.135	0.99	1.0	0.014	0.065	0.079	0.011	0.41	-1.11	0
Second Quarter WY 2018-2019											
1/23/19	14:00	0.111	1.59	2.0	0.012	0.067	0.079	0.016	0.42	0.00	0
2/12/19	14:45	0.069	1.48	1.5	0.015	0.048	0.063	0.019	0.40	-3.33	0.1
3/20/19	14:40	0.046	1.81	2.5	0.016	0.058	0.074	0.012	0.37	-2.78	0.1
Third Quarter WY 2018-2019											
4/10/19	13:35	0.069	2.50	3.0	0.019	0.098	0.117	0.028	0.37	-1.67	0
4/24/19	13:20	0.323	1.86	3.0	0.029	0.124	0.153	0.023	0.45	7.78	0
5/8/19	13:55	1.037	8.88	8.0	0.030	0.142	0.172	0.047	0.40	6.67	0
5/22/19	13:30	0.963	1.47	3.5	0.037	0.061	0.098	0.018	0.43	0.00	0.7
6/5/19 ³	13:20	< 3.456	13.90	22.0	0.025	0.286	0.311	0.096	0.36	11.67	0
6/19/19 ³	13:20	< 5.982	10.70	25.0	0.055	0.240	0.295	0.096	0.38	13.33	0
6/26/19 ³	13:10	< 5.087	3.25	2.5	0.035	0.084	0.119	0.025	0.35	7.78	0
Fourth Quarter WY 2018-2019											
7/2/19 ³	13:20	< 4.244	5.52	2.5	0.025	0.088	0.113	0.023	0.35	10.56	0
7/17/19	13:00	1.966	1.81	2.0	0.016	0.072	0.088	0.023	0.28	12.78	0
8/14/19	13:50	0.753	2.66	2.0	0.017	0.090	0.107	0.018	0.25	15.56	0
9/18/19	13:30	0.503	2.57	2.5	0.012	0.15	0.162	0.025	0.33	4.44	0
Annual Summary	Minimum	0.046	0.72	1.00	0.011	0.043	0.054	0.011	0.25	-3.33	-
	Maximum	5.982	13.90	25.00	0.055	0.286	0.311	0.096	0.45	15.56	-
	Average	1.474	3.86	5.03	0.022	0.104	0.126	0.030	0.37	5.29	-
	90th Percentile	-	-	22.60	-	-	-	-	-	-	-

¹ Standards are annual averages for the receiving waters of Trout Creek.

² Standards are for receiving waters of Trout Creek, 90th Percentile.

³ Flow measurement is approximate (underestimate) due to flow out of banks and flume being overtopped.

Heavenly Valley Creek - Sky
Meadows (43HVC-1A)

Table A-1:		Heavenly Mountain Resort water year 2019/2020 water quality monitoring data from station 43HVC-1A, Heavenly Valley Creek at Sky Meadows. This station is located above the snowmaking pond at an elevation of 8,525 feet.										
Date	Time	Discharge (cfs)	Turbidity (ntu)	Suspended Sediment ² (mg/L)	Total Nitrite/Nitrate (mg/L)	Total Kjeldahl N (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	Chloride (mg/L)	Site Water Temperature (Deg C)	Site Ambient Temperature (Deg C)	Precipitation (in)
Lahontan Standards ¹		N/A	N/A	60	N/A	N/A	0.190	0.015	0.15	N/A	N/A	N/A
First Quarter WY 2019-2020												
10/15/19	13:10	0.357	1.27	2.0	0.011	0.137	0.148	0.015	0.3	5.8	16.9	0.0
11/13/19	12:50	0.244	1.17	1.5	0.007	0.134	0.141	0.014	0.3	9.8	11.8	0.0
12/11/19	13:40	0.173	1.06	1.0	0.015	0.061	0.076	0.012	0.7	1.8	-0.3	0.0
Second Quarter WY 2019-2020												
1/14/20	14:10	0.123	1.82	2.5	0.007	0.055	0.062	0.016	0.4	0.2	-0.1	0.1
2/11/20	13:40	0.100	3.18	14.5	0.009	0.141	0.150	0.021	0.4	1.0	1.4	0.0
3/23/20	-	Neither flow nor water quality samples could be collected because of restricted on-mountain access due to COVID-19 resort closure.										0.0
Third Quarter WY 2019-2020												
4/7/20	-	Neither flow nor water quality samples could be collected because of restricted on-mountain access due to COVID-19 resort closure.										0.5
4/21/20	-	Neither flow nor water quality samples could be collected because of restricted on-mountain access due to COVID-19 resort closure.										0.0
5/5/20	-	Neither flow nor water quality samples could be collected because of restricted on-mountain access due to COVID-19 resort closure.										0.0
5/20/20	13:05	0.830	1.69	4.0	0.037	0.078	0.115	0.025	0.7	4.5	4.7	0.2
5/27/20	13:00	0.939	2.83	2.5	0.025	0.101	0.126	0.023	0.8	9.8	20.3	0.0
6/2/20	13:20	1.062	2.17	5.0	0.024	0.114	0.138	0.019	0.7	10.3	18.3	0.0
6/16/20	12:55	1.037	1.88	7.5	0.027	0.089	0.116	0.020	0.8	10.0	14.1	0.0
6/30/20	13:30	0.503	1.59	4.0	0.018	0.097	0.115	0.020	0.5	11.9	19.7	0.0
Fourth Quarter WY 2019-2020												
7/14/20	13:05	0.307	1.19	2.5	0.013	0.100	0.113	0.021	0.5	14.0	25.0	0.0
8/18/20	13:25	0.111	2.01	5.0	0.008	0.100	0.108	0.016	0.5	14.0	23.0	0.0
9/22/20	13:00	0.069	2.36	3.5	0.005	0.059	0.064	0.017	0.5	8.5	25.0	0.0
Annual Summary	Minimum	0.069	1.06	1.00	0.005	0.055	0.062	0.012	0.30	0.2	-0.3	-
	Maximum	1.062	3.18	14.50	0.037	0.141	0.150	0.025	0.80	14.0	25.0	-
	Average	0.481	1.86	4.27	0.016	0.097	0.113	0.018	0.55	7.8	13.8	-
90th Percentile		-	-	11.70	-	-	-	-	-		-	-

¹ Standards are annual averages for the receiving waters of Trout Creek.

² Standards are for receiving waters of Trout Creek, 90th Percentile.

Heavenly Valley Creek - Sky Meadows
(43HVC-1A)

Table A-1:			Heavenly Mountain Resort water year 2020-2021 water quality monitoring data from station 43HVC-1A, Heavenly Valley Creek at Sky Meadows. This station is located above the snowmaking pond at an elevation of 8,525 feet.										
Date	Notes	Time	Discharge (cfs)	Turbidity (ntu)	Suspended Sediment ² (mg/L)	Total Nitrite/Nitrate (mg/L)	Total Kjeldahl N (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	Chloride (mg/L)	Site Water Temperature (Deg C)	Site Ambient Temperature (Deg C)	Precipitation (in)
Lahontan Standards	¹		N/A	N/A	60	N/A	N/A	0.190	0.015	0.15	N/A	N/A	N/A
First Quarter WY 2020-2021													
10/20/20		13:40	0.026	1.81	3.0	0.002	0.065	0.067	0.015	0.6	11.5	22.5	0.0
11/19/20		13:30	0.060	32.0	38	0.002	0.433	0.435	0.147	1.4	N/A	18.0	2.2
12/9/20		13:20	0.069	1.08	1.0	0.004	0.047	0.051	0.016	0.9	N/A	N/A	0.0
Second Quarter WY 2020-2021													
1/13/21		13:10	0.060	5.94	6.0	0.009	0.235	0.244	0.035	0.579	2.5	3.9	0.0
2/17/21	³	13:45	0.042	1.65	2.5	0.003	0.079	0.082	0.015	0.469	2.7	1.0	0.0
3/17/21	³	13:25	0.027	2.11	2.5	0.003	0.05	0.054	0.011	0.214	1.8	5.3	0.0
Third Quarter WY 2020-2021													
4/6/21	³	13:25	0.079	1.09	1.5	0.027	0.118	0.145	0.021	0.719	3.7	10.1	0.0
4/20/21		13:15	0.187	1.69	2.0	0.032	0.171	0.203	0.029	0.954	5.7	13.6	0.0
5/4/21		13:30	0.357	2.85	4.5	0.031	0.20	0.227	0.025	0.824	8.20	22.9	0.0
5/18/21	³	12:55	0.511	1.32	1.5	0.035	0.098	0.133	0.019	0.850	10.7	16.2	0.0
5/25/21		12:50	0.624	1.58	2.5	0.030	0.124	0.154	0.020	0.718	7.7	14.0	0.0
6/1/21	³	12:55	0.556	1.25	2.0	0.020	0.087	0.107	0.012	0.763	11.9	18.6	0.0
6/15/21		13:15	0.651	1.84	4.0	0.050	0.114	0.164	0.020	1.04	11.8	14.4	0.0
6/30/21	³	12:35	0.308	1.76	4.0	0.050	0.087	0.137	0.018	0.767	12.7	22.8	0.0
Fourth Quarter WY 2020-2021													
7/13/21		13:15	0.078	1.94	3.5	0.014	0.111	0.125	0.024	0.644	14.1	24.3	0.0
No WQ Samples Collected in August due to Caldor Fire, Forest Closures and Basin Evacuation													
9/20/21		11:50	0.034	11.70	8.5	0.003	0.104	0.107	0.043	0.452	8.3	17.5	0.0
Annual Summary													
		Minimum	0.026	1.08	1.00	0.002	0.047	0.051	0.011	0.214	1.80	1.00	0.0
		Maximum	0.651	32.0	38.0	0.050	0.433	0.435	0.147	1.40	14.1	24.3	2.2
		Average	0.270	4.83	5.88	0.021	0.131	0.152	0.031	0.769	8.69	15.7	0.17
90th Percentile					17.4								

¹ Standards are annual averages for the receiving waters of Trout Creek.

² For Suspended Sediment, standards are for streams tributary to Lake Tahoe. Suspended Sediment concentrations shall not exceed a 90th percentile value of 60 mg/L.

³ The Chloride Sample Batch Matrix Spike (MS) and/or Matrix Spike Duplicate (MSD) were outside acceptable limits, batch Laboratory Control Sample (LCS) was acceptable.

Heavenly Valley Creek - Patsy's
(43HVC-2)

Table A-2:		Heavenly Mountain Resort water year 2016/2017 water quality monitoring data from station 43HVC-2, Heavenly Valley Creek below Patsy's Chair. This station is located just beyond ski area development within this watershed at an elevation of 8,000 feet.									
Date	Time	Discharge (cfs)	Turbidity (ntu)	Suspended Sediment ² (mg/L)	Total Nitrite/Nitrate (mg/L)	Total Kjeldahl N (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	Chloride (mg/L)	Average Temperature (Deg C)	Precipitation (in)
Lahontan Standards ¹		N/A	N/A	60	N/A	N/A	0.190	0.015	0.15	N/A	N/A
First Quarter WY 2016-2017											
10/13/16	13:45	0.100	0.48	1.0	0.080	0.053	0.133	0.023	0.96	7.78	0
11/15/16	13:25	0.174	0.45	1.0	0.062	0.056	0.118	0.013	1.0	6.67	0
12/20/2016 ³	15:05	0.123	0.73	1.5	0.075	0.067	0.142	0.016	0.72	1.11	0.1
Second Quarter WY 2016-2017											
1/17/17	15:30	0.201	2.08	2.0	0.066	0.090	0.156	0.020	1.4	1.67	0
2/23/17	15:40	0.230	1.06	1.0	0.074	0.057	0.131	0.011	0.99	-8.89	0.1
3/16/17	14:45	0.292	1.06	1.5	0.068	0.063	0.131	0.016	0.87	5.00	0
Third Quarter WY 2016-2017											
4/4/17	14:35	0.505	0.96	1.5	0.078	0.065	0.143	0.015	0.78	2.78	0
4/19/17	14:30	0.544	1.58	1.0	0.096	0.060	0.156	0.019	0.81	2.78	0
5/4/17	13:45	3.09	14.6	20.0	0.073	0.242	0.315	0.075	0.54	10.56	0
5/18/17	13:45	4.67	2.43	3.5	0.064	0.104	0.168	0.025	0.56	3.33	0
6/1/17 ⁴	14:00	13.45	15.3	24.5	0.047	0.198	0.245	0.096	0.43	6.11	0
6/8/17 ⁴	14:20	20.88	5.79	9.0	0.052	0.166	0.218	0.047	0.39	6.11	0
6/22/17 ⁴	14:45	29.23	20.5	47.5	0.064	0.235	0.299	0.137	0.35	16.11	0
6/29/17	14:45	17.03	2.89	5.0	0.052	0.092	0.144	0.029	0.36	11.67	0
Fourth Quarter WY 2016-2017											
7/13/17	13:20	6.000	1.62	3.0	0.024	0.103	0.127	0.024	0.38	15.00	0
8/23/17	13:05	1.466	2.06	2.0	0.011	0.120	0.131	0.021	0.49	11.67	0.1
9/14/17	13:52	0.712	1.71	1.0	0.016	0.107	0.123	0.022	0.52	8.33	0
Annual Summary	Minimum	0.100	0.450	1.00	0.011	0.053	0.118	0.011	0.35	-8.9	-
	Maximum	29.230	20.500	47.50	0.096	0.242	0.315	0.137	1.40	16.1	-
	Average	5.806	4.429	7.41	0.059	0.110	0.169	0.036	0.68	6.3	-
	90th Percentile	-	-	29.10	-	-	-	-	-	-	-

¹ Standards are annual averages for the receiving waters of Trout Creek.

² Standards are for receiving waters of Trout Creek, 90th Percentile.

³ The matrix spike/matrix spike duplicate (MS/MSD) values for the chloride sample were

⁴ Flow is approximate due to flume being overtopped

Heavenly Valley Creek - Below Patsys
(43HVC-2)

Table A-2:		Heavenly Mountain Resort water year 2017/2018 water quality monitoring data from station 43HVC-2, Heavenly Valley Creek below Patsy's Chair. This station is located just beyond ski area development within this watershed at an elevation of 8,000 feet.									
Date	Time	Discharge (cfs)	Turbidity (ntu)	Suspended Sediment ² (mg/L)	Total Nitrite/Nitrate (mg/L)	Total Kjeldahl N (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	Chloride (mg/L)	Average Temperature (Deg C)	Precipitation (in)
Lahontan Standards ¹		N/A	N/A	60	N/A	N/A	0.190	0.015	0.15	N/A	N/A
First Quarter WY 2017-2018											
10/18/17	13:40	0.626	1.05	1.5	0.015	0.101	0.116	0.017	0.55	7.22	0
11/14/17	13:40	0.393	0.67	1.5	0.028	0.068	0.096	0.019	0.76	0.56	0.3
12/21/17	13:50	0.174	0.77	1.5	0.063	0.095	0.158	0.011	1.00	-6.11	0.2
Second Quarter WY 2017-2018											
1/17/18	14:00	0.174	5.24	4.5	0.048	0.073	0.121	0.027	0.96	3.89	0
2/14/18	15:00	0.100	1.47	1.0	0.047	0.064	0.111	0.012	0.95	-5.56	0
3/20/18	14:35	0.148	1.42	1.0	0.051	0.050	0.101	0.016	0.96	0.00	0.1
Third Quarter WY 2017-2018											
4/4/18	15:15	0.292	0.76	1.0	0.049	0.053	0.102	0.012	1.40	4.44	0
4/18/18	13:40	0.668	1.38	1.5	0.051	0.054	0.105	0.014	0.81	-1.11	0
5/3/18	14:05	1.638	32.3	29.0	0.051	0.162	0.213	0.114	1.00	5.00	0
5/17/18	13:50	2.527	8.73	9.5	0.018	0.171	0.189	0.041	0.63	4.44	0.7
5/23/18	13:30	2.665	3.31	2.5	0.027	0.107	0.134	0.022	0.55	6.67	0.2
5/30/18	13:45	3.316	2.40	3.0	0.030	0.085	0.115	0.021	0.49	9.44	0
6/6/18	13:15	3.543	2.04	3.5	0.021	0.089	0.110	0.024	0.44	8.89	0
6/20/18	13:10	3.093	1.85	2.0	0.016	0.096	0.112	0.017	0.44	13.33	0
Fourth Quarter WY 2017-2018											
7/19/18	13:05	0.894	1.46	3.0	0.017	0.112	0.129	0.021	0.46	16.67	0
8/16/18	13:50	0.505	2.0	3.0	0.018	0.104	0.122	0.017	0.49	13.89	0
9/12/18	13:35	0.358	2.0	1.0	0.017	0.084	0.101	0.022	0.54	7.78	0
Annual Summary	Minimum	0.10	0.67	1.00	0.015	0.050	0.096	0.011	0.44	-6.1	-
	Maximum	3.54	32.30	29.00	0.063	0.171	0.213	0.114	1.40	16.7	-
	Average	1.46	4.05	4.12	0.033	0.092	0.126	0.025	0.73	5.3	-
	90th Percentile	-	-	13.40	-	-	-	-	-	-	-

¹ Standards are annual averages for the receiving waters of Trout Creek.

² Standards are for receiving waters of Trout Creek, 90th Percentile.

Heavenly Valley Creek - Below Patsys
(43HVC-2)

Table A-2:		Heavenly Mountain Resort water year 2018/2019 water quality monitoring data from station 43HVC-2, Heavenly Valley Creek below Patsy's Chair. This station is located just beyond ski area development within this watershed at an elevation of 8,000 feet.									
Date	Time	Discharge (cfs)	Turbidity (ntu)	Suspended Sediment ² (mg/L)	Total Nitrite/Nitrate (mg/L)	Total Kjeldahl N (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	Chloride (mg/L)	Average Temperature (Deg C)	Precipitation (in)
Lahontan Standards ¹		N/A	N/A	60	N/A	N/A	0.190	0.015	0.15	N/A	N/A
First Quarter WY 2018-2019											
10/17/18	13:15	0.324	1.01	1.0	0.008	0.061	0.069	0.019	0.58	5.00	0
11/15/18	13:05	0.230	0.80	1.0	0.021	0.05	0.071	0.012	1.10	3.33	0
12/12/18	14:40	0.079	0.52	0.5	0.032	0.059	0.091	0.016	0.97	-1.11	0
Second Quarter WY 2018-2019											
1/23/19	14:30	0.060	0.73	2.0	0.022	0.052	0.074	0.016	1.20	0.00	0
2/12/19	15:15	0.015	1.45	1.0	0.026	0.052	0.078	0.012	1.30	-3.33	0.1
3/21/19	15:00	0.187	0.83	1.0	0.046	0.048	0.094	0.011	0.99	-2.78	0.1
Third Quarter WY 2018-2019											
4/10/19	13:55	0.260	1.06	1.0	0.052	0.045	0.097	0.020	2.30	-1.67	0
4/24/19	13:45	0.756	2.34	2.0	0.046	0.102	0.148	0.023	0.99	7.78	0
5/8/19	13:20	2.066	7.30	6.0	0.066	0.137	0.203	0.038	0.75	6.67	0
5/22/19	14:00	2.326	10.20	10.5	0.054	0.128	0.182	0.049	0.64	0.00	0.7
6/5/19	14:00	6.000	16.10	27.0	0.029	0.197	0.226	0.092	0.50	11.67	0
6/19/19	13:00	11.194	9.31	10.0	0.045	0.119	0.164	0.044	0.48	13.33	0
6/26/19	12:50	8.044	1.88	1.5	0.030	0.091	0.121	0.020	0.42	7.78	0
Fourth Quarter WY 2018-2019											
7/2/19	13:00	1.757	1.02	1.5	0.024	0.082	0.106	0.023	0.57	10.56	0
7/17/19	12:30	3.241	1.67	2.0	0.01	0.127	0.137	0.020	0.40	12.78	0
8/14/19	12:40	0.894	1.16	1.0	0.016	0.073	0.089	0.019	0.49	15.56	0
9/18/19	12:55	0.230	2.15	3.0	0.023	0.080	0.103	0.030	0.72	4.44	0
Annual Summary											
	Minimum	0.015	0.52	0.50	0.008	0.045	0.069	0.011	0.40	-3.33	-
	Maximum	11.194	16.10	27.0	0.066	0.197	0.226	0.092	2.30	15.56	-
	Average	2.215	3.50	4.24	0.032	0.088	0.121	0.027	0.85	5.29	-
90th Percentile		-	-	13.80	-	-	-	-	-	-	-

¹ Standards are annual averages for the receiving waters of Trout Creek.

² Standards are for receiving waters of Trout Creek, 90th Percentile.

Heavenly Valley Creek - Below Patsys
(43HVC-2)

Table A-2:		Heavenly Mountain Resort water year 2019/2020 water quality monitoring data from station 43HVC-2, Heavenly Valley Creek below Patsy's Chair. This station is located just beyond ski area development within this watershed at an elevation of 8,000 feet.										
Date	Time	Discharge (cfs)	Turbidity (ntu)	Suspended Sediment ² (mg/L)	Total Nitrite/Nitrate (mg/L)	Total Kjeldahl N (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	Chloride (mg/L)	Site Water Temperature (Deg C)	Site Ambient Temperature (Deg C)	Precipitation (in)
Lahontan Standards ¹		N/A	N/A	60	N/A	N/A	0.190	0.015	0.15	N/A	N/A	N/A
First Quarter WY 2019-2020												
10/15/19	12:50	0.505	0.87	1.0	0.007	0.069	0.076	0.016	0.4	5.1	13.3	0.0
11/13/19	12:35	0.358	0.53	1.0	0.008	0.055	0.063	0.015	0.6	10.1	4.7	0.0
12/11/19	13:05	0.100	0.65	0.5	0.002	0.078	0.080	0.018	1.3	2.5	0.9	0.0
Second Quarter WY 2019-2020												
1/14/20	14:40	0.100	0.29	2.0	0.015	0.054	0.069	0.017	0.9	1.6	0.9	0.1
2/11/20	14:00	0.100	0.27	1.5	0.025	0.052	0.077	0.015	0.9	2.0	4.9	0.0
3/23/20	-	Neither flow nor water quality samples could be collected because of restricted on-mountain access due to COVID-19 resort closure.										0.0
Third Quarter WY 2019-2020												
4/7/20	-	Neither flow nor water quality samples could be collected because of restricted on-mountain access due to COVID-19 resort closure.										0.5
4/21/20	-	Neither flow nor water quality samples could be collected because of restricted on-mountain access due to COVID-19 resort closure.										0.0
5/5/20	12:45	0.942	1.37	2.7	0.049	0.115	0.164	0.020	1.3	6.8	15.1	0.0
5/20/20	12:45	1.142	1.69	2.5	0.037	0.100	0.137	0.026	0.9	4.6	4.2	0.2
5/27/20	12:45	1.194	1.62	2.5	0.023	0.119	0.142	0.019	0.9	9.6	20.8	0.0
6/2/20	13:00	1.142	1.62	3.0	0.020	0.103	0.123	0.019	0.9	10.0	20.8	0.0
6/16/20	12:40	1.638	17.10	12.0	0.010	0.170	0.180	0.051	1.0	9.9	14.4	0.0
6/30/20	13:15	0.668	1.24	3.0	0.013	0.122	0.135	0.018	0.6	11.9	19.7	0.0
Fourth Quarter WY 2019-2020												
7/14/20	12:45	0.090	0.80	1.5	0.054	0.077	0.131	0.018	1.3	11.0	23.5	0.0
8/18/20	13:05	0.174	0.89	3.0	0.026	0.074	0.100	0.020	0.7	11.0	25.0	0.0
9/22/20	12:40	0.100	1.03	3.0	0.021	0.070	0.091	0.024	0.7	7.0	17.0	0.0
Annual Summary	Minimum	0.090	0.27	0.50	0.002	0.052	0.000	0.015	0.40	1.6	0.9	-
	Maximum	1.638	17.10	12.00	0.054	0.170	0.180	0.051	1.30	11.9	25.0	-
	Average	0.590	2.14	2.80	0.022	0.090	0.105	0.021	0.89	7.4	13.2	-
90th Percentile		-	-	7.50	-	-	-	-	-	-	-	-

¹ Standards are annual averages for the receiving waters of Trout Creek.

² Standards are for receiving waters of Trout Creek, 90th Percentile.

Heavenly Valley Creek - Below Patsys
(43HVC-2)

Table A-2:			Heavenly Mountain Resort water year 2020-2021 water quality monitoring data from station 43HVC-2, Heavenly Valley Creek below Patsy's Chair. This station is located just beyond ski area development within this watershed at an elevation of 8,000 feet.										
Date	Notes	Time	Discharge (cfs)	Turbidity (ntu)	Suspended Sediment ² (mg/L)	Total Nitrite/Nitrate (mg/L)	Total Kjeldahl N (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	Chloride (mg/L)	Site Water Temperature (Deg C)	Site Ambient Temperature (Deg C)	Precipitation (in)
Lahontan Standards	¹		N/A	N/A	60	N/A	N/A	0.190	0.015	0.15	N/A	N/A	N/A
First Quarter WY 2020-2021													
10/20/20		13:20	0.060	1.11	1.5	0.017	0.051	0.068	0.018	1.2	10.0	25.0	0.0
11/19/20		14:05	0.079	1.31	1.0	0.001	0.091	0.092	0.022	1.9	N/A	N/A	2.2
12/9/20		13:00	0.079	0.30	2.0	0.030	0.043	0.073	0.023	1.6	N/A	N/A	0.0
Second Quarter WY 2020-2021													
1/13/21		13:40	0.123	10.3	8.5	0.028	0.332	0.360	0.044	3.71	3.2	3.9	0.0
2/17/21		14:10	No samples collected or flow measured due to extremely low flow conditions as the site.								N/A	N/A	0.0
3/17/21		14:10	No samples collected or flow measured due to extremely low flow conditions as the site.								N/A	N/A	0.0
Third Quarter WY 2020-2021													
4/6/21		13:40	No samples collected or flow measured due to extremely low flow conditions as the site.								N/A	N/A	0.0
4/20/21		13:25	0.292	4.95	3.5	0.03	0.119	0.149	0.032	1.38	N/A	N/A	0.0
5/4/21		13:10	0.467	1.03	1.5	0.062	0.085	0.147	0.018	1.40	7.4	25.2	0.0
5/18/21	³	12:40	0.505	0.83	1.5	0.038	0.103	0.141	0.014	1.19	9.6	19.2	0.0
5/25/21		12:40	0.544	0.61	1.5	0.026	0.086	0.112	0.013	1.12	7.7	14.0	0.0
6/1/21	³	12:40	0.505	0.57	1.0	0.022	0.073	0.095	0.009	1.08	11.6	23.8	0.0
6/15/21		12:55	0.505	0.99	3.0	0.017	0.083	0.100	0.015	1.04	12.6	16.0	0.0
6/30/21	³	12:20	0.292	0.86	3.5	0.017	0.086	0.103	0.014	1.06	13.3	23.3	0.0
Fourth Quarter WY 2020-2021													
7/13/21		13:00	0.123	0.40	1.0	0.046	0.078	0.124	0.021	1.19	13.7	30.4	0.0
No WQ Samples Collected in August due to Caldor Fire, Forest Closures and Basin Evacuation													
9/20/21		11:30	0.005	28.10	29.5	0.008	0.392	0.400	0.127	1.35	7.9	10.4	0.0
Annual Summary		Minimum	0.005	0.30	1.00	0.001	0.043	0.068	0.009	1.04	3.2	3.9	0.0
		Maximum	0.544	28.10	29.50	0.062	0.392	0.400	0.127	3.71	13.7	30.4	2.2
		Average	0.275	3.95	4.54	0.026	0.125	0.151	0.028	1.48	9.7	19.1	0.1
90th Percentile					21.10								

¹ Standards are annual averages for the receiving waters of Trout Creek.

² For Suspended Sediment, standards are for streams tributary to Lake Tahoe. Suspended Sediment concentrations shall not exceed a 90th percentile value of 60 mg/L.

³ For Chloride, batch MS and/or MSD were outside acceptance limits, batch LCS was acceptable.

Heavenly Valley Creek -Property Line
(43HVC-3)

Table A-3:		Heavenly Mountain Resort water year 2016/2017 water quality monitoring data from station 43HVC-3, Heavenly Valley Creek at the Property Line. This station is located just above the Forest Service property line and subdivision development at an elevation of 6,620 feet.									
Date	Time	Discharge (cfs)	Turbidity (ntu)	Suspended Sediment ² (mg/L)	Total Nitrite/Nitrate (mg/L)	Total Kjeldahl N (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	Chloride (mg/L)	Average Temperature (Deg C)	Precipitation (in)
Lahontan Standards¹		N/A	N/A	60	N/A	N/A	0.190	0.015	0.15	N/A	N/A
First Quarter WY 2016-2017											
10/13/16	12:15	0.042	6.25	1.0	0.005	0.057	0.062	0.023	0.82	7.78	0
11/15/16	12:00	0.158	0.20	1.0	0.003	0.050	0.053	0.011	0.95	6.67	0
12/20/16	12:00	0.088	1.77	4.0	0.003	0.094	0.097	0.021	1.1	1.11	0.1
Second Quarter WY 2016-2017											
1/17/17	13:50	0.394	1.47	2.0	0.001	0.075	0.076	0.018	1.1	1.67	0
2/23/17	12:30	0.475	0.75	1.0	0.002	0.048	0.050	0.011	0.95	-8.89	0.1
3/16/17	12:30	0.913	0.80	1.5	0.003	0.067	0.070	0.015	0.80	5.00	0
Third Quarter WY 2016-2017											
4/4/17	12:20	1.69	0.55	1.0	0.003	0.060	0.063	0.017	0.70	2.78	0
4/19/17	12:25	1.81	0.74	1.0	0.003	0.062	0.065	0.019	0.72	2.78	0
5/4/17	12:05	5.0	9.50	17.0	0.025	0.254	0.279	0.050	0.56	10.56	0
5/18/17	12:10	8.66	6.36	14.0	0.025	0.104	0.129	0.040	0.56	3.33	0
6/1/17	12:15	20.02	8.72	18.0	0.030	0.158	0.188	0.080	0.45	6.11	0
6/8/17	12:30	23.62	40.5	71.0	0.036	0.280	0.316	0.202	0.40	6.11	0
6/22/17	12:50	31.60	33.0	87.0	0.047	0.414	0.461	0.213	0.36	16.11	0
6/29/17	12:30	20.30	5.82	18.0	0.041	0.121	0.162	0.074	0.38	11.67	0
Fourth Quarter WY 2016-2017											
7/13/17	11:45	6.82	8.52	14.0	0.017	0.179	0.196	0.054	0.39	15.00	0
8/23/17	11:40	2.09	1.89	1.5	0.005	0.175	0.180	0.022	0.5	11.67	0.1
9/14/17	12:20	1.45	1.05	3.0	0.003	0.118	0.121	0.027	0.51	8.33	0
Annual Summary	Minimum	0.04	0.20	1.00	0.001	0.048	0.050	0.011	0.36	-8.9	-
	Maximum	31.60	40.50	87.00	0.047	0.414	0.461	0.213	1.10	16.1	-
	Average	7.36	7.52	15.06	0.015	0.136	0.151	0.053	0.66	6.3	-
90th Percentile		-	-	74.20	-	-	-	-	-	-	-

¹ Standards are annual averages for the receiving waters of Trout Creek.

² Standards are for receiving waters of Trout Creek, 90th Percentile.

Heavenly Valley Creek - Property Line
(43HVC-3)

Table A-3:		Heavenly Mountain Resort water year 2017/2018 water quality monitoring data from station 43HVC-3, Heavenly Valley Creek at the Property Line. This station is located just above the Forest Service property line and subdivision development at an elevation of 6,620 feet.									
Date	Time	Discharge (cfs)	Turbidity (ntu)	Suspended Sediment ² (mg/L)	Total Nitrite/Nitrate (mg/L)	Total Kjeldahl N (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	Chloride (mg/L)	Average Temperature (Deg C)	Precipitation (in)
Lahontan Standards ¹		N/A	N/A	60	N/A	N/A	0.190	0.015	0.15	N/A	N/A
First Quarter WY 2017-2018											
10/18/17	12:10	1.029	0.70	0.5	0.001	0.068	0.069	0.015	0.51	7.22	0
11/14/17	12:05	0.448	0.45	1.0	0.003	0.063	0.066	0.020	0.69	0.56	0.3
12/21/17	12:25	0.223	2.89	11.5	0.004	0.13	0.134	0.024	0.87	-6.11	0.2
Second Quarter WY 2017-2018											
1/17/18	11:40	0.195	0.46	0.5	0.004	0.054	0.058	0.015	0.76	3.89	0
2/14/18	12:25	0.088	1.34	1.0	0.005	0.06	0.065	0.015	0.76	-5.56	0
3/20/18	12:55	0.229	0.43	0.5	0.004	0.052	0.056	0.014	0.79	0.00	0.1
Third Quarter WY 2017-2018											
4/4/18	12:30	0.616	2.50	2.5	0.004	0.075	0.079	0.022	0.97	4.44	0
4/18/18	11:50	1.155	1.04	1.0	0.007	0.056	0.063	0.015	0.77	-1.11	0
5/3/18	12:20	2.292	1.78	1.5	0.011	0.067	0.078	0.016	0.33	5.00	0
5/17/18	12:00	2.923	3.33	3.0	0.010	0.083	0.093	0.027	0.31	4.44	0.7
5/23/18	12:15	3.073	2.59	3.0	0.007	0.086	0.093	0.022	0.31	6.67	0.2
5/30/18	12:15	5.280	2.45	2.5	0.010	0.097	0.107	0.020	0.31	9.44	0
6/6/18	11:50	4.497	2.59	4.0	0.009	0.091	0.100	0.028	0.45	8.89	0
6/20/18	11:50	3.144	1.84	2.0	0.009	0.142	0.151	0.023	0.46	13.33	0
Fourth Quarter WY 2017-2018											
7/19/18	11:35	1.354	1.26	2.5	0.008	0.082	0.090	0.020	0.48	16.67	0
8/16/18	12:25	0.642	1.13	2.0	0.010	0.072	0.082	0.016	0.51	13.89	0
9/12/18	12:25	0.364	0.63	1.0	0.007	0.053	0.060	0.022	0.57	7.78	0
Annual Summary	Minimum	0.09	0.43	0.50	0.001	0.052	0.056	0.014	0.31	-6.1	-
	Maximum	5.28	3.33	11.5	0.011	0.142	0.151	0.028	0.97	16.7	-
	Average	1.85	1.61	2.35	0.007	0.078	0.085	0.020	0.58	5.3	-
90th Percentile		-	-	5.50	-	-	-	-	-	-	-

¹ Standards are annual averages for the receiving waters of Trout Creek.

² Standards are for receiving waters of Trout Creek, 90th Percentile.

Heavenly Valley Creek - Property Line
(43HVC-3)

Table A-3:		Heavenly Mountain Resort water year 2018/2019 water quality monitoring data from station 43HVC-3, Heavenly Valley Creek at the Property Line. This station is located just above the Forest Service property line and subdivision development at an elevation of 6,620 feet.									
Date	Time	Discharge (cfs)	Turbidity (ntu)	Suspended Sediment ² (mg/L)	Total Nitrite/Nitrate (mg/L)	Total Kjeldahl N (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	Chloride (mg/L)	Average Temperature (Deg C)	Precipitation (in)
Lahontan Standards¹		N/A	N/A	60	N/A	N/A	0.190	0.015	0.15	N/A	N/A
First Quarter WY 2018-2019											
10/17/18	11:40	0.233	0.94	1.0	0.003	0.059	0.062	0.020	0.62	5.00	0
11/15/18	11:30	0.092	0.35	1.0	0.005	0.041	0.046	0.015	0.67	3.33	0
12/12/18	12:20	0.075	1.32	3.0	0.004	0.071	0.075	0.023	0.78	-1.11	0
Second Quarter WY 2018-2019											
1/23/19	12:10	0.019	1.36	4.0	0.005	0.089	0.094	0.028	0.79	0.00	0
2/12/19	12:45	0.007	1.80	4.0	0.006	0.092	0.098	0.023	0.76	-3.33	0.1
3/21/19	12:15	0.254	0.90	1.5	0.003	0.059	0.062	0.012	0.92	-2.78	0.1
Third Quarter WY 2018-2019											
4/10/19	11:55	0.579	0.93	1.5	0.003	0.080	0.083	0.019	1.00	-1.67	0
4/24/19	11:55	1.541	1.15	3.0	0.005	0.075	0.080	0.023	0.87	7.78	0
5/8/19	11:30	2.891	3.04	3.5	0.026	0.090	0.116	0.026	0.70	6.67	0
5/22/19	11:40	3.430	4.20	5.0	0.021	0.086	0.107	0.030	0.63	0.00	0.7
6/5/19	11:20	4.817	8.49	10.5	0.013	0.125	0.138	0.040	0.53	11.67	0
6/19/19	11:30	12.216	10.80	21.0	0.029	0.166	0.195	0.065	0.43	13.33	0
6/26/19	11:30	7.814	3.52	3.5	0.017	0.095	0.112	0.026	0.42	7.78	0
Fourth Quarter WY 2018-2019											
7/2/19	11:30	2.346	6.67	11.5	0.006	0.132	0.138	0.044	0.45	10.56	0
7/17/19	11:13	3.183	1.25	1.5	0.004	0.080	0.084	0.021	0.40	12.78	0
8/14/19	11:30	1.345	1.49	1.0	0.004	0.062	0.066	0.018	0.46	15.56	0
9/18/19	11:30	0.301	1.34	1.0	0.002	0.05	0.052	0.024	0.63	4.44	0
Annual Summary											
Annual Summary	Minimum	0.007	0.35	1.00	0.002	0.041	0.046	0.012	0.40	-3.33	-
	Maximum	12.216	10.80	21.0	0.029	0.166	0.195	0.065	1.00	15.56	-
	Average	2.420	2.91	4.56	0.009	0.085	0.095	0.027	0.65	5.29	-
90th Percentile		-	-	13.40	-	-	-	-	-	-	-

¹ Standards are annual averages for the receiving waters of Trout Creek.

² Standards are for receiving waters of Trout Creek, 90th Percentile.

Heavenly Valley Creek - Property Line
(43HVC-3)

Table A-3:		Heavenly Mountain Resort water year 2019/2020 water quality monitoring data from station 43HVC-3, Heavenly Valley Creek at the Property Line. This station is located just above the Forest Service property line and subdivision development at an elevation of 6,620 feet.										
Date	Time	Discharge (cfs)	Turbidity (ntu)	Suspended Sediment ² (mg/L)	Total Nitrite/Nitrate (mg/L)	Total Kjeldahl N (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	Chloride (mg/L)	Site Water Temperature (Deg C)	Site Ambient Temperature (Deg C)	Precipitation (in)
Lahontan Standards ¹		N/A	N/A	60	N/A	N/A	0.190	0.015	0.15	N/A	N/A	N/A
First Quarter WY 2019-2020												
10/15/19	11:30	0.739	0.79	1.0	0.001	0.078	0.079	0.016	0.4	4.2	7.3	0.0
11/13/19	11:20	0.516	0.61	1.0	0.001	0.068	0.069	0.019	0.6	4.5	11.1	0.0
12/11/19	11:55	0.254	0.48	0.5	0.019	0.066	0.085	0.016	0.9	2.0	1.5	0.0
Second Quarter WY 2019-2020												
1/14/20	12:00	0.102	6.27	14.5	0.002	0.218	0.220	0.055	0.7	1.3	-1.8	0.1
2/11/20	11:40	0.080	0.52	1.0	0.005	0.073	0.078	0.016	0.7	1.4	3.8	0.0
3/23/20	13:00	0.215	0.44	1.5	0.005	0.051	0.056	0.013	0.7	1.7	3.4	0.0
Third Quarter WY 2019-2020												
4/7/20	12:30	0.152	0.84	1.5	0.001	0.056	0.057	0.019	1.6	1.8	4.6	0.5
4/21/20	11:35	0.479	0.44	2.0	0.002	0.063	0.065	0.016	4.0	3.3	8.5	0.0
5/5/20	11:25	1.496	1.01	3.3	0.005	0.079	0.084	0.019	1.3	5.1	14.6	0.0
5/20/20	11:20	1.513	0.83	1.5	0.001	0.066	0.067	0.026	1.0	3.9	6.0	0.2
5/27/20	11:20	1.433	1.61	3.0	0.001	0.105	0.106	0.021	0.8	8.5	23.3	0.0
6/2/20	11:35	1.361	1.06	3.0	0.003	0.083	0.086	0.018	0.9	8.3	18.4	0.0
6/16/20	11:20	1.095	1.92	3.5	0.001	0.082	0.083	0.017	1.0	8.6	17.0	0.0
6/20/20	11:45	0.557	0.79	3.0	0.003	0.086	0.089	0.018	0.7	10.4	20.3	0.0
Fourth Quarter WY 2019-2020												
7/14/20	11:20	0.035	0.61	2.0	0.004	0.075	0.079	0.020	1.1	11.5	25.5	0.0
8/18/20	11:40	0.068	0.58	3.0	0.001	0.076	0.077	0.019	0.9	10.0	23.0	0.0
9/22/20	11:30	N/A ³	0.54	3.0	0.002	0.060	0.062	0.030	0.7	8.5	21.5	0.0
Annual Summary	Minimum	0.035	0.44	0.50	0.001	0.051	0.000	0.013	0.40	1.3	-1.8	-
	Maximum	1.513	6.27	14.5	0.019	0.218	0.220	0.055	4.00	11.5	25.5	-
	Average	0.631	1.14	2.84	0.003	0.081	0.080	0.021	1.06	5.6	12.2	-
90th Percentile		-	-	5.70	-	-	-	-	-	-	-	-

¹ Standards are annual averages for the receiving waters of Trout Creek.

² Standards are for receiving waters of Trout Creek, 90th Percentile.

³ Flow could not be sample due to low water conditions, but water quality samples were taken.

Heavenly Valley Creek - Property Line
(43HVC-3)

Table A-3:			Heavenly Mountain Resort water year 2020-2021 water quality monitoring data from station 43HVC-3, Heavenly Valley Creek at the Property Line. This station is located just above the Forest Service property line and subdivision development at an elevation of 6,620 feet.										
Date	Notes	Time	Discharge (cfs)	Turbidity (ntu)	Suspended Sediment ² (mg/L)	Total Nitrite/Nitrate (mg/L)	Total Kjeldahl N (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	Chloride (mg/L)	Site Water Temperature (Deg C)	Site Ambient Temperature (Deg C)	Precipitation (in)
Lahontan Standards	¹		N/A	N/A	60	N/A	N/A	0.190	0.015	0.15	N/A	N/A	N/A
First Quarter WY 2020-2021													
10/20/20		12:15	No samples collected or flow measured due to extremely low flow conditions as the site.								N/A	N/A	0.0
11/19/20		11:35	No samples collected or flow measured due to extremely low flow conditions as the site.								7.0	8.0	2.2
12/9/20		11:40	No samples collected or flow measured due to extremely low flow conditions as the site.								N/A	N/A	0.0
Second Quarter WY 2020-2021													
1/13/21		11:20	No samples collected or flow measured due to extremely low flow conditions as the site.								N/A	N/A	0.0
2/17/21		11:50	No samples collected or flow measured due to extremely low flow conditions as the site.								N/A	N/A	0.0
3/17/21		11:35	No samples collected or flow measured due to extremely low flow conditions as the site.								N/A	N/A	0.0
Third Quarter WY 2020-2021													
4/6/21	³	11:45	No flow, but sample taken	1.48	2.5	0.009	0.086	0.095	0.032	0.812	5.6	13.1	0.0
4/20/21		11:30	0.058	4.69	6.5	0.014	0.451	0.465	0.065	1.29	5.5	17.3	0.0
5/4/21		11:50	0.386	0.71	1.0	0.003	0.074	0.077	0.019	1.20	6.4	20.5	0.0
5/18/21	³	12:00	0.578	0.58	1.0	0.003	0.057	0.060	0.016	1.18	8.0	19.9	0.0
5/25/21		11:25	0.600	0.58	1.0	0.002	0.053	0.055	0.014	1.11	6.5	15.8	0.0
6/1/21	³	11:25	0.415	0.49	1.0	0.001	0.058	0.059	0.011	1.21	9.1	23.8	0.0
6/15/21		11:45	0.480	0.30	1.0	0.001	0.402	0.403	0.047	1.01	10.5	23.5	0.0
6/30/21	³	11:10	0.118	0.46	2.5	0.001	0.058	0.059	0.013	1.24	12.0	25.4	0.0
Fourth Quarter WY 2020-2021													
7/13/21		11:20	0.009	0.53	1.0	0.002	0.057	0.059	0.025	1.07	13.3	30.4	0.0
No WQ Samples Collected in August due to Caldor Fire, Forest Closures and Basin Evacuation													
9/20/21	⁵	-	-	-	-	-	-	-	-	-	-	-	-
Annual Summary		Minimum	0.009	0.30	1.0	0.001	0.053	0.055	0.011	0.812	5.5	13.1	0.0
		Maximum	0.600	4.69	6.5	0.014	0.451	0.465	0.065	1.29	13.3	30.4	0.0
		Average	0.331	1.09	1.9	0.004	0.144	0.148	0.027	1.12	8.5	21.1	0.0
90th Percentile ⁴					6.50								

¹ Standards are annual averages for the receiving waters of Trout Creek.

² For Suspended Sediment, standards are for streams tributary to Lake Tahoe. Suspended Sediment concentrations shall not exceed a 90th percentile value of 60 mg/L.

³ For Chloride, batch MS and/or MSD were outside acceptance limits, batch LCS was acceptable.

⁴ There are not enough numbers in the range to interpolate a value for the 90th percentile.

⁵ Site was not sampled due to Caldor fire/USFS closure.

Bijou Park Creek -
Below California Parking Lot
(43BPC-4)

Table A-4:		Heavenly Mountain Resort water year 2016/2017 water quality monitoring data from station 43BPC-4, Bijou Park Creek below California Parking Lot. This station is located 1/4 miles below the culvert outlet draining the parking lot off of Wildwood Avenue at an elevation of 6,530 feet.									
Date	Time	Discharge (cfs)	Turbidity (ntu)	Suspended Sediment (mg/L)	Total Nitrite/ Nitrate (mg/L)	Total Kjeldahl N (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	Chloride (mg/L)	Average Temperature (Deg C)	Precipitation (in)
Lahontan Standards ¹		N/A	20	60	N/A	N/A	0.15	0.008	3.0	N/A	N/A
First Quarter WY 2016-2017											
10/13/16	12:55	0.020	12.5	5.0	0.362	0.184	0.546	0.081	51	7.78	0
11/15/16	12:40	0.031	18.7	5.0	0.273	0.281	0.554	0.069	57	6.67	0
12/20/16	12:45	0.063	18.2	9.0	0.274	0.311	0.585	0.067	71	1.11	0.1
Second Quarter WY 2016-2017											
1/17/17	16:00	0.172	47.2	28.0	0.189	0.524	0.713	0.163	160	1.67	0
2/23/17	16:20	0.249	35.8	30.0	0.398	0.395	0.793	0.136	250	-8.89	0.1
3/16/17	15:30	0.592	63.9	64.0	0.207	0.592	0.799	0.230	58	5.00	0
Third Quarter WY 2016-2017											
4/4/17	13:05	0.489	19.9	17	0.471	0.304	0.775	0.093	53	2.78	0
4/19/17	13:10	0.745	15.4	11.5	0.432	0.278	0.710	0.088	48	2.78	0
5/4/17	12:45	1.46	24.2	33.0	0.211	0.365	0.576	0.155	23	10.56	0
5/18/17	12:50	0.638	14.0	11.5	0.240	0.228	0.468	0.094	31	3.33	0
6/1/17	13:00	0.490	24.0	19.5	0.174	0.288	0.462	0.117	33	6.11	0
6/8/17	14:50	0.361	15.1	5.5	0.168	0.283	0.451	0.082	35	6.11	0
6/22/17	13:50	0.431	16.9	9.5	0.135	0.257	0.392	0.117	33	16.11	0
6/29/17	15:10	0.255	16.4	10.0	0.207	0.275	0.482	0.107	36	11.67	0
Fourth Quarter WY 2016-2017											
7/13/17	12:36	0.259	17.6	10.0	0.159	0.294	0.453	0.108	32	15.00	0
8/23/17	12:25	0.174	15.4	5.5	0.158	0.271	0.429	0.119	33	11.67	0.1
9/14/17	13:10	0.150	12.3	4.5	0.171	0.335	0.506	0.103	34	8.33	0
Annual Summary	Min	0.02	12.30	4.50	0.135	0.184	0.392	0.067	23.0	-8.9	-
	Max	1.46	63.90	64.00	0.471	0.592	0.799	0.230	250.0	16.1	-
	Average	0.39	22.8	16.38	0.249	0.321	0.570	0.113	61.1	6.3	-

¹ Standards are for receiving water objectives from the Lahontan Basin Plan expressed as an annual average.

Bijou Park Creek - Below California Parking Lot
(43BPC-4)

Table A-4:		Heavenly Mountain Resort water year 2017/2018 water quality monitoring data from station 43BPC-4, Bijou Park Creek below California Parking Lot. This station is located 1/4 miles below the culvert outlet draining the parking lot off of Wildwood Avenue at an elevation of 6,530 feet.									
Date	Time	Discharge (cfs)	Turbidity (ntu)	Suspended Sediment (mg/L)	Total Nitrite/ Nitrate (mg/L)	Total Kjeldahl N (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	Chloride (mg/L)	Average Temperature (Deg C)	Precipitation (in)
Lahontan Standards ¹		N/A	20	60	N/A	N/A	0.15	0.008	3.0	N/A	N/A
First Quarter WY 2017-2018											
10/18/17	12:55	0.188	23.4	11.0	0.106	0.759	0.865	0.193	46	7.22	0
11/14/17	12:55	0.119	9.52	3.5	0.169	0.303	0.472	0.095	36	0.56	0.3
12/21/17	14:30	0.120	16.0	11.5	0.205	0.680	0.885	0.136	40	-6.11	0.2
Second Quarter WY 2017-2018											
1/17/18	12:25	0.141	18.2	7.0	0.207	0.200	0.407	0.049	35	3.89	0
2/14/18	13:10	0.131	10.8	3.5	0.210	0.211	0.421	0.088	40	-5.56	0
3/20/18	15:10	0.284	208	108	0.182	1.398	1.580	0.590	350	0.00	0.1
Third Quarter WY 2017-2018											
4/4/18	13:30	0.333	18.2	12	0.282	0.300	0.582	0.095	45	4.44	0
4/18/18	12:35	0.479	11.3	7.0	0.352	0.261	0.613	0.077	37	-1.11	0
5/3/18	13:30	0.423	11.7	5.5	0.227	0.185	0.412	0.073	21	5.00	0
5/17/18	12:50	0.337	9.5	5.5	0.207	0.222	0.429	0.080	28	4.44	0.7
5/23/18	14:30	0.298	12.4	5.0	0.239	0.185	0.424	0.074	32	6.67	0.2
5/30/18	13:05	0.217	15.1	12.0	0.184	0.212	0.396	0.072	27	9.44	0
6/6/18	12:30	0.171	16.3	9.0	0.193	0.256	0.449	0.117	27	8.89	0
6/20/18	12:30	0.174	15.6	5.5	0.190	0.236	0.426	0.091	26	13.33	0
Fourth Quarter WY 2017-2018											
7/19/18	12:15	0.133	21.4	42.0	0.134	0.409	0.543	0.408	21	16.67	0
8/16/18	13:05	0.050	23.6	6.0	0.151	0.256	0.407	0.137	26	13.89	0
9/12/18	16:00	0.064	27.6	8.5	0.150	0.246	0.396	0.131	27	7.78	0
Annual Summary	Min	0.050	9.49	3.50	0.106	0.185	0.396	0.049	21.0	-6.1	-
	Max	0.479	208	108	0.352	1.398	1.580	0.590	350.0	16.7	-
	Average	0.211	27.6	15.4	0.199	0.372	0.539	0.147	50.8	5.3	-

¹ Standards are for receiving water objectives from the Lahontan Basin Plan expressed as an annual average.

Bijou Park Creek - Below California Parking Lot
(43BPC-4)

Table A-4:		Heavenly Mountain Resort water year 2018/2019 water quality monitoring data from station 43BPC-4, Bijou Park Creek below California Parking Lot. This station is located 1/4 miles below the culvert outlet draining the parking lot off of Wildwood Avenue at an elevation of 6,530 feet.									
Date	Time	Discharge (cfs)	Turbidity (ntu)	Suspended Sediment (mg/L)	Total Nitrite/ Nitrate (mg/L)	Total Kjeldahl N (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	Chloride (mg/L)	Average Temperature (Deg C)	Precipitation (in)
Lahontan Standards ¹		N/A	20	60	N/A	N/A	0.150	0.008	3.0	N/A	N/A
First Quarter WY 2018-2019											
10/17/18	12:35	0.051	17.1	4.0	0.157	0.21	0.367	0.093	30	5.00	0
11/15/18	12:15	0.058	13.60	4.0	0.149	0.203	0.352	0.075	31	3.33	0
12/12/18	13:10	0.044	13.7	4.5	0.171	0.238	0.409	0.082	41	-1.11	0
Second Quarter WY 2018-2019											
1/23/19	13:00	0.166	134.0	86.0	0.140	1.058	1.198	0.453	170	0.00	0
2/12/19	13:55	0.429	134.0	80.0	0.063	0.933	0.996	0.628	210	-3.33	0.1
3/21/19	13:05	0.243	144.0	78.0	0.152	0.792	0.944	0.364	140	-2.78	0.1
Third Quarter WY 2018-2019											
4/10/19	12:35	0.363	18.5	10.0	0.313	0.264	0.577	0.088	58	-1.67	0
4/24/19	14:24	1.222	32.5	36.0	0.283	0.335	0.618	0.184	22	7.78	0
5/8/19	12:20	0.563	17.4	10.5	0.294	0.285	0.579	0.104	45	6.67	0
5/22/19	12:25	0.399	15.1	8.5	0.238	0.225	0.463	0.089	33	0.00	0.7
6/5/19	12:25	0.329	13.7	4.5	0.228	0.214	0.442	0.065	33	11.67	0
6/19/19	12:20	0.168	14.4	5.5	0.212	0.237	0.449	0.090	33	13.33	0
6/26/19	12:25	0.168	14.6	4.0	0.201	0.199	0.400	0.084	32	7.78	0
Fourth Quarter WY 2018-2019											
7/2/19	12:30	0.152	17.1	6.0	0.196	0.212	0.408	0.093	31	10.56	0
7/17/19	11:55	0.129	16.2	5.5	0.161	0.248	0.409	0.102	29	12.78	0
8/14/19	14:40	0.063	18.3	6.0	0.156	0.176	0.332	0.108	28	15.56	0
9/18/19	12:20	0.061	13.3	6.0	0.102	0.25	0.352	0.116	28	4.44	0
Annual Summary											
Annual Summary	Min	0.044	13.3	4.0	0.063	0.176	0.332	0.065	22	-3.33	-
	Max	1.222	144.0	86.0	0.313	1.058	1.198	0.628	210	15.56	-
	Average	0.271	38.1	21.1	0.189	0.358	0.547	0.166	58.5	5.29	-

¹ Standards are for receiving water objectives from the Lahontan Basin Plan expressed as an annual average.

Bijou Park Creek - Below California Parking Lot
(43BPC-4)

Table A-4:		Heavenly Mountain Resort water year 2019/2020 water quality monitoring data from station 43BPC-4, Bijou Park Creek below California Parking Lot. This station is located 1/4 miles below the culvert outlet draining the parking lot off of Wildwood Avenue at an elevation of 6,530 feet.										
Date	Time	Discharge (cfs)	Turbidity (ntu)	Suspended Sediment (mg/L)	Total Nitrite/ Nitrate (mg/L)	Total Kjeldahl N (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	Chloride (mg/L)	Site Water Temperature (Deg C)	Site Ambient Temperature (Deg C)	Precipitation (in)
Lahontan Standards ¹		N/A	20	60	N/A	N/A	0.150	0.008	3.0	N/A	N/A	N/A
First Quarter WY 2019-2020												
10/15/19	12:15	0.048	16.4	8.0	0.143	0.233	0.376	0.116	23.6	11.8	11.6	0.0
11/13/19	12:00	0.107	45.3	19.0	0.200	0.210	0.410	0.267	26.0	11.0	10.6	0.0
12/11/19	14:20	0.112	12.6	5.0	0.157	0.594	0.751	0.075	371.0	7.2	2.8	0.0
Second Quarter WY 2019-2020												
1/14/20	12:45	0.249	12.9	5.5	0.171	0.225	0.396	0.087	66.0	5.3	-0.5	0.1
2/11/20	12:30	0.118	11.8	7.0	0.201	0.461	0.662	0.087	66.0	6.3	4.5	0.0
3/23/20	14:00	0.307	10.9	7.5	0.227	0.234	0.461	0.072	47.7	6.2	3.5	0.0
Third Quarter WY 2019-2020												
4/7/20	13:30	0.359	58.3	54.5	0.128	0.547	0.675	0.278	48.7	6.6	2.5	0.5
4/21/20	12:20	0.189	9.4	5.3	0.222	0.204	0.426	0.069	48.0	9.2	11.7	0.0
5/5/20	12:05	0.308	7.8	6.7	0.378	0.201	0.579	0.073	28.7	10.0	16.0	0.0
5/20/20	12:00	0.272	8.2	2.0	0.340	0.246	0.586	0.036	29.2	9.9	8.0	0.2
5/27/20	12:05	0.166	9.9	3.0	0.382	0.208	0.590	0.059	29.9	12.4	22.0	0.0
6/2/20	12:20	0.161	11.3	4.0	0.359	0.228	0.587	0.065	29.6	12.3	18.0	0.0
6/16/20	12:00	0.137	12.2	5.0	0.333	0.208	0.541	0.060	30.1	11.9	17.0	0.0
6/30/20	12:35	0.080	14.7	5.0	0.244	0.196	0.440	0.079	28.0	13.6	20.4	0.0
Fourth Quarter WY 2019-2020												
7/14/20	12:05	0.081	16.3	7.5	0.248	0.184	0.432	0.111	26.5	15.5	25.5	0.0
8/18/20	12:25	0.161	11.4	6.5	0.134	0.213	0.347	0.041	27.8	15.0	25.0	0.0
9/22/20	12:05	0.040	17.1	8.5	0.362	0.153	0.515	0.123	28.5	13.5	21.5	0.0
Annual Summary												
Annual Summary	Minimum	0.040	7.8	2.0	0.128	0.153	0.347	0.036	23.6	5.3	-0.5	-
	Maximum	0.359	58.3	54.5	0.382	0.594	0.751	0.278	371.0	15.5	25.5	-
	Average	0.170	16.9	9.4	0.249	0.267	0.516	0.100	56.2	10.5	12.9	-

¹ Standards are for receiving water objectives from the Lahontan Basin Plan expressed as an annual average.

Bijou Park Creek - Below California Parking Lot
(43BPC-4)

Table A-4:			Heavenly Mountain Resort water year 2020-2021 water quality monitoring data from station 43BPC-4, Bijou Park Creek below California Parking Lot. This station is located 1/4 miles below the culvert outlet draining the parking lot off of Wildwood Avenue at an elevation of 6,530 feet.										
Date	Notes	Time	Discharge (cfs)	Turbidity (ntu) ²	Suspended Sediment ³ (mg/L)	Total Nitrite/ Nitrate (mg/L)	Total Kjeldahl N (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	Chloride (mg/L)	Site Water Temperature (Deg C)	Site Ambient Temperature (Deg C)	Precipitation (in)
Lahontan Standards	¹		N/A	20	60	N/A	N/A	0.150	0.008	3.0	N/A	N/A	N/A
First Quarter WY 2020-2021													
10/20/20		12:40	0.033	11.9	3.5	0.141	0.179	0.320	0.091	30.7	16.5	21.0	0.0
11/19/20		12:10	0.556	123.0	74.5	0.122	0.903	1.025	0.378	133	19.0	17.0	2.2
12/9/20		12:10	0.040	12.0	4.0	0.130	0.197	0.327	0.058	38.0	N/A	N/A	0.0
Second Quarter WY 2020-2021													
1/13/21		12:00	0.154	86.9	45.5	0.207	0.504	0.711	0.304	85.0	7.0	8.7	0.0
2/17/21		14:40	0.086	21.1	10.5	0.160	0.327	0.487	0.081	80.6	1.7	4.7	0.0
3/17/21	⁴	12:05	0.050	11.8	4.5	0.142	0.265	0.407	0.065	69.4	6.3	3.7	0.0
Third Quarter WY 2020-2021													
4/6/21	⁴	12:15	0.137	13.2	5.0	0.205	0.222	0.427	0.072	41.8	8.0	11.6	0.0
4/20/21		12:15	0.187	24.0	15.5	0.240	0.266	0.506	0.116	38.5	9.9	16.9	0.0
5/4/21		12:30	0.146	174.0	98.5	0.271	1.031	1.302	1.092	40.5	11.4	16.5	0.0
5/18/21	⁴	12:40	0.060	7.9	3.0	0.290	0.251	0.541	0.065	48.0	13.1	20.8	0.0
5/25/21		12:00	0.088	12.1	4.0	0.299	0.192	0.491	0.064	47.0	11.9	15.5	0.0
6/1/21	⁴	12:00	0.059	13.0	4.5	0.301	0.299	0.600	0.056	43.7	12.8	25.0	0.0
6/15/21		12:20	0.480	15.4	5.0	0.287	0.236	0.523	0.072	38.3	10.5	23.5	0.0
6/30/21	⁴	11:45	0.050	13.0	6.0	0.287	0.200	0.487	0.071	35.0	15.2	26.5	0.0
Fourth Quarter WY 2020-2021													
7/13/21		12:10	0.032	15.5	6.5	0.390	0.171	0.561	0.090	31.0	16.2	27.4	0.0
No WQ Samples Collected in August due to Caldor Fire, Forest Closures and Basin Evacuation													
9/20/21		12:45	0.022	21.6	20.0	0.199	0.239	0.438	0.171	27.2	14.3	17.9	0.0
Annual Summary	Minimum		0.022	7.9	3.0	0.122	0.171	0.320	0.056	27.2	1.7	3.7	0.0
	Maximum		0.556	174.0	98.5	0.390	1.031	1.302	1.092	133.0	19.0	27.4	2.2
	Average		0.136	36.0	19.4	0.229	0.343	0.572	0.178	51.7	11.6	17.1	0.1
90th Percentile					81.7								

¹ Standards are for receiving water objectives from the Lahontan Basin Plan expressed as an annual average.

² Turbidity standard value, for discharge from California Base Area, is calculated as the daily average of all effluent samples collected from a single discharge point.

³ For Suspended Sediment, standards are for streams tributary to Lake Tahoe. Suspended Sediment concentrations shall not exceed a 90th percentile value of 60 mg/L.

⁴ For Chloride, batch MS and/or MSD were outside acceptance limits, batch LCS was acceptable.

Hidden Valley Creek -
Reference Reach
(43HDVC-5)

Table A-5:		Heavenly Mountain Resort water year 2016/2017 water quality monitoring data from station 43HDVC-5, Hidden Valley Creek baseline station. This station is located just above the confluence with Trout Creek, at an elevation of 6,680 feet.									
Date	Time	Discharge (cfs)	Turbidity (ntu)	Suspended Sediment (mg/L)	Total Nitrite/Nitrate (mg/L)	Total Kjeldahl N (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	Chloride (mg/L)	Average Temperature (Deg C)	Precipitation (in)
Lahontan Standards¹		N/A	N/A	60	N/A	N/A	0.19	0.015	0.15	N/A	N/A
First Quarter WY 2016-2017											
10/13/16	11:00	0.331	0.37	1.0	0.005	0.048	0.053	0.030	0.26	7.78	0
11/15/16	10:45	0.350	0.44	2.5	0.003	0.070	0.073	0.017	0.29	6.67	0
12/20/16	10:35	0.619	3.05	2.5	0.005	0.099	0.104	0.024	0.42	1.11	0.1
Second Quarter WY 2016-2017											
1/17/17	11:33	0.92	47.2	3.5	0.005	0.124	0.129	0.026	0.40	1.67	0
2/23/17	10:30	2.30	2.37	1.5	0.004	0.125	0.129	0.020	0.35	-8.89	0.1
3/16/17	10:45	2.80	1.92	2.5	0.005	0.118	0.123	0.025	0.33	5.00	0
Third Quarter WY 2016-2017											
4/4/17	10:45	3.74	2.34	3.5	0.004	0.131	0.135	0.025	0.29	2.78	0
4/19/17	10:40	4.69	1.97	2.5	0.004	0.134	0.138	0.031	0.32	2.78	0
5/4/17	10:40	7.41	4.62	6.0	0.008	0.222	0.230	0.038	0.25	10.56	0
5/18/17	10:50	7.52	2.35	2.5	0.004	0.119	0.123	0.021	0.23	3.33	0
6/1/17	10:50	17.03	4.73	13.0	0.005	0.168	0.173	0.035	0.17	6.11	0
6/8/17	11:00	23.06	10.1	20.5	0.005	0.285	0.290	0.057	0.16	6.11	0
6/22/17	11:15	28.38	10.0	26.0	0.004	0.284	0.288	0.066	0.13	16.11	0
6/29/17	10:55	16.02	2.79	7.5	0.001	0.109	0.110	0.032	0.15	11.67	0
Fourth Quarter WY 2016-2017											
7/13/17	10:30	7.024	1.34	3.0	0.004	0.090	0.094	0.021	0.15	15.00	0
8/23/17	10:30	2.681	0.86	1.0	0.003	0.101	0.104	0.024	0.26	11.67	0.1
9/14/17	10:30	1.595	0.54	0.5	0.003	0.083	0.086	0.026	0.24	8.33	0
Annual Summary	Minimum	0.331	0.37	0.50	0.001	0.048	0.053	0.017	0.13	-8.9	-
	Maximum	28.38	47.20	26.00	0.008	0.285	0.290	0.066	0.42	16.1	-
	Average	7.440	5.71	5.85	0.004	0.136	0.140	0.030	0.26	6.6	-
90th Percentile		-	-	21.60	-	-	-	-	-	-	-

¹ Standards are annual averages for the receiving waters of Trout Creek. For Suspended Sediment, standards are for streams tributary to Lake Tahoe. Suspended Sediment concentrations shall not exceed a 90th percentile value of 60 mg/L.

Hidden Valley Creek - Lower Hidden
(43HDVC-5)

Table A-5:		Heavenly Mountain Resort water year 2017/2018 water quality monitoring data from station 43HDVC-5, Hidden Valley Creek baseline station. This station is located just above the confluence with Trout Creek, at an elevation of 6,680 feet.									
Date	Time	Discharge (cfs)	Turbidity (ntu)	Suspended Sediment (mg/L)	Total Nitrite/Nitrate (mg/L)	Total Kjeldahl N (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	Chloride (mg/L)	Average Temperature (Deg C)	Precipitation (in)
Lahontan Standards ¹		N/A	N/A	60	N/A	N/A	0.19	0.015	0.15	N/A	N/A
First Quarter WY 2017-2018											
10/18/17	10:35	1.163	0.60	1.0	0.002	0.082	0.084	0.020	0.24	7.22	0
11/14/17	11:00	1.163	0.65	1.5	0.003	0.076	0.079	0.027	0.32	0.56	0.3
12/21/17	10:45	0.824	0.86	1.0	0.006	0.085	0.091	0.016	0.29	-6.11	0.2
Second Quarter WY 2017-2018											
1/17/18	10:30	0.713	1.3	1.5	0.006	0.114	0.120	0.018	0.26	3.89	0
2/14/18	11:00	0.538	0.94	1.0	0.008	0.058	0.066	0.018	0.28	-5.56	0
3/20/18	10:50	0.547	1.29	1.5	0.009	0.055	0.064	0.020	0.29	0.00	0.1
Third Quarter WY 2017-2018											
4/4/18	10:30	1.197	2.09	2.0	0.007	0.121	0.128	0.021	0.27	4.44	0
4/8/18	10:30	2.091	1.66	2.5	0.006	0.099	0.105	0.020	0.24	-1.11	0
5/3/18	11:05	2.619	1.14	1.0	0.006	0.062	0.068	0.016	0.21	5.00	0
5/17/18	10:35	3.771	1.06	2.0	0.006	0.070	0.076	0.021	0.16	4.44	0.7
5/23/18	11:00	4.249	1.28	1.0	0.004	0.067	0.071	0.016	0.14	6.67	0.2
5/30/18	11:00	7.259	1.50	2.5	0.004	0.093	0.097	0.018	0.12	9.44	0
6/6/18	10:45	5.997	0.81	2.0	0.005	0.096	0.101	0.016	0.12	8.89	0
6/20/18	10:40	3.672	1.93	1.5	0.001	0.076	0.077	0.018	0.12	13.33	0
Fourth Quarter WY 2017-2018											
7/19/18	10:30	0.997	0.97	3.0	0.010	0.090	0.100	0.023	0.23	16.67	0
8/16/18	11:05	0.501	0.69	1.5	0.016	0.074	0.090	0.018	0.20	13.89	0
9/12/18	11:00	0.375	1.09	1.0	0.017	0.068	0.085	0.027	0.22	7.78	0
Annual Summary	Minimum	0.38	0.60	1.00	0.001	0.055	0.064	0.016	0.12	-6.1	-
	Maximum	7.26	2.09	3.00	0.017	0.121	0.128	0.027	0.32	16.7	-
	Average	2.49	1.17	1.62	0.007	0.082	0.088	0.020	0.22	5.3	-
90th Percentile		-	-	2.60	-	-	-	-	-	-	-

¹ Standards are annual averages for the receiving waters of Trout Creek. For Suspended Sediment, standards are for streams tributary to Lake Tahoe. Suspended Sediment concentrations shall not exceed a 90th percentile value of 60 mg/L.

Hidden Valley Creek - Lower Hidden
(43HDVC-5)

Table A-5:		Heavenly Mountain Resort water year 2018/2019 water quality monitoring data from station 43HDVC-5, Hidden Valley Creek baseline station. This station is located just above the confluence with Trout Creek, at an elevation of 6,680 feet.									
Date	Time	Discharge (cfs)	Turbidity (ntu)	Suspended Sediment (mg/L)	Total Nitrite/Nitrate (mg/L)	Total Kjeldahl N (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	Chloride (mg/L) ^{2, 3}	Average Temperature (Deg C)	Precipitation (in)
Lahontan Standards ¹		N/A	N/A	60	N/A	N/A	0.19	0.015	0.15	N/A	N/A
First Quarter WY 2018-2019											
10/17/18	10:30	0.423	0.51	1.0	0.003	0.053	0.056	0.021	0.24	5.00	0
11/15/18	10:30	0.420	0.47	1.0	0.006	0.048	0.054	0.019	0.25	3.33	0
12/12/18	10:30	0.461	1.39	0.5	0.006	0.060	0.066	0.018	0.30	-1.11	0
Second Quarter WY 2018-2019											
1/23/19	10:30	0.424	1.0	1.5	0.009	0.079	0.088	0.022	0.30	0.00	0
2/12/19	10:45	0.503	1.67	3.5	0.017	0.095	0.112	0.023	0.30	-3.33	0.1
3/21/19	10:30	0.810	1.46	1.0	0.009	0.100	0.109	0.017	0.32	-2.78	0.1
Third Quarter WY 2018-2019											
4/10/19	10:30	2.321	3.80	3.0	0.011	0.169	0.180	0.031	0.36	-1.67	0
4/24/19	10:30	2.745	3.34	4.0	0.011	0.153	0.164	0.034	0.27	7.78	0
5/8/19	10:30	2.066	2.32	2.0	0.008	0.119	0.127	0.027	ND	6.67	0
5/22/19	10:30	3.146	1.87	2.0	0.004	0.070	0.074	0.022	ND	0.00	0.7
6/5/19	10:30	5.236	4.15	5.0	0.006	0.147	0.153	0.027	ND	11.67	0
6/19/19	10:30	15.882	4.79	7.0	0.003	0.149	0.152	0.027	ND	13.33	0
6/26/19	10:30	11.209	1.66	2.5	0.002	0.074	0.076	0.021	ND	7.78	0
Fourth Quarter WY 2018-2019											
7/2/19	10:30	7.806	4.20	2.0	0.001	0.079	0.080	0.024	ND	10.56	0
7/17/19	10:30	3.963	0.68	1.5	0.001	0.061	0.062	0.021	ND	12.78	0
8/14/19	10:30	1.916	0.85	1.0	0.004	0.070	0.074	0.022	ND	15.56	0
9/18/19	10:30	0.594	0.81	1.0	0.002	0.07	0.072	0.028	ND	4.44	0
Annual Summary											
Annual Summary	Minimum	0.420	0.47	0.50	0.001	0.048	0.054	0.017	ND	-3.33	-
	Maximum	15.88	4.79	7.00	0.017	0.169	0.180	0.034	0.36	15.56	-
	Average	3.525	2.06	2.32	0.006	0.094	0.100	0.024	0.22	5.73	-
90th Percentile		-	-	5.40	-	-	-	-	-	-	-

¹ Standards are annual averages for the receiving waters of Trout Creek. For Suspended Sediment, standards are for streams tributary to Lake Tahoe. Suspended Sediment concentrations shall not exceed a 90th percentile value of 60 mg/L.

² In January 2019, EPA changed the methodology reporting limits. The chloride minimum detection reporting limit is now 0.25 mg/L which is greater than the Lahontan standard.

³ ND samples were considered as (0.15 mg/L) for calculation of the annual average.

Hidden Valley Creek - Lower Hidden
(43HDVC-5)

Table A-5:		Heavenly Mountain Resort water year 2019/2020 water quality monitoring data from station 43HDVC-5, Hidden Valley Creek baseline station. This station is located just above the confluence with Trout Creek, at an elevation of 6,680 feet.										
Date	Time	Discharge (cfs)	Turbidity (ntu)	Suspended Sediment (mg/L)	Total Nitrite/Nitrate (mg/L)	Total Kjeldahl N (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	Chloride (mg/L)	Site Water Temperature (Deg C)	Site Ambient Temperature (Deg C)	Precipitation (in)
Lahontan Standards ¹		N/A	N/A	60	N/A	N/A	0.19	0.015	0.15	N/A	N/A	N/A
First Quarter WY 2019-2020												
10/15/19	10:30	0.630	0.73	1.0	0.001	0.058	0.059	0.021	0.3	3.9	4.5	0.0
11/13/19	10:30	0.665	0.50	1.0	0.001	0.049	0.050	0.021	0.5	4.5	8.0	0.0
12/11/19	10:30	0.743	0.51	0.5	0.003	0.069	0.072	0.021	0.5	2.0	1.0	0.0
Second Quarter WY 2019-2020												
1/14/20	10:30	0.566	0.41	2.0	0.002	0.054	0.056	0.024	0.3	0.4	-1.8	0.1
2/11/20	10:30	0.739	0.50	4.0	0.009	0.074	0.083	0.023	0.3	-0.2	-3.1	0.0
3/23/20	11:00	0.545	0.59	2.0	0.006	0.074	0.080	0.018	0.2	1.6	0.8	0.0
Third Quarter WY 2019-2020												
4/7/20	10:30	0.624	0.57	1.0	0.011	0.118	0.129	0.019	0.5	2.5	1.4	0.5
4/21/20	10:30	0.704	1.48	3.3	0.011	0.100	0.111	0.023	0.4	2.2	3.3	0.0
5/5/20	10:30	1.635	1.48	4.0	0.006	0.096	0.102	0.023	0.8	4.7	11.0	0.0
5/20/20	10:30	2.783	1.39	3.5	0.001	0.114	0.115	0.028	0.3	3.2	4.4	0.2
5/27/20	10:30	2.377	1.62	3.0	0.001	0.123	0.124	0.020	0.2	7.2	17.6	0.0
6/2/20	10:30	3.741	1.31	2.0	0.004	0.098	0.102	0.018	ND	6.5	15.8	0.0
6/16/20	10:30	2.180	0.79	3.5	0.001	0.072	0.073	0.016	0.6	7.7	14.5	0.0
6/30/20	10:30	1.280	1.13	2.5	0.004	0.090	0.094	0.020	0.3	8.9	16.1	0.0
Fourth Quarter WY 2019-2020												
7/14/20	10:30	0.749	0.96	3.0	0.010	0.091	0.101	0.024	ND	10.5	23.5	0.0
8/18/20	10:30	0.373	1.32	4.0	0.001	0.096	0.097	0.028	0.6	13.0	22.0	0.0
9/22/20	10:30	0.341	0.65	3.0	0.001	0.065	0.066	0.028	0.5	7.0	18.5	0.0
Annual Summary												
Annual Summary	Minimum	0.341	0.41	0.50	0.001	0.049	0.050	0.016	0.20	-0.2	-3.1	-
	Maximum	3.741	1.62	4.00	0.011	0.123	0.129	0.028	0.80	13.0	23.5	-
	Average	1.216	0.94	2.55	0.004	0.085	0.089	0.022	0.42	5.0	9.3	-
90th Percentile ²		-	-	4.00	-	-	-	-	-	-	-	-

¹ Standards are annual averages for the receiving waters of Trout Creek. For Suspended Sediment, standards are for streams tributary to Lake Tahoe. Suspended Sediment concentrations shall not exceed a 90th percentile value of 60 mg/L.

Hidden Valley Creek - Lower Hidden
(43HDVC-5)

Table A-5:			Heavenly Mountain Resort water year 2020-2021 water quality monitoring data from station 43HDVC-5, Hidden Valley Creek baseline station. This station is located just above the confluence with Trout Creek, at an elevation of 6,680 feet.										
Date	Notes	Time	Discharge (cfs)	Turbidity (ntu)	Suspended Sediment ² (mg/L)	Total Nitrite/Nitrate (mg/L)	Total Kjeldahl N (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	Chloride (mg/L)	Site Water Temperature (Deg C)	Site Ambient Temperature (Deg C)	Precipitation (in)
Lahontan Standards	¹		N/A	N/A	60	N/A	N/A	0.19	0.015	0.15	N/A	N/A	N/A
First Quarter WY 2020-2021													
10/20/20		11:00	0.437	0.74	1.0	0.002	0.076	0.078	0.023	0.6	9.5	17.5	0.0
11/19/20		10:30	0.319	1.78	1.0	0.002	0.110	0.112	0.023	1.1	5.5	4.5	2.2
12/9/20		10:30	0.405	0.35	3.0	0.001	0.052	0.053	0.028	0.8	N/A	N/A	0.0
Second Quarter WY 2020-2021													
1/13/21		10:30	0.476	0.94	0.5	0.003	0.106	0.109	0.029	0.287	2.1	1.2	0.0
2/17/21	³	10:30	0.307	0.74	1.0	0.005	0.079	0.084	0.020	0.292	0.2	-2.6	0.0
3/17/21	³	10:30	0.451	0.49	0.5	0.006	0.048	0.054	0.018	0.282	0.9	-0.3	0.0
Third Quarter WY 2020-2021													
4/6/21	³	10:30	0.494	0.97	0.5	0.021	0.116	0.137	0.026	0.348	2.9	2.8	0.0
4/20/21		10:30	0.453	0.80	0.5	0.018	0.126	0.144	0.028	0.322	3.8	8.9	0.0
5/4/21		10:30	0.447	0.57	1.5	0.003	0.092	0.095	0.022	0.258	5.0	15.0	0.0
5/18/21	³	10:30	1.647	3.11	2.5	0.006	0.102	0.108	0.020	0.212	6.4	14.3	0.0
5/25/21		10:30	1.781	1.06	2.0	0.003	0.102	0.105	0.018	0.226	5.2	11.9	0.0
6/1/21	³	10:30	1.737	1.05	2.5	0.001	0.105	0.106	0.016	0.185	9.5	21.3	0.0
6/15/21		10:30	1.077	0.81	3.0	0.002	0.086	0.088	0.021	0.149	10.6	21.4	0.0
6/30/21	³	10:30	0.809	1.09	4.5	0.002	0.089	0.091	0.021	0.261	12.5	22.8	0.0
Fourth Quarter WY 2020-2021													
7/13/21	⁴	10:30	0.418	-	-	-	-	-	-	0.197	14.0	24.2	0.0
No WQ Samples Collected in August due to Caldor Fire, Forest Closures and Basin Evacuation													
9/20/21	⁵	-	-	-	-	-	-	-	-	-	-	-	-
Annual Summary		Minimum	0.307	0.35	0.50	0.001	0.048	0.053	0.016	0.15	0.2	-2.6	0.0
		Maximum	1.781	3.11	4.50	0.021	0.126	0.144	0.029	1.10	14.0	24.2	2.2
		Average	0.751	1.04	1.71	0.005	0.092	0.097	0.022	0.37	6.3	11.6	0.1
90th Percentile					3.75								

¹ Standards are annual averages for the receiving waters of Trout Creek.

² For Suspended Sediment, standards are for streams tributary to Lake Tahoe. Suspended Sediment concentrations shall not exceed a 90th percentile value of 60 mg/L.

³ The Chloride Sample Batch Matrix Spike (MS) and/or Matrix Spike Duplicate (MSD) were outside acceptable limits, batch Laboratory Control Sample (LCS) was acceptable.

⁴ The WQ Analysis Bottle broke/leaked during shipment to Laboratory (High Sierra Labs). No sample was available for analysis.

⁵ Site was not sampled due to Caldor fire/USFS closure.

Edgewood Creek -Above Boulder Parking Lot
(43HVE-1)

Table A-6:		Heavenly Mountain Resort water year 2016/2017 water quality monitoring data from station 43HVE-1, Edgewood Creek above Boulder Parking Lot. This station is located in Edgewood Bowl above the learn-to-ski center, at an elevation of 7,280 feet.											
Date	Time	Discharge (cfs)	Specific Conductivity (mmhos)	Turbidity (ntu)	Suspended Sediment (mg/L)	Total Nitrite/Nitrate (mg/L)	Total Kjeldahl N (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	Soluble Reactive P (mg/L)	Dissolved P (mg/L)	Average Temperature (Deg C)	Precipitation (in)
NDEP Standards ¹		N/A	N/A	10	25.0	N/A	N/A	0.6 ²	0.1	N/A	N/A	N/A	N/A
First Quarter WY 2016-2017													
10/13/16	No Samples Collected Due to Low Flows											7.78	0
11/15/16	No Samples Collected Due to Low Flows											6.67	0
12/20/16 ³	16:00	-	92.9	2.33	2.5	0.003	0.284	0.287	0.045	0.015	0.028	1.11	0.1
Second Quarter WY 2016-2017													
1/17/17	No Samples Collected Due to groomed ski run over creek											1.67	0
2/23/17	No Samples Collected Due to groomed ski run over creek											-8.89	0.1
3/16/17	No Samples Collected Due to groomed ski run over creek											5.00	0
Third Quarter WY 2016-2017													
4/4/17	No Samples Collected Due to groomed ski run over creek											2.78	0
4/19/17	No Samples Collected Due to groomed ski run over creek											2.78	0
5/4/17	14:30	1.13	53.5	2.02	3.0	0.004	0.097	0.101	0.017	0.009	0.015	10.56	0
5/18/17	14:25	1.48	54.8	0.74	1.0	0.002	0.093	0.095	0.022	0.010	0.018	3.33	0
6/1/17	15:35	2.43	39.8	0.89	1.0	0.002	0.086	0.088	0.030	0.016	0.026	6.11	0
6/8/17	15:35	0.965	46.5	0.73	0.5	0.002	0.112	0.114	0.026	0.015	0.020	6.11	0
6/22/17	16:40	0.308	73.5	0.82	1.5	0.002	0.227	0.229	0.038	0.017	0.029	16.11	0
6/29/17	15:45	0.234	81.5	1.14	4.0	0.002	0.211	0.213	0.039	0.015	0.029	11.67	0
Fourth Quarter WY 2016-2017													
7/13/17	15:05	0.096	97.70	3.92	5.50	0.003	0.356	0.359	0.059	0.01	0.025	15.00	0
8/23/17	14:32	0.131	104.80	3.87	3.00	0.003	0.162	0.165	0.037	0.008	0.019	11.67	0.1
9/14/17	15:15	0.076	105.70	20.80	8.50	0.002	0.252	0.254	0.07	0.005	0.016	8.33	0
Annual Summary	Minimum	0.076	39.80	0.73	0.50	0.002	0.086	0.088	0.017	0.005	0.015	-8.89	-
	Maximum	2.426	105.70	20.80	8.50	0.004	0.356	0.359	0.070	0.017	0.029	16.11	-
	Average	0.760	73.09	3.88	3.11	0.002	0.177	0.180	0.038	0.012	0.022	6.34	-

¹ NDEP Standards are from the Nevada Administrative Code (NAC) Chapter 445A.1915. All listed numbers are standards for single values no greater than a given parameter unless otherwise noted.

² Annual Average

³ Flows too low to measure; however water quality samples collected.

Edgewood Creek - Above
(43HVE-1)

Table A-6:		Heavenly Mountain Resort water year 2017/2018 water quality monitoring data from station 43HVE-1, Edgewood Creek above Boulder Parking Lot. This station is located in Edgewood Bowl above the learn-to-ski center, at an elevation of 7,280 feet.											
Date	Time	Discharge (cfs)	Specific Conductivity (mmhos)	Turbidity (ntu)	Suspended Sediment (mg/L)	Total Nitrite/Nitrate (mg/L)	Total Kjeldahl N (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	Soluble Reactive P (mg/L)	Dissolved P (mg/L)	Average Temperature (Deg C)	Precipitation (in)
NDEP Standards ¹		N/A	N/A	10	25	N/A	N/A	0.6 ²	0.1	N/A	N/A	N/A	N/A
First Quarter WY 2017-2018													
10/18/17	14:50	0.05	85.1	1.11	2.0	0.001	0.126	0.127	0.023	0.004	0.011	7.22	0
11/14/17	14:35	0.04	73.2	5.47	13.0	0.003	0.224	0.227	0.1	0.006	0.016	0.56	0.3
12/21/17	15:15	***UNABLE TO SAMPLE DUE TO ICE ON STREAM***										-6.11	0.2
Second Quarter WY 2017-2018													
1/17/18	14:45	0.09	59.0	0.87	1.00	0.002	0.104	0.106	0.015	0.005	0.01	3.89	0
2/14/18	15:45	***UNABLE TO SAMPLE DUE TO ICE ON STREAM***										-5.56	0
3/20/18	15:42	***UNABLE TO SAMPLE DUE TO ICE ON STREAM***										0.00	0.1
Third Quarter WY 2017-2018													
4/4/18	16:05	0.16	78.2	3.17	3.5	0.003	0.124	0.127	0.029	0.003	0.007	4.44	0
4/18/18	15:05	0.19	70.5	0.84	1.0	0.002	0.062	0.064	0.017	0.005	0.012	-1.11	0
5/3/18	15:00	0.57	56.2	2.97	3.0	0.002	0.131	0.133	0.034	0.008	0.013	5.00	0
5/17/18	16:15	0.35	54.2	1.05	1.0	0.002	0.080	0.082	0.025	0.009	0.021	4.44	0.7
5/23/18	15:30	0.34	54.9	0.95	1.0	0.002	0.095	0.097	0.021	0.007	0.016	6.67	0.2
5/30/18	14:55	0.17	60.0	0.79	0.5	0.001	0.106	0.107	0.022	0.004	0.015	9.44	0
6/6/18	15:00	0.16	67.7	0.93	1.5	0.003	0.084	0.087	0.029	0.006	0.020	8.89	0
6/20/18	14:40	0.17	80.2	2.89	6.0	0.003	0.191	0.194	0.053	0.007	0.015	13.33	0
Fourth Quarter WY 2017-2018													
7/19/18	14:45	0.16	101.7	11.7	10.5	0.004	0.166	0.170	0.065	0.012	0.023	16.67	0
8/16/18	14:50	0.03	118.4	33.3	34.0	0.004	0.285	0.289	0.184	0.012	0.016	13.89	0
9/12/18	15:30	**UNABLE TO SAMPLE DUE TO LOW FLOWS, STAGNANT WATER, AND HEAVY VEGETATION IN CHANNEL**										7.78	0
Annual Summary	Minimum	0.032	54.2	0.79	0.50	0.001	0.062	0.064	0.015	0.003	0.007	-6.11	-
	Maximum	0.565	118.4	33.30	34.0	0.004	0.285	0.289	0.184	0.012	0.023	16.67	-
	Average	0.192	75.0	5.43	6.42	0.003	0.140	0.142	0.050	0.007	0.015	6.507	-

¹ NDEP Standards are from the Nevada Administrative Code (NAC) Chapter 445A.1915. All listed numbers are standards for single values no greater than a given parameter unless otherwise noted.

² Annual Average

Edgewood Creek - Above
(43HVE-1)

Table A-6:		Heavenly Mountain Resort water year 2018/2019 water quality monitoring data from station 43HVE-1, Edgewood Creek above Boulder Parking Lot. This station is located in Edgewood Bowl above the learn-to-ski center, at an elevation of 7,280 feet.											
Date	Time	Discharge (cfs)	Specific Conductivity (mmhos)	Turbidity (ntu)	Suspended Sediment (mg/L)	Total Nitrite/Nitrate (mg/L)	Total Kjeldahl N (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	Soluble Reactive P (mg/L)	Dissolved P (mg/L)	Average Temperature (Deg C)	Precipitation (in)
NDEP Standards ¹		N/A	N/A	10	25	N/A	N/A	0.6 ²	0.1	N/A	N/A	N/A	N/A
First Quarter WY 2018-2019													
10/17/18	15:00	Unable to measure flow or collect water quality samples on 10/17 due to low flows and heavy vegetation in channel at monitoring location										5.00	0
11/15/18	15:00	0.103	61.3	1.45	2.5	0.004	0.085	0.089	0.023	0.004	0.011	3.33	0
12/12/18	16:20	- ³	63.9	3.75	4.0	0.003	0.124	0.127	0.039	0.005	0.011	-1.11	0
Second Quarter WY 2018-2019													
1/23/19	16:00	Unable to measure flow or collect water quality samples on 1/23 due to complete stream snow cover at monitoring location										0.00	0
2/12/19	16:45	Unable to measure flow or collect water quality samples on 2/12 due to complete stream snow cover at monitoring location										-3.33	0.1
3/21/19	16:30	Unable to measure flow or collect water quality samples on 3/21 due to complete stream snow cover at monitoring location										-2.78	0.1
Third Quarter WY 2018-2019													
4/10/19	15:20	Unable to measure flow or collect water quality samples on 4/10 due to complete stream snow cover at monitoring location										-1.67	0
4/24/19	15:30	0.554	59.6	13.00	16.0	0.005	0.259	0.264	0.145	0.007	0.015	7.78	0
5/8/19	15:20	1.241	49.8	3.35	4.0	0.003	0.107	0.110	0.047	0.008	0.015	6.67	0
5/22/19	15:20	0.401	50.2	3.83	5.0	0.001	0.103	0.104	0.054	0.007	0.015	0.00	0.7
6/5/19	14:45	0.342	58.2	3.00	1.5	0.002	0.110	0.112	0.031	0.013	0.019	11.67	0
6/19/19	14:35	0.159	77.5	2.18	1.5	0.002	0.171	0.173	0.032	0.007	0.017	13.33	0
6/26/19	14:35	0.161	74.6	13.80	11.0	0.002	0.235	0.237	0.112	0.009	0.019	7.78	0
Fourth Quarter WY 2018-2019													
7/2/19	14:40	0.177	79.7	8.4	8.0	0.001	0.196	0.197	0.076	0.006	0.018	10.56	0
7/17/19	14:45	0.084	91.4	8.3	8.0	0.001	0.22	0.221	0.079	0.008	0.021	12.78	0
8/14/19	15:40	0.071	108.70	11.80	16.0	0.003	0.296	0.299	0.105	0.011	0.021	15.56	0
9/18/19	16:00	0.152	106.10	308.00	844.0	0.003	9.340	9.343	3.824	0.008	0.023	4.44	0
Annual Summary	Minimum	0.071	49.8	1.45	1.50	0.001	0.085	0.089	0.023	0.004	0.011	-3.33	-
	Maximum	1.241	108.7	308.00	844.00	0.005	9.340	9.343	3.824	0.013	0.023	15.56	-
	Average	0.301	73.4	31.74	76.79	0.003	0.937	0.940	0.381	0.008	0.017	6.87	-

¹ NDEP Standards are from the Nevada Administrative Code (NAC) Chapter 445A.1915. All listed numbers are standards for single values no greater than a given parameter unless otherwise noted.

² Annual Average

³ Unable to measure flow due to low flows and snow cover on 12/12; however, water quality samples were collected

⁴ Unable to measure flow or collect water quality samples on 1/23 or 2/12 due to complete stream snow cover at monitoring location

Edgewood Creek - Above
(43HVE-1)

Table A-6:		Heavenly Mountain Resort water year 2019/2020 water quality monitoring data from station 43HVE-1, Edgewood Creek above Boulder Parking Lot. This station is located in Edgewood Bowl above the learn-to-ski center, at an elevation of 7,280 feet.												
Date	Time	Discharge (cfs)	Specific Conductivity (mmhos)	Turbidity (ntu)	Suspended Sediment (mg/L)	Total Nitrite/Nitrate (mg/L)	Total Kjeldahl N (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	Soluble Reactive P (mg/L)	Dissolved P (mg/L)	Site Water Temperature (Deg C)	Site Ambient Temperature (Deg C)	Precipitation (in)
NDEP Standards ¹		N/A	N/A	10 ²	25 ²	N/A	N/A	0.6 ² / 0.6 ³	0.1 ² / 0.05 ³	N/A	N/A	N/A	N/A	N/A
First Quarter WY 2019-2020														
10/15/19	14:30	0.071	81.3	6.08	9.0	0.001	0.175	0.176	0.066	0.005	0.011	11.9	13.3	0.0
11/13/19	14:05	- ⁴	68.5	9.40	12.0	0.001	0.202	0.203	0.083	0.004	0.013	8.4	12.9	0.0
12/11/19	15:45	- ⁵	60.7	3.25	3.0	0.002	0.138	0.140	0.037	0.004	0.011	N/A	N/A	0.0
Second Quarter WY 2019-2020														
1/14/20	15:45	Neither flow nor water quality samples could be collected due to snow cover across channel.												0.1
2/11/20	15:30	Neither flow nor water quality samples could be collected due to ice cover across channel. No flow was apparent under ice.												0.0
3/23/20	15:45	Neither flow nor water quality samples could be collected due to snow cover across channel.												0.0
Third Quarter WY 2019-2020														
4/7/20	14:50	- ⁴	72.5	5.28	8.5	0.001	0.258	0.259	0.059	0.002	0.013	1.9	6.2	0.5
4/21/20	13:30	0.208	67.7	19.3	32.7	0.003	0.301	0.304	0.209	0.005	0.013	8.9	16.2	0.0
5/5/20	14:00	0.243	55.0	7.76	16.0	0.001	0.216	0.217	0.115	0.005	0.022	14.9	18.0	0.0
5/20/20	14:30	0.195	57.0	3.17	5.0	0.001	0.151	0.152	0.050	0.003	0.022	14.8	9.5	0.2
5/27/20	14:20	0.160	68.7	2.61	4.0	0.024	0.211	0.235	0.042	0.003	0.016	20.8	26.5	0.0
6/2/20	14:45	0.111	69.2	3.26	4.0	0.003	0.149	0.152	0.043	0.008	0.017	21.8	30.0	0.0
6/16/20	14:20	0.057	75.8	5.19	6.5	0.002	0.145	0.147	0.052	0.008	0.015	18.1	17.6	0.0
6/30/20	14:55	- ⁴	86.3	11.3	17.5	0.003	0.323	0.326	0.119	0.005	0.019	20.0	18.6	0.0
Fourth Quarter WY 2019-2020														
7/14/20	14:05	- ⁴	92.4	15.0	30.5	0.003	0.377	0.380	0.212	0.009	0.021	24.0	28.0	0.0
8/18/20	14:20	- ⁴	120.4	19.0	31.0	0.002	0.514	0.516	0.201	0.009	0.02	24.0	25.0	0.0
9/22/20	14:20	Neither flow nor water quality samples could be collected due to low flow conditions.												
Annual Summary	Minimum	0.057	55.0	2.61	3.00	0.001	0.138	0.140	0.037	0.002	0.011	1.9	6.2	-
	Maximum	0.243	120.4	19.30	32.70	0.024	0.514	0.516	0.212	0.009	0.022	24.0	30.0	-
	Average	0.149	75.0	8.51	13.82	0.004	0.243	0.247	0.099	0.005	0.016	15.8	18.5	-

¹ NDEP Standards are from the Nevada Administrative Code (NAC) Chapter 445A.1664.

² Not to exceed standard for a single value.

³ Not to exceed standard for the annual average.

⁴ Collected water quality samples, but could not measure flow due to stagnant water and muck layer on channel bottom

⁵ Collected water quality samples, but could not measure flow due to partial snow cover across channel

Edgewood Creek - Above
(43HVE-1)

Table A-6:			Heavenly Mountain Resort water year 2020-2021 water quality monitoring data from station 43HVE-1, Edgewood Creek above Boulder Parking Lot. This station is located in Edgewood Bowl above the learn-to-ski center, at an elevation of 7,280 feet.												
Date	Notes	Time	Discharge (cfs)	Specific Conductivity (mmhos)	Turbidity (ntu)	Suspended Sediment (mg/L)	Total Nitrite/Nitrate (mg/L)	Total Kjeldahl N (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L) ³	Soluble Reactive P (mg/L)	Dissolved P (mg/L)	Site Water Temperature (Deg C)	Site Ambient Temperature (Deg C)	Precipitation (in)
NDEP Standards	¹		N/A	N/A	10.0	25.0	N/A	N/A	0.6 ²	0.1 (SV) 0.05 (AA)	N/A	N/A	N/A	N/A	N/A
First Quarter WY 2020-2021															
10/20/20		15:00	No samples collected or flow measured due to extremely low flow conditions as the site.										N/A	N/A	0.0
11/19/20		16:04	No samples collected or flow measured due to extremely low flow conditions and snow cover at the site.										N/A	N/A	2.2
12/9/20		15:10	No samples collected or flow measured due to extremely low flow conditions and snow cover at the site.										N/A	N/A	0.0
Second Quarter WY 2020-2021															
1/13/21		15:15	No samples collected or flow measured due to extremely low flow conditions and snow cover at the site.										N/A	N/A	0.0
2/17/21		15:40	No samples collected or flow measured due to extremely low flow conditions and snow cover at the site.										N/A	N/A	0.0
3/17/21	⁴	15:15	N/A	77.5	5.72	10.0	0.002	0.206	0.208	0.057	0.003	0.011	2.5	3.5	0.0
Third Quarter WY 2020-2021															
4/6/21		14:55	0.122	70.5	15.80	23.5	0.001	0.295	0.296	0.152	0.006	0.015	10.5	13.8	0.0
4/20/21		14:35	0.192	60.6	12.6	21.0	0.003	0.3	0.303	0.143	0.009	0.021	14.9	18.6	0.0
5/4/21		15:00	0.114	14.3	55.0	26.0	0.003	0.303	0.306	0.155	0.007	0.020	16.9	17.5	0.0
5/18/21		14:30	0.114	65.6	1.50	1.5	0.001	0.156	0.157	0.028	0.003	0.013	21.0	21.1	0.0
5/25/21		14:15	0.059	62.5	1.26	3.0	0.002	0.112	0.114	0.022	0.002	0.014	18.5	13.8	0.0
6/1/21		14:10	No flow measured, but samples were taken	73.1	1.61	2.5	0.001	0.154	0.155	0.021	0.003	0.009	24.1	24.1	0.0
6/15/21		14:30	No samples collected or flow measured due to extremely low flow conditions as the site.										N/A	20.3	0.0
6/30/21		14:00	No samples collected or flow measured due to extremely low flow conditions as the site.										24.9	27.5	0.0
Fourth Quarter WY 2020-2021															
7/13/21		14:25	No samples collected or flow measured due to no water at the site.										-	29.7	0.0
No WQ Samples Collected in August due to Caldor Fire, Forest Closures and Basin Evacuation															
9/20/21		13:45	No samples collected or flow measured due to no water at the site.										-	19.5	0.0
Annual Summary		Minimum	0.1	14.3	1.26	1.5	0.001	0.112	0.114	0.021	0.002	0.009	2.5	3.5	0.0
		Maximum	0.2	77.5	55.00	26.0	0.003	0.303	0.306	0.155	0.009	0.021	24.9	29.7	2.2
		Average	0.1	60.6	13.36	12.5	0.002	0.218	0.220	0.083	0.005	0.015	16.7	19.0	0.1

¹ NDEP Standards are from the Nevada Administrative Code Chapter 445A.1664 Truckee Region: Edgewood Creek at Palisades Dr. All listed numbers are standards for single values no greater than a given parameter unless otherwise noted.

² The Total Nitrogen Standard shown is for both single values as well as annual average values no greater than 0.6 mg/L listed.

³ There are two standards for Total Phosphorus provided by NDEP Code 445A.1664. The single value of 0.1 mg/L for all samples collected, as well the annual average standard value of 0.05 mg/L.

⁴ Collected water quality samples, but could not measure flow due to partial snow cover across channel

Edgewood Creek - Below Boulder Parking Lot
(43HVE-2)

Table A-7:		Heavenly Mountain Resort water year 2016/2017 water quality monitoring data from station 43HVE-2, Edgewood Creek below Boulder Parking Lot. . This station is located 1/4 mile below the parking lot, underneath the power lines at an elevation of 7,120 feet.											
Date	Time	Discharge (cfs)	Specific Conductivity (mmhos)	Turbidity (ntu)	Suspended Sediment (mg/L)	Total Nitrite/Nitrate (mg/L)	Total Kjeldahl N (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	Soluble Reactive P (mg/L)	Dissolved P (mg/L)	Average Temperature (Deg C)	Precipitation (in)
NDEP Standards ¹		N/A	N/A	10.0	25.0	N/A	N/A	0.6 ²	0.1	N/A	N/A	N/A	N/A
First Quarter WY 2016-2017													
10/13/16	15:00	0.007	141.7	0.68	2.0	0.035	0.068	0.103	0.023	0.004	0.022	7.78	0
11/15/16	15:00	0.013	154.9	0.53	1.0	0.046	0.102	0.148	0.011	0.003	0.010	6.67	0
12/20/16	16:20	0.090	185.3	3.16	1.5	0.069	0.256	0.325	0.02	0.006	0.011	1.11	0.1
Second Quarter WY 2016-2017													
1/17/17	No samples collected due to snow/access/winter resort operations											1.67	0
2/23/17	No samples collected due to snow/access/winter resort operations											-8.89	0.1
3/16/17	No samples collected due to significant snow depth											5.00	0
Third Quarter WY 2016-2017													
4/4/17	15:35	0.688	118.7	18.2	13.0	0.052	0.258	0.310	0.058	0.012	0.016	2.78	0
4/16/17	15:40	1.00	142.4	11.0	8.5	0.067	0.226	0.293	0.095	0.007	0.016	2.78	0
5/4/17	15:00	1.92	91.5	30.0	39.0	0.024	0.374	0.398	0.155	0.009	0.029	10.56	0
5/18/17	14:45	1.72	82.1	6.17	7.0	0.012	0.174	0.186	0.037	0.007	0.015	3.33	0
6/1/17	16:00	2.26	57.4	6.04	9.0	0.007	0.173	0.180	0.052	0.009	0.017	6.11	0
6/8/17	15:55	1.22	71.9	3.73	2.5	0.012	0.15	0.162	0.026	0.009	0.016	6.11	0
6/22/17	16:20	0.480	105.2	3.92	3.5	0.032	0.238	0.270	0.038	0.010	0.023	16.11	0
6/29/17	16:05	0.258	116.8	5.59	4.0	0.044	0.198	0.242	0.039	0.010	0.023	11.67	0
Fourth Quarter WY 2016-2017													
7/13/17	15:30	0.217	135.7	9.06	5.5	0.067	0.228	0.295	0.043	0.011	0.025	15.00	0
8/23/17	14:58	0.523	144.1	8.90	3.0	0.074	0.173	0.247	0.036	0.008	0.023	11.67	0.1
9/14/17	15:45	0.155	135.2	14.70	26.0	0.061	0.264	0.325	0.106	0.012	0.021	8.33	0
Annual Summary	Minimum	0.007	57.40	0.53	1.000	0.007	0.068	0.103	0.011	0.003	0.010	-8.9	-
	Maximum	2.255	185.30	30.00	39.000	0.074	0.374	0.398	0.155	0.012	0.029	16.1	-
	Average	0.753	120.21	8.69	8.964	0.043	0.206	0.249	0.053	0.008	0.019	6.3	-

¹ NDEP Standards are from the Nevada Administrative Code (NAC) Chapter 445A.1915. All listed numbers are standards for single values no greater than a given parameter unless otherwise noted.

² Annual Average

Edgewood Creek - Below
(43HVE-2)

Table A-7:		Heavenly Mountain Resort water year 2017/2018 water quality monitoring data from station 43HVE-2, Edgewood Creek below Boulder Parking Lot. This station is located 1/4 mile below the parking lot, underneath the power lines at an elevation of 7,120 feet.											
Date	Time	Discharge (cfs)	Specific Conductivity (mmhos)	Turbidity (ntu)	Suspended Sediment (mg/L)	Total Nitrite/Nitrate (mg/L)	Total Kjeldahl N (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	Soluble Reactive P (mg/L)	Dissolved P (mg/L)	Average Temperature (Deg C)	Precipitation (in)
NDEP Standards ¹		N/A	N/A	10.0	25.0	N/A	N/A	0.6 ²	0.1	N/A	N/A	N/A	N/A
First Quarter WY 2017-2018													
10/18/17	15:15	0.637	123.3	4.43	1.5	0.034	0.117	0.151	0.022	0.005	0.014	7.22	0
11/14/17	15:00	0.261	107.4	4.11	2.5	0.034	0.13	0.164	0.029	0.006	0.017	0.56	0.3
12/21/17	15:30	0.193	72.2	5.50	25.5	0.046	0.224	0.270	0.037	0.005	0.011	-6.11	0.2
Second Quarter WY 2017-2018													
1/17/18	15:10	0.237	94.9	7.19	3.5	0.048	0.135	0.183	0.024	0.005	0.011	3.89	0
2/14/18	16:00	0.186	55.7	4.81	1.5	0.046	0.117	0.163	0.024	0.006	0.014	-5.56	0
3/20/18	16:02	0.327	212.0	125	82.0	0.061	0.513	0.574	0.254	0.004	0.008	0.00	0.1
Third Quarter WY 2017-2018													
4/4/18	16:35	0.731	96.4	44.6	34.0	0.038	0.262	0.300	0.142	0.004	0.008	4.44	0
4/18/18	14:35	0.593	96.2	6.9	5.0	0.028	0.128	0.156	0.032	0.005	0.013	-1.11	0
5/3/18	15:30	0.952	73.3	15.7	11.0	0.015	0.178	0.193	0.065	0.007	0.012	5.00	0
5/17/18	16:00	0.630	75.5	4.13	3.0	0.018	0.123	0.141	0.032	0.008	0.021	4.44	0.7
5/23/18	15:15	0.392	83.0	3.44	3.0	0.019	0.145	0.164	0.027	0.007	0.019	6.67	0.2
5/30/18	15:30	0.265	88.8	3.90	2.0	0.023	0.132	0.155	0.031	0.005	0.018	9.44	0
6/6/18	14:30	0.186	97.8	4.67	3.0	0.039	0.141	0.180	0.032	0.007	0.025	8.89	0
6/20/18	14:00	0.100	109.6	3.75	2.5	0.057	0.121	0.178	0.027	0.007	0.016	13.33	0
Fourth Quarter WY 2017-2018													
7/19/18	14:20	0.044	126.2	6.18	4.5	0.093	0.147	0.240	0.033	0.010	0.022	16.67	0
8/16/18	14:30	0.027	135.8	8.19	6.0	0.082	0.290	0.372	0.036	0.014	0.018	13.89	0
9/12/18	15:05	0.032	134.4	4.53	2.0	0.046	0.123	0.169	0.026	0.006	0.019	7.78	0
Annual Summary	Minimum	0.027	55.70	3.44	1.50	0.015	0.117	0.141	0.022	0.004	0.008	-6.1	-
	Maximum	0.952	212.0	125	82.0	0.093	0.513	0.574	0.254	0.014	0.025	16.7	-
	Average	0.341	104.9	15.1	11.32	0.043	0.178	0.221	0.051	0.007	0.016	5.3	-

¹ NDEP Standards are from the Nevada Administrative Code (NAC) Chapter 445A.1915. All listed numbers are standards for single values no greater than a given parameter unless otherwise noted.

² Annual Average

Edgewood Creek - Below
(43HVE-2)

Table A-7:		Heavenly Mountain Resort water year 2018/2019 water quality monitoring data from station 43HVE-2, Edgewood Creek below Boulder Parking Lot. This station is located 1/4 mile below the parking lot, underneath the power lines at an elevation of 7,120 feet.											
Date	Time	Discharge (cfs)	Specific Conductivity (mmhos)	Turbidity (ntu)	Suspended Sediment (mg/L)	Total Nitrite/Nitrate (mg/L)	Total Kjeldahl N (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	Soluble Reactive P (mg/L)	Dissolved P (mg/L)	Average Temperature (Deg C)	Precipitation (in)
NDEP Standards ¹		N/A	N/A	10.0	25.0	N/A	N/A	0.6 ²	0.1	N/A	N/A	N/A	N/A
First Quarter WY 2018-2019													
10/17/18	14:30	0.116	117.7	12.0	1.5	0.032	0.127	0.159	0.023	0.005	0.015	5.00	0
11/15/18	14:30	0.124	105.9	3.48	3.0	0.033	0.107	0.140	0.020	0.003	0.012	3.33	0
12/12/18	15:50	0.106	104.2	5.37	2.5	0.050	0.158	0.208	0.033	0.009	0.015	-1.11	0
Second Quarter WY 2018-2019													
1/23/19	15:30	0.309	1407.0	324.0	176.0	0.063	1.421	1.484	0.761	0.005	0.013	0.00	0
2/12/19	16:15	Unable to measure flow or collect water quality samples on 2/12 due to complete stream snow cover at monitoring location										-3.33	0.1
3/21/19	16:00	0.384	233.0	340.0	44.5	0.061	1.113	1.174	0.684	0.005	0.008	-2.78	0.1
Third Quarter WY 2018-2019													
4/10/19	14:50	0.861	123.6	15.3	11.5	0.035	0.187	0.222	0.055	0.006	0.014	-1.67	0
4/24/19	15:00	1.151	87.2	62.8	56.0	0.025	0.402	0.427	0.254	0.009	0.018	7.78	0
5/8/19	15:00	2.185	66.9	26.2	34.7	0.011	0.237	0.248	0.173	0.009	0.019	6.67	0
5/22/19	14:55	1.143	77.0	8.01	6.5	0.015	0.126	0.141	0.042	0.005	0.014	0.00	0.7
6/5/19	15:15	0.582	88.8	4.48	3.0	0.015	0.125	0.140	0.034	0.009	0.018	11.67	0
6/19/19	14:15	0.321	110.9	5.39	2.5	0.038	0.147	0.185	0.034	0.010	0.021	13.33	0
6/26/19	14:10	0.246	114.2	5.54	1.5	0.043	0.197	0.240	0.037	0.007	0.023	7.78	0
Fourth Quarter WY 2018-2019													
7/2/19	14:30	0.179	119.0	7.35	4.0	0.049	0.145	0.194	0.042	0.010	0.023	10.56	0
7/17/19	14:20	0.138	128.6	6.47	3.0	0.063	0.164	0.227	0.041	0.012	0.027	12.78	0
8/14/19	15:20	0.016	135.9	5.46	1.5	0.081	0.217	0.298	0.035	0.012	0.022	15.56	0
9/18/19	15:35	0.134	126.7	6.62	3.5	0.053	0.160	0.213	0.047	0.013	0.027	4.44	0
Annual Summary													
Minimum		0.016	66.90	3.48	1.50	0.011	0.107	0.140	0.020	0.003	0.008	-3.33	-
Maximum		2.185	1407.0	340	176.0	0.081	1.421	1.484	0.761	0.013	0.027	15.56	-
Average		0.500	196.7	52.4	22.20	0.042	0.315	0.356	0.145	0.008	0.018	5.29	-

¹ NDEP Standards are from the Nevada Administrative Code (NAC) Chapter 445A.1915. All listed numbers are standards for single values no greater than a given parameter unless otherwise noted.

² Annual Average

³ Unable to measure flow or collect water quality samples on 2/12 due to stream snow cover and recent tree fall activity at monitoring location

Edgewood Creek - Below
(43HVE-2)

Table A-7:		Heavenly Mountain Resort water year 2019/2020 water quality monitoring data from station 43HVE-2, Edgewood Creek below Boulder Parking Lot. This station is located 1/4 mile below the parking lot, underneath the power lines at an elevation of 7,120 feet.												
Date	Time	Discharge (cfs)	Specific Conductivity (mmhos)	Turbidity (ntu)	Suspended Sediment (mg/L)	Total Nitrite/Nitrate (mg/L)	Total Kjeldahl N (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	Soluble Reactive P (mg/L)	Dissolved P (mg/L)	Site Water Temperature (Deg C)	Site Ambient Temperature (Deg C)	Precipitation (in)
NDEP Standards ¹		N/A	N/A	10 ²	25 ²	N/A	N/A	0.6 ² / 0.6 ³	0.1 ² / 0.05 ³	N/A	N/A	N/A	N/A	N/A
First Quarter WY 2019-2020														
10/15/19	14:10	0.118	122.3	4.51	1.0	0.045	0.100	0.145	0.024	0.007	0.015	7.4	10.9	0.0
11/13/19	13:45	0.133	105.2	35.60	19.0	0.038	0.272	0.310	0.135	0.005	0.016	6.0	8.4	0.0
12/11/19	15:15	0.314	130.4	9.59	5.0	0.056	0.165	0.221	0.052	0.009	0.018	2.3	1.2	0.0
Second Quarter WY 2019-2020														
1/14/20	15:00	0.087	108.3	4.67	3.0	0.055	0.121	0.176	0.026	0.007	0.018	N/A	N/A	0.1
2/11/20	15:10	0.198	114.3	6.09	4.5	0.064	0.157	0.221	0.034	0.004	0.012	1.5	1.4	0.00
2/23/20	15:00	0.251	140.6	6.75	7.5	0.073	0.169	0.242	0.037	0.003	0.010	1.9	1.0	0.00
Third Quarter WY 2019-2020														
4/7/20	14:20	0.287	131.2	16.1	8.5	0.073	0.223	0.296	0.066	0.004	0.018	1.7	2.6	0.5
4/21/20	13:00	0.579	91.3	65.7	74.7	0.032	0.515	0.547	0.427	0.006	0.013	6.3	8.4	0.0
5/5/20	13:30	0.632	76.3	11.2	16.0	0.020	0.220	0.240	0.102	0.005	0.017	12.0	15.5	0.0
5/20/20	14:10	0.317	90.4	3.96	5.0	0.034	0.139	0.173	0.046	0.006	0.023	10.0	5.2	0.2
5/27/20	14:00	0.232	101.1	3.62	3.5	0.033	0.153	0.186	0.034	0.005	0.017	14.1	23.3	0.0
6/2/20	14:20	0.180	107.4	3.68	2.5	0.048	0.131	0.179	0.030	0.008	0.019	13.6	20.9	0.0
6/16/20	14:00	0.139	114.8	3.14	2.5	0.046	0.114	0.160	0.026	0.007	0.017	11.2	15.4	0.0
6/30/20	14:30	0.044	128.2	2.21	2.5	0.089	0.137	0.226	0.031	0.006	0.022	12.4	22.6	0.0
Fourth Quarter WY 2019-2020														
7/14/20	14:20	0.037	137.5	3.19	3.0	0.106	0.165	0.271	0.032	0.005	0.018	13.0	24.5	0.0
8/18/20	14:45	0.033	149.7	3.85	5.5	0.070	0.253	0.323	0.035	0.011	0.022	15.0	24.0	0.0
9/22/20	14:00	0.031	141.5	2.4	3	0.064	0.139	0.203	0.029	0.005	0.021	7.5	20.5	0.0
Annual Summary														
Annual Summary	Minimum	0.031	76.30	2.21	1.00	0.020	0.100	0.145	0.024	0.003	0.010	1.5	1.0	-
	Maximum	0.632	149.7	65.70	74.70	0.106	0.515	0.547	0.427	0.011	0.023	15.0	24.5	-
	Average	0.212	117.1	10.96	9.81	0.056	0.187	0.242	0.069	0.006	0.017	8.5	12.9	-

¹ NDEP Standards are from the Nevada Administrative Code (NAC) Chapter 445A.1664.

² Not to exceed standard for a single value.

³ Not to exceed standard for the annual average.

Edgewood Creek - Below
(43HVE-2)

Table A-7:			Heavenly Mountain Resort water year 2020-2021 water quality monitoring data from station 43HVE-2, Edgewood Creek below Boulder Parking Lot. This station is located 1/4 mile below the parking lot, underneath the power lines at an elevation of 7,120 feet.												
Date	Notes	Time	Discharge (cfs)	Specific Conductivity (mmhos)	Turbidity (ntu)	Suspended Sediment (mg/L)	Total Nitrite/Nitrate (mg/L)	Total Kjeldahl N (mg/L)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L) ³	Soluble Reactive P (mg/L)	Dissolved P (mg/L)	Site Water Temperature (Deg C)	Site Ambient Temperature (Deg C)	Precipitation (in)
NDEP Standards	¹		N/A	N/A	10.0	25.0	N/A	N/A	0.6 ²	0.1(SV) 0.05 (AA)	N/A	N/A	N/A	N/A	N/A
First Quarter WY 2020-2021															
10/20/20		14:40	0.033	133.4	1.45	1.5	0.035	0.085	0.120	0.018	0.002	0.012	10.5	21.5	0.0
11/19/20		15:40	0.117	122.4	7.12	6.0	0.033	0.262	0.295	0.036	0.006	0.014	N/A	N/A	2.2
12/9/20		14:40	0.075	119.7	2.66	2.0	0.060	0.106	0.166	0.025	0.004	0.017	N/A	N/A	0.0
Second Quarter WY 2020-2021															
1/13/21		14:45	0.230	157.1	22.50	12.5	0.057	0.279	0.336	0.090	0.011	0.022	2.5	3.2	0.0
2/17/21		15:20	0.084	144.2	6.05	2.5	0.076	0.196	0.272	0.027	0.007	0.013	0.6	-3.4	0.0
3/17/21		14:55	0.050	144.0	9.89	3.0	0.087	0.131	0.218	0.038	0.009	0.017	3.4	6.0	0.0
Third Quarter WY 2020-2021															
4/6/21		14:30	0.428	103.1	26.4	22.5	0.038	0.343	0.381	0.133	0.008	0.019	7.0	10.1	0.0
4/20/21		14:15	0.357	87.0	15.0	14.0	0.038	0.3	0.338	0.100	0.01	0.023	10.7	12.5	0.0
5/4/21		14:40	0.339	18.0	80.1	13.5	0.028	0.236	0.264	0.099	0.009	0.020	13.4	18.1	0.0
5/18/21		14:00	0.051	106.3	3.10	1.5	0.034	0.179	0.213	0.026	0.01	0.017	12.6	21.1	0.0
5/25/21		13:50	0.043	107.5	4.12	2.0	0.044	0.148	0.192	0.028	0.009	0.021	10.2	12.9	0.0
6/1/21		13:45	0.036	123.9	3.42	2.0	0.054	0.135	0.189	0.017	0.005	0.012	12.5	22.8	0.0
6/15/21		14:10	0.024	137.0	3.23	3.5	0.069	0.125	0.194	0.029	0.003	0.015	17.3	18.8	0.0
6/30/21		13:35	0.016	146.1	3.81	6.5	0.069	0.138	0.207	0.028	0.004	0.013	12.6	25.0	0.0
Fourth Quarter WY 2020-2021															
7/13/21	⁴	14:25	N/A	144.1	6.66	10.0	0.099	0.213	0.312	0.06	0.007	0.019	12.6	26.9	0.0
No WQ Samples Collected in August due to Caldor Fire, Forest Closures and Basin Evacuation															
9/20/21		13:25	N/A	142.0	18.5	26	0.032	0.356	0.388	0.066	0.011	0.013	8.5	14.2	0.0
Annual Summary	Minimum		0.016	18.00	1.45	1.50	0.028	0.085	0.120	0.017	0.002	0.012	0.60	-3.4	0.0
	Maximum		0.428	157.1	80.10	26.00	0.099	0.356	0.388	0.133	0.011	0.023	17.3	26.9	2.2
	Average		0.135	121.0	13.38	8.06	0.053	0.202	0.255	0.051	0.007	0.017	9.60	15.0	0.1

¹ NDEP Standards are from the Nevada Administrative Code Chapter 445A.1664 Truckee Region: Edgewood Creek at Palisades Dr. All listed numbers are standards for single values no greater than a given parameter unless otherwise noted.

² The Total Nitrogen Standard shown is for both single values as well as annual average values no greater than 0.6 mg/L listed.

³ There are two standards for Total Phosphorus provided by NDEP Code 445A.1664. The single value of 0.1 mg/L for all samples collected, as well the annual average standard value of 0.05 mg/L.

⁴ No flow measurements taken, due to instrument malfunction.

Heavenly Mountain Resort
Water Years 2017–2021

APPENDIX

B

HYDROLOGY GRAPHS

Appendix B

Hydrology Graphs

B.1 SNOTEL Hydrology Graph

B.2 Heavenly Valley Creek versus Hidden Valley Creek

Total Nitrogen 5 Year Rolling Average

Total Phosphorus 5 Year Rolling Average

B.3 Heavenly Valley, Hidden Valley Creek, Bijou Park Creek, and Edgewood Creek Hydrology Graphs

Hydrograph Representing Heavenly Valley Creek and Hidden Valley Creek for the Water Year Ending in 2021

Hydrograph Representing Bijou Park Creek for the Water Year Ending in 2021

Hydrograph Representing Edgewood Creek for the Water Year Ending in 2021

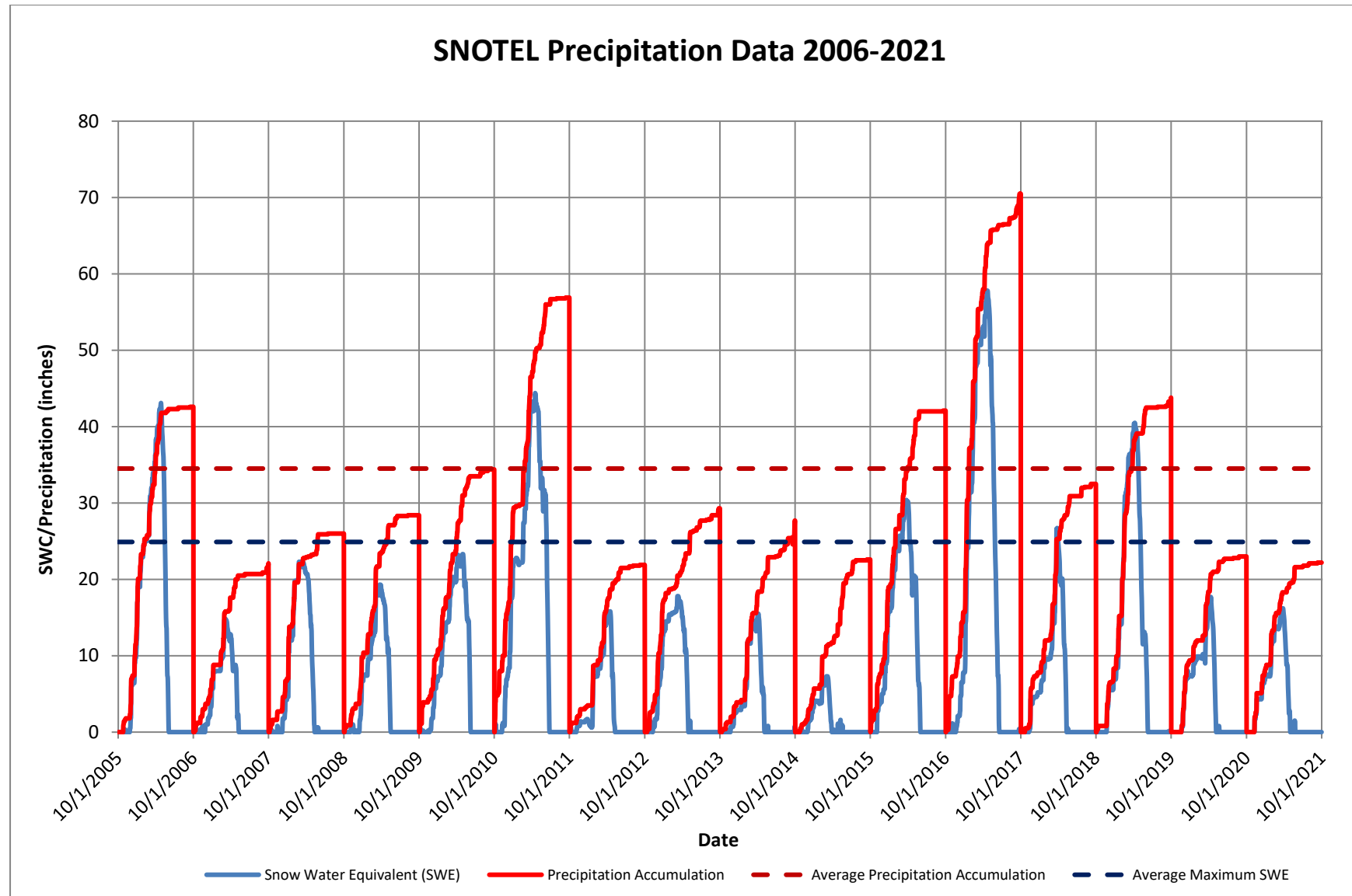


Figure B.1 SNOTEL Precipitation Data 2006–2021

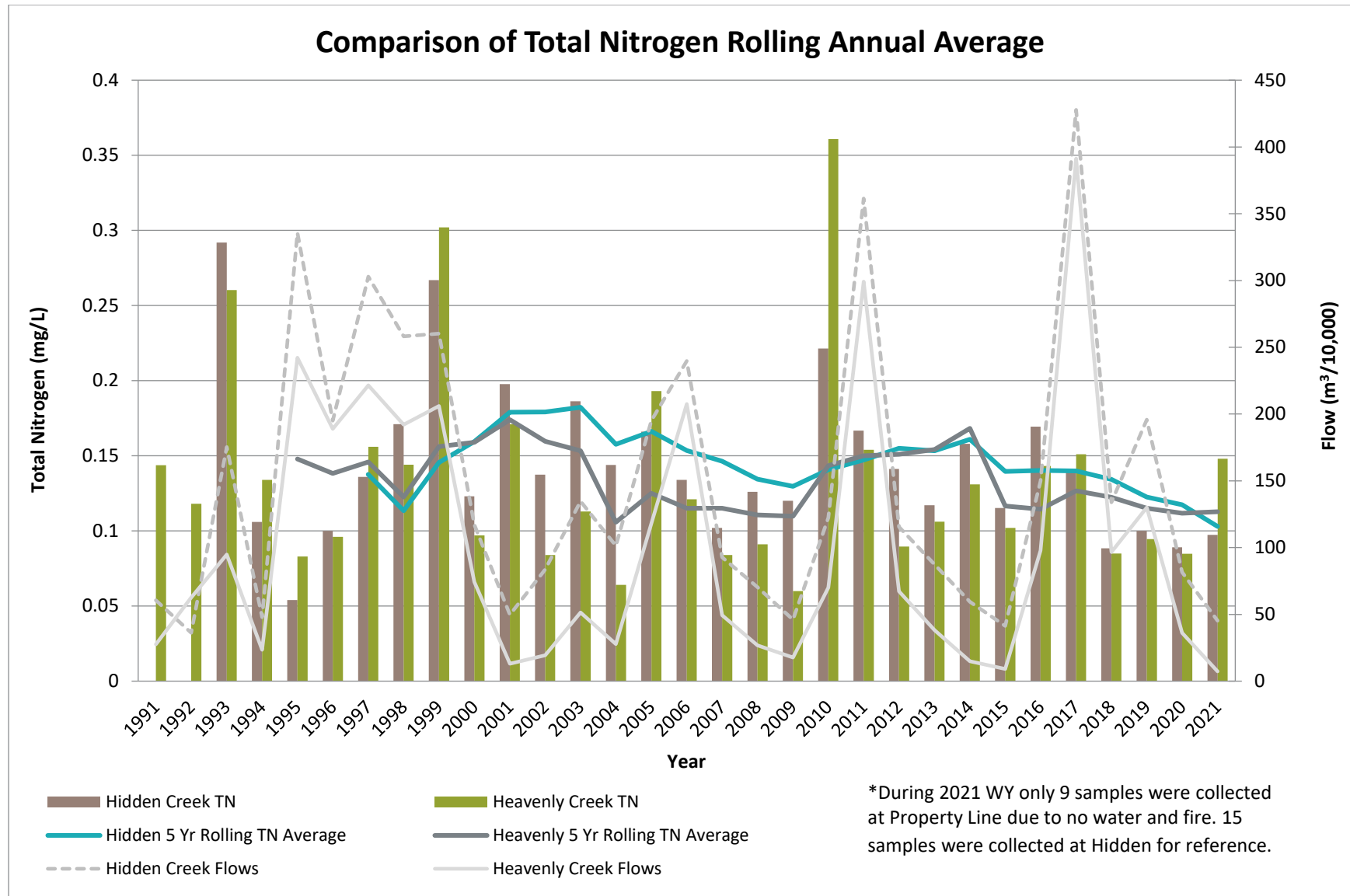


Figure B.2-1 Heavenly Valley Creek and Hidden Valley Creek Total Nitrogen Rolling Average (1991–2016)

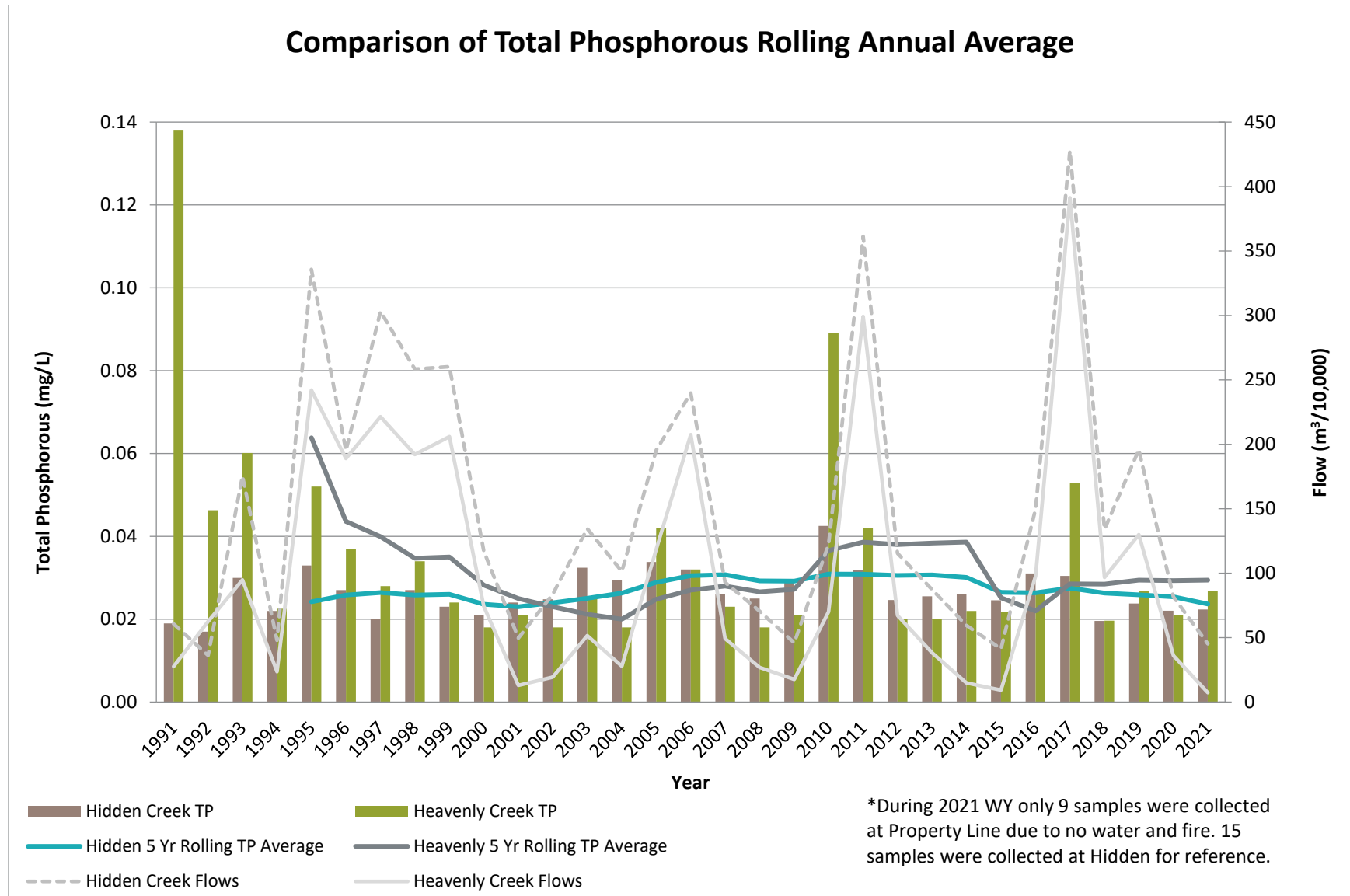


Figure B.2-2 Heavenly Valley Creek and Hidden Valley Creek Total Phosphorus Rolling Average (1991–2016)

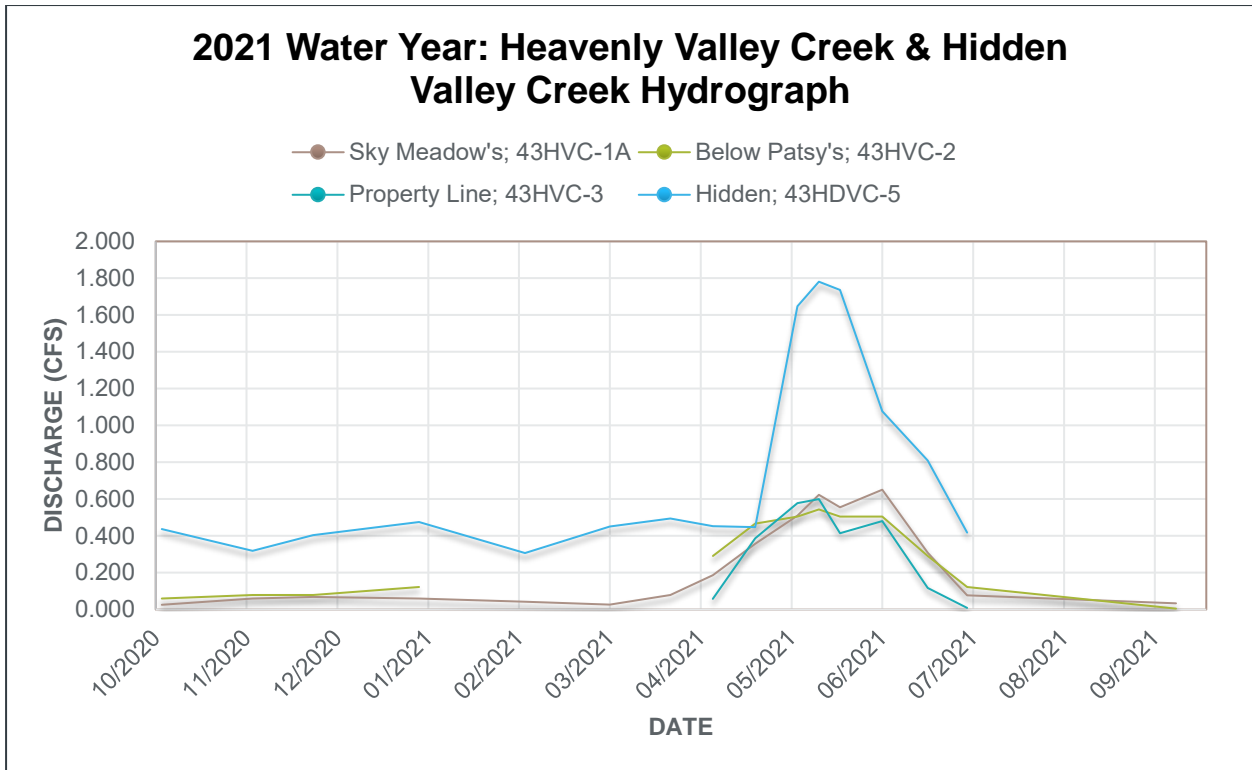


Figure B.3-1 Hydrograph Representing Heavenly Valley Creek and Hidden Valley Creek for the Water Year Ending in 2021

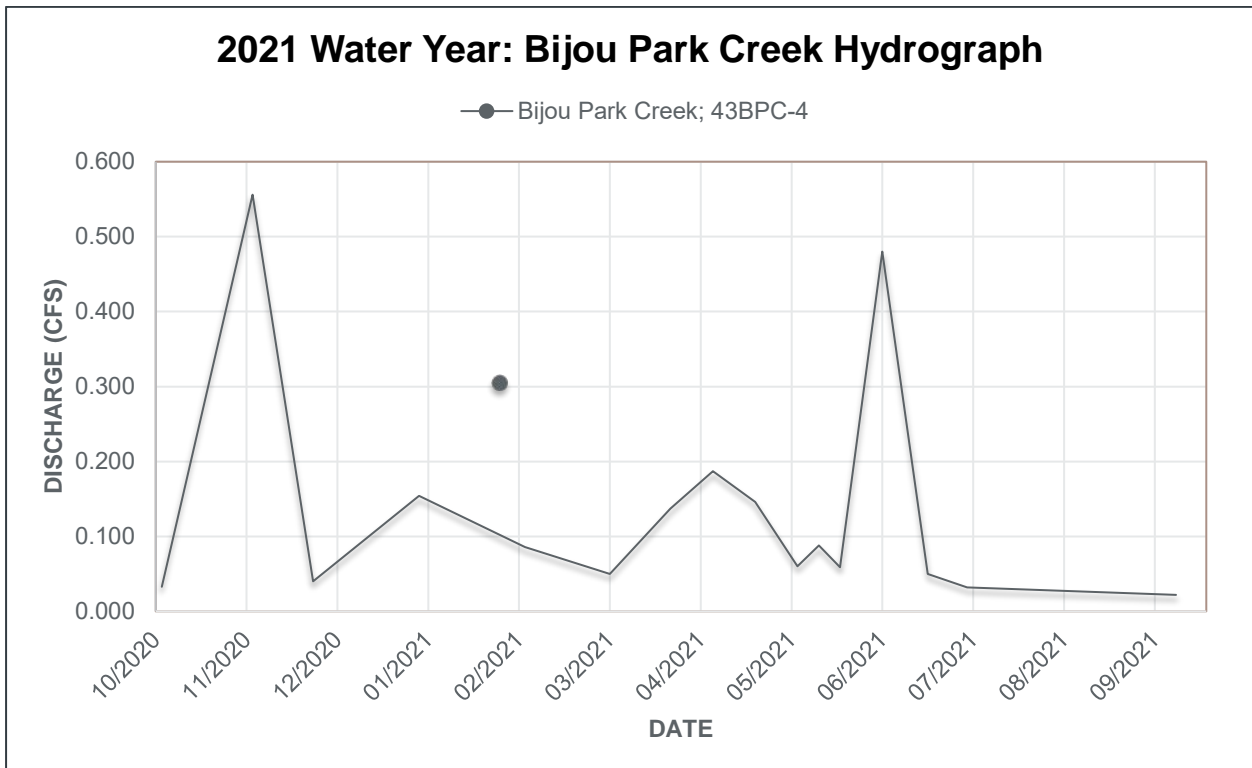


Figure B.3-2 Hydrograph Representing Bijou Park Creek for the Water Year Ending in 2021

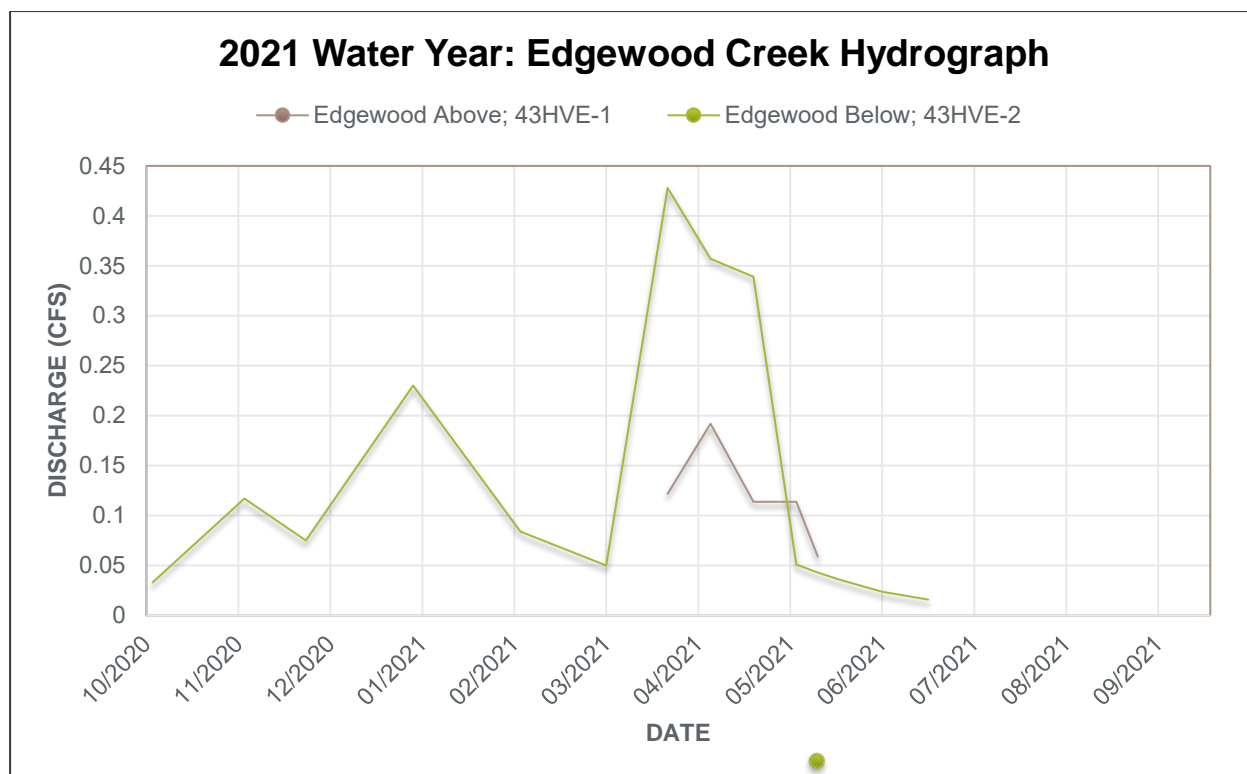


Figure B.3-3 Hydrograph Representing Edgewood Creek for the Water Year Ending in 2021

Heavenly Mountain Resort
Water Years 2017–2021

APPENDIX

C

STREAMFLOW
STATISTICAL INFORMATION
TABLES AND GRAPHS

Appendix C

Streamflow Statistical Information Tables and Graphs

C.1 Statistical Tables

- C.1-1 Sky Meadows (43HVC-1a)**
- C.1-2 Below Patsy's (43HVC-2)**
- C.1-3 Property Line (43HVC-3)**
- C.1-4 Bijou Park Creek (43BPC-4)**
- C.1-5 Hidden Valley Creek (43HDVC-5)**

C.2 Annual Average Discharge compared to Constituent Data for Sky Meadows (43HVC-1a) (2006–2021)

- C.2-1 Turbidity Versus Flow, Sky Meadows (43HVC-1A) (2006–2021)**
- C.2-2 Suspended Sediment Versus Flow, Sky Meadows (43HVC-1A) (2006–2021)**
- C.2-3 Total Nitrite/Nitrate Versus Flow, Sky Meadows (43HVC-1A) (2006–2021)**
- C.2-4 TKN Versus Flow, Sky Meadows (43HVC-1A) (2006–2021)**
- C.2-5 Total Nitrogen Versus Flow, Sky Meadows (43HVC-1A) (2006–2021)**
- C.2-6 Total Phosphorus Versus Flow, Sky Meadows (43HVC-1A) (2006–2021)**
- C.2-7 Chloride Versus Flow, Sky Meadows (43HVC-1A) (2006–2021)**

C.3 Annual Average Discharge compared to Constituent Data for Patsy's (43HVC-2) (2006–2021)

- C.3-1 Turbidity Versus Flow, Patsy's (43HVC-2) (2006–2021)**
- C.3-2 Suspended Sediment Versus Flow, Patsy's (43HVC-2) (2006–2021)**
- C.3-3 Total Nitrite/Nitrate Versus Flow, Patsy's (43HVC-2) (2006–2021)**
- C.3-4 TKN Versus Flow, Patsy's (43HVC-2) (2006–2021)**
- C.3-5 Total Nitrogen Versus Flow, Patsy's (43HVC-2) (2006–2021)**
- C.3-6 Total Phosphorus Versus Flow, Patsy's (43HVC-2) (2006–2021)**
- C.3-7 Chloride Versus Flow, Patsy's (43HVC-2) (2006–2021)**

C.4 Annual Average Discharge compared to Constituent Data for Property Line (43HVC-3) (2006–2021)

- C.4-1 Turbidity Versus Flow, Property Line (43HVC-3) (2006–2021)**
- C.4-2 Suspended Sediment Versus Flow, Property Line (43HVC-3) (2006–2021)**
- C.4-3 Total Nitrite/Nitrate Versus Flow, Property Line (43HVC-3) (2006–2021)**

- C.4-4 Total Kjeldahl Nitrogen Versus Flow, Property Line (43HVC-3) (2006–2021)**
- C.4-5 Total Nitrogen Versus Flow, Property Line (43HVC-3) (2006–2021)**
- C.4-6 Total Phosphorus Versus Flow, Property Line (43HVC-3) (2006–2021)**
- C.4-7 Chloride Versus Flow, Property Line (43HVC-3) (2006–2021)**
- C.5 Annual Average Discharge compared to Constituent Data for Bijou Park Creek (43BPC-4) (2006–2021)**
 - C.5-1 Turbidity Versus Flow, Bijou Park Creek (43BPC-4) (2006–2021)**
 - C.5-2 Suspended Sediment Versus Flow, Bijou Park Creek (43BPC-4) (2006–2021)**
 - C.5-3 Total Nitrite/Nitrate Versus Flow, Bijou Park Creek (43BPC-4) (2006–2021)**
 - C.5-4 TKN Versus Flow, Bijou Park Creek (43BPC-4) (2006–2021)**
 - C.5-5 Total Nitrogen Versus Flow, Bijou Park Creek (43BPC-4) (2006–2021)**
 - C.5-6 Total Phosphorus Versus Flow, Bijou Park Creek (43BPC-4) (2006–2021)**
 - C.5-7 Chloride Versus Flow, Bijou Park Creek (43BPC-4) (2006–2021)**
- C.6 Annual Average Discharge compared to Constituent Data for Hidden Valley Creek (43HDVC-5) (2006–2021)**
 - C.6-1 Turbidity Versus Flow, Hidden Valley Creek (43HDVC-5) (2006–2021)**
 - C.6-2 Suspended Sediment Versus Flow, Hidden Valley Creek (43HDVC-5) (2006–2021)**
 - C.6-3 Total Nitrite/Nitrate Versus Flow, Hidden Valley Creek (43HDVC-5) (2006–2021)**
 - C.6-4 TKN Versus Flow, Hidden Valley Creek (43HDVC-5) (2006–2021)**
 - C.6-5 Total Nitrogen Versus Flow, Hidden Valley Creek (43HDVC-5) (2006–2021)**
 - C.6-6 Total Phosphorus Versus Flow, Hidden Valley Creek (43HDVC-5) (2006–2021)**
 - C.6-7 Chloride Versus Flow, Hidden Valley Creek (43HDVC-5) (2006–2021)**
- C.7 Annual Average Discharge compared to Constituent Data for Upper Edgewood (43HVE-1) (2006–2021)**
 - C.7-1 Specific Conductivity Versus Flow, Upper Edgewood Creek (43HVE-1) (2006–2021)**
 - C.7-2 Turbidity Versus Flow, Upper Edgewood Creek (43HVE-1) (2006–2021)**
 - C.7-3 Suspended Sediment Versus Flow, Upper Edgewood Creek (43HVE-1) (2006–2021)**
 - C.7-4 Total Nitrate/Nitrite Versus Flow, Upper Edgewood Creek (43HVE-1) (2006–2021)**
 - C.7-5 TKN Versus Flow, Upper Edgewood Creek (43HVE-1) (2006–2021)**
 - C.7-6 Total Nitrogen Versus Flow, Upper Edgewood Creek (43HVE-1) (2006–2021)**
 - C.7-7 Total Phosphorus Versus Flow, Upper Edgewood Creek (43HVE-1) (2006–2021)**
 - C.7-8 Soluble Reactive Phosphorus Versus Flow, Upper Edgewood Creek (43HVE-1) (2006–2021)**
 - C.7-9 Dissolved Phosphorus Versus Flow, Upper Edgewood Creek (43HVE-1) (2006–2021)**

C.8 Annual Average Discharge compared to Constituent Data for Upper Edgewood (43HVE-1) (2006–2021)

- C.8-1 Specific Conductivity Versus Flow, Lower Edgewood Creek (43HVE-2) (2006–2021)
- C.8-2 Turbidity Versus Flow, Lower Edgewood Creek (43HVE-2) (2006–2021)
- C.8-3 Suspended Sediment Versus Flow, Lower Edgewood Creek (43HVE-2) (2006–2021)
- C.8-4 Total Nitrate/Nitrite Versus Flow, Lower Edgewood Creek (43HVE-2) (2006–2021)
- C.8-5 TKN Versus Flow, Lower Edgewood Creek (43HVE-2) (2006–2021)
- C.8-6 Total Nitrogen Versus Flow, Lower Edgewood Creek (43HVE-2) (2006–2021)
- C.8-7 Total Phosphorus Versus Flow, Lower Edgewood Creek (43HVE-2) (2006–2021)
- C.8-8 Soluble Reactive Phosphorus Versus Flow, Lower Edgewood Creek (43HVE-2) (2006–2021)
- C.8-9 Dissolved Phosphorus Versus Flow, Lower Edgewood Creek (43HVE-2) (2006–2021)

C.9 Constituent Data for Bijou Park Creek (43BPC-4) and Hidden Valley Creek (43HDVC-5) (1991–2021)

- C.9-1 Turbidity Annual Averages, Bijou Park Creek (43BPC-4) and Hidden Valley Creek (43HDVC-5) (1991–2021)
- C.9-2 Suspended Sediment 90th Percentile Values, Bijou Park Creek (43BPC-4) and Hidden Valley Creek (43HDVC-5) (1991–2021)
- C.9-3 Nitrate/Nitrite Annual Averages, Bijou Park Creek (43BPC-4) and Hidden Valley Creek (43HDVC-5) (1991–2021)
- C.9-4 TKN Annual Averages, Bijou Park Creek (43BPC-4) and Hidden Valley Creek (43HDVC-5) (1991–2021)
- C.9-5 Total Nitrogen Annual Averages, Bijou Park Creek (43BPC-4) and Hidden Valley Creek (43HDVC-5) (1991–2021)
- C.9-6 Total Phosphorus Annual Averages, Bijou Park Creek (43BPC-4) and Hidden Valley Creek (43HDVC-5) (1991–2021)
- C.9-7 Chloride Annual Averages, Bijou Park Creek (43BPC-4) and Hidden Valley Creek (43HDVC-5) (1991–2021)

C.10 Constituent Data for Heavenly Valley Creek (43HVC-1A, 43HVC-2, 43HVC-3) and Hidden Valley Creek (43HDVC-5) (1991–2021)

- C.10-1 Turbidity Annual Averages, Heavenly Valley Creek (43HVC-1A, 43HVC-2, 43HVC-3) and Hidden Valley Creek (43HDVC-5) (1991–2021)
- C.10-2 Suspended Sediment 90th Percentile Values, Heavenly Valley Creek (43HVC-1A, 43HVC-2, 43HVC-3) and Hidden Valley Creek (43HDVC-5) (1991–2021)
- C.10-3 Nitrate/Nitrite Annual Averages, Heavenly Valley Creek (43HVC-1A, 43HVC-2, 43HVC-3) and Hidden Valley Creek (43HDVC-5) (1991–2021)
- C.10-4 TKN Annual Averages, Heavenly Valley Creek (43HVC-1A, 43HVC-2, 43HVC-3) and Hidden Valley Creek (43HDVC-5) (1991–2021)
- C.10-5 Total Nitrogen Annual Averages, Heavenly Valley Creek (43HVC-1A, 43HVC-2, 43HVC-3) and Hidden Valley Creek (43HDVC-5) (1991–2021)

- C.10-6 Total Phosphorus Annual Averages, Heavenly Valley Creek (43HVC-1A, 43HVC-2, 43HVC-3) and Hidden Valley Creek (43HDVC-5) (1991–2021)**
- C.10-7 Chloride Annual Averages, Heavenly Valley Creek (43HVC-1A, 43HVC-2, 43HVC-3) and Hidden Valley Creek (43HDVC-5) (1991–2021)**
- C.11 Constituent Data for Edgewood Creek (43HVC-1A, 43HVC-2, 43HVC-3) and Hidden Valley Creek (43HDVC-5) (2006–2021)**
 - C.11-1 Turbidity Annual Averages, Edgewood Creek (43HVE-1, 43HVE-2) and Hidden Valley Creek (43HDVC-5) (2006–2021)**
 - C.11-2 Suspended Sediment Annual Averages, Edgewood Creek (43HVE-1, 43HVE-2) and Hidden Valley Creek (43HDVC-5) (2006–2021)**
 - C.11-3 Nitrate/Nitrite Annual Averages, Edgewood Creek (43HVE-1, 43HVE-2) and Hidden Valley Creek (43HDVC-5) (2006–2021)**
 - C.11-4 TKN Annual Averages, Edgewood Creek (43HVE-1, 43HVE-2) and Hidden Valley Creek (43HDVC-5) (2006–2021)**
 - C.11-5 Total Nitrogen Annual Averages, Edgewood Creek (43HVE-1, 43HVE-2) and Hidden Valley Creek (43HDVC-5) (2006–2021)**
 - C.11-6 Total Phosphorus Annual Averages, Edgewood Creek (43HVE-1, 43HVE-2) and Hidden Valley Creek (43HDVC-5) (2006–2021)**
 - C.11-7 Soluble Reactive Phosphorus Annual Averages, Edgewood Creek (43HVE-1, 43HVE-2) and Hidden Valley Creek (43HDVC-5) (2006–2021)**
 - C.11-8 Dissolved Phosphorus Annual Averages, Edgewood Creek (43HVE-1, 43HVE-2) (2006–2021)**
 - C.11-9 Specific Conductivity Annual Averages, Edgewood Creek (43HVE-1, 43HVE-2) and Hidden Valley Creek (43HDVC-5) (2006–2021)**
- C.12 Box and Whisker Plots showing the Variance between Property Line (43HVC-3) and Hidden Valley Creek (43HDVC-5)**
 - C.12-1 Box and Whisker Legend**
 - C.12-2 Heavenly and Hidden Valley Creek Total Nitrogen Graphical Comparison (1993–2021)**
 - C.12-3 Heavenly and Hidden Valley Creek TSS Graphical Comparison (1995–2021)**
 - C.12-4 Heavenly and Hidden Valley Creek Total Phosphorus Graphical Comparison (1993–2021)**
 - C.12-5 Heavenly and Hidden Valley Creek Turbidity Graphical Comparison (1993–2021)**
 - C.12-6 Heavenly and Hidden Valley Creek Chloride Graphical Comparison (2012–2021)**

Sky Meadows
(43HVC-1A)

C.1-1

Water Year: 2017							
Parameters	Min	Max	Mean	Median	Std Err	90th Percentile	Applicable Annual Average Standard
Streamflow (cfs)	0.173	6.69	1.874	0.4185	2.502	-	-
Turbidity (NTU)	1.06	40.3	5.372	2.4	9.243	-	-
Suspended Sediment (mg/L)	1.00	93.50	11.941	4	22.480	46.30	60.0
Nitrite/Nitrate (mg/L)	0.016	0.083	0.040	0.035	0.017	-	-
Total Kjeldahl Nitrogen (mg/L)	0.053	0.46	0.142	0.117	0.096	-	-
Total Nitrogen (mg/L)	0.09	0.543	0.182	0.152	0.109	-	0.19
Total Phosphorus (mg/L)	0.013	0.271	0.048	0.024	0.066	-	0.015
Chloride (mg/L)	0.27	0.57	0.391	0.36	0.088	-	0.15

Water Year: 2018							
Parameters	Min	Max	Mean	Median	Std Err	90th Percentile	Applicable Annual Average Standard
Streamflow (cfs)	0.10	3.49	1.19	0.75	1.16	-	-
Turbidity (NTU)	0.88	7.03	2.72	1.93	1.94	-	-
Suspended Sediment (mg/L)	1.00	9.00	3.53	2.50	2.53	7.95	60.0
Nitrite/Nitrate (mg/L)	0.01	0.06	0.03	0.03	0.02	-	-
Total Kjeldahl Nitrogen (mg/L)	0.06	0.20	0.10	0.08	0.05	-	-
Total Nitrogen (mg/L)	0.08	0.24	0.13	0.10	0.06	-	0.19
Total Phosphorus (mg/L)	0.01	0.04	0.02	0.02	0.01	-	0.015
Chloride (mg/L)	0.28	0.40	0.34	0.35	0.03	-	0.15

Water Year: 2019							
Parameters	Min	Max	Mean	Median	Std Err	90th Percentile	Applicable Annual Average Standard
Streamflow (cfs)	0.046	1.966	0.484	0.187	0.565	-	-
Turbidity (NTU)	0.72	13.90	3.857	2.18	3.898	-	-
Suspended Sediment (mg/L)	1.00	25.00	5.029	2.5	7.145	22.60	60.0
Nitrite/Nitrate (mg/L)	0.011	0.055	0.022	0.017	0.012	-	-
Total Kjeldahl Nitrogen (mg/L)	0.043	0.286	0.104	0.084	0.068	-	-
Total Nitrogen (mg/L)	0.054	0.311	0.126	0.107	0.075	-	0.19
Total Phosphorus (mg/L)	0.011	0.096	0.030	0.023	0.026	-	0.015
Chloride (mg/L)	0.25	0.45	0.367	0.37	0.053	-	0.15

Water Year: 2020							
Parameters	Min	Max	Mean	Median	Std Err	90th Percentile	Applicable Annual Average Standard
Streamflow (cfs)	0.069	1.062	0.450	0.307	0.381	-	-
Turbidity (NTU)	1.06	3.18	1.863	1.82	0.650	-	-
Suspended Sediment (mg/L)	1.00	14.50	4.269	3.5	3.533	11.70	60.0
Nitrite/Nitrate (mg/L)	0.005	0.037	0.016	0.013	0.010	-	-
Total Kjeldahl Nitrogen (mg/L)	0.055	0.141	0.097	0.1	0.029	-	-
Total Nitrogen (mg/L)	0.062	0.15	0.113	0.115	0.030	-	0.19
Total Phosphorus (mg/L)	0.012	0.025	0.018	0.019	0.004	-	0.015
Chloride (mg/L)	0.30	0.80	0.546	0.5	0.176	-	0.15

Water Year: 2021							
Parameters	Min	Max	Mean	Median	Std Err	90th Percentile	Applicable Annual Average Standard
Streamflow (cfs)	0.026	0.651	0.229	0.079	0.235	-	-
Turbidity (NTU)	1.08	32	4.476	1.785	7.812	-	-
Suspended Sediment (mg/L)	1.00	38	5.438	2.750	8.888	17.35	60.0
Nitrite/Nitrate (mg/L)	0.002	0.05	0.020	0.017	0.017	-	-
Total Kjeldahl Nitrogen (mg/L)	0.047	0.433	0.133	0.108	0.095	-	-
Total Nitrogen (mg/L)	0.051	0.435	0.152	0.135	0.095	-	0.19
Total Phosphorus (mg/L)	0.011	0.147	0.029	0.020	0.032	-	0.015
Chloride (mg/L)	0.214	1.40	0.743	0.741	0.272	-	0.15

C.1-2

Water Year: 2017							
Parameters	Min	Max	Mean	Median	Std Err	90th Percentile	Applicable Annual Average Standard
Streamflow (cfs)	0.1	29.23	5.806	0.712	8.871	-	-
Turbidity (NTU)	0.45	20.5	4.429	1.710	6.136	-	-
Suspended Sediment (mg/L)	1.00	47.50	7.412	2.000	12.424	29.10	60.0
Nitrite/Nitrate (mg/L)	0.011	0.096	0.059	0.064	0.023	-	-
Total Kjeldahl Nitrogen (mg/L)	0.053	0.242	0.110	0.092	0.062	-	-
Total Nitrogen (mg/L)	0.118	0.315	0.169	0.143	0.062	-	0.19
Total Phosphorus (mg/L)	0.011	0.137	0.036	0.022	0.035	-	0.015
Chloride (mg/L)	0.35	1.40	0.679	0.560	0.296	-	0.15

Water Year: 2018							
Parameters	Min	Max	Mean	Median	Std Err	90th Percentile	Applicable Annual Average Standard
Streamflow (cfs)	0.10	3.54	1.46	0.63	1.26	-	-
Turbidity (NTU)	0.67	32.30	4.05	1.85	7.55	-	-
Suspended Sediment (mg/L)	1.00	29.00	4.12	2.00	6.74	13.40	60.0
Nitrite/Nitrate (mg/L)	0.02	0.06	0.03	0.03	0.02	-	-
Total Kjeldahl Nitrogen (mg/L)	0.05	0.17	0.09	0.09	0.03	-	-
Total Nitrogen (mg/L)	0.10	0.21	0.13	0.12	0.03	-	0.19
Total Phosphorus (mg/L)	0.01	0.11	0.03	0.02	0.02	-	0.015
Chloride (mg/L)	0.44	1.40	0.73	0.63	0.28	-	0.15

Water Year: 2019							
Parameters	Min	Max	Mean	Median	Std Err	90th Percentile	Applicable Annual Average Standard
Streamflow (cfs)	0.015	11.194	2.22	0.76	3.24	-	-
Turbidity (NTU)	0.52	16.10	3.50	1.45	4.47	-	-
Suspended Sediment (mg/L)	0.50	27	4.24	1.50	6.62	13.80	60.0
Nitrite/Nitrate (mg/L)	0.008	0.066	0.03	0.03	0.02	-	-
Total Kjeldahl Nitrogen (mg/L)	0.045	0.197	0.09	0.08	0.04	-	-
Total Nitrogen (mg/L)	0.069	0.226	0.12	0.10	0.05	-	0.19
Total Phosphorus (mg/L)	0.011	0.092	0.03	0.02	0.02	-	0.015
Chloride (mg/L)	0.40	2.30	0.85	0.72	0.47	-	0.15

Water Year: 2020							
Parameters	Min	Max	Mean	Median	Std Err	90th Percentile	Applicable Annual Average Standard
Streamflow (cfs)	0.09	1.638	0.59	0.4315	0.53	-	-
Turbidity (NTU)	0.27	17.10	2.14	0.96	4.33	-	-
Suspended Sediment (mg/L)	0.50	12.00	2.80	2.5	2.78	7.50	60.0
Nitrite/Nitrate (mg/L)	0.002	0.054	0.02	0.0205	0.02	-	-
Total Kjeldahl Nitrogen (mg/L)	0.052	0.17	0.09	0.0775	0.03	-	-
Total Nitrogen (mg/L)	0	0.18	0.10	0.1	0.05	-	0.19
Total Phosphorus (mg/L)	0.015	0.051	0.02	0.0185	0.01	-	0.015
Chloride (mg/L)	0.40	1.30	0.89	0.9	0.28	-	0.15

Water Year: 2021							
Parameters	Min	Max	Mean	Median	Std Err	90th Percentile	Applicable Annual Average Standard
Streamflow (cfs)	0.005	0.544	0.28	0.29	0.21	-	-
Turbidity (NTU)	0.30	28.10	3.95	0.99	7.77	-	-
Suspended Sediment (mg/L)	1.00	29.50	4.54	1.50	7.77	21.10	60.0
Nitrite/Nitrate (mg/L)	0.001	0.062	0.03	0.03	0.02	-	-
Total Kjeldahl Nitrogen (mg/L)	0.043	0.392	0.12	0.09	0.11	-	-
Total Nitrogen (mg/L)	0.068	0.4	0.15	0.11	0.11	-	0.19
Total Phosphorus (mg/L)	0.009	0.127	0.03	0.02	0.03	-	0.015
Chloride (mg/L)	1.04	3.71	1.48	1.20	0.71	-	0.15

C.1-3

Water Year: 2017							
Parameters	Min	Max	Mean	Median	Std Err	90th Percentile	Applicable Annual Average Standard
Streamflow (cfs)	0.042	31.602	7.360	1.809	10.028	-	-
Turbidity (NTU)	0.20	40.500	7.52	1.89	11.54	-	-
Suspended Sediment (mg/L)	1.000	87.000	15.059	3.00	25.15	74.20	60.0
Nitrite/Nitrate (mg/L)	0.001	0.047	0.01	0.005	0.016	-	-
Total Kjeldahl Nitrogen (mg/L)	0.048	0.414	0.136	0.104	0.10	-	-
Total Nitrogen (mg/L)	0.05	0.461	0.151	0.12	0.11	-	0.19
Total Phosphorus (mg/L)	0.011	0.213	0.05	0.02	0.062	-	0.015
Chloride (mg/L)	0.36	1.10	0.662	0.560	0.25	-	0.15

Water Year: 2018							
Parameters	Min	Max	Mean	Median	Std Err	90th Percentile	Applicable Annual Average Standard
Streamflow (cfs)	0.088	5.28	1.85	1.155	1.694	-	-
Turbidity (NTU)	0.43	3.330	1.61	1.78	0.932	-	-
Suspended Sediment (mg/L)	0.50	11.50	2.353	2.00	2.46	5.50	60.0
Nitrite/Nitrate (mg/L)	0.001	0.01	0.01	0.007	0.00	-	-
Total Kjeldahl Nitrogen (mg/L)	0.052	0.142	0.08	0.08	0.028	-	-
Total Nitrogen (mg/L)	0.06	0.151	0.085	0.08	0.03	-	0.19
Total Phosphorus (mg/L)	0.01	0.03	0.020	0.020	0.00	-	0.015
Chloride (mg/L)	0.310	0.97	0.58	0.510	0.205	-	0.15

Water Year: 2019							
Parameters	Min	Max	Mean	Median	Std Err	90th Percentile	Applicable Annual Average Standard
Streamflow (cfs)	0.007	12.22	2.42	1.345	3.302	-	-
Turbidity (NTU)	0.35	10.800	2.91	1.36	3.005	-	-
Suspended Sediment (mg/L)	1.00	21.00	4.559	3.00	5.25	13.40	60.0
Nitrite/Nitrate (mg/L)	0.002	0.03	0.01	0.005	0.01	-	-
Total Kjeldahl Nitrogen (mg/L)	0.041	0.166	0.09	0.08	0.032	-	-
Total Nitrogen (mg/L)	0.05	0.195	0.095	0.08	0.04	-	0.19
Total Phosphorus (mg/L)	0.01	0.07	0.027	0.023	0.01	-	0.015
Chloride (mg/L)	0.400	1.00	0.65	0.630	0.186	-	0.15

Water Year: 2020							
Parameters	Min	Max	Mean	Median	Std Err	90th Percentile	Applicable Annual Average Standard
Streamflow (cfs)	0.035	1.513	0.631	0.498	0.564	-	-
Turbidity (NTU)	0.44	6.27	1.138	0.790	1.384	-	-
Suspended Sediment (mg/L)	0.50	14.5	2.841	2.000	3.154	5.70	60.0
Nitrite/Nitrate (mg/L)	0.001	0.019	0.003	0.002	0.004	-	-
Total Kjeldahl Nitrogen (mg/L)	0.051	0.218	0.081	0.075	0.037	-	-
Total Nitrogen (mg/L)	0	0.22	0.080	0.079	0.041	-	0.19
Total Phosphorus (mg/L)	0.013	0.055	0.021	0.019	0.010	-	0.015
Chloride (mg/L)	0.40	4.00	1.059	0.900	0.808	-	0.15

Water Year: 2021							
Parameters	Min	Max	Mean	Median	Std Err	90th Percentile	Applicable Annual Average Standard
Streamflow (cfs)	0.009	0.6	0.331	0.4005	0.236	-	-
Turbidity (NTU)	0.30	4.69	1.091	0.58	1.391	-	-
Suspended Sediment (mg/L)	1	6.5	1.944	1.00	1.828	6.50	60.0
Nitrite/Nitrate (mg/L)	0.001	0.014	0.004	0.00	0.005	-	-
Total Kjeldahl Nitrogen (mg/L)	0.053	0.451	0.144	0.06	0.161	-	-
Total Nitrogen (mg/L)	0.055	0.465	0.148	0.06	0.163	-	0.19
Total Phosphorus (mg/L)	0.011	0.065	0.027	0.02	0.018	-	0.015
Chloride (mg/L)	0.812	1.29	1.125	1.18	0.146	-	0.15

C.1-4

Water Year: 2017							
Parameters	Min	Max	Mean	Median	Std Err	90th Percentile	Applicable Annual Average Standard
Streamflow (cfs)	0.02	1.46	0.39	0.26	0.35	-	-
Turbidity (NTU)	12.30	63.90	22.79	17.60	13.85	-	20.0
Suspended Sediment (mg/L)	4.50	64.00	16.38	10.00	15.29	39.20	60.0
Nitrite/Nitrate (mg/L)	0.14	0.47	0.25	0.21	0.10	-	-
Total Kjeldahl Nitrogen (mg/L)	0.18	0.59	0.32	0.29	0.10	-	-
Total Nitrogen (mg/L)	0.39	0.80	0.57	0.55	0.14	-	0.15
Total Phosphorus (mg/L)	0.07	0.23	0.11	0.11	0.04	-	0.008
Chloride (mg/L)	23.00	250.00	61.06	36.00	57.85	-	3.0

Water Year: 2018							
Parameters	Min	Max	Mean	Median	Std Err	90th Percentile	Applicable Annual Average Standard
Streamflow (cfs)	0.05	0.479	0.21	0.17	0.12	-	-
Turbidity (NTU)	9.49	208	27.57	16.00	46.80	-	20.0
Suspended Sediment (mg/L)	3.50	108	15.44	7.00	25.43	55.20	60.0
Nitrite/Nitrate (mg/L)	0.106	0.352	0.20	0.19	0.06	-	-
Total Kjeldahl Nitrogen (mg/L)	0.185	1.398	0.37	0.26	0.31	-	-
Total Nitrogen (mg/L)	0.396	1.58	0.54	0.43	0.30	-	0.15
Total Phosphorus (mg/L)	0.049	0.59	0.15	0.10	0.14	-	0.008
Chloride (mg/L)	21	350	50.82	32.00	77.48	-	3.0

Water Year: 2019							
Parameters	Min	Max	Mean	Median	Std Err	90th Percentile	Applicable Annual Average Standard
Streamflow (cfs)	0.044	1.222	0.27	0.17	0.29	-	-
Turbidity (NTU)	13.3	144	38.09	17.10	47.60	-	20.0
Suspended Sediment (mg/L)	4	86	21.12	6.00	29.72	81.20	60.0
Nitrite/Nitrate (mg/L)	0.063	0.313	0.19	0.17	0.07	-	-
Total Kjeldahl Nitrogen (mg/L)	0.176	1.058	0.36	0.24	0.28	-	-
Total Nitrogen (mg/L)	0.332	1.198	0.55	0.44	0.26	-	0.15
Total Phosphorus (mg/L)	0.065	0.628	0.17	0.09	0.16	-	0.008
Chloride (mg/L)	22	210	58.47	33.00	56.76	-	3.0

Water Year: 2020							
Parameters	Min	Max	Mean	Median	Std Err	90th Percentile	Applicable Annual Average Standard
Streamflow (cfs)	0.04	0.359	0.17	0.16	0.10	-	-
Turbidity (NTU)	7.84	58.3	16.85	12.20	13.62	-	20.0
Suspended Sediment (mg/L)	2	54.5	9.41	6.50	12.18	26.10	60.0
Nitrite/Nitrate (mg/L)	0.128	0.382	0.25	0.23	0.09	-	-
Total Kjeldahl Nitrogen (mg/L)	0.153	0.594	0.27	0.21	0.13	-	-
Total Nitrogen (mg/L)	0.347	0.751	0.52	0.52	0.12	-	0.15
Total Phosphorus (mg/L)	0.036	0.278	0.10	0.08	0.07	-	0.008
Chloride (mg/L)	23.6	371	56.19	29.60	82.26	-	3.0

Water Year: 2021							
Parameters	Min	Max	Mean	Median	Std Err	90th Percentile	Applicable Annual Average Standard
Streamflow (cfs)	0.022	0.556	0.14	0.07	0.16	-	-
Turbidity (NTU)	7.91	174	36.03	14.30	48.51	-	20.0
Suspended Sediment (mg/L)	3	98.5	19.41	5.50	28.60	81.7	60.0
Nitrite/Nitrate (mg/L)	0.122	0.39	0.23	0.22	0.08	-	-
Total Kjeldahl Nitrogen (mg/L)	0.171	1.031	0.34	0.25	0.26	-	-
Total Nitrogen (mg/L)	0.32	1.302	0.57	0.50	0.26	-	0.15
Total Phosphorus (mg/L)	0.056	1.092	0.18	0.08	0.26	-	0.008
Chloride (mg/L)	27.2	133	51.73	41.15	27.67	-	3.0

Hidden Valley Creek
(43HDVC-5)

C.1-5

Water Year: 2017							
Parameters	Min	Max	Mean	Median	Std Err	90th Percentile	Applicable Annual Average Standard
Streamflow (cfs)	0.331	28.38	7.440	3.743	8.529	-	-
Turbidity (NTU)	0.37	47.20	5.705	2.35	11.081	-	-
Suspended Sediment (mg/L)	0.50	26.00	5.853	2.5	7.265	21.60	60
Nitrite/Nitrate (mg/L)	0.001	0.008	0.004	0.004	0.001	-	-
Total Kjeldahl Nitrogen (mg/L)	0.048	0.285	0.136	0.119	0.068	-	-
Total Nitrogen (mg/L)	0.053	0.29	0.140	0.123	0.068	-	0.19
Total Phosphorus (mg/L)	0.017	0.066	0.030	0.026	0.013	-	0.015
Chloride (mg/L)	0.13	0.42	0.259	0.26	0.088	-	0.15

Water Year: 2018							
Parameters	Min	Max	Mean	Median	Std Err	90th Percentile	Applicable Annual Average Standard
Streamflow (cfs)	0.375	7.259	2.492	1.197	2.166	-	-
Turbidity (NTU)	0.600	2.090	1.168	1.090	0.452	-	-
Suspended Sediment (mg/L)	1.000	3.000	1.618	1.500	0.597	2.600	60
Nitrite/Nitrate (mg/L)	0.001	0.017	0.007	0.006	0.004	-	-
Total Kjeldahl Nitrogen (mg/L)	0.055	0.121	0.082	0.076	0.018	-	-
Total Nitrogen (mg/L)	0.064	0.128	0.088	0.085	0.018	-	0.19
Total Phosphorus (mg/L)	0.016	0.027	0.020	0.018	0.003	-	0.015
Chloride (mg/L)	0.120	0.320	0.218	0.220	0.069	-	0.15

Water Year: 2019							
Parameters	Min	Max	Mean	Median	Std Err	90th Percentile	Applicable Annual Average Standard
Streamflow (cfs)	0.42	15.88	3.525	2.066	4.355	-	-
Turbidity (NTU)	0.47	4.79	2.056	1.66	1.443	-	-
Suspended Sediment (mg/L)	0.50	7.00	2.324	2	1.722	5.40	60
Nitrite/Nitrate (mg/L)	0.001	0.017	0.006	0.006	0.004	-	-
Total Kjeldahl Nitrogen (mg/L)	0.048	0.169	0.094	0.079	0.039	-	-
Total Nitrogen (mg/L)	0.054	0.18	0.100	0.08	0.041	-	0.19
Total Phosphorus (mg/L)	0.017	0.034	0.024	0.022	0.005	-	0.015
Chloride (mg/L)	ND	0.36	0.217	0.15	0.078	-	0.15

Water Year: 2020							
Parameters	Min	Max	Mean	Median	Std Err	90th Percentile	Applicable Annual Average Standard
Streamflow (cfs)	0.341	3.741	1.216	0.739	0.986	-	-
Turbidity (NTU)	0.41	1.62	0.938	0.79	0.420	-	-
Suspended Sediment (mg/L)	0.50	4.00	2.547	3	1.162	4.00	60
Nitrite/Nitrate (mg/L)	0.001	0.011	0.004	0.003	0.004	-	-
Total Kjeldahl Nitrogen (mg/L)	0.049	0.123	0.085	0.09	0.023	-	-
Total Nitrogen (mg/L)	0.05	0.129	0.089	0.094	0.024	-	0.19
Total Phosphorus (mg/L)	0.016	0.028	0.022	0.021	0.004	-	0.015
Chloride (mg/L)	0.20	0.80	0.420	0.4	0.170	-	0.15

Water Year: 2021							
Parameters	Min	Max	Mean	Median	Std Err	90th Percentile	Applicable Annual Average Standard
Streamflow (cfs)	0.307	1.781	0.751	0.453	0.539	-	-
Turbidity (NTU)	0.35	3.11	1.036	0.875	0.687	-	-
Suspended Sediment (mg/L)	0.50	4.50	1.714	1.25	1.236	3.75	60
Nitrite/Nitrate (mg/L)	0.001	0.021	0.005	0.003	0.006	-	-
Total Kjeldahl Nitrogen (mg/L)	0.048	0.126	0.092	0.097	0.023	-	-
Total Nitrogen (mg/L)	0.053	0.144	0.097	0.1	0.026	-	0.19
Total Phosphorus (mg/L)	0.016	0.029	0.022	0.0215	0.004	-	0.015
Chloride (mg/L)	0.15	1.10	0.368	0.282	0.264	-	0.15

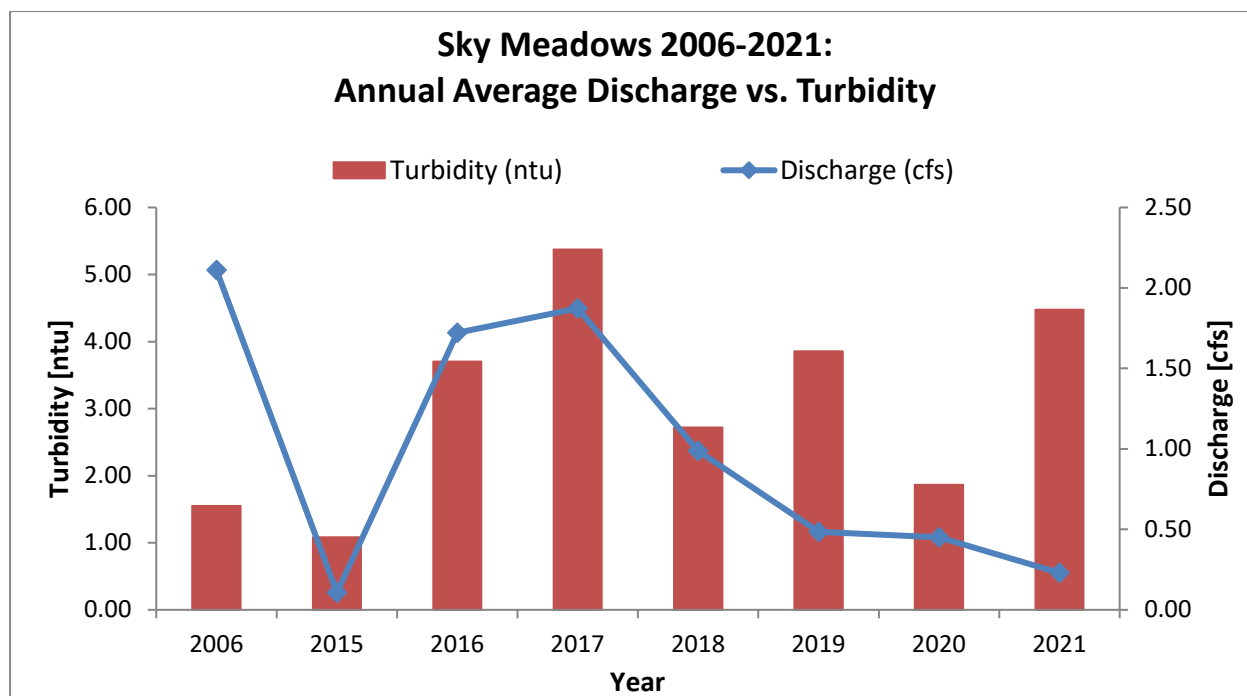


Figure C.2-1 Turbidity Versus Flow, Sky Meadows (43HVC-1A) (2006–2021)

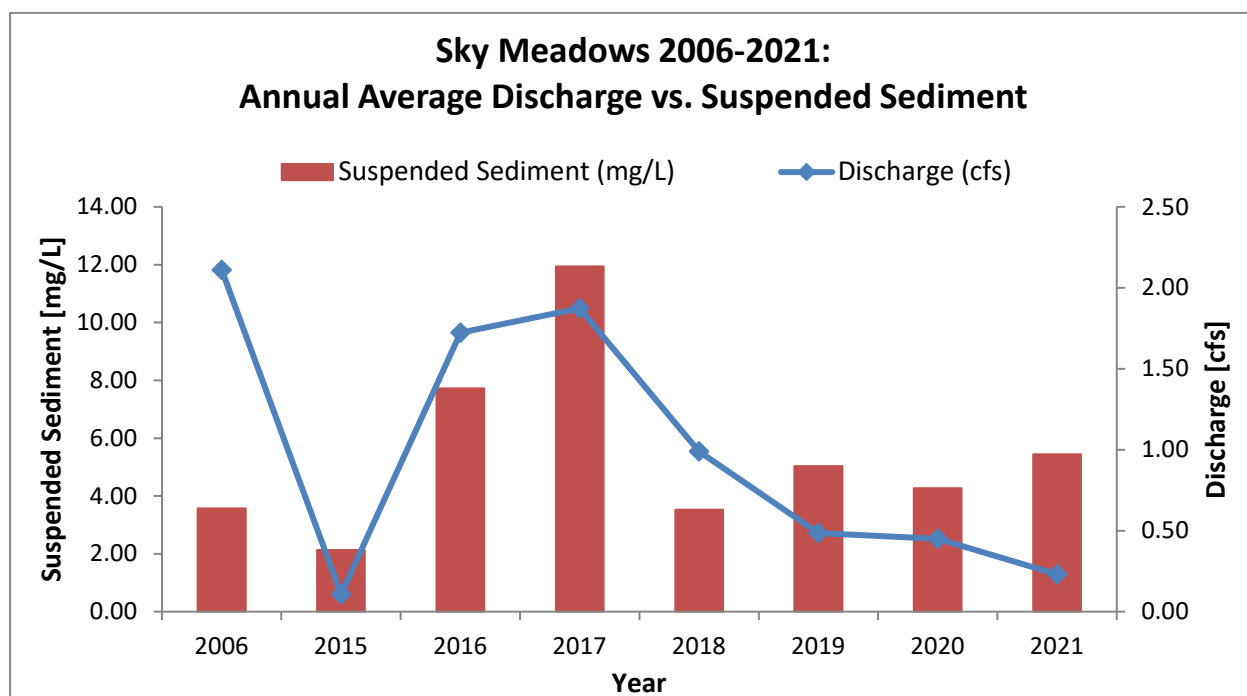


Figure C.2-2 Suspended Sediment Versus Flow, Sky Meadows (43HVC-1A) (2006–2021)

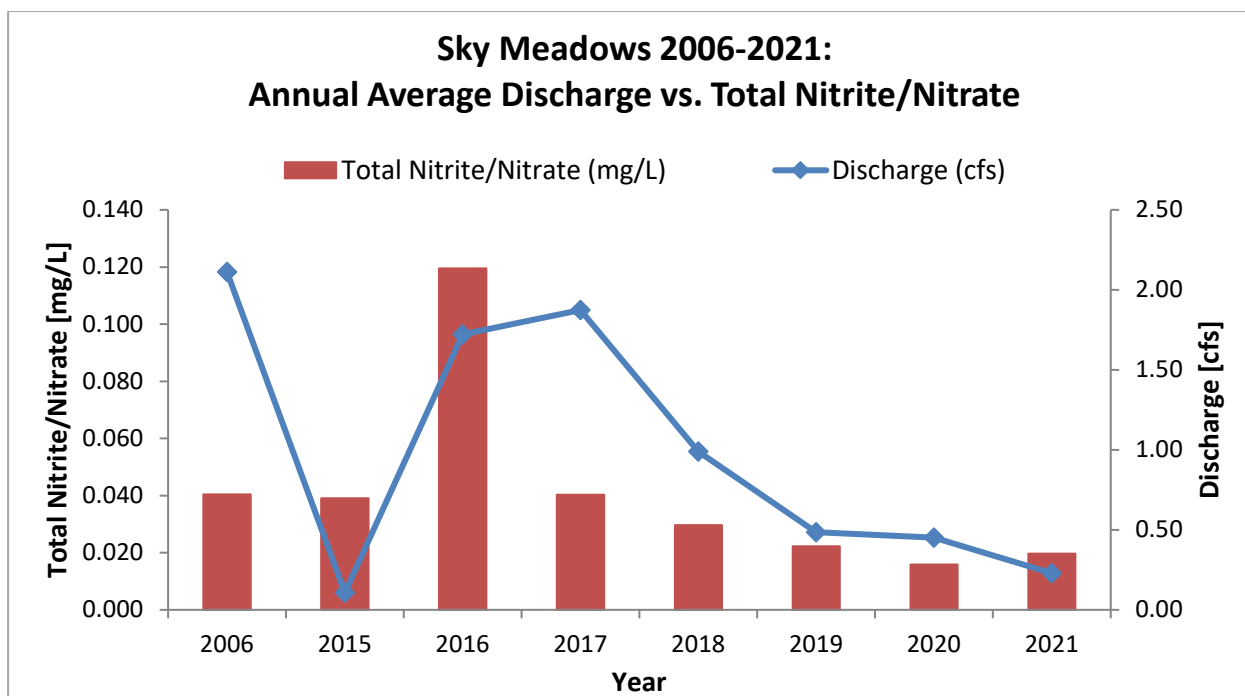


Figure C.2-3 Total Nitrite/Nitrate Versus Flow, Sky Meadows (43HVC-1A) (2006–2021)

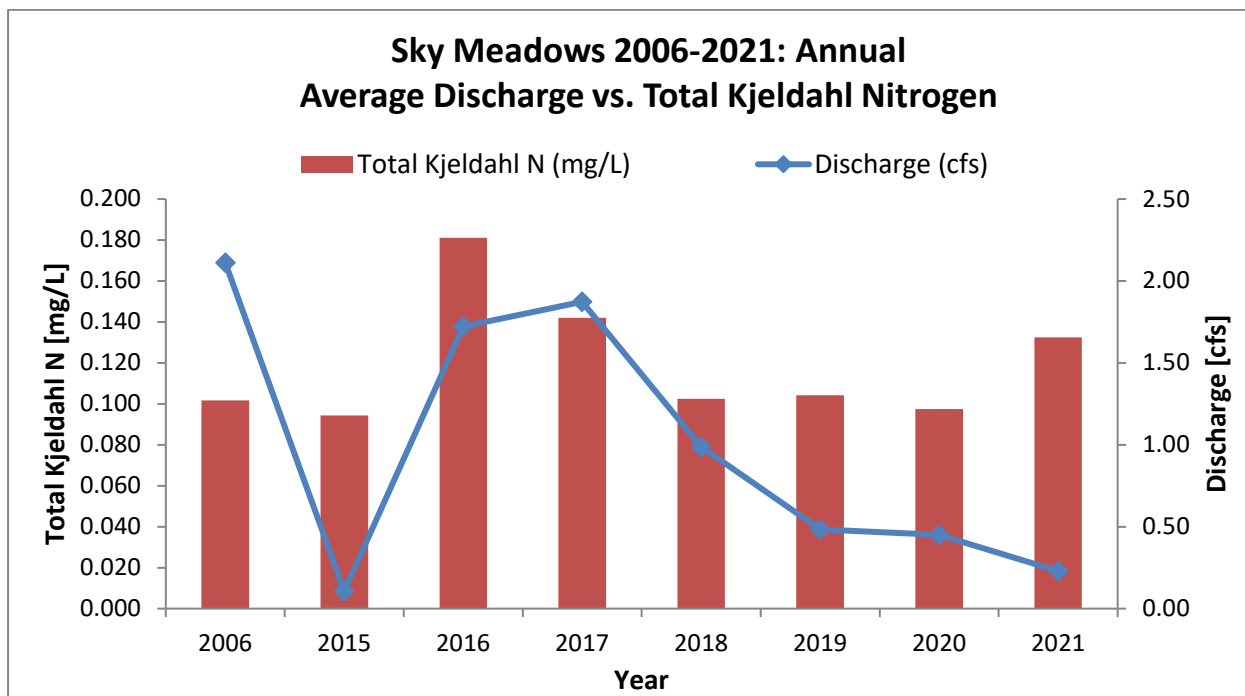


Figure C.2-4 TKN Versus Flow, Sky Meadows (43HVC-1A) (2006–2021)

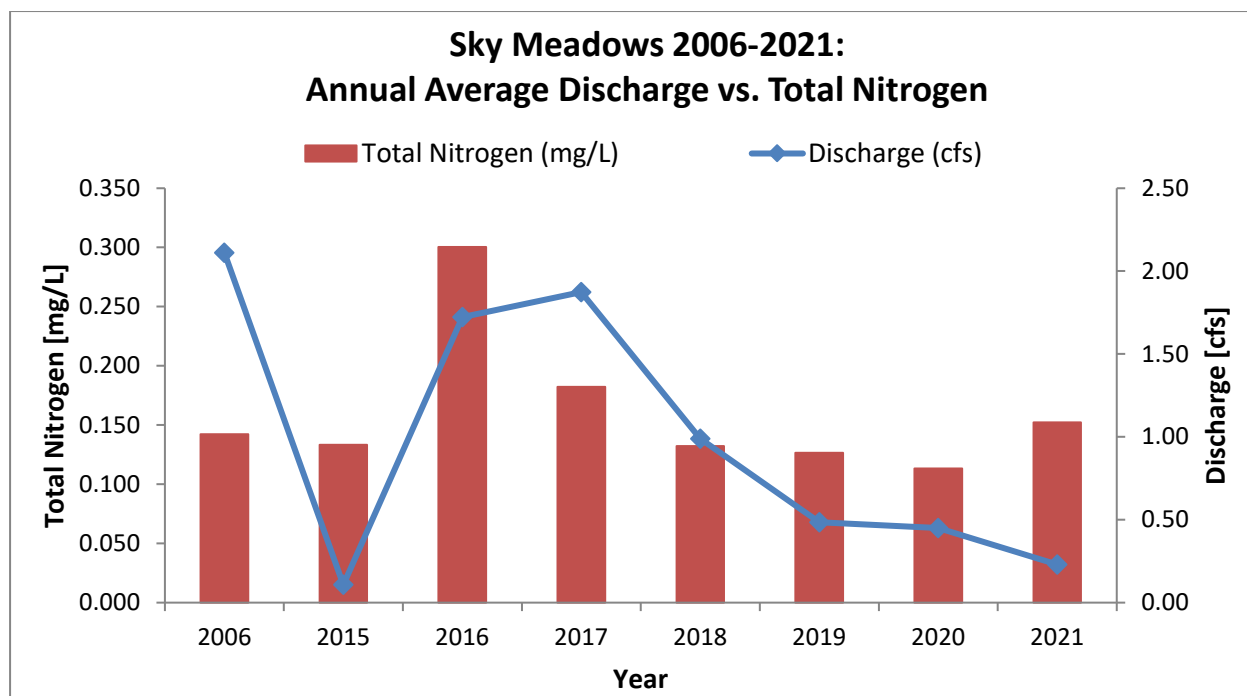


Figure C.2-5 Total Nitrogen Versus Flow, Sky Meadows (43HVC-1A) (2006–2021)

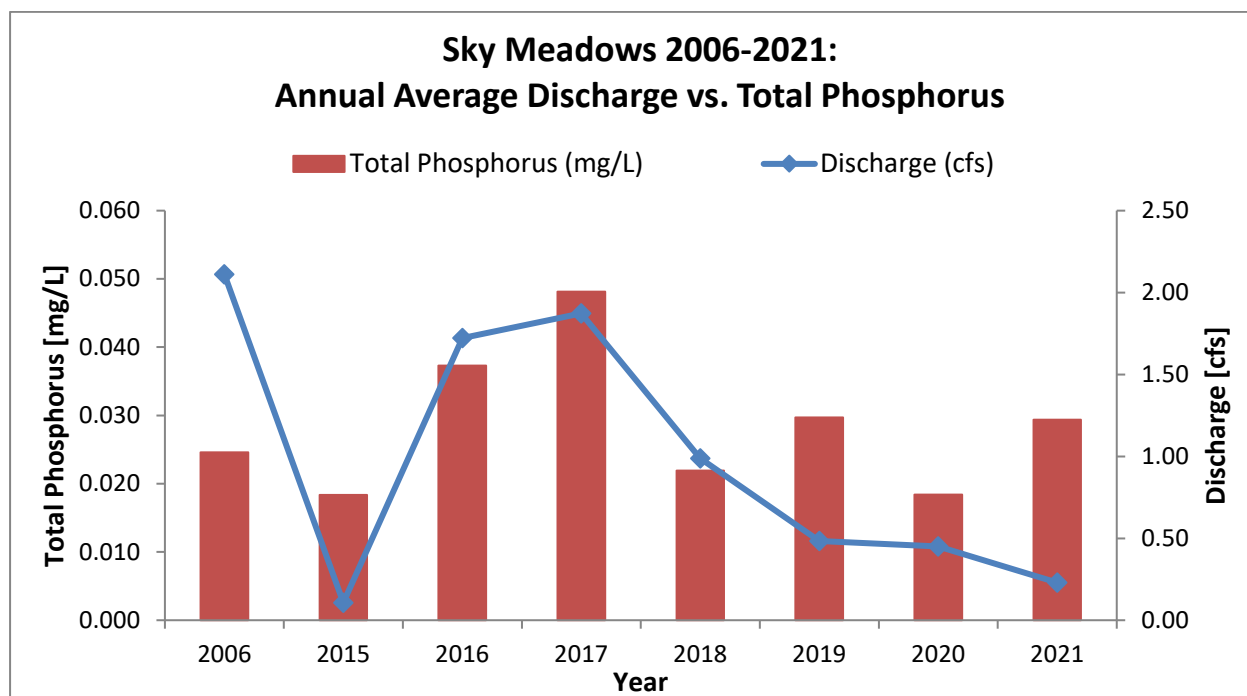


Figure C.2-6 Total Phosphorus Versus Flow, Sky Meadows (43HVC-1A) (2006–2021)

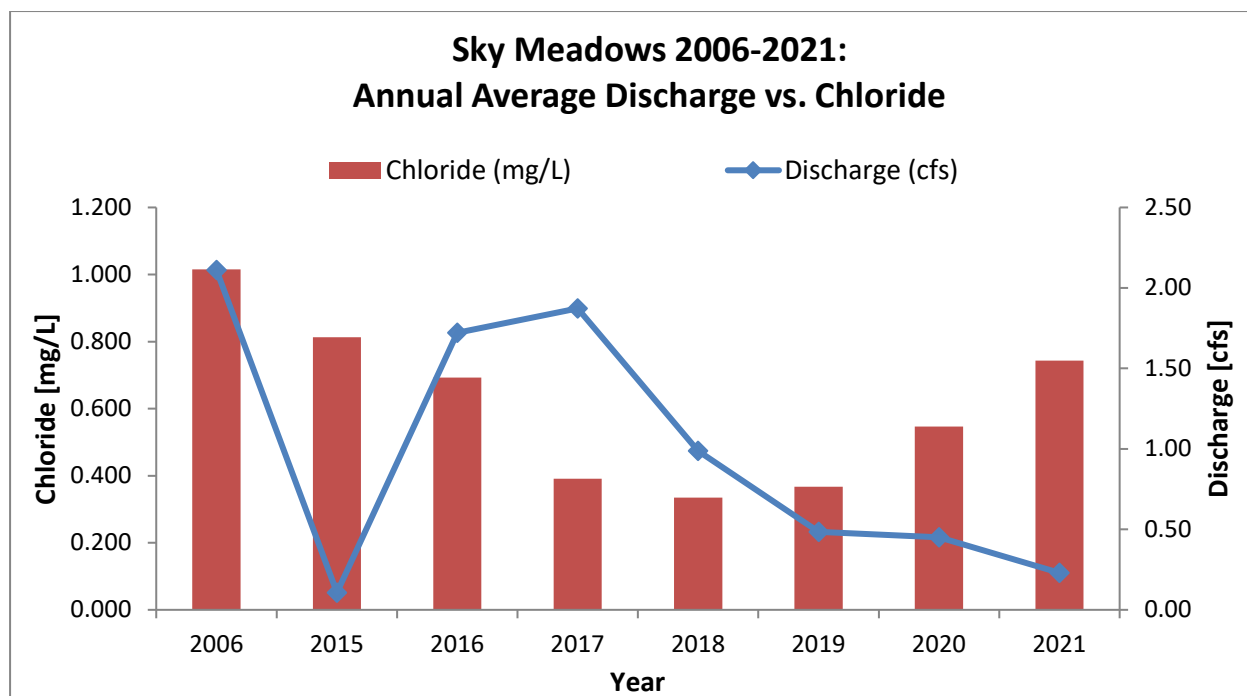


Figure C.2-7 Chloride Versus Flow, Sky Meadows (43HVC-1A) (2006–2021)

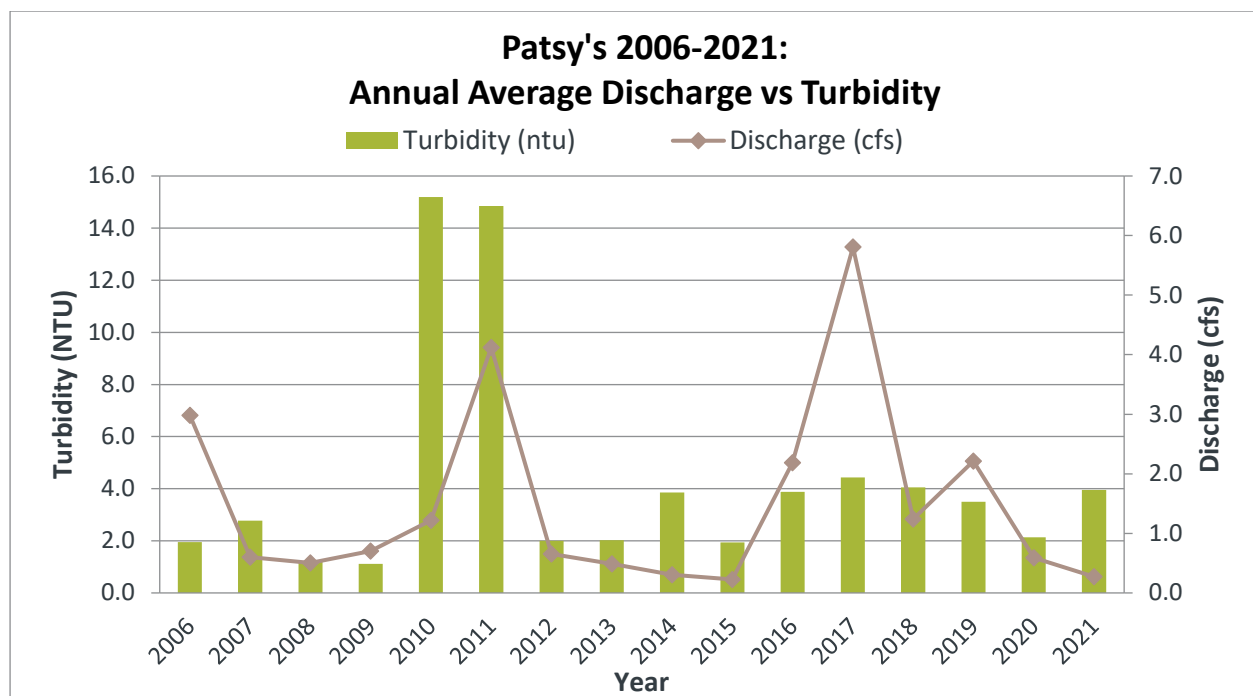


Figure C.3-1 Turbidity Versus Flow, Patsy's (43HVC-2) (2006–2021)

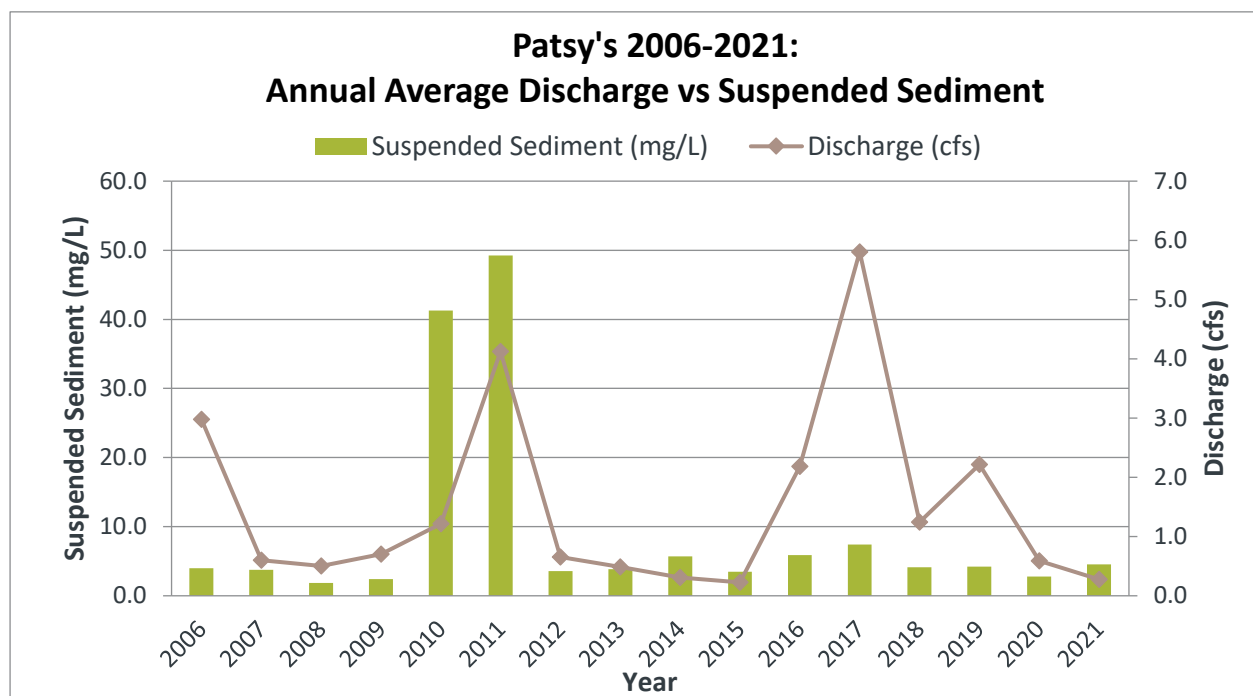


Figure C.3-2 Suspended Sediment Versus Flow, Patsy's (43HVC-2) (2006–2021)

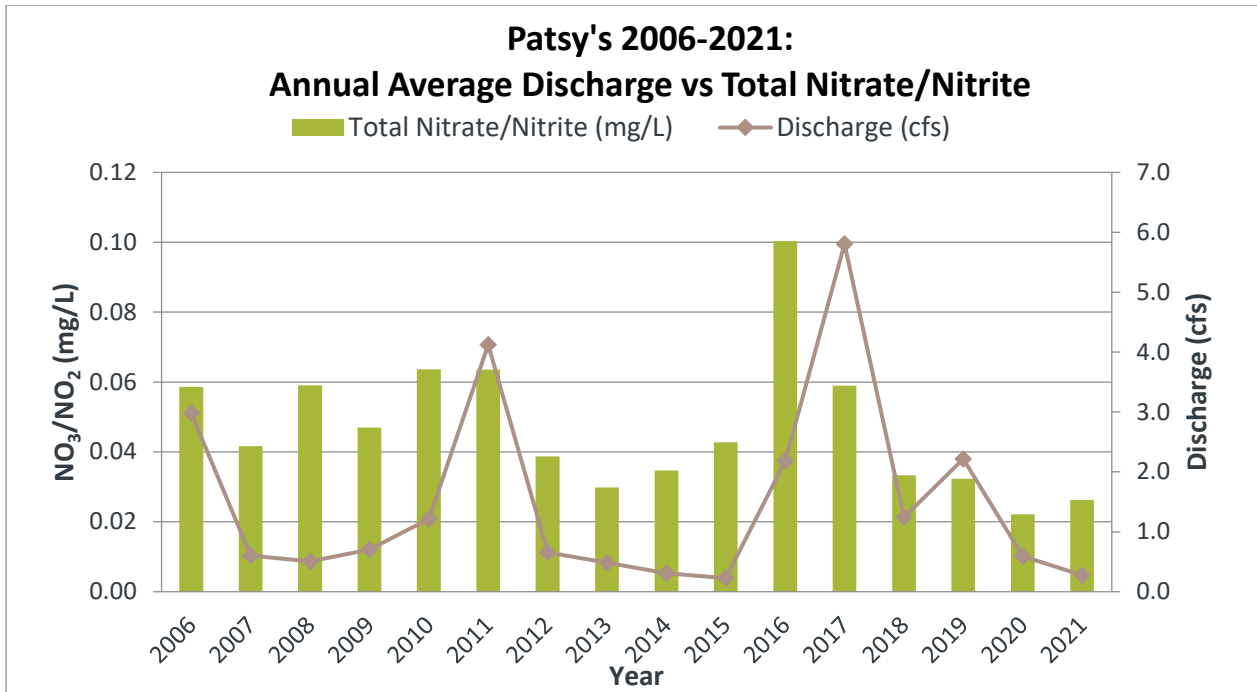


Figure C.3-3 Total Nitrite/Nitrate Versus Flow, Patsy's (43HVC-2) (2006–2021)

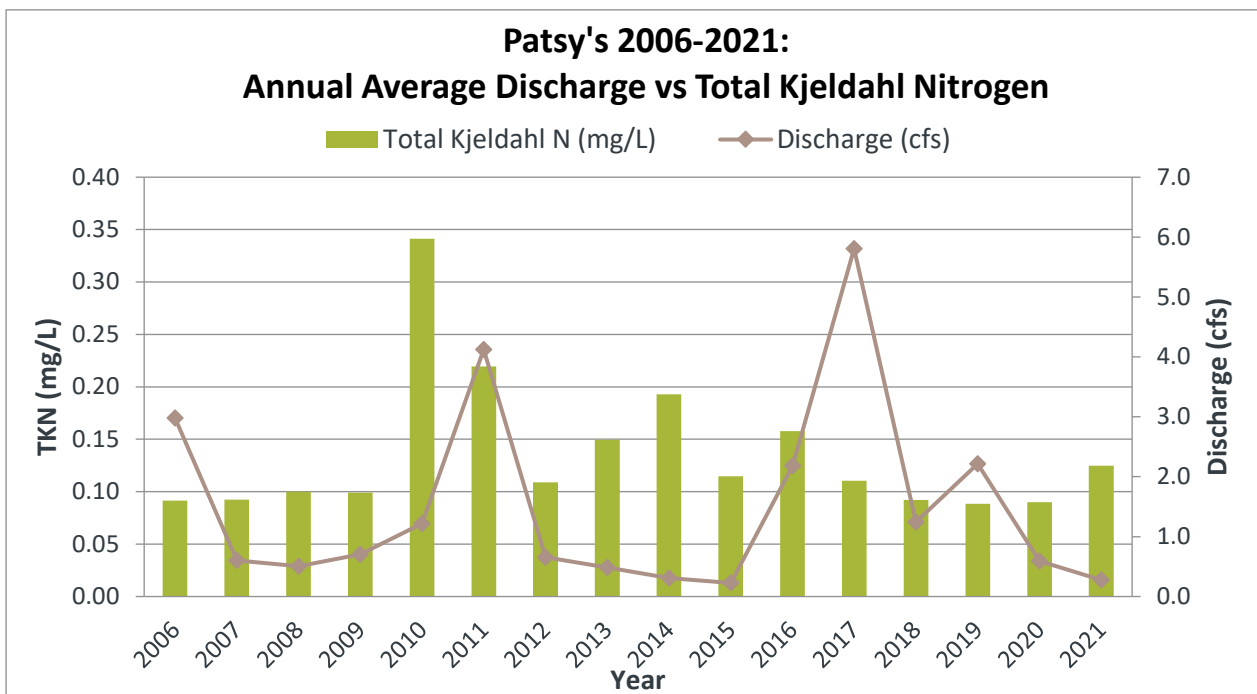


Figure C.3-4 TKN Versus Flow, Patsy's (43HVC-2) (2006–2021)

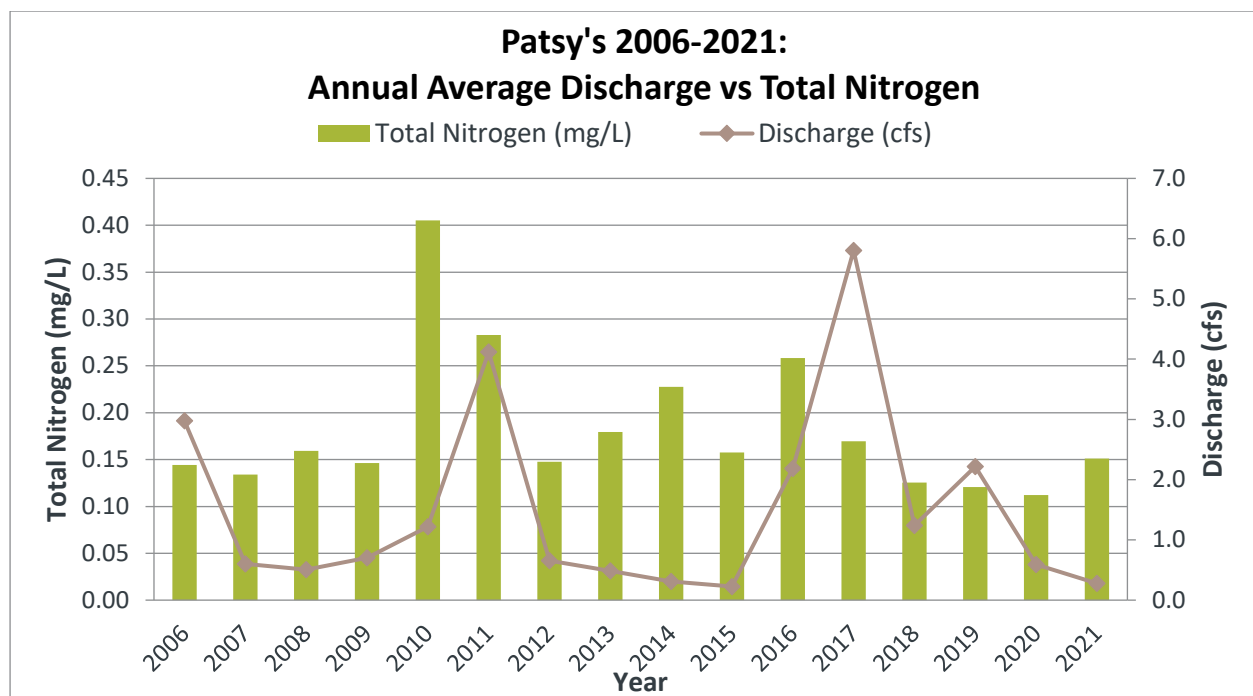


Figure C.3-5 Total Nitrogen Versus Flow, Patsy's (43HVC-2) (2006–2021)

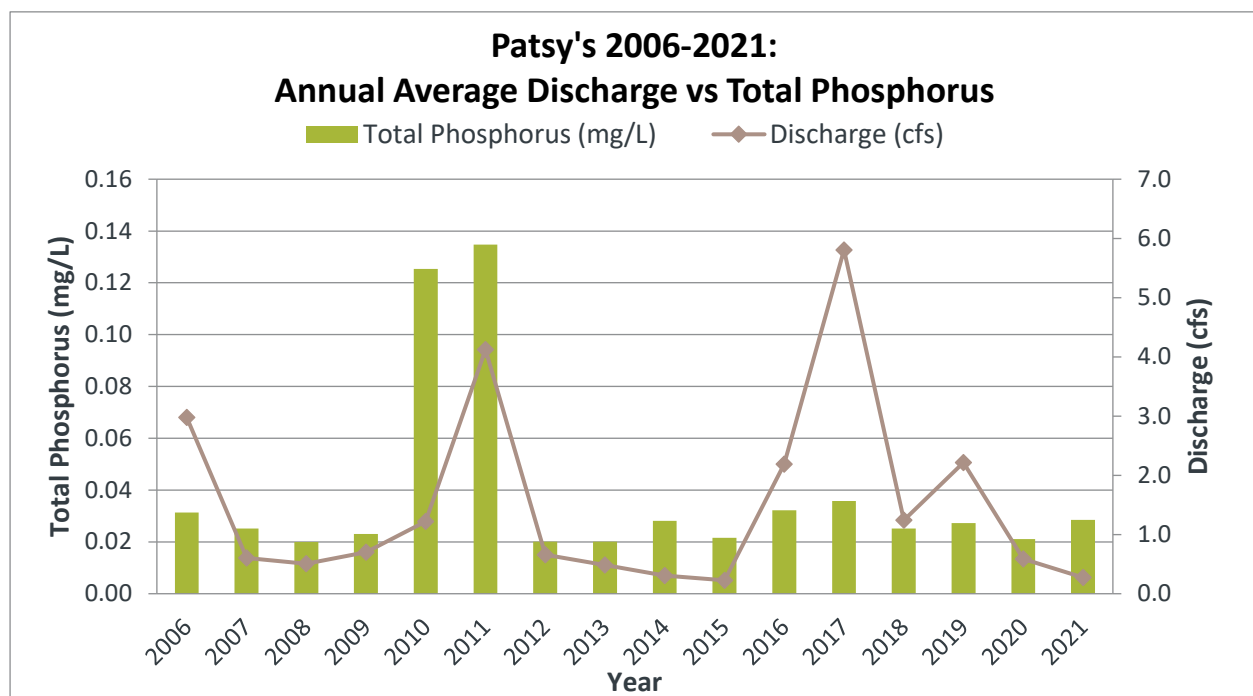


Figure C.3-6 Total Phosphorus Versus Flow, Patsy's (43HVC-2) (2006–2021)

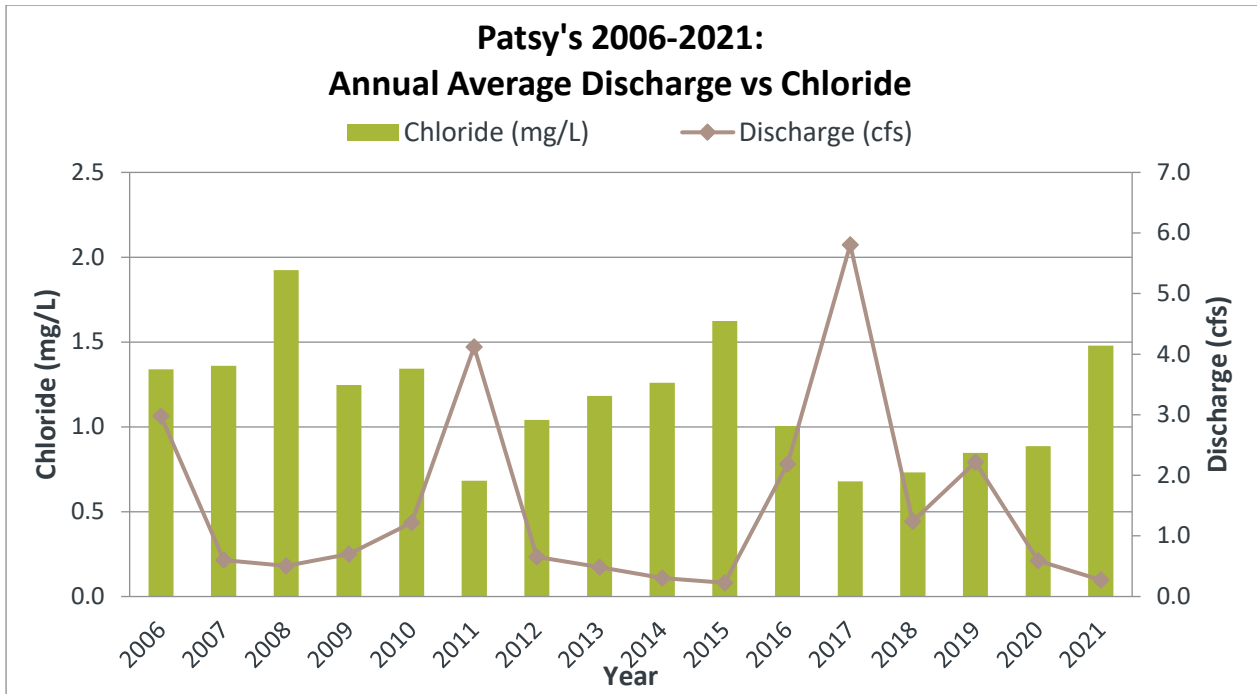


Figure C.3-7 Chloride Versus Flow, Patsy's (43HVC-2) (2006–2021)

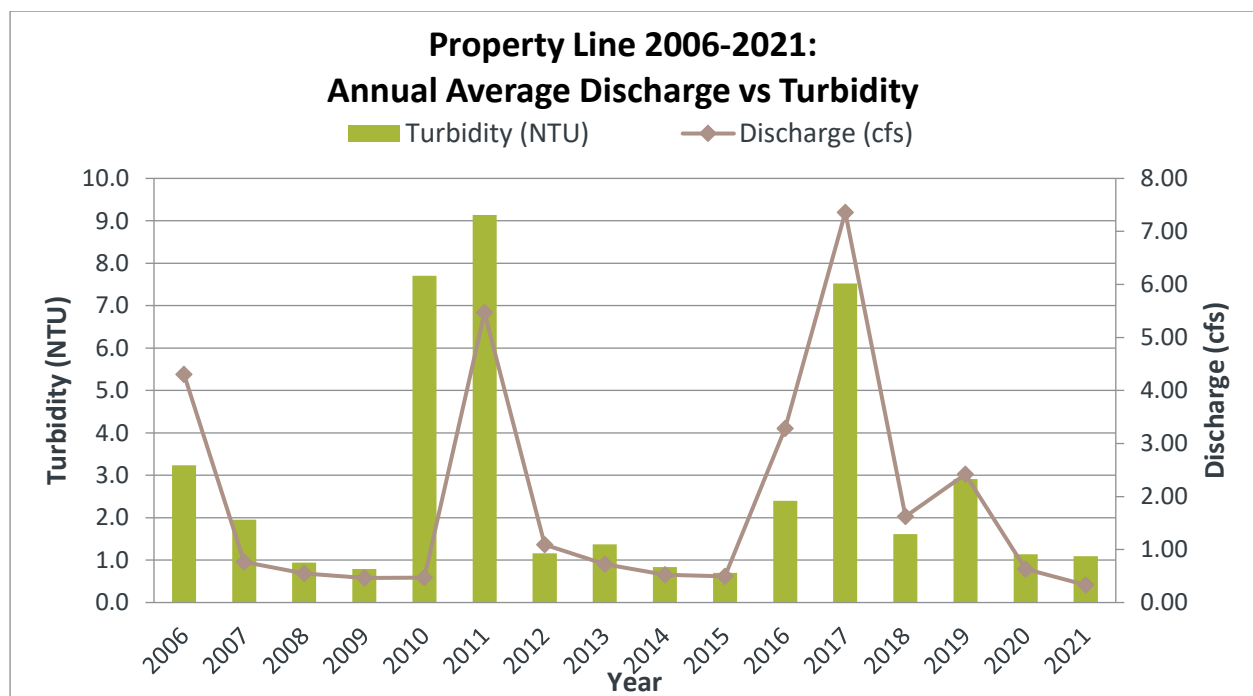


Figure C.4-1 Turbidity Versus Flow, Property Line (43HVC-3) (2006–2021)

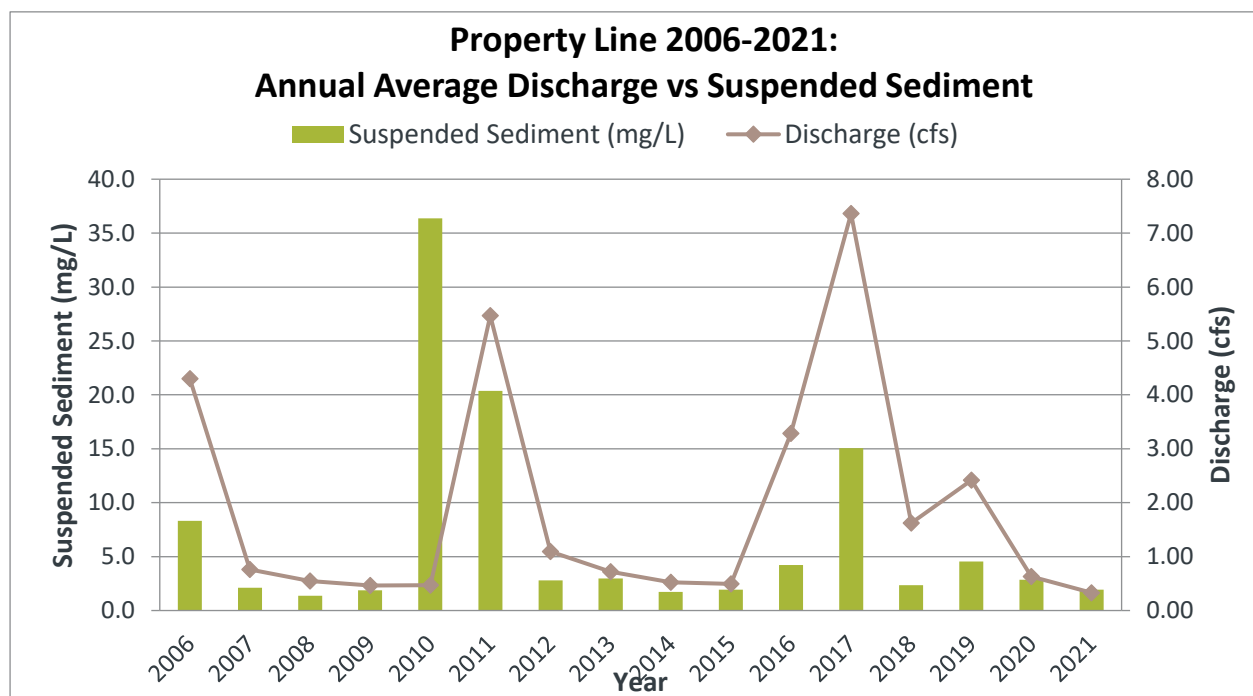


Figure C.4-2 Suspended Sediment Versus Flow, Property Line (43HVC-3) (2006–2021)

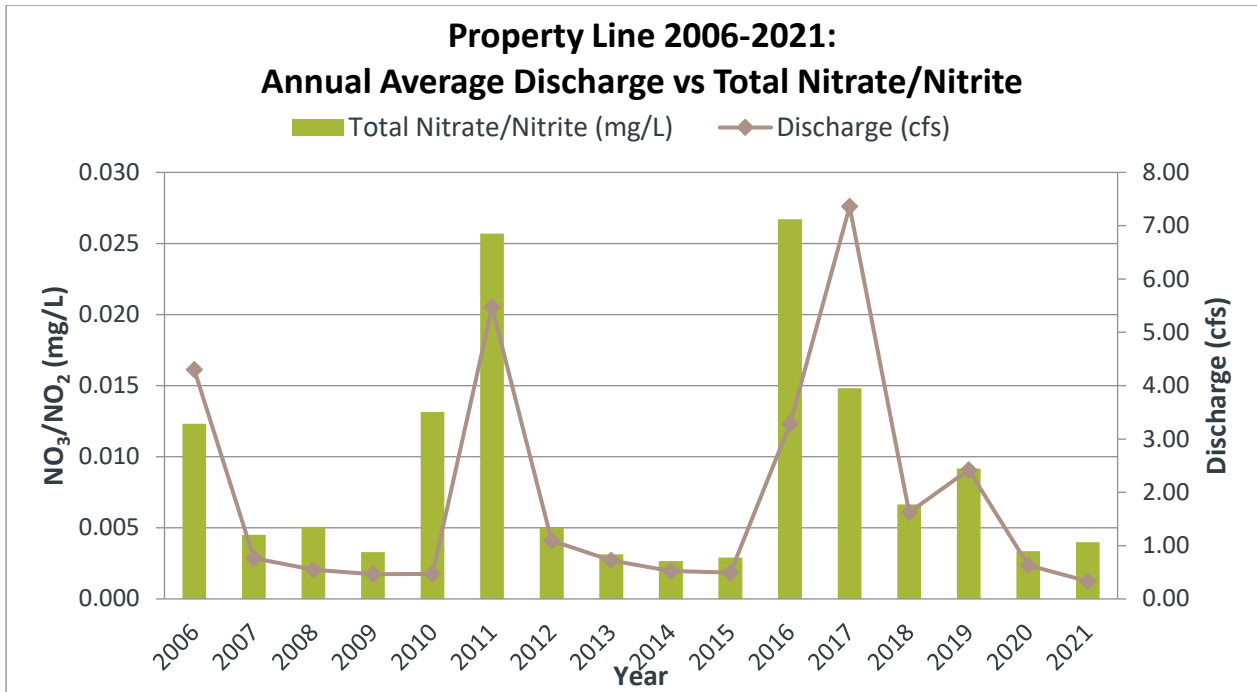


Figure C.4-3 Total Nitrite/Nitrate Versus Flow, Property Line (43HVC-3) (2006–2021)

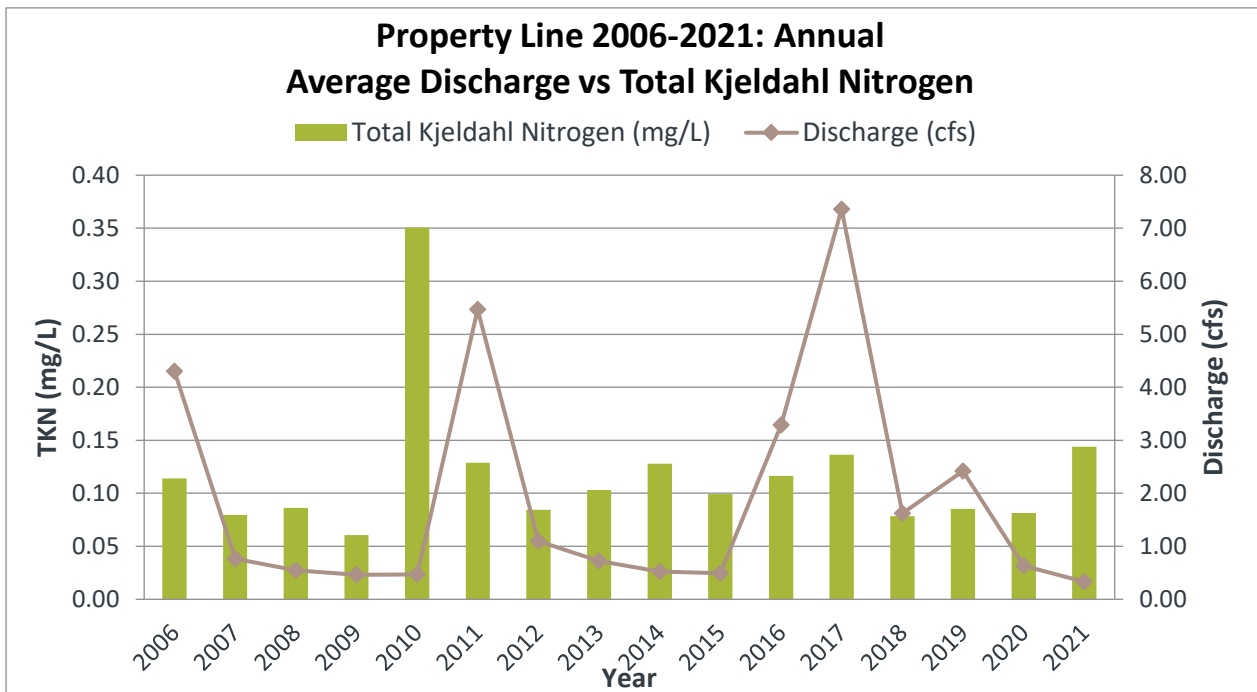


Figure C.4-4 Total Kjeldahl Nitrogen Versus Flow, Property Line (43HVC-3) (2006–2021)

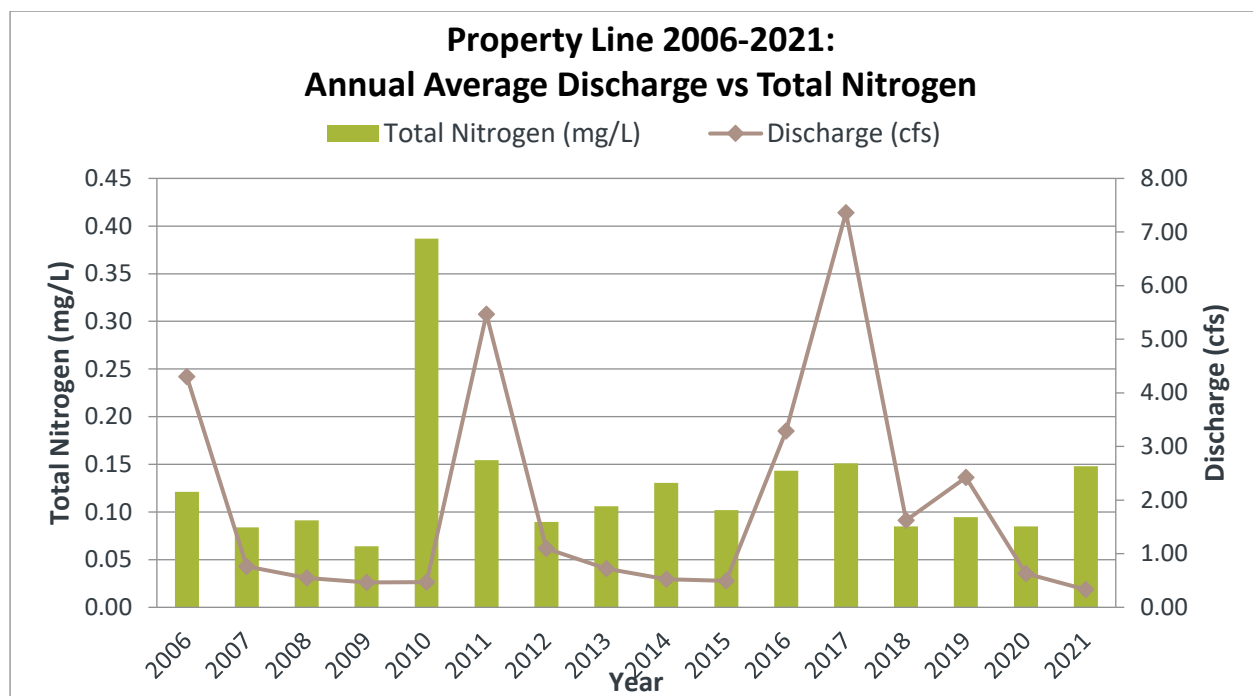


Figure C.4-5 Total Nitrogen Versus Flow, Property Line (43HVC-3) (2006–2021)

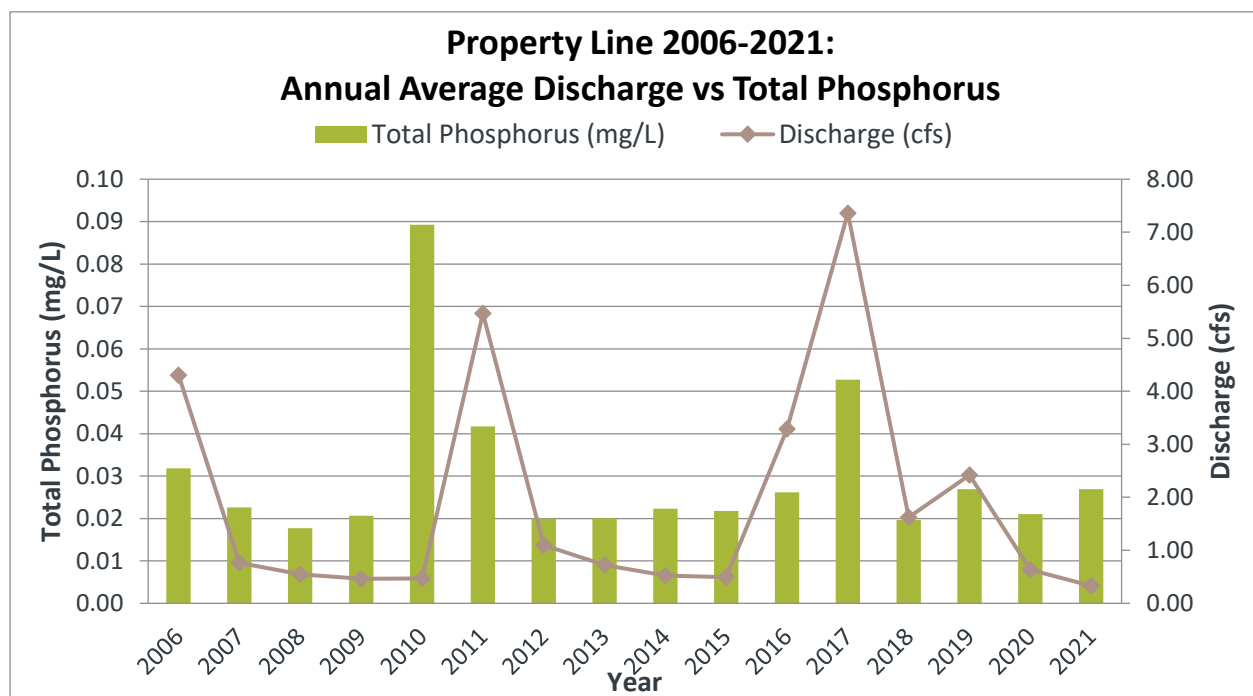


Figure C.4-6 Total Phosphorus Versus Flow, Property Line (43HVC-3) (2006–2021)

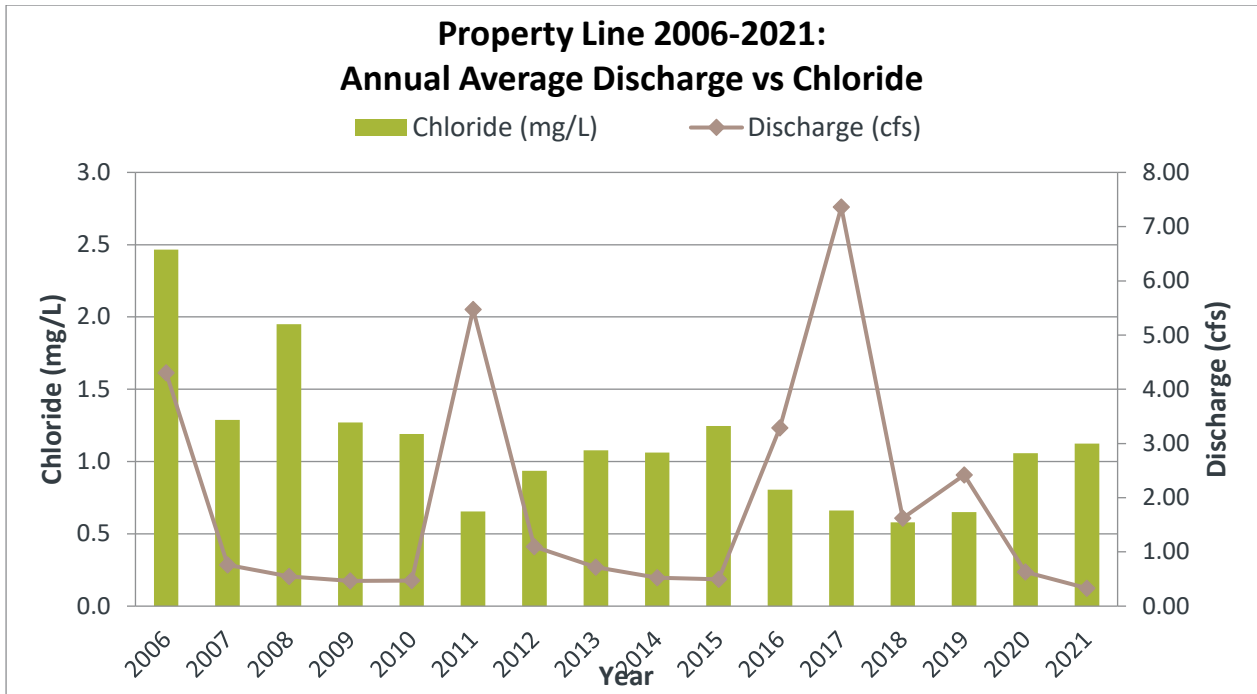


Figure C.4-7 Chloride Versus Flow, Property Line (43HVC-3) (2006–2021)

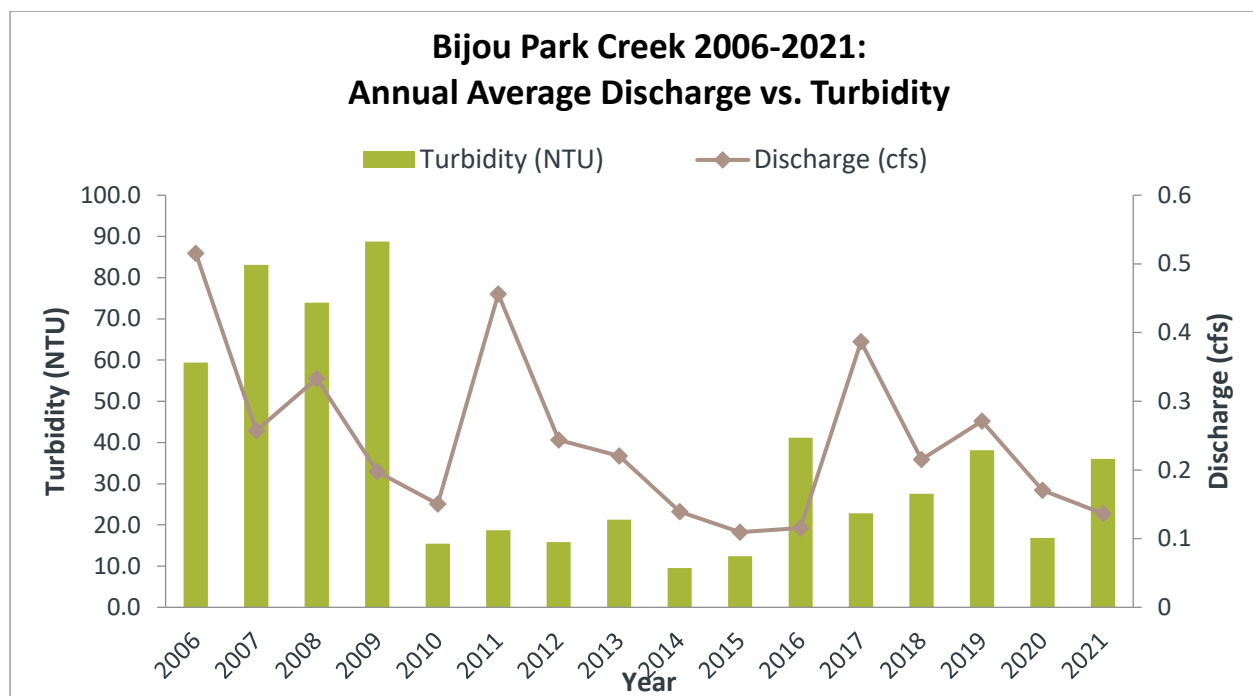


Figure C.5-1 Turbidity Versus Flow, Bijou Park Creek (43BPC-4) (2006–2021)

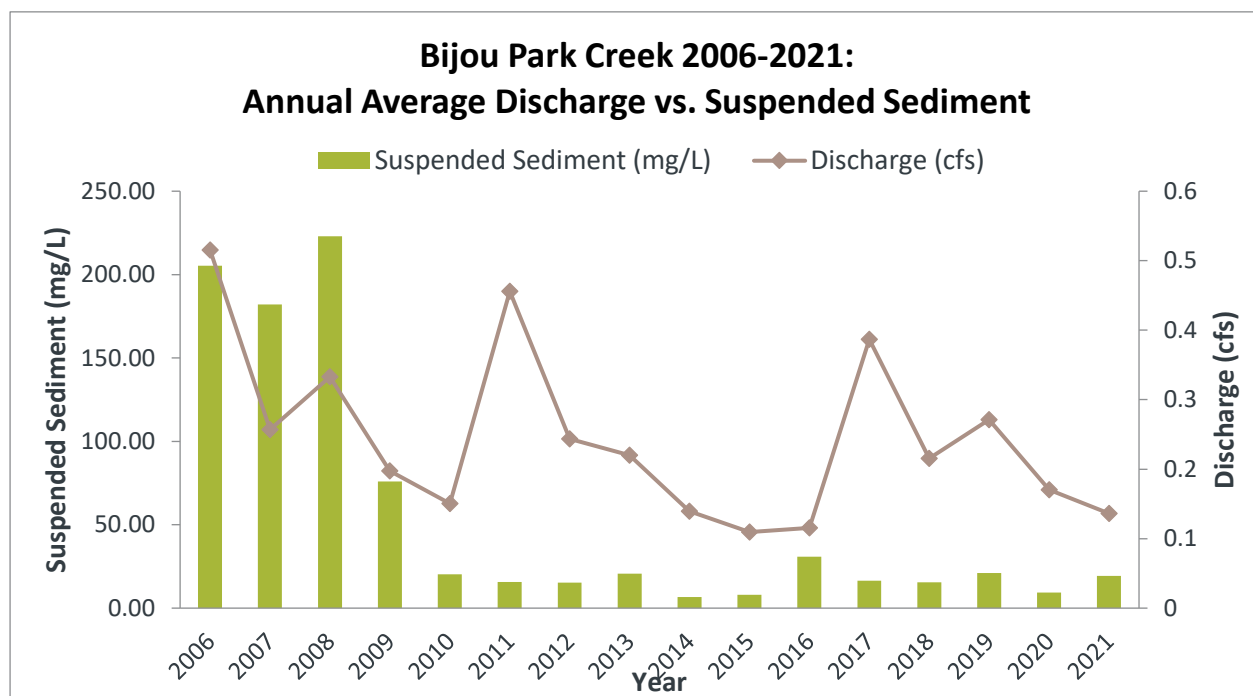


Figure C.5-2 Suspended Sediment Versus Flow, Bijou Park Creek (43BPC-4) (2006–2021)

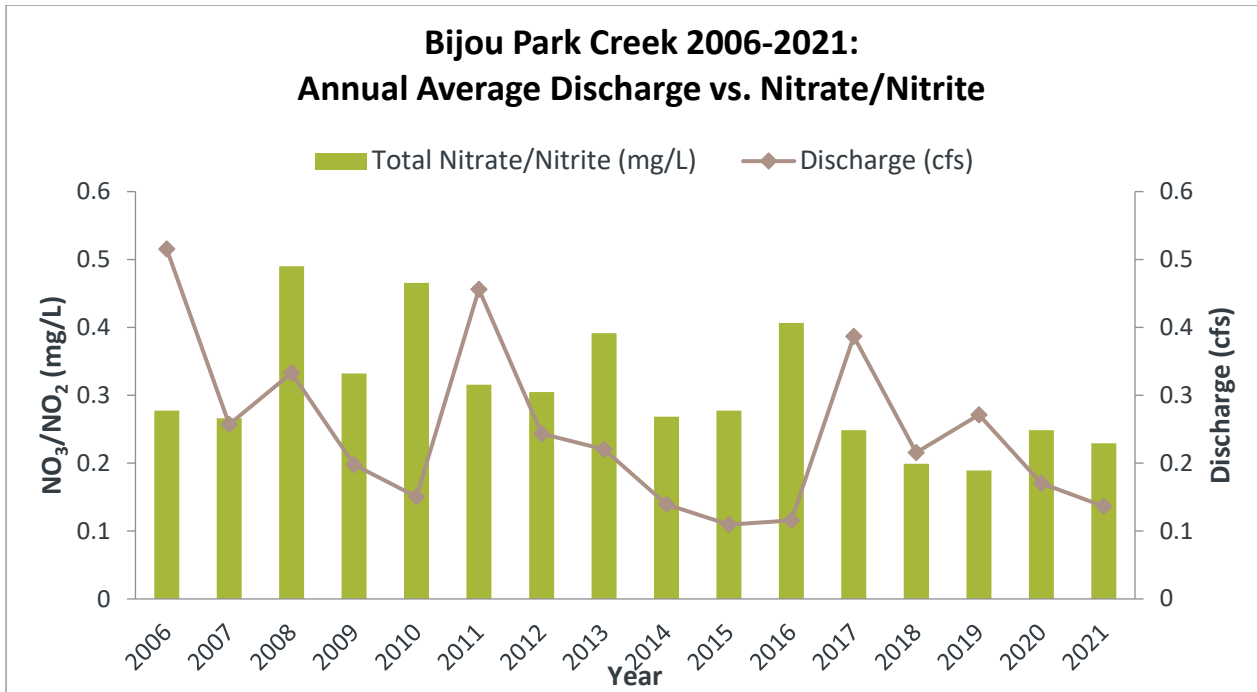


Figure C.5-3 Total Nitrite/Nitrate Versus Flow, Bijou Park Creek (43BPC-4) (2006–2021)

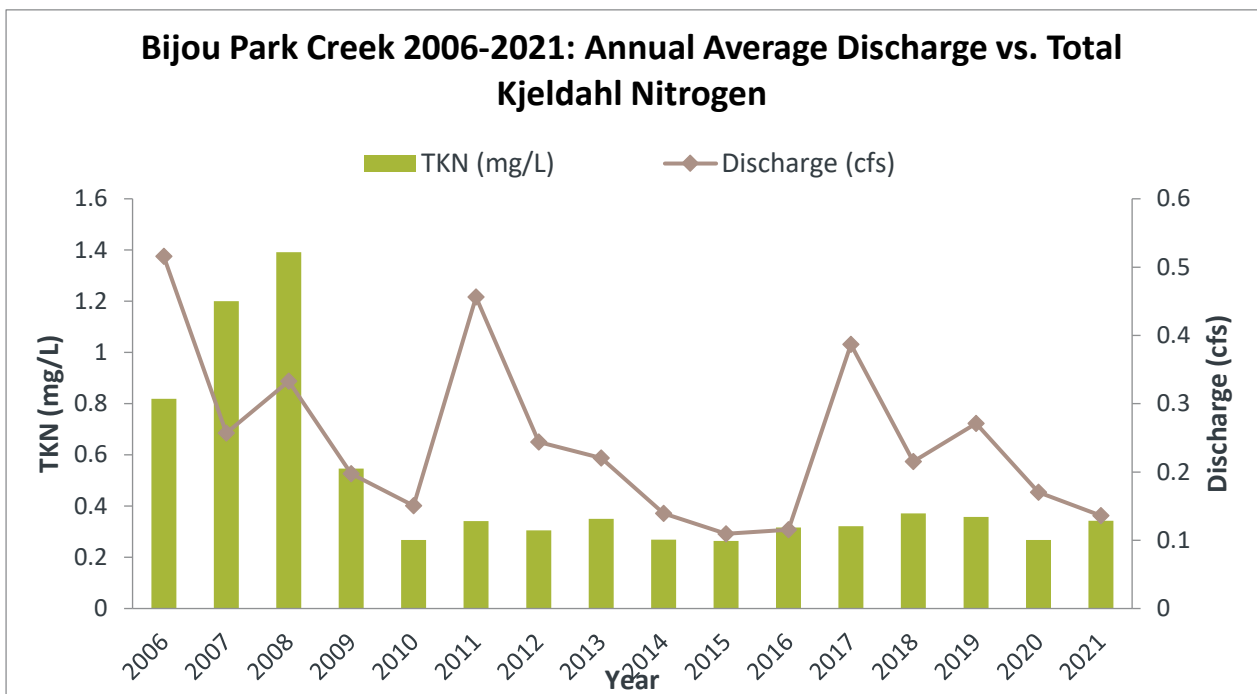


Figure C.5-4 TKN Versus Flow, Bijou Park Creek (43BPC-4) (2006–2021)

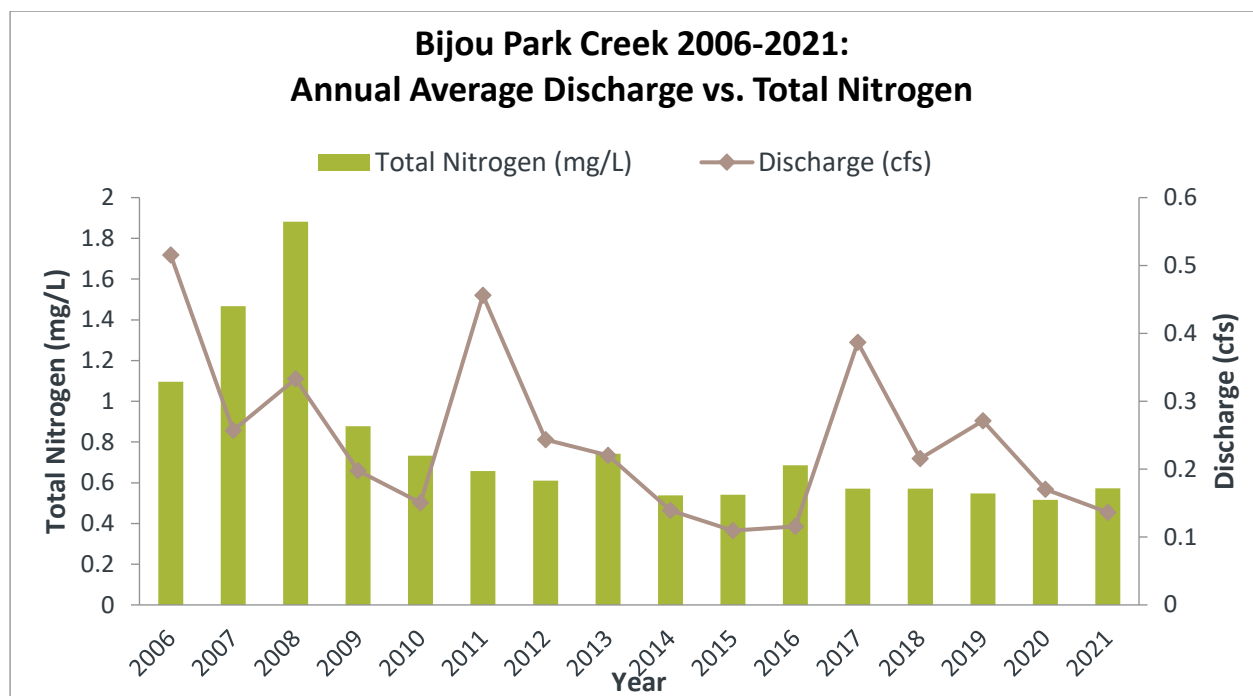


Figure C.5-5 Total Nitrogen Versus Flow, Bijou Park Creek (43BPC-4) (2006–2021)

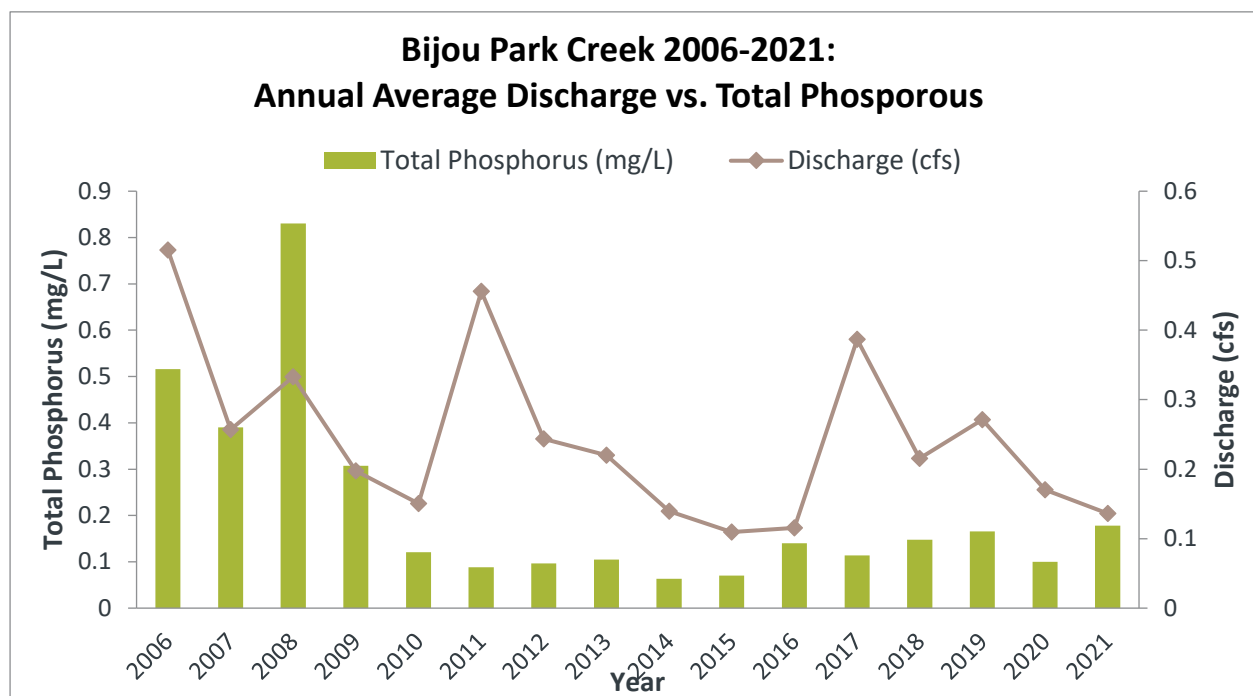


Figure C.5-6 Total Phosphorous Versus Flow, Bijou Park Creek (43BPC-4) (2006–2021)

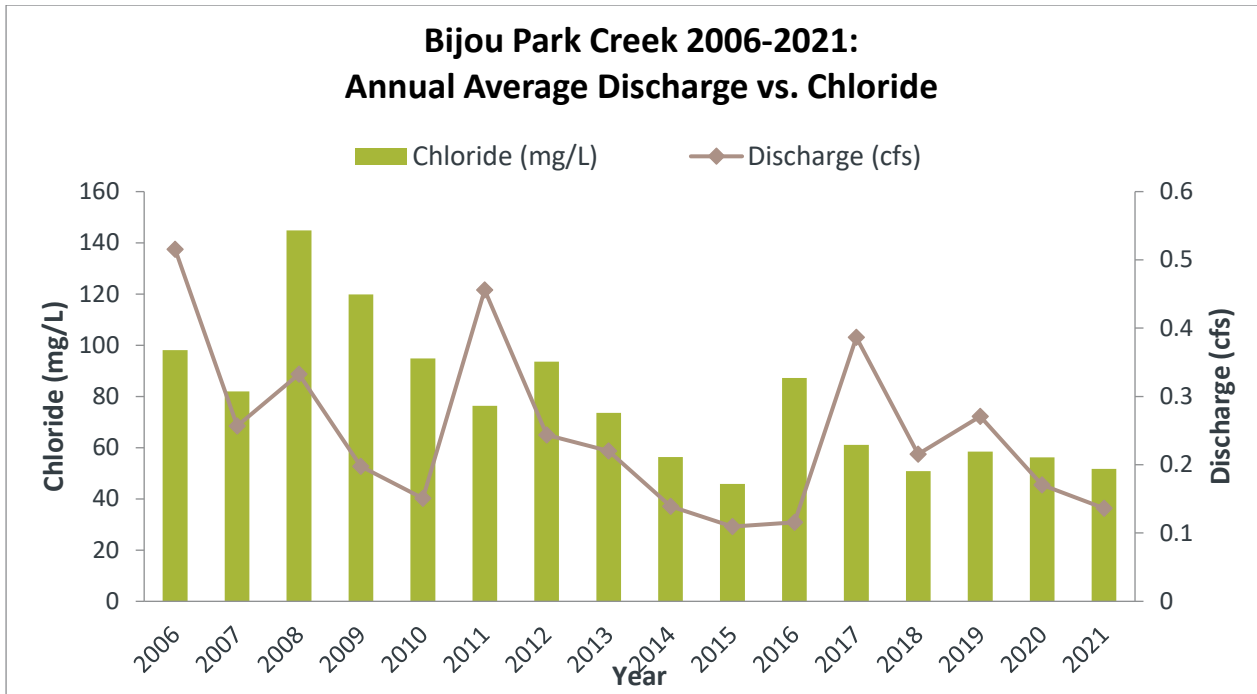


Figure C.5-7 Chloride Versus Flow, Bijou Park Creek (43BPC-4) (2006–2021)

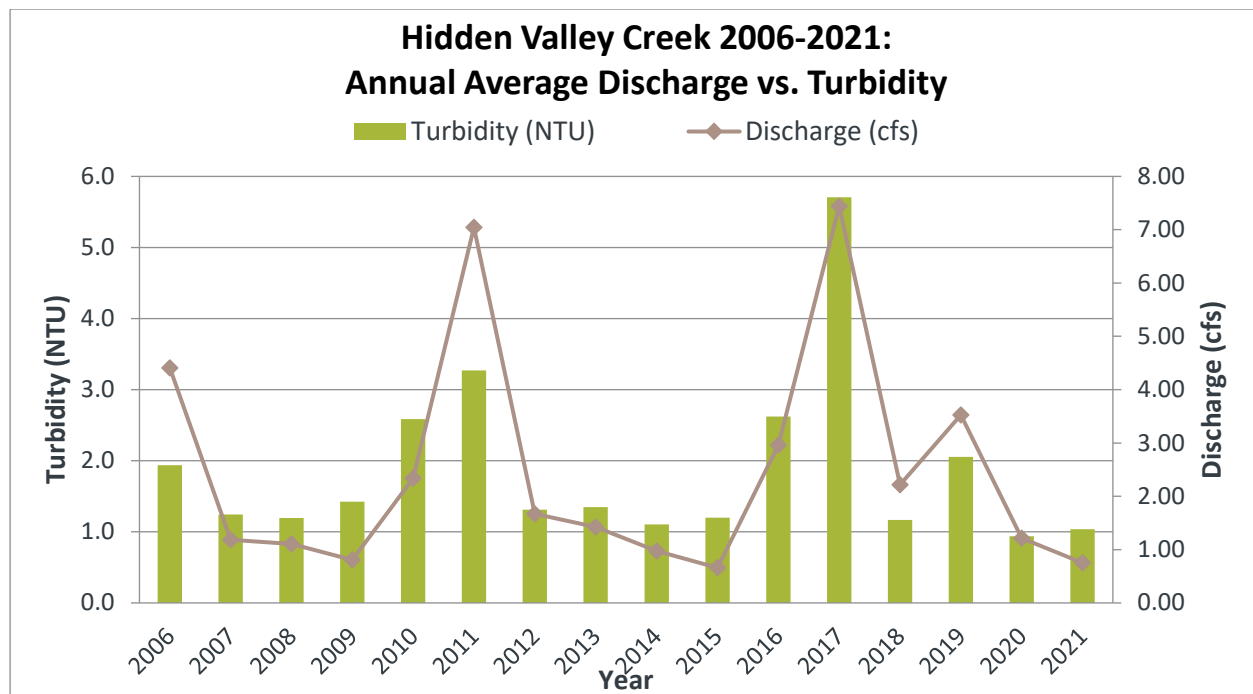


Figure C.6-1 Turbidity Versus Flow, Hidden Valley Creek (43HDVC-5) (2006–2021)

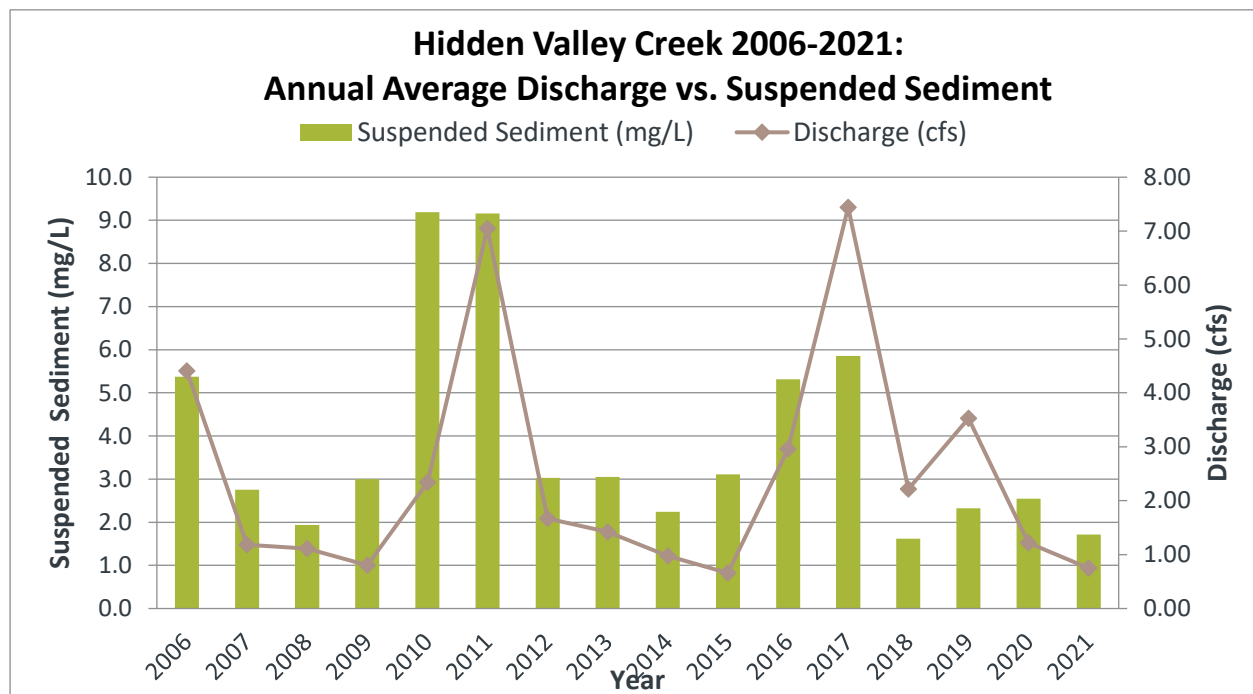


Figure C.6-2 Suspended Sediment Versus Flow, Hidden Valley Creek (43HDVC-5) (2006–2021)

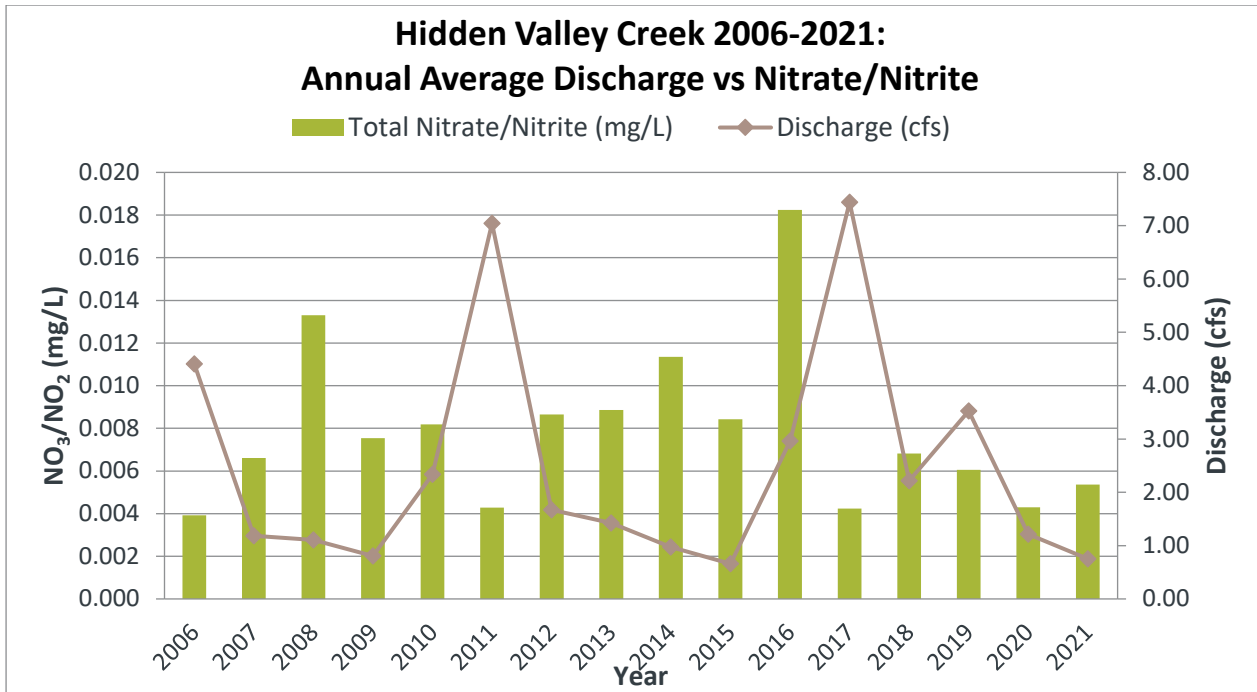


Figure C.6-3 Total Nitrite/Nitrate Versus Flow, Hidden Valley Creek (43HDVC-5) (2006–2021)

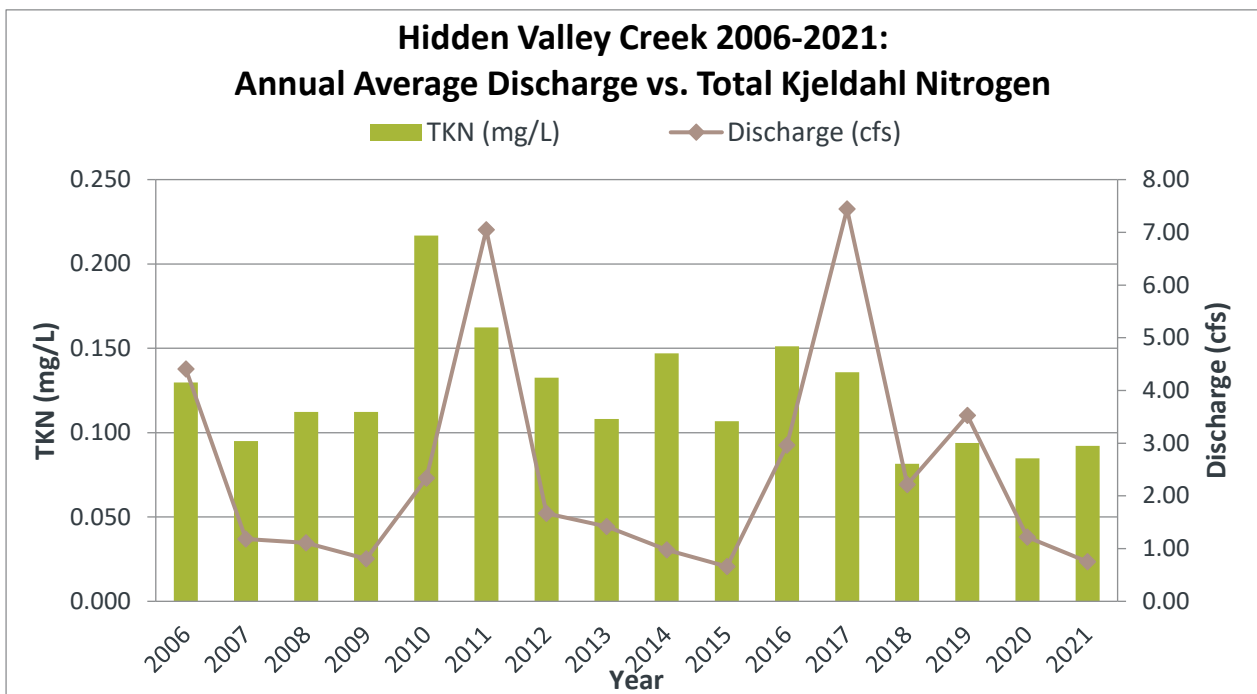


Figure C.6-4 TKN Versus Flow, Hidden Valley Creek (43HDVC-5) (2006–2021)

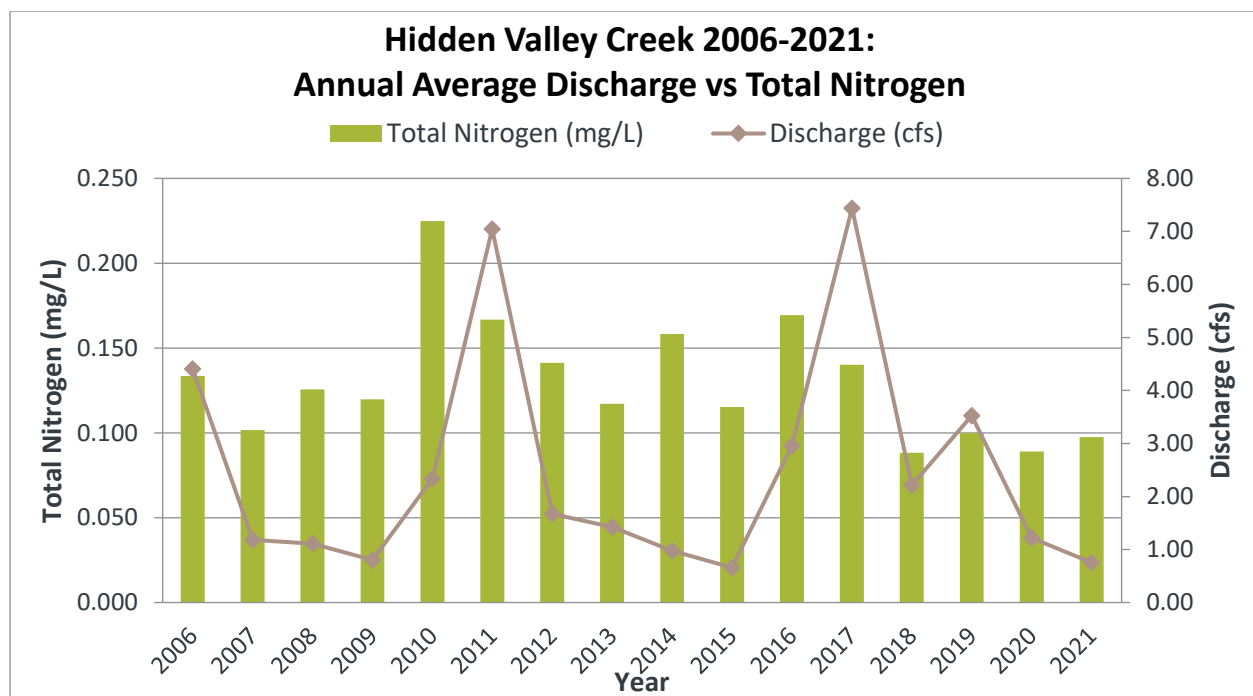


Figure C.6-5 Total Nitrogen Versus Flow, Hidden Valley Creek (43HDVC-5) (2006–2021)

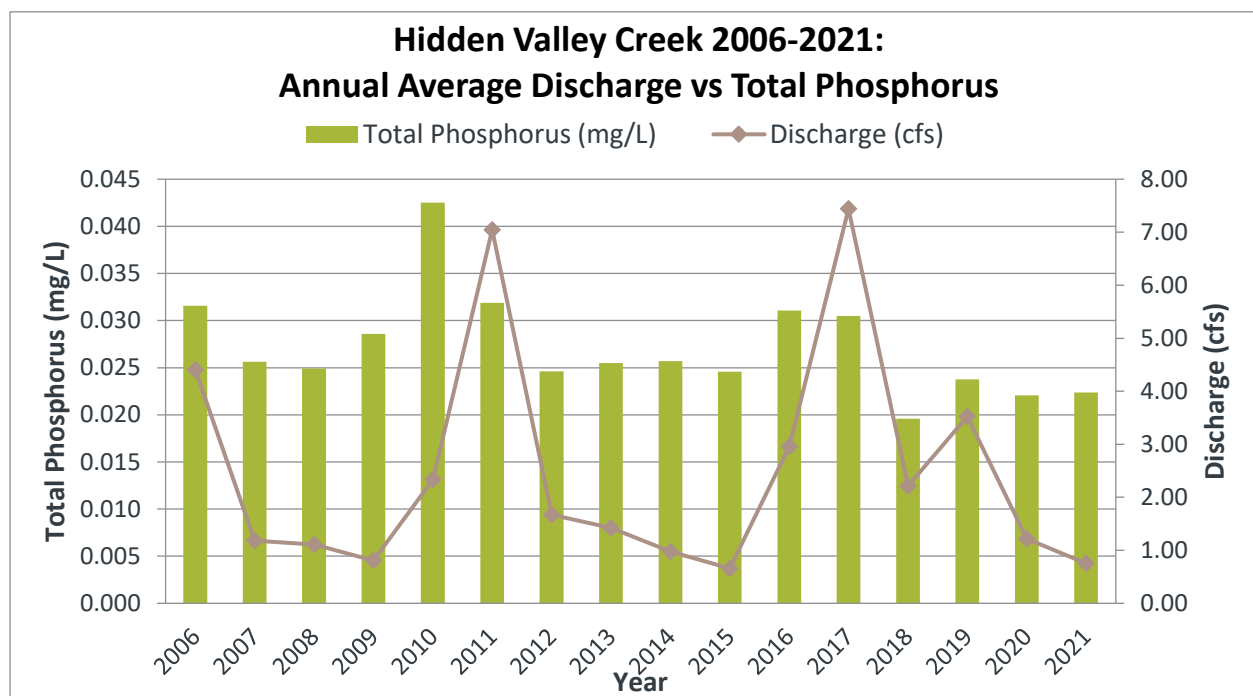


Figure C.6-6 Total Phosphorus Versus Flow, Hidden Valley Creek (43HDVC-5) (2006–2021)

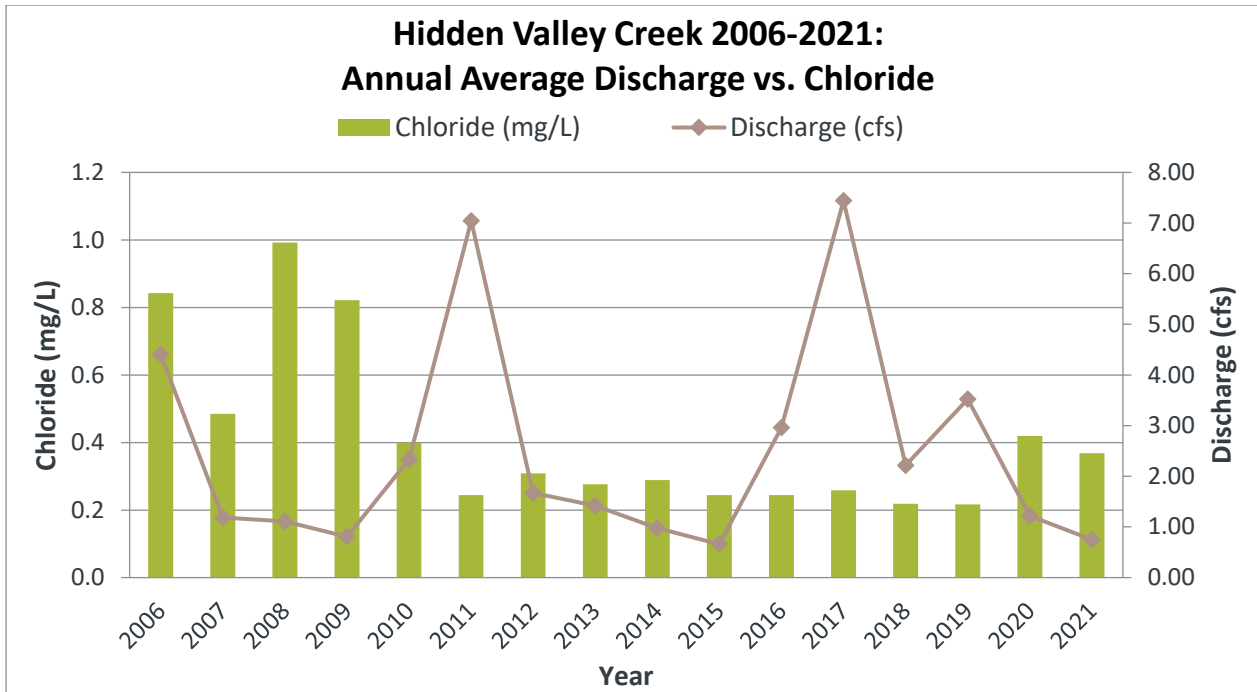


Figure C.6-7 Chloride Versus Flow, Hidden Valley Creek (43HDVC-5) (2006–2021)

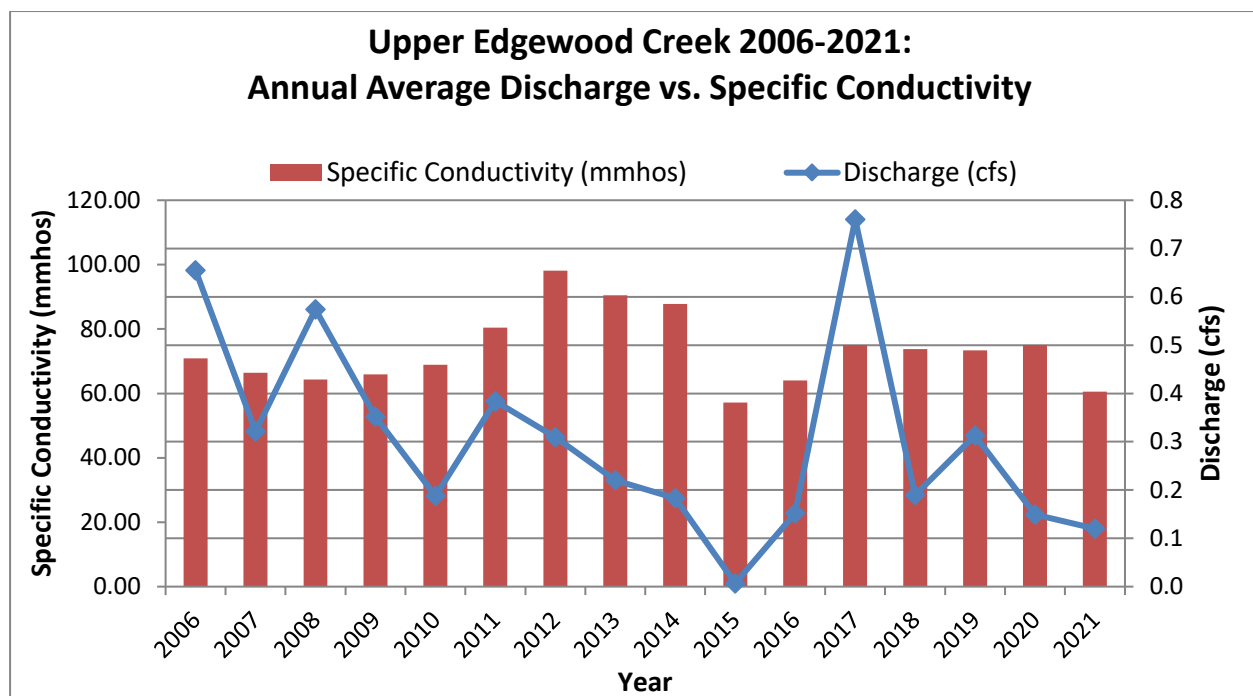


Figure C.7-1 Specific Conductivity Versus Flow, Upper Edgewood Creek (43HVE-1) (2006–2021)

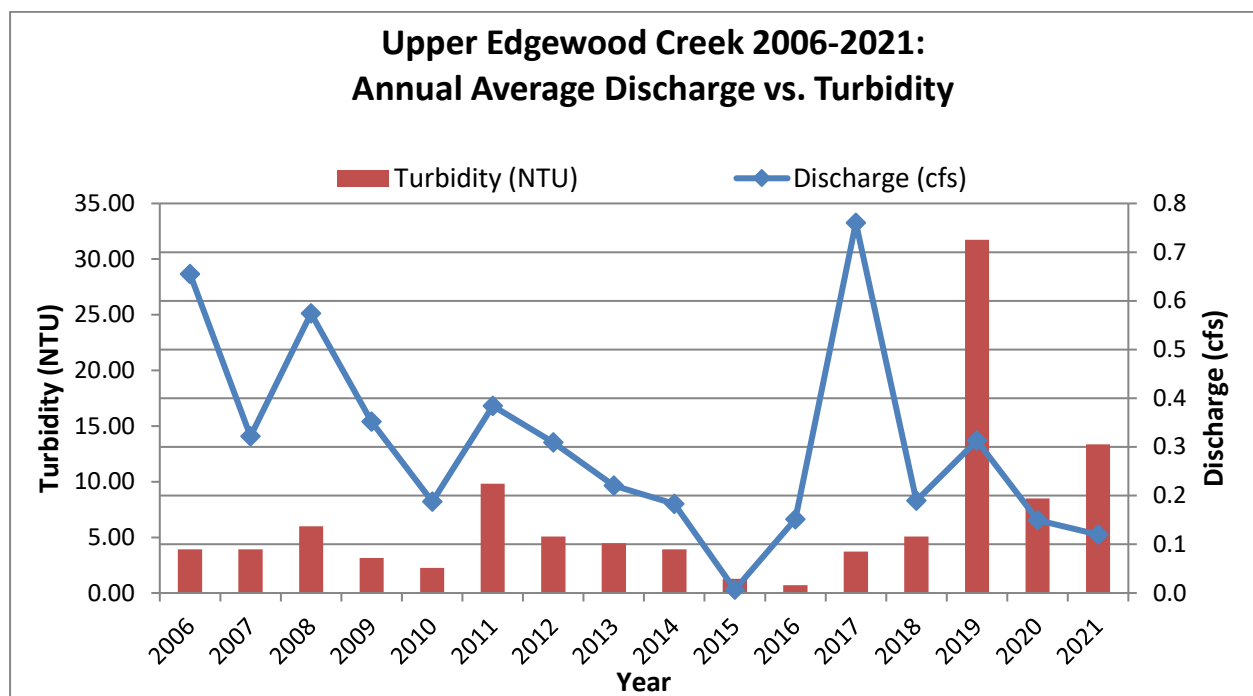


Figure C.7-2 Turbidity Versus Flow, Upper Edgewood Creek (43HVE-1) (2006–2021)

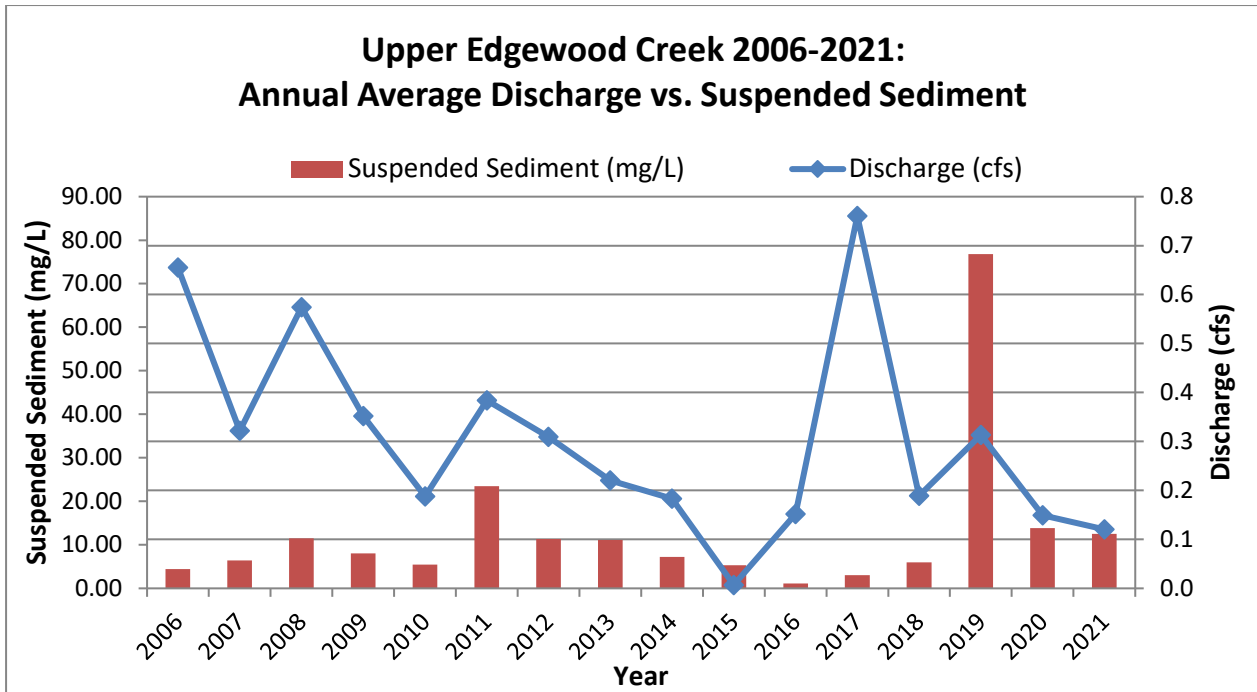


Figure C.7-3 Suspended Sediment Versus Flow, Upper Edgewood Creek (43HVE-1) (2006–2021)

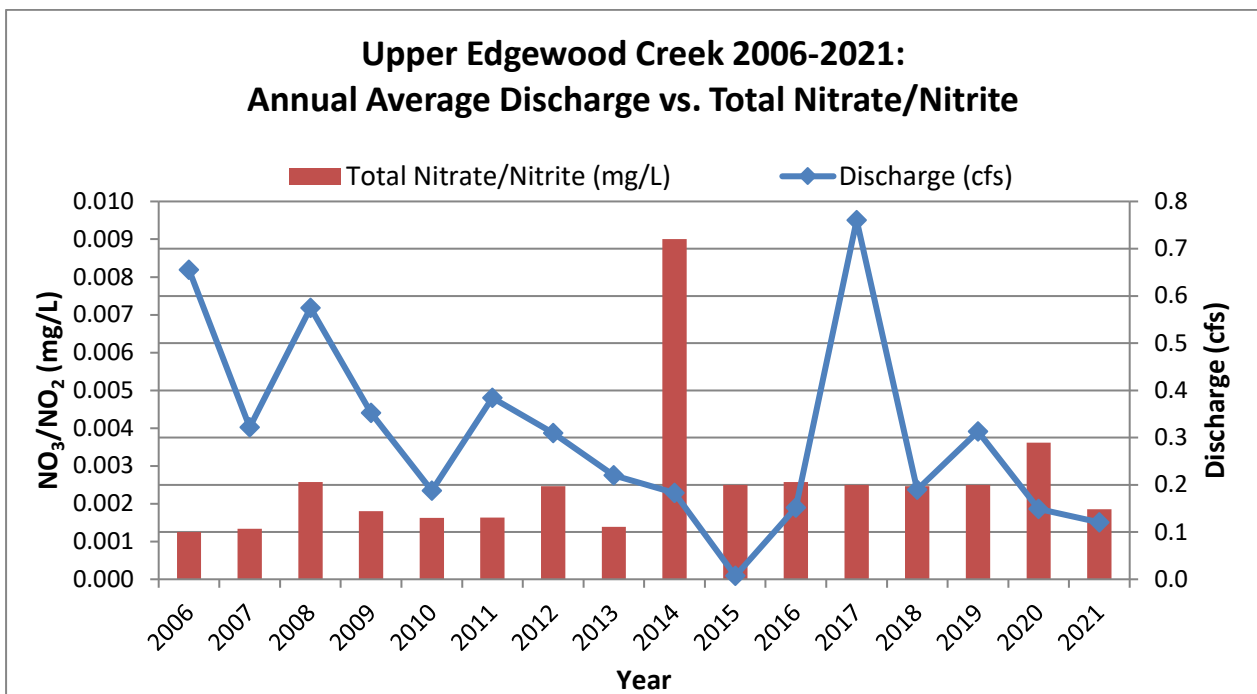


Figure C.7-4 Total Nitrate/Nitrite Versus Flow, Upper Edgewood Creek (43HVE-1) (2006–2021)

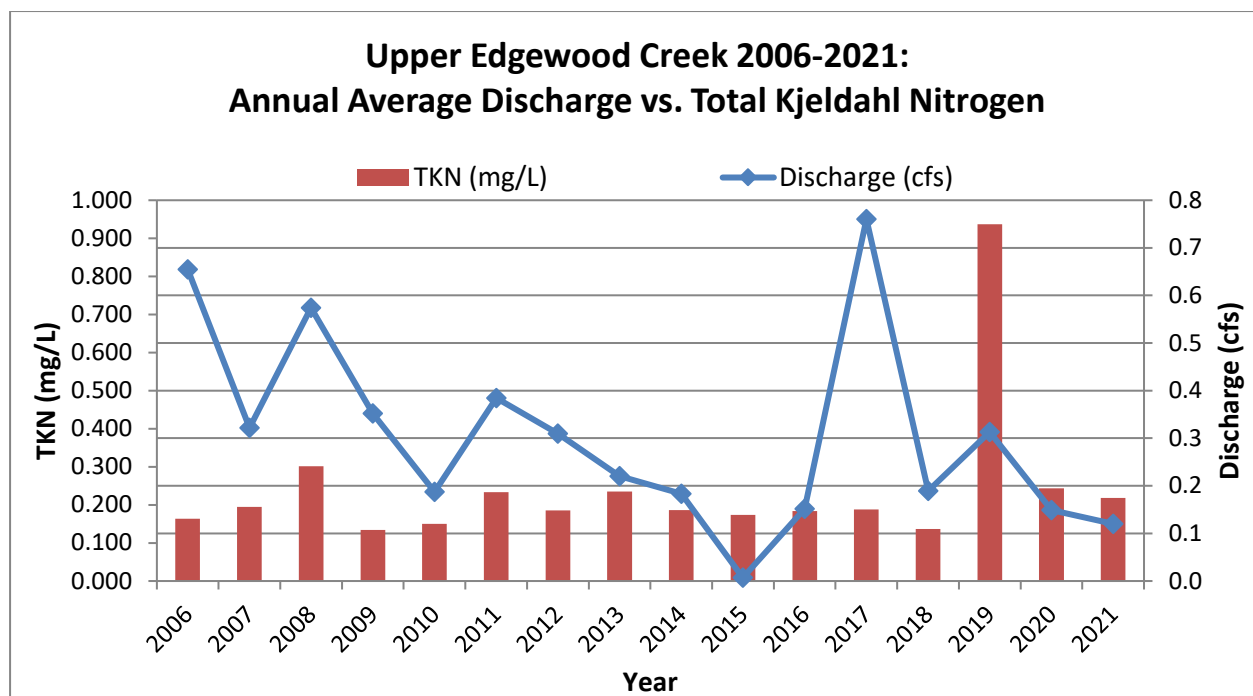


Figure C.7-5 TKN Versus Flow, Upper Edgewood Creek (43HVE-1) (2006–2021)

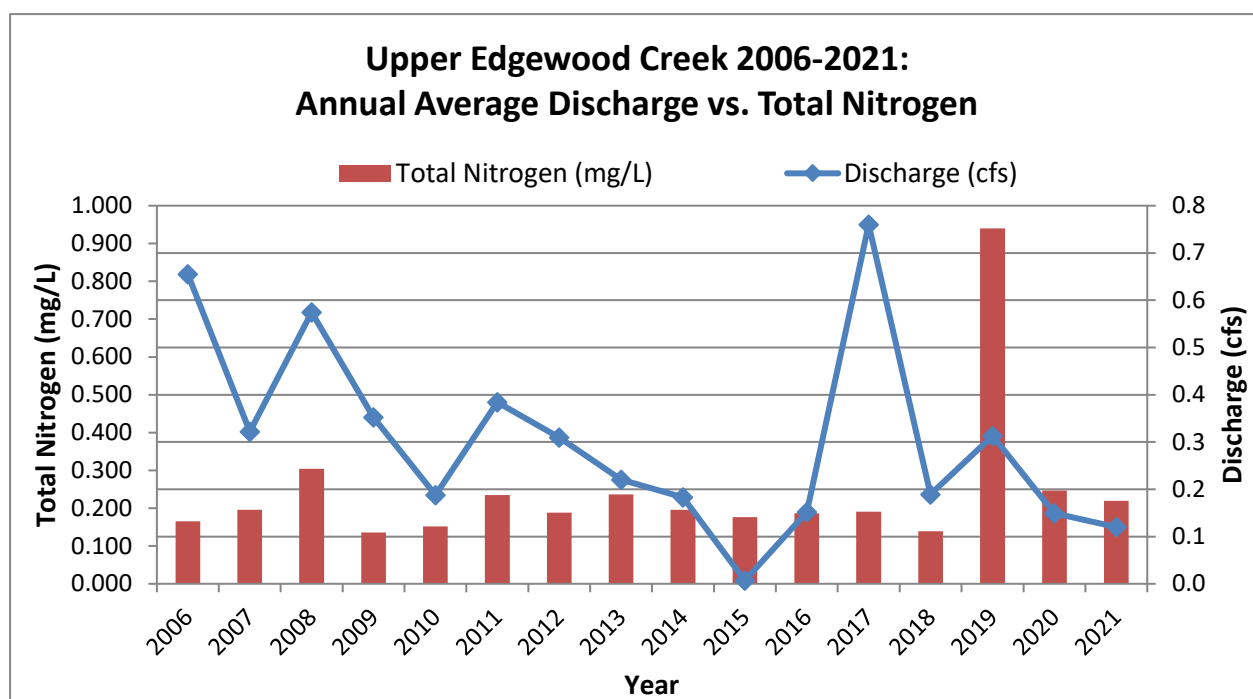


Figure C.7-6 Total Nitrogen Versus Flow, Upper Edgewood Creek (43HVE-1) (2006–2021)

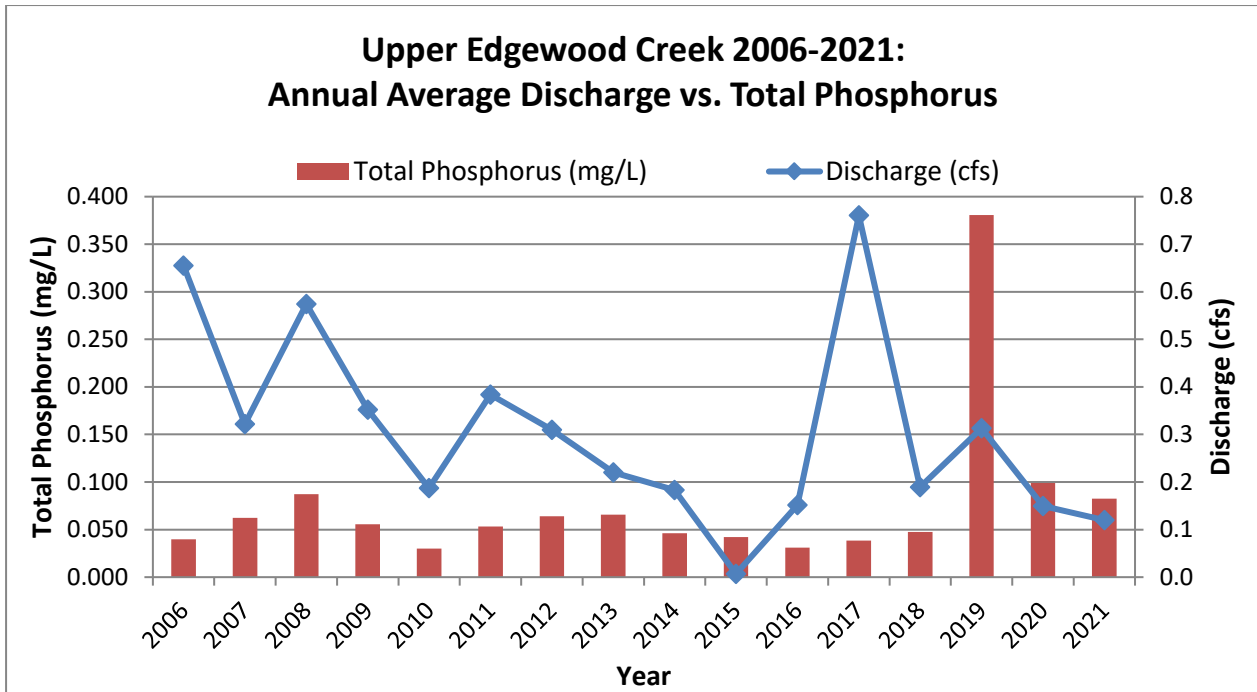


Figure C.7-7 Total Phosphorus Versus Flow, Upper Edgewood Creek (43HVE-1) (2006–2021)

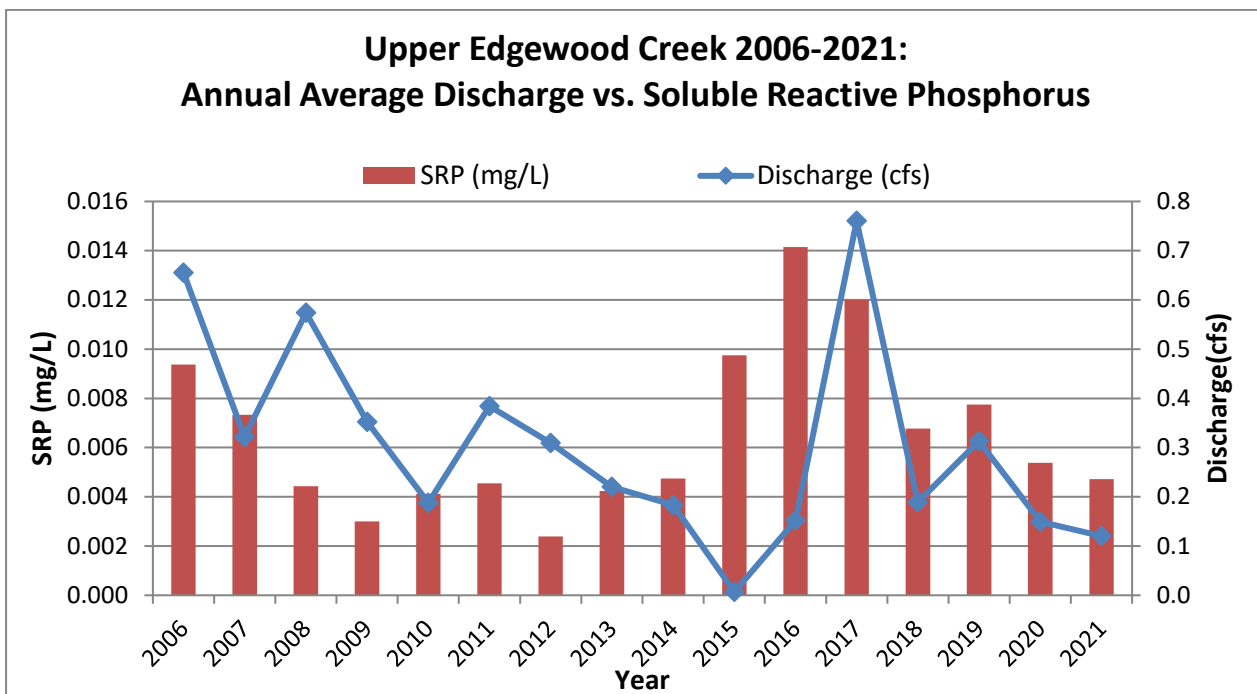


Figure C.7-8 Soluble Reactive Phosphorus Versus Flow, Upper Edgewood Creek (43HVE-1) (2006–2021)

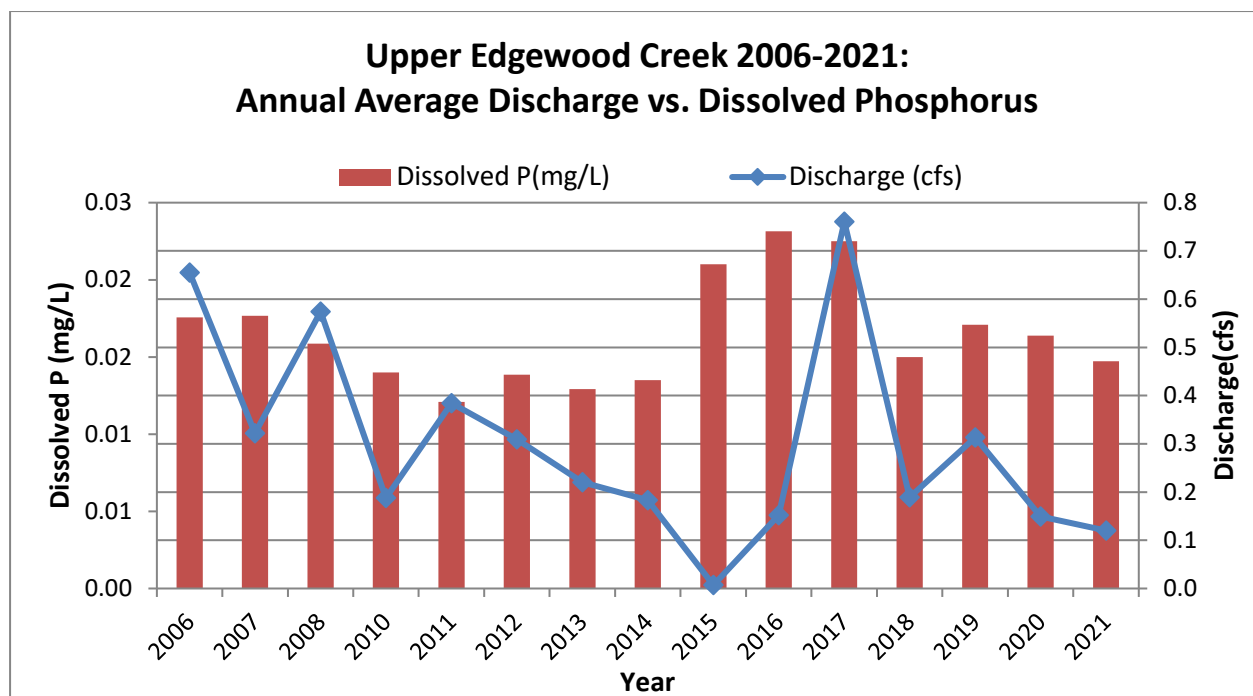


Figure C.7-9 Dissolved Phosphorus Versus Flow, Upper Edgewood Creek (43HVE-1) (2006–2021)

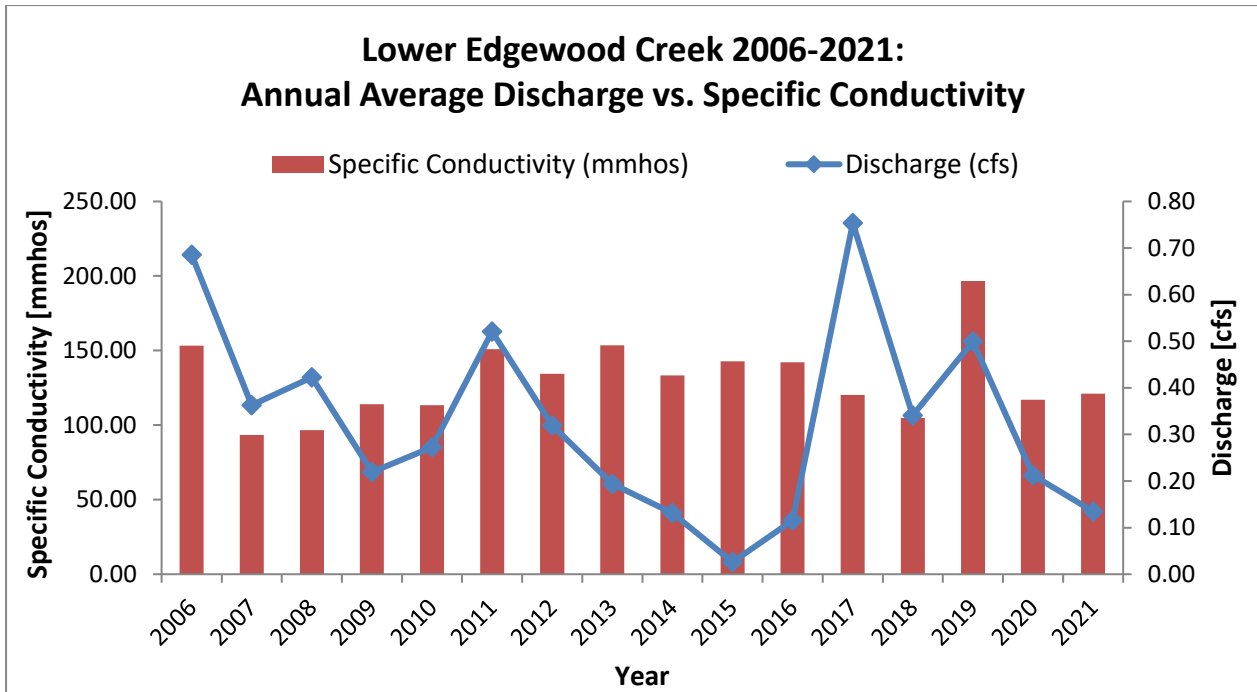


Figure C.8-1 Specific Conductivity Versus Flow, Lower Edgewood Creek (43HVE-2) (2006–2021)

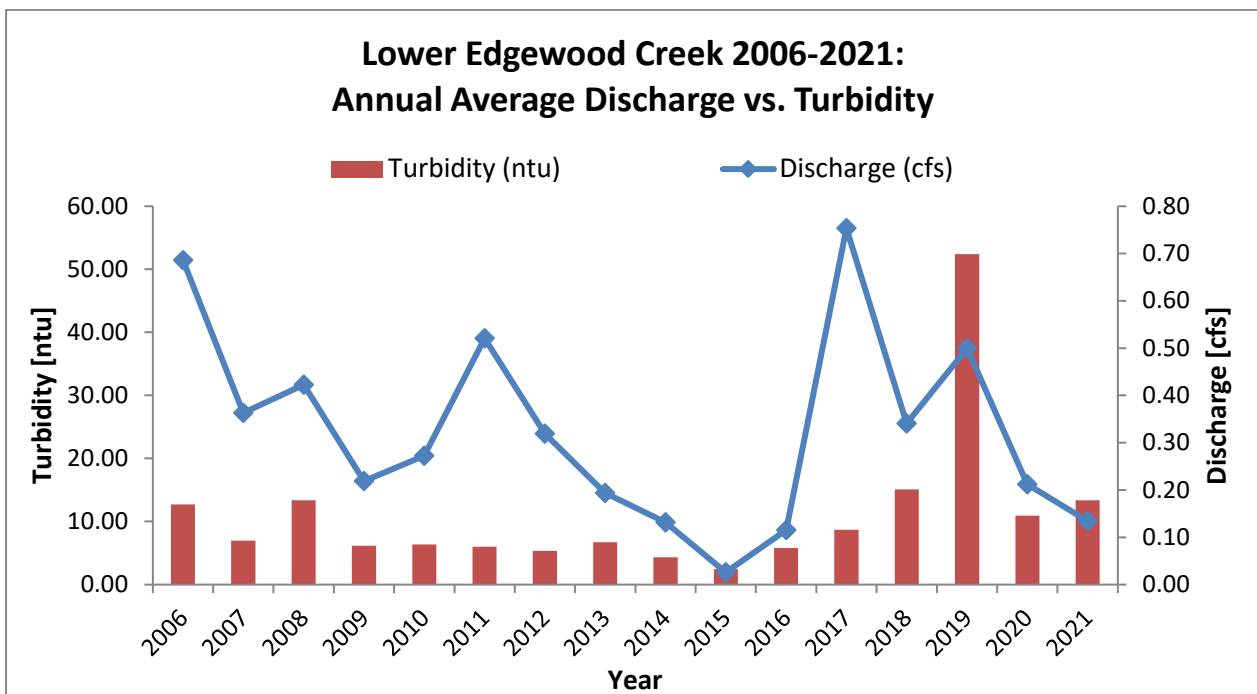


Figure C.8-2 Turbidity Versus Flow, Lower Edgewood Creek (43HVE-2) (2006–2021)

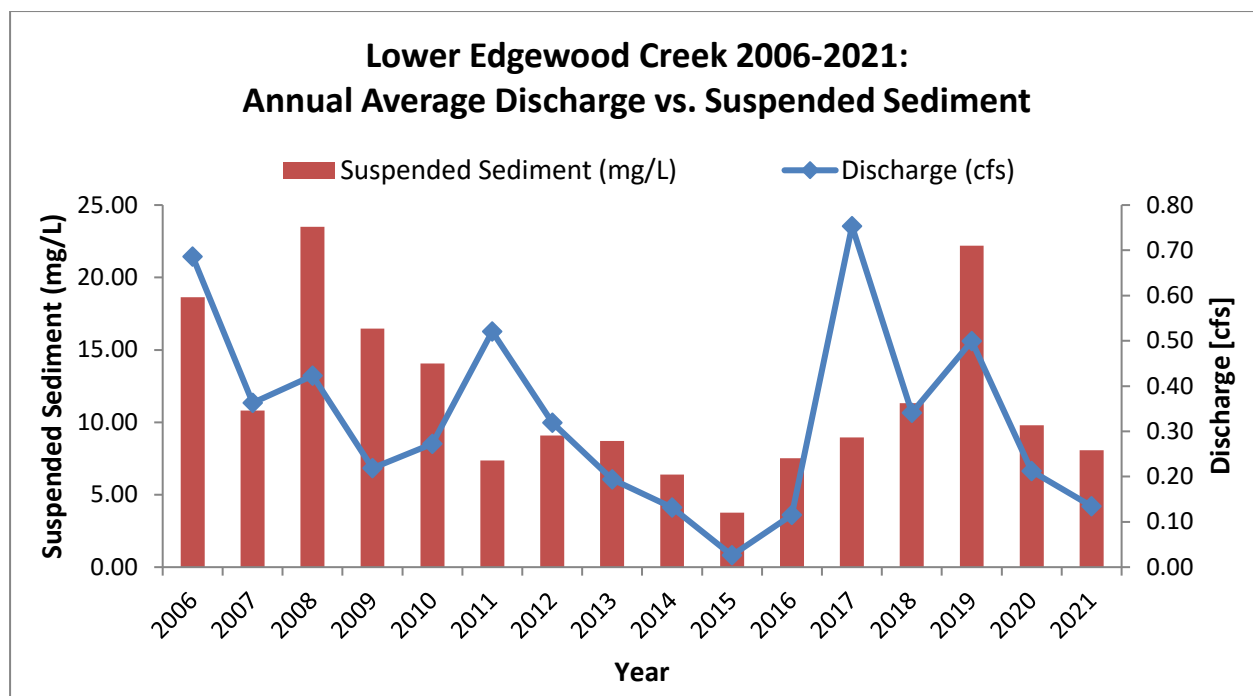


Figure C.8-3 Suspended Sediment Versus Flow, Lower Edgewood Creek (43HVE-2) (2006–2021)

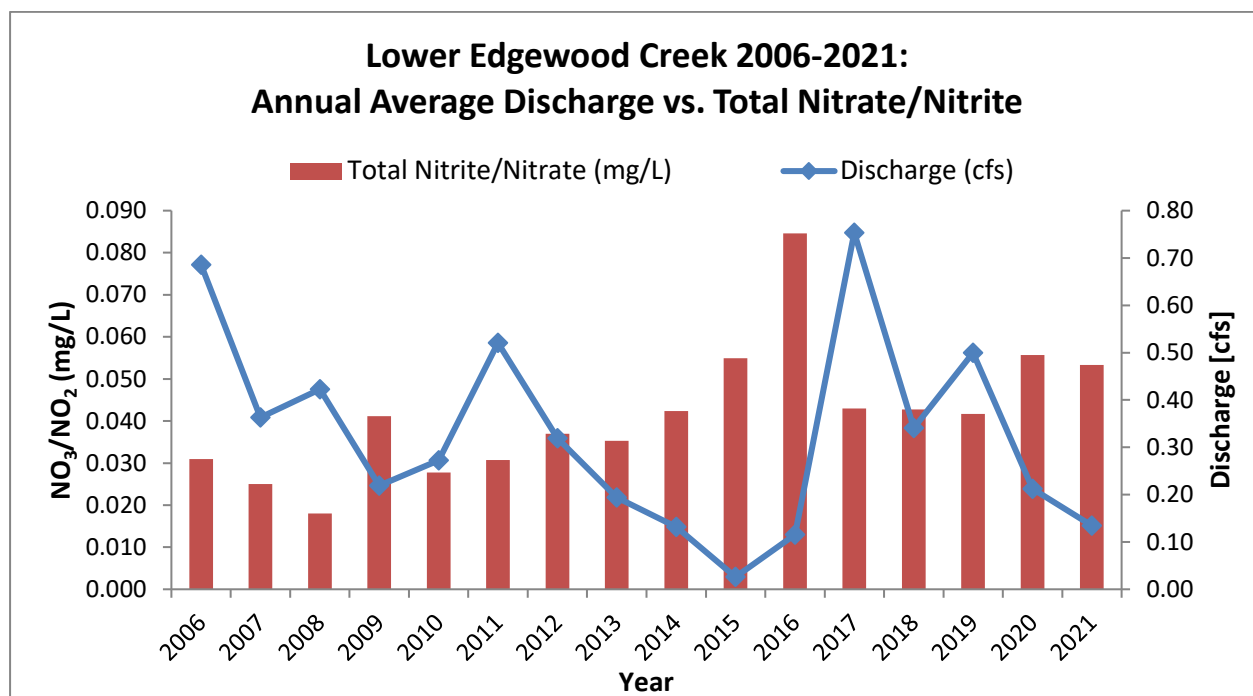


Figure C.8-4 Total Nitrate/Nitrite Versus Flow, Lower Edgewood Creek (43HVE-2) (2006–2021)

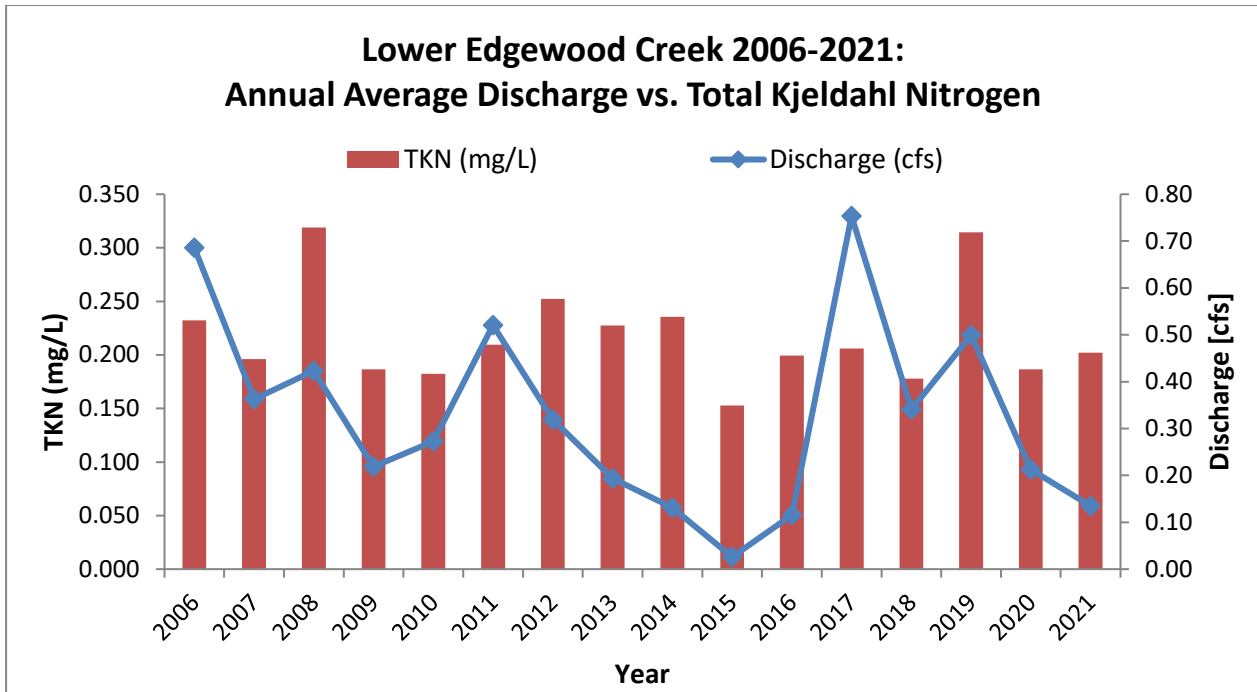


Figure C.8-5 TKN Versus Flow, Lower Edgewood Creek (43HVE-2) (2006–2021)

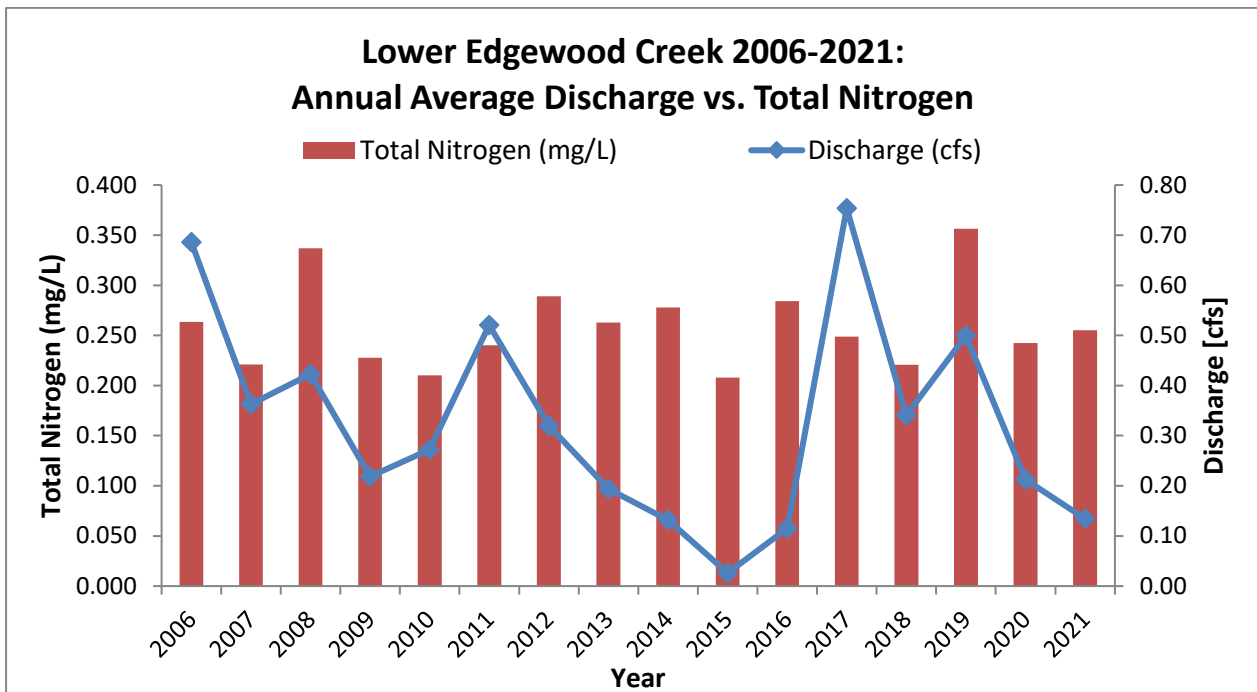


Figure C.8-6 Total Nitrogen Versus Flow, Lower Edgewood Creek (43HVE-2) (2006–2021)

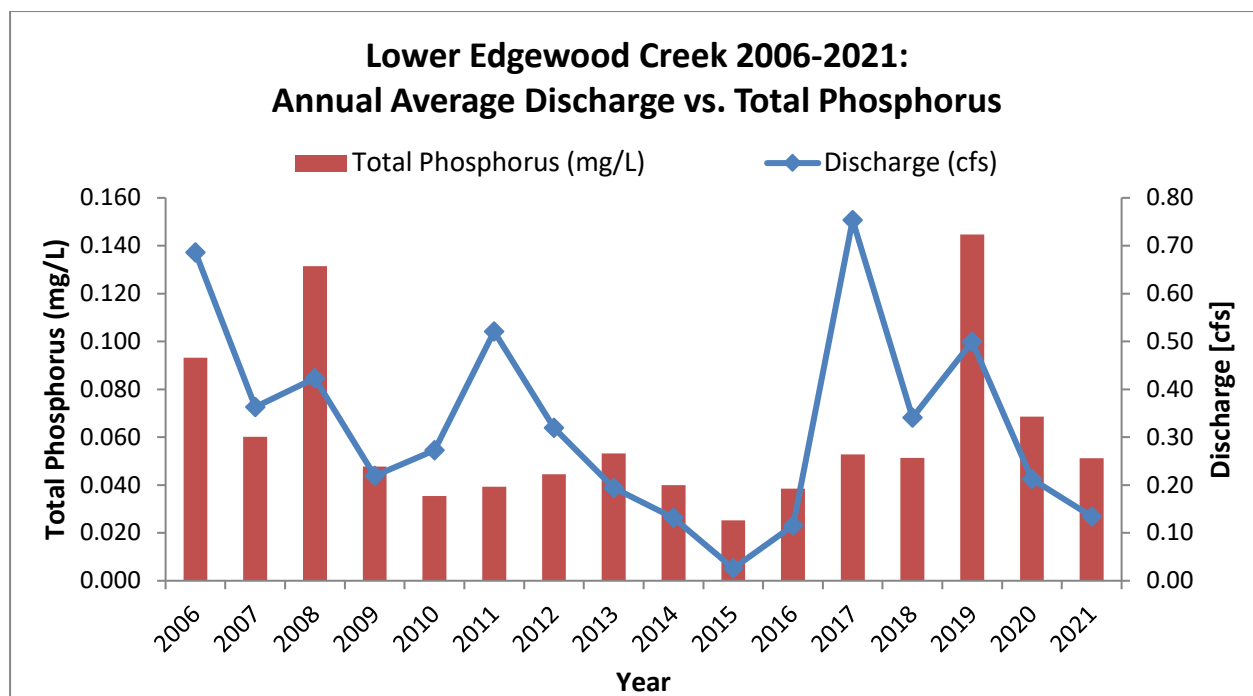


Figure C.8-7 Total Phosphorus Versus Flow, Lower Edgewood Creek (43HVE-2) (2006–2021)

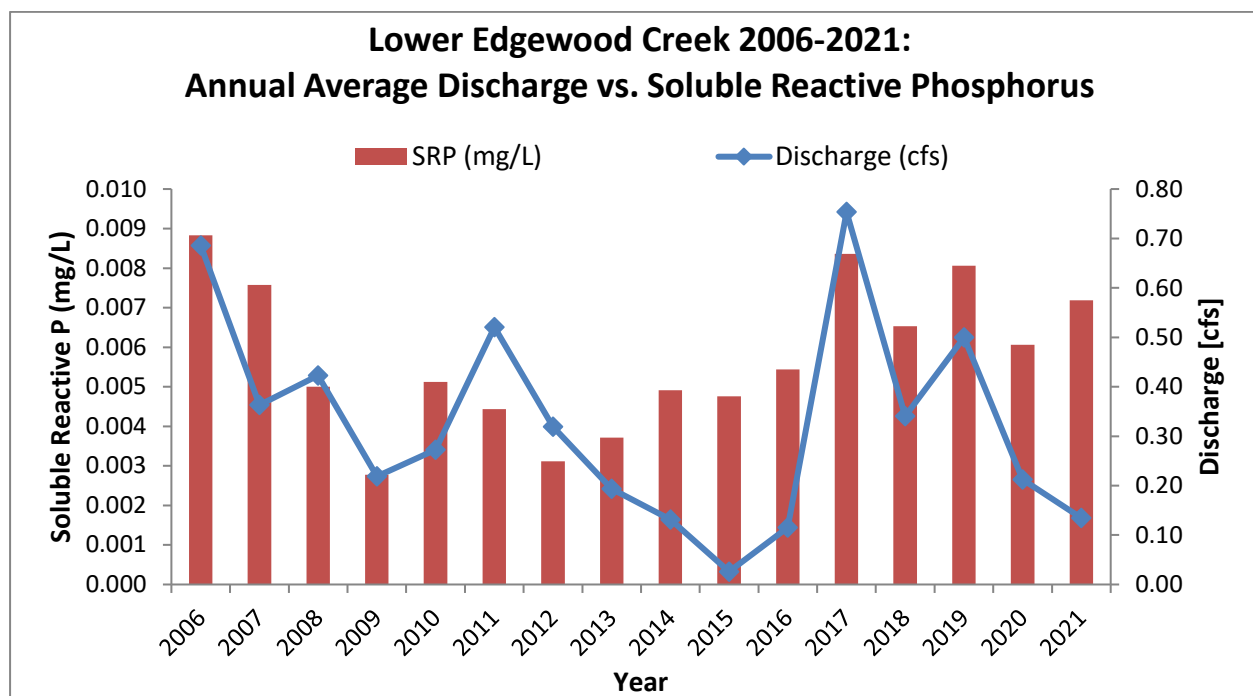


Figure C.8-8 Soluble Reactive Phosphorus Versus Flow, Lower Edgewood Creek (43HVE-2) (2006–2021)

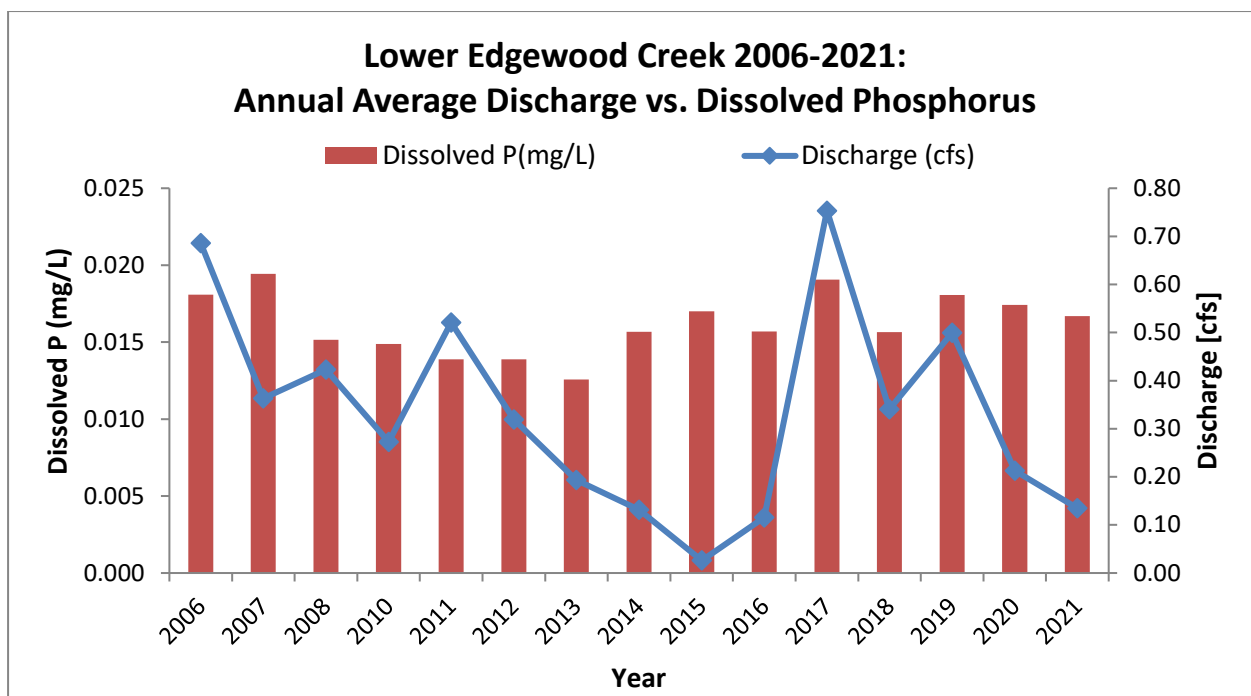


Figure C.8-9 Dissolved Phosphorus Versus Flow, Lower Edgewood Creek (43HVE-2) (2006–2021)

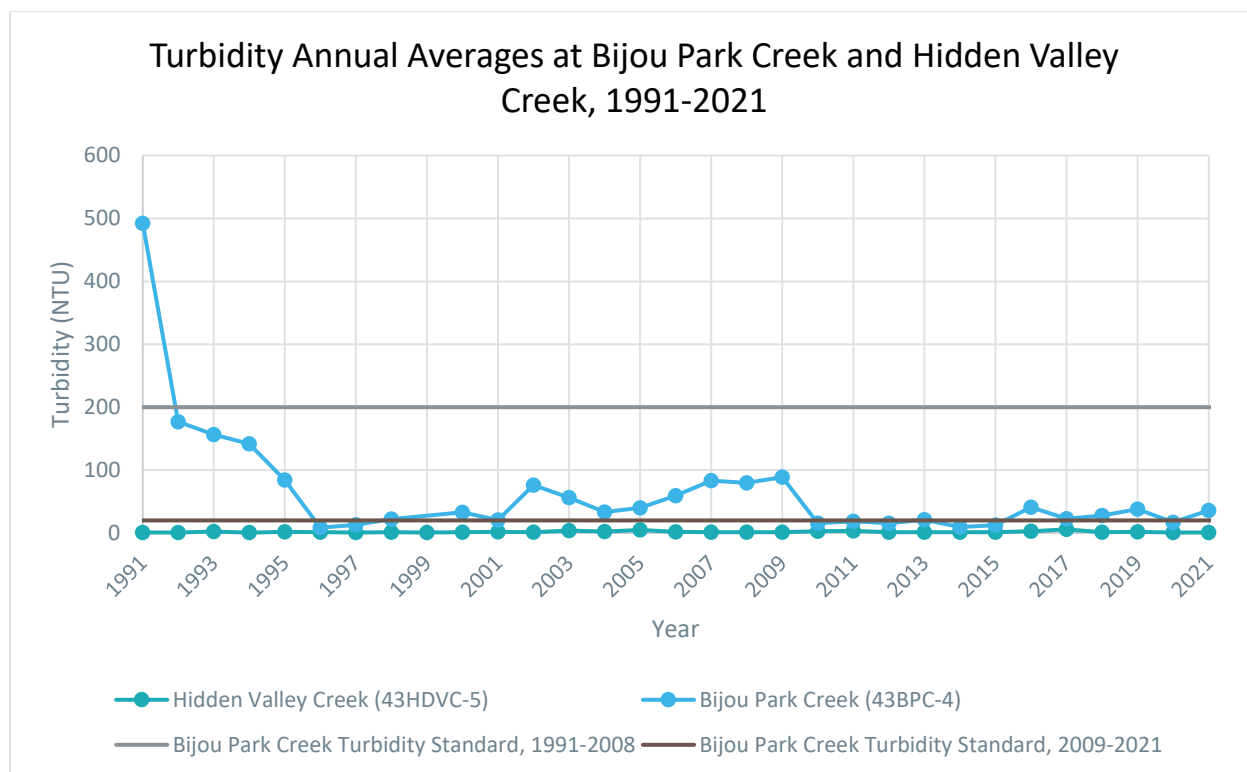


Figure C.9-1 Turbidity Annual Averages, Bijou Park Creek (43BPC-4) and Hidden Valley Creek (43HDVC-5) (1991–2021)

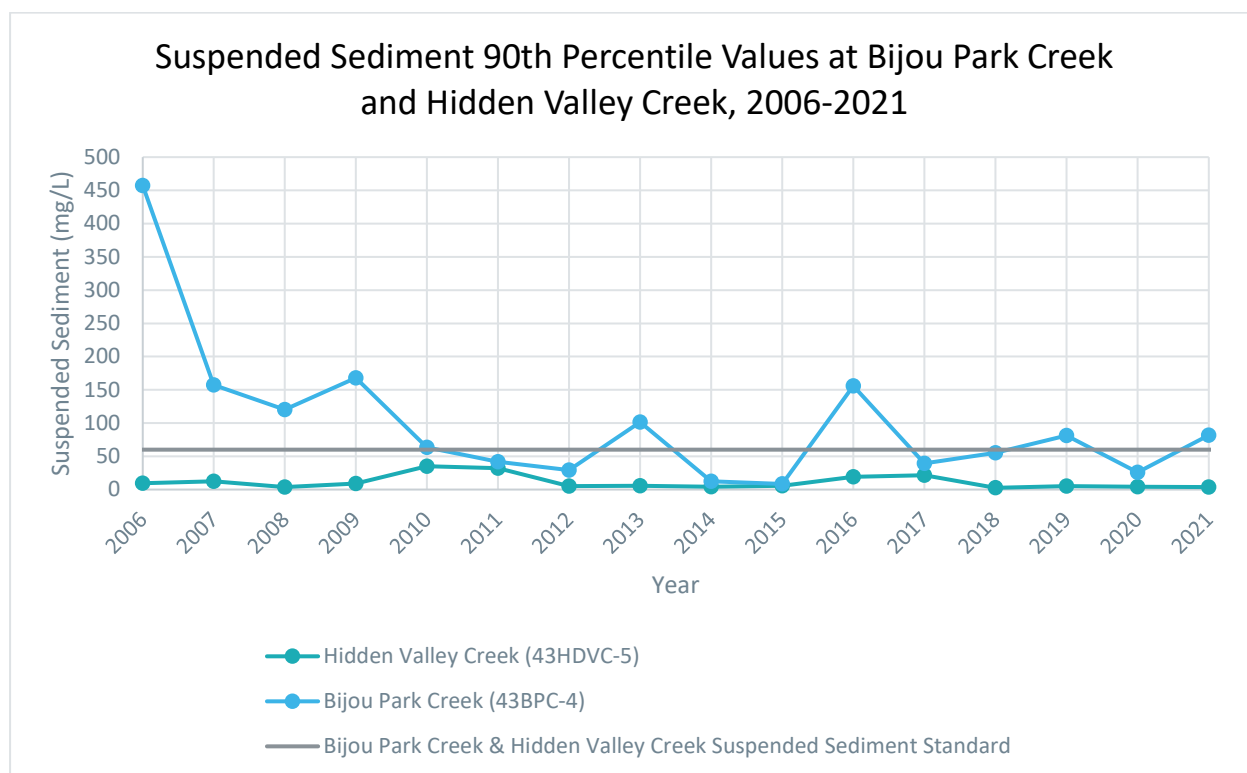


Figure C.9-2 Suspended Sediment 90th Percentile Values, Bijou Park Creek (43BPC-4) and Hidden Valley Creek (43HDVC-5) (1991–2021)

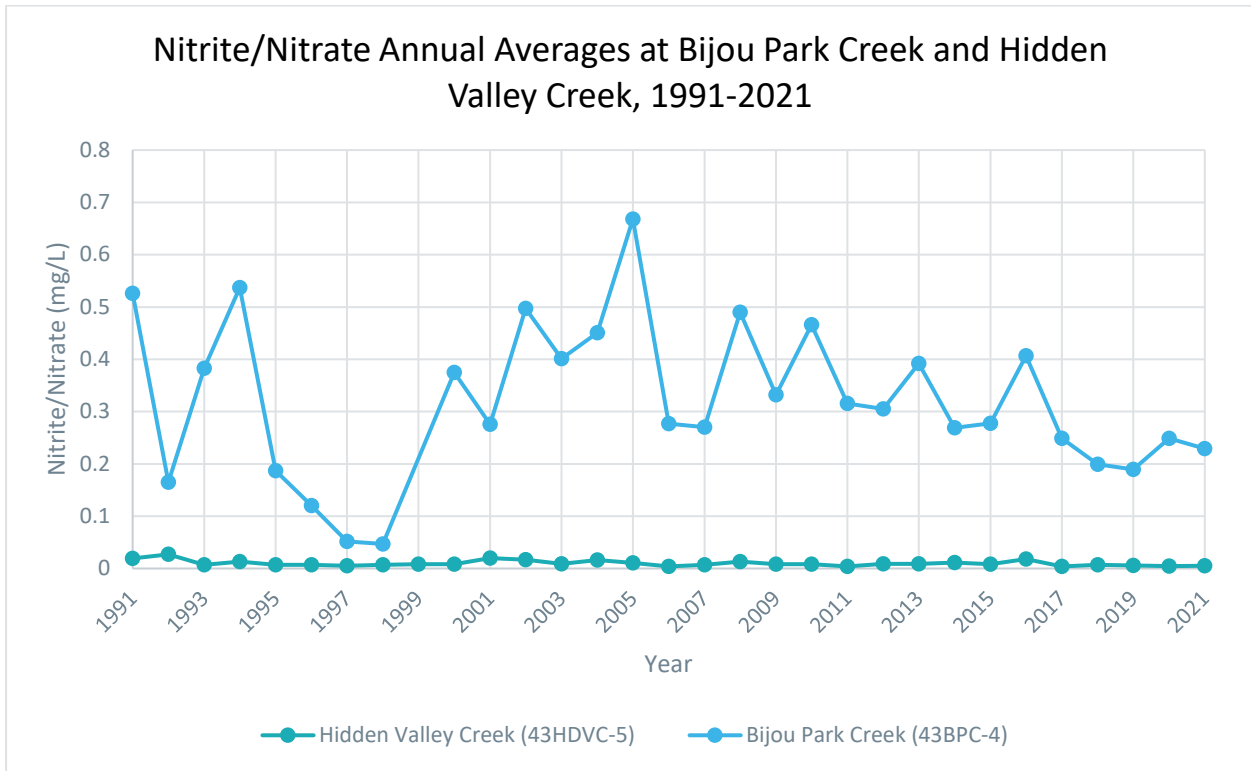


Figure C.9-3 Nitrate/Nitrite Annual Averages, Bijou Park Creek (43BPC-4) and Hidden Valley Creek (43HDVC-5) (1991–2021)

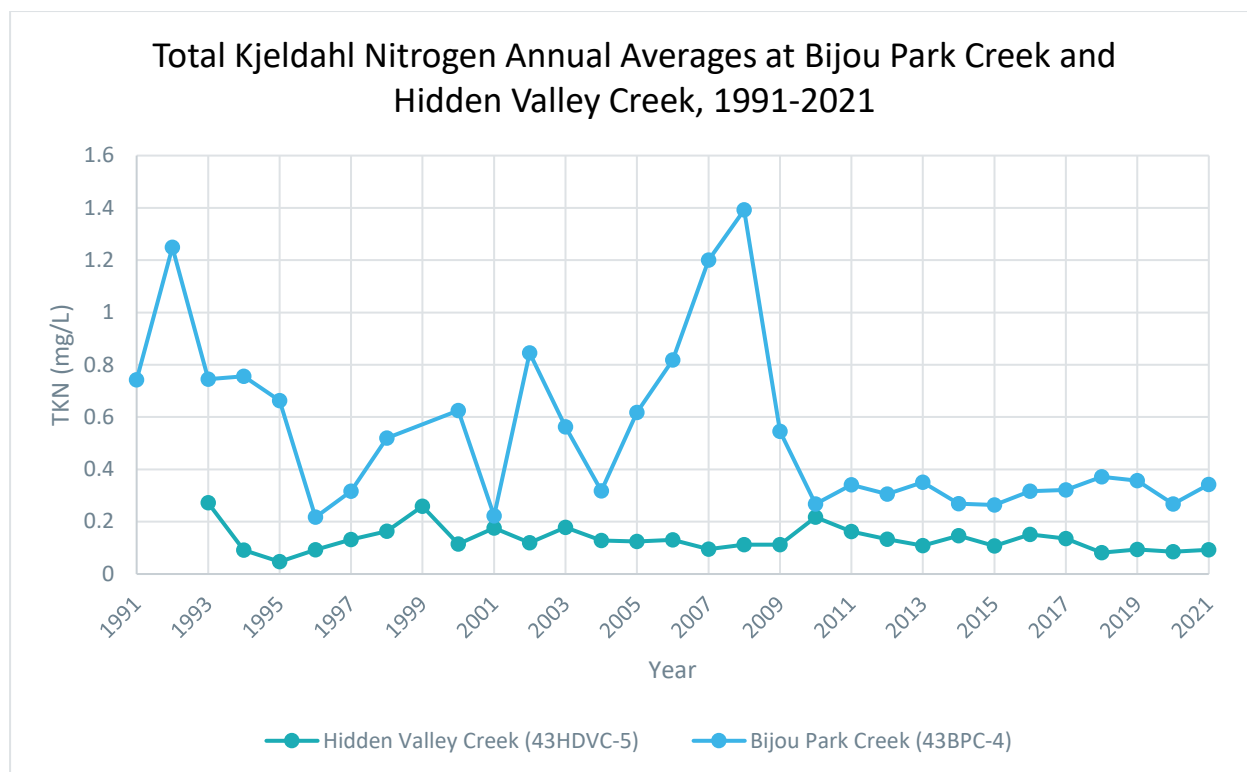


Figure C.9-4 TKN Annual Averages, Bijou Park Creek (43BPC-4) and Hidden Valley Creek (43HDVC-5) (1991–2021)

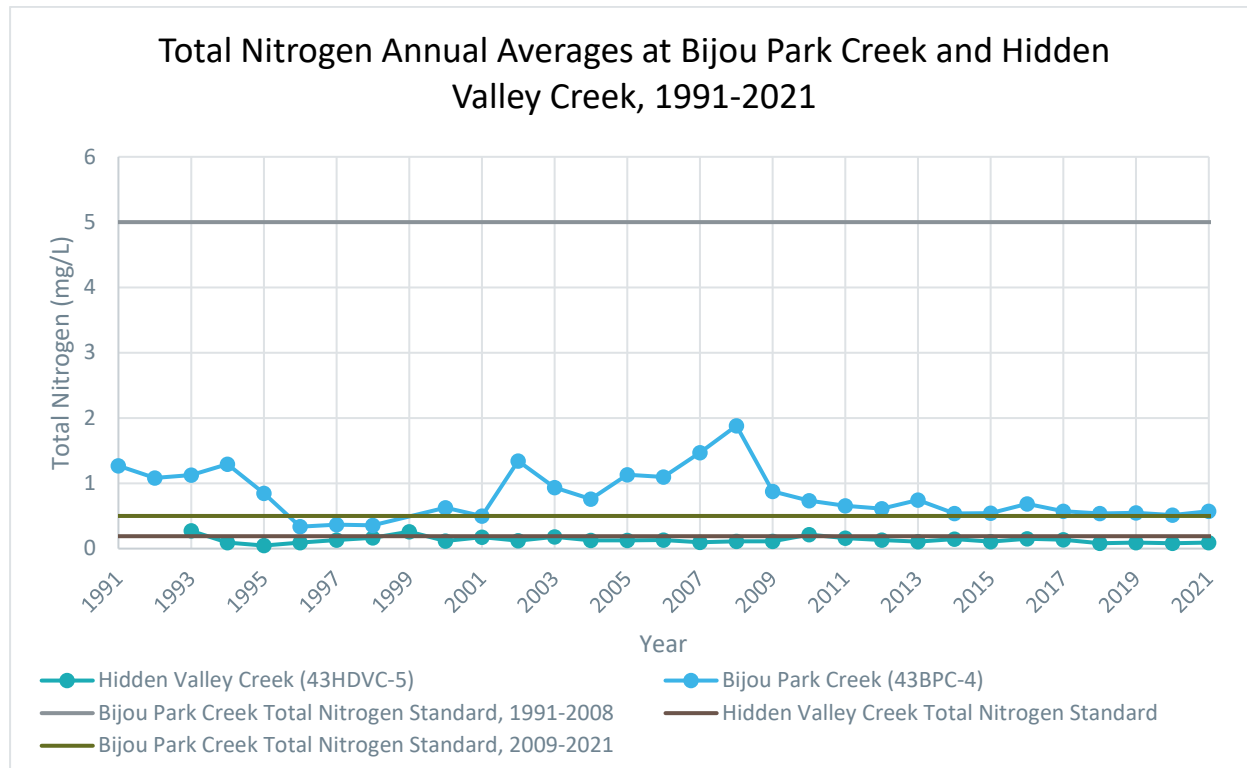


Figure C.9-5 Total Nitrogen Annual Averages, Bijou Park Creek (43BPC-4) and Hidden Valley Creek (43HDVC-5) (1991–2021)

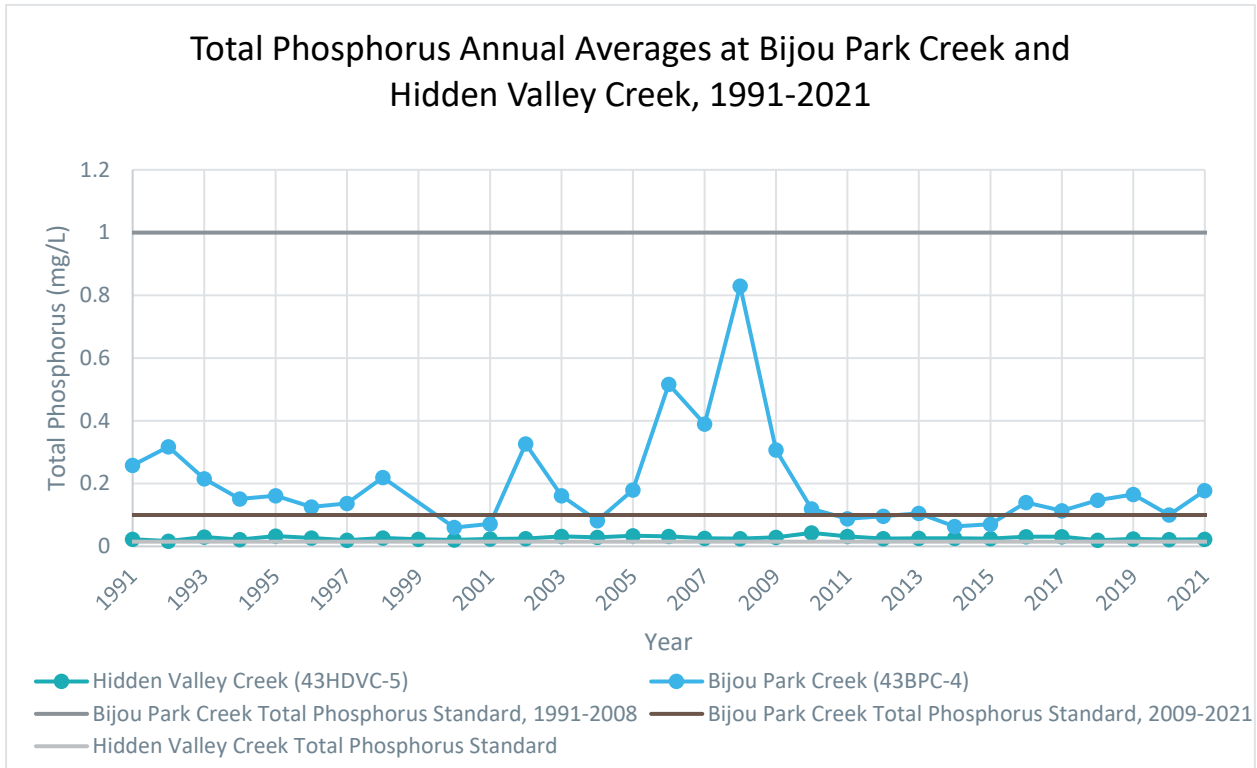


Figure C.9-6 Total Phosphorus Annual Averages, Bijou Park Creek (43BPC-4) and Hidden Valley Creek (43HDVC-5) (1991–2021)

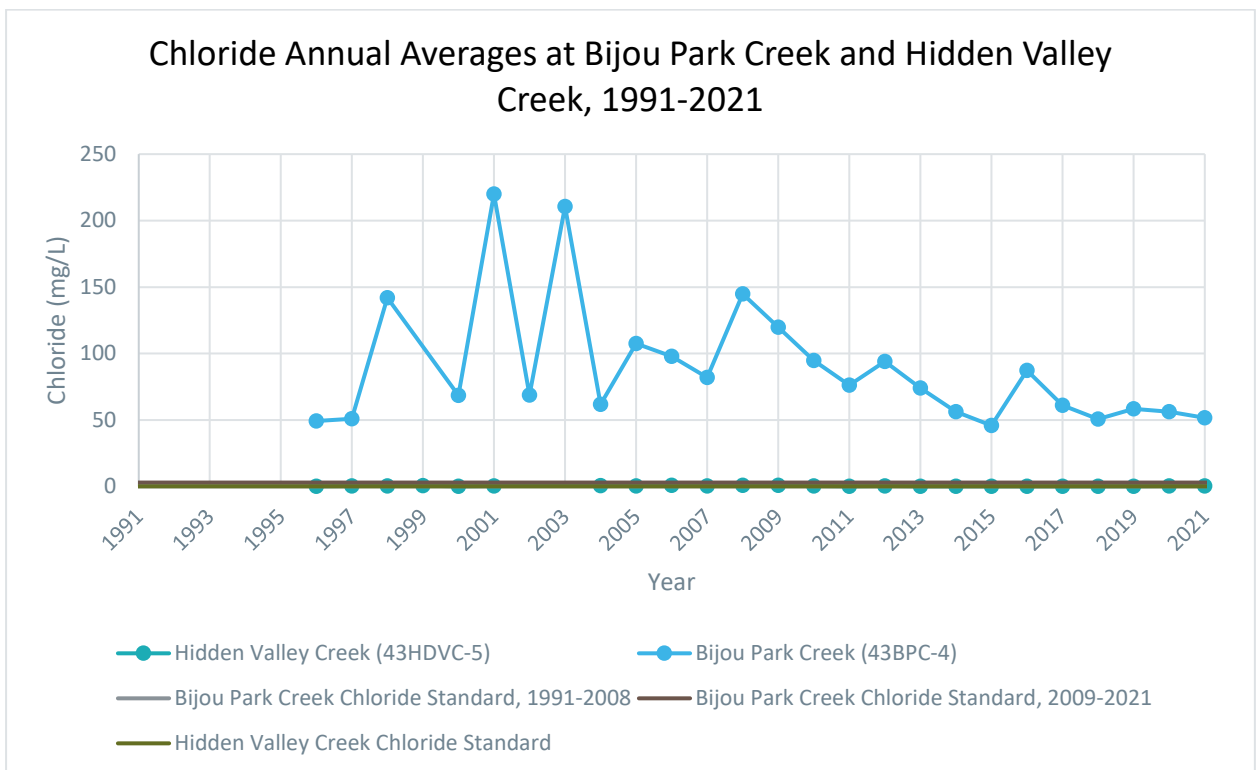


Figure C.9-7 Chloride Annual Averages, Bijou Park Creek (43BPC-4) and Hidden Valley Creek (43HDVC-5) (1991–2021)

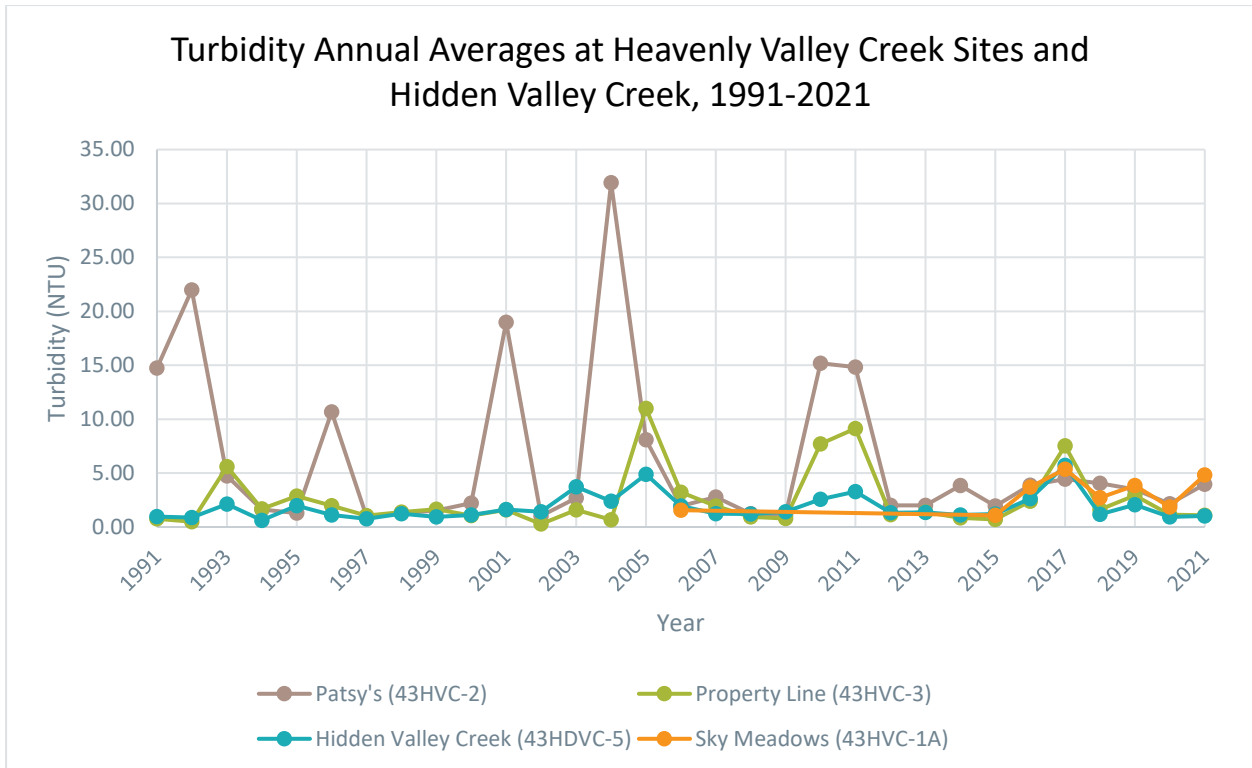


Figure C.10-1 Turbidity Annual Averages, Heavenly Valley Creek (43HVC-1A, 43HVC-2, 43HVC-3) and Hidden Valley Creek (43HDVC-5) (1991–2021)

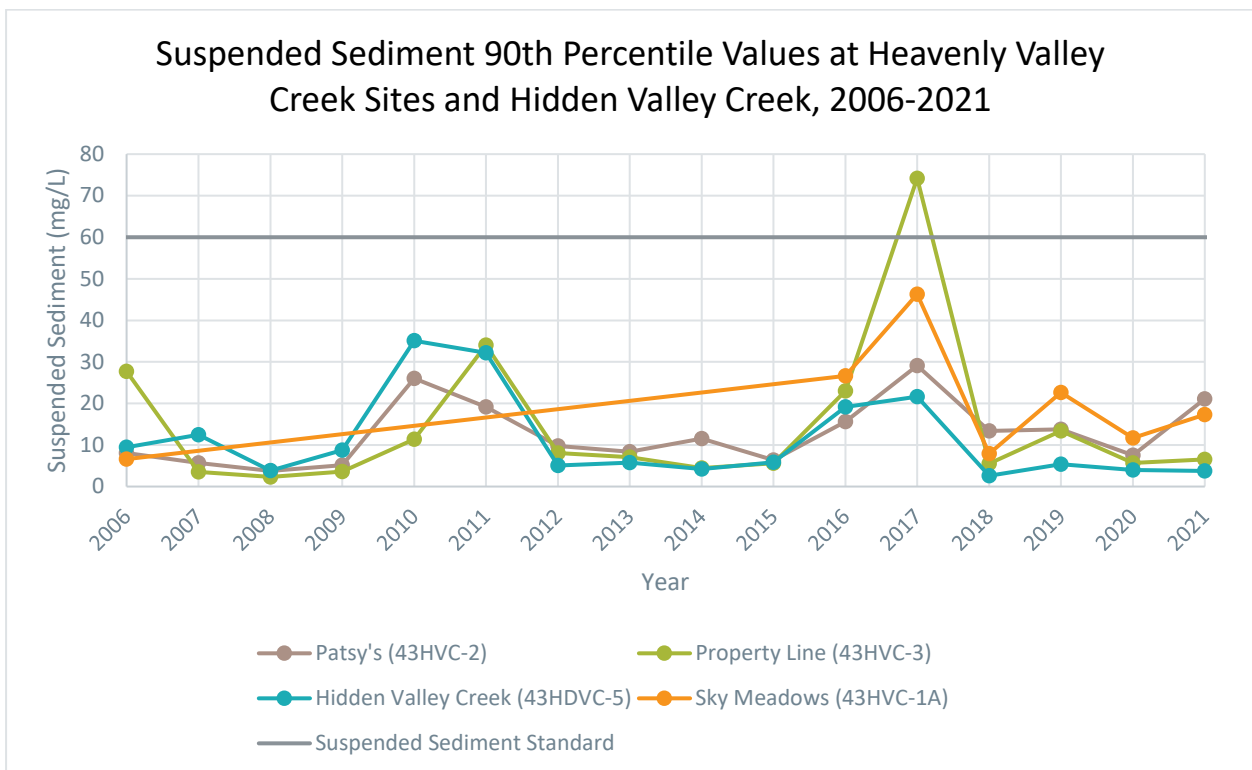


Figure C.10-2 Suspended Sediment 90th Percentile Values, Heavenly Valley Creek (43HVC-1A, 43HVC-2, 43HVC-3) and Hidden Valley Creek (43HDVC-5) (1991–2021)

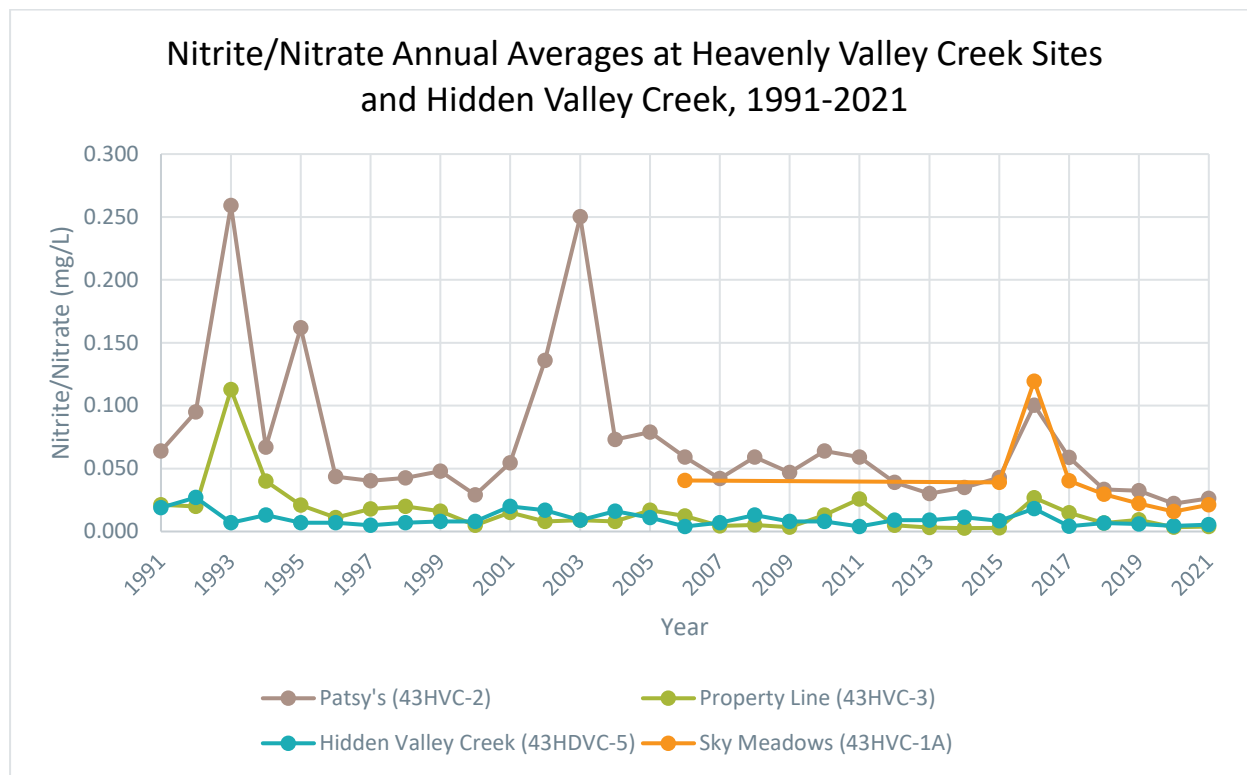


Figure C.10-3 Nitrate/Nitrite Annual Averages, Heavenly Valley Creek (43HVC-1A, 43HVC-2, 43HVC-3) and Hidden Valley Creek (43HDVC-5) (1991–2021)

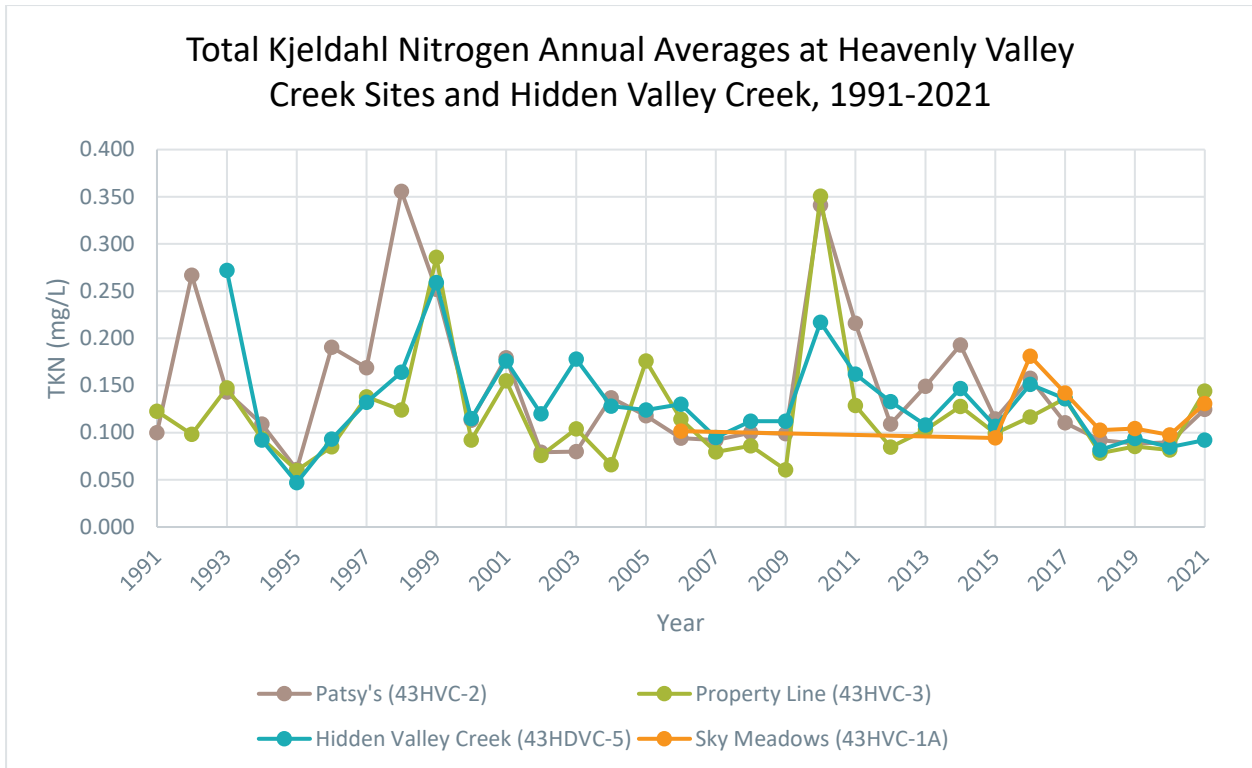


Figure C.10-4 TKN Annual Averages, Heavenly Valley Creek (43HVC-1A, 43HVC-2, 43HVC-3) and Hidden Valley Creek (43HDVC-5) (1991–2021)

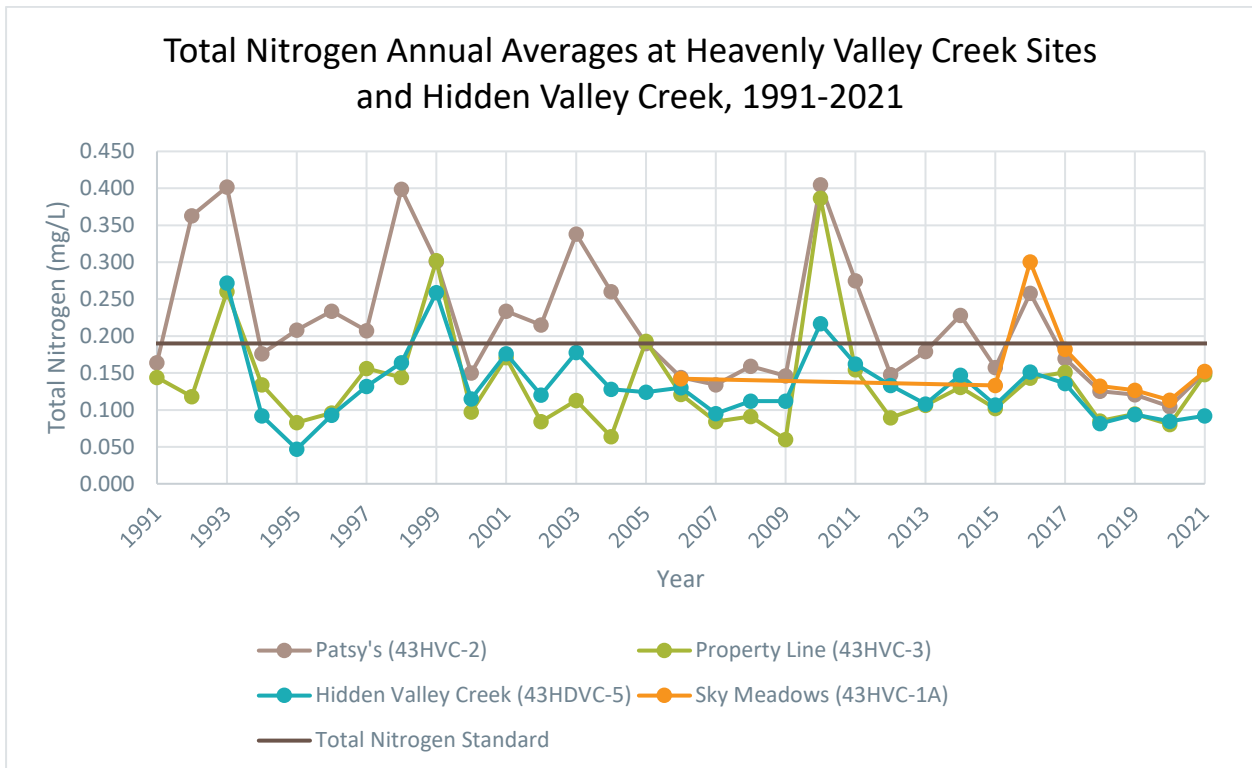


Figure C.10-5 Total Nitrogen Annual Averages, Heavenly Valley Creek (43HVC-1A, 43HVC-2, 43HVC-3) and Hidden Valley Creek (43HDVC-5) (1991–2021)

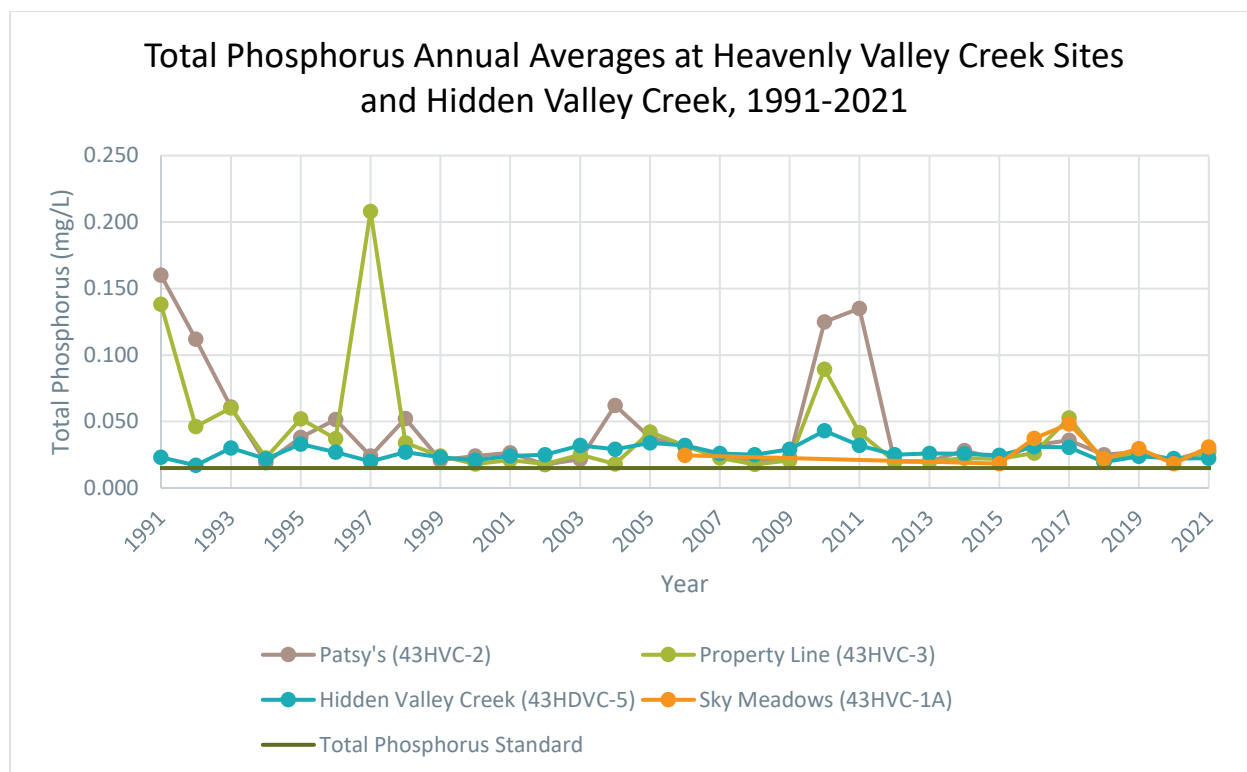


Figure C.10-6 Total Phosphorus Annual Averages, Heavenly Valley Creek (43HVC-1A, 43HVC-2, 43HVC-3) and Hidden Valley Creek (43HDVC-5) (1991–2021)

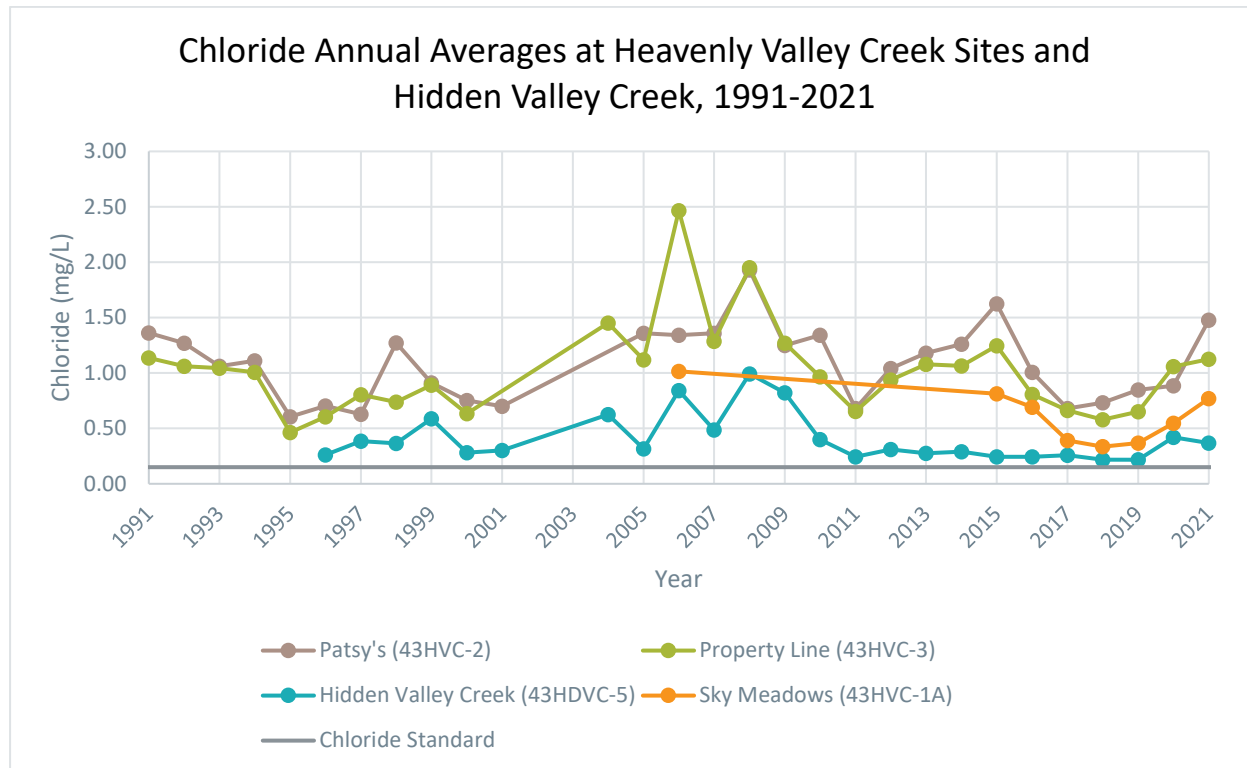


Figure C.10-7 Chloride Annual Averages, Heavenly Valley Creek (43HVC-1A, 43HVC-2, 43HVC-3) and Hidden Valley Creek (43HDVC-5) (1991–2021)

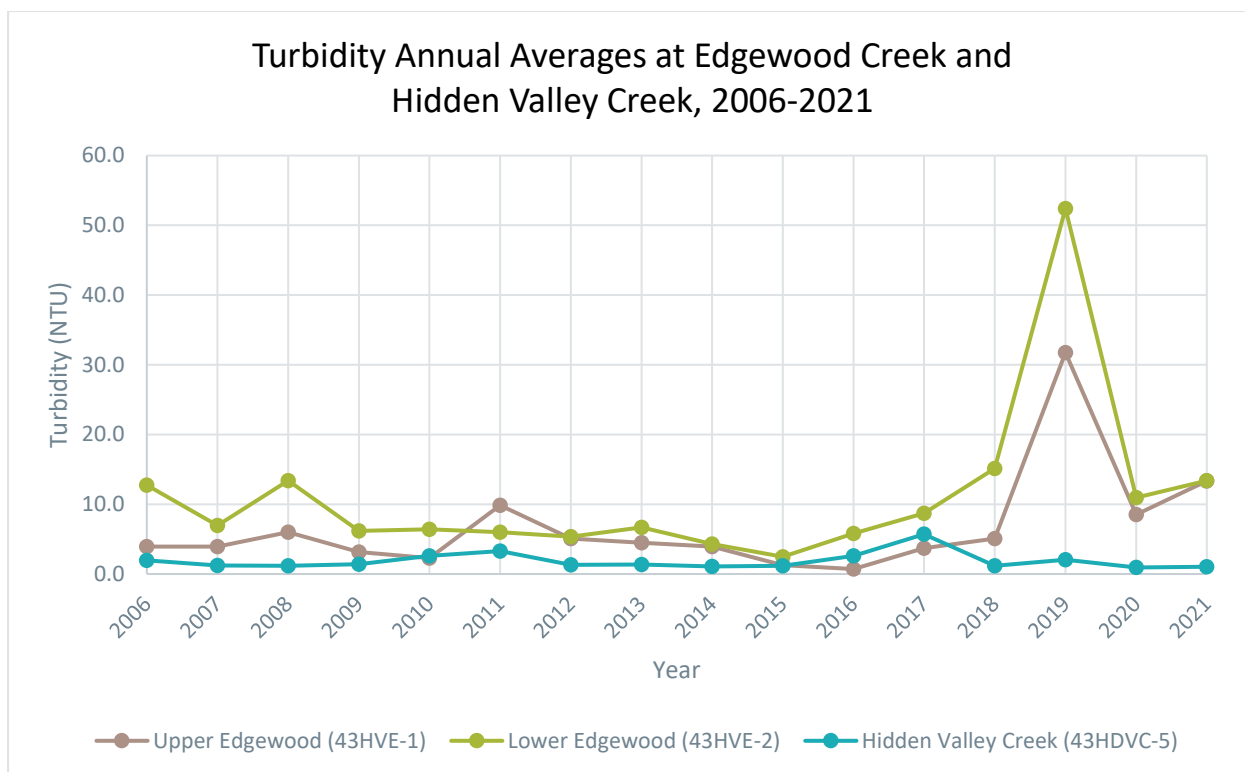


Figure C.11-1 Turbidity Annual Averages, Edgewood Creek (43HVE-1, 43HVE-2) and Hidden Valley Creek (43HDVC-5) (2006–2021)

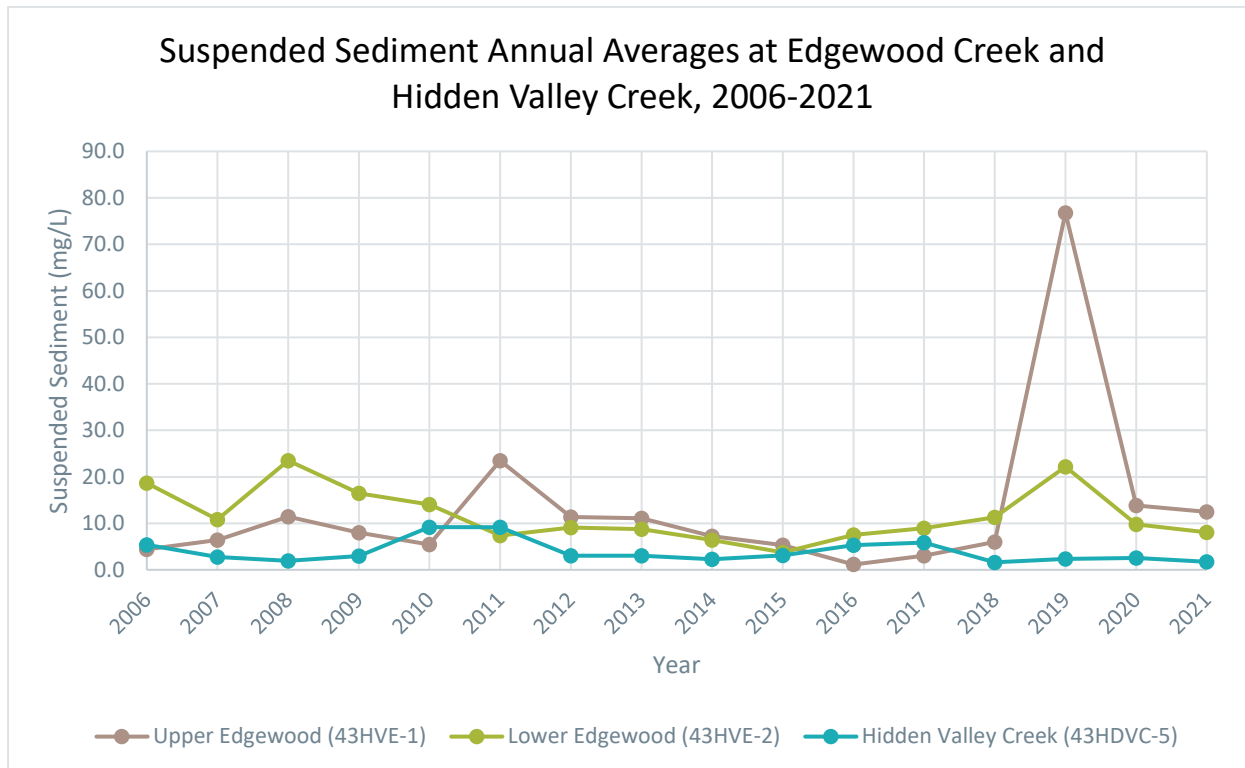


Figure C.11-2 Suspended Sediment Annual Averages, Edgewood Creek (43HVE-1, 43HVE-2) and Hidden Valley Creek (43HDVC-5) (2006–2021)

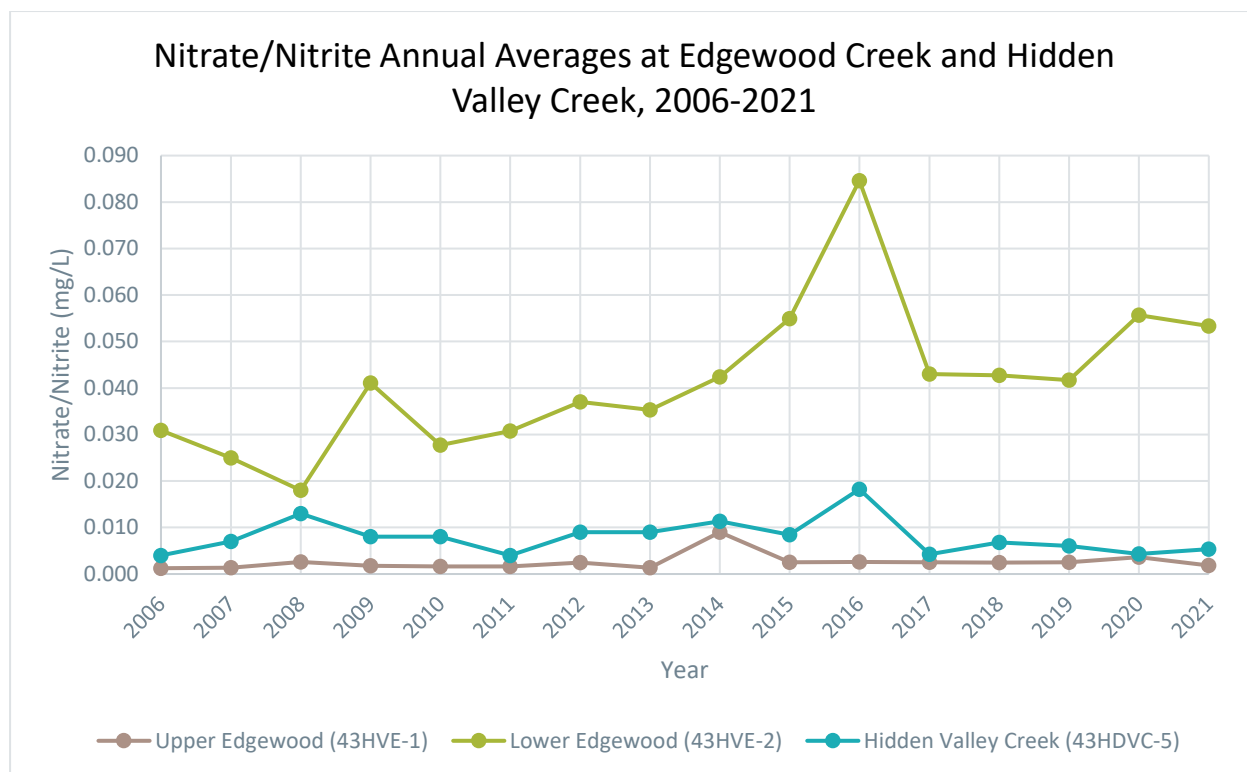


Figure C.11-3 Nitrate/Nitrite Annual Averages, Edgewood Creek (43HVE-1, 43HVE-2) and Hidden Valley Creek (43HDVC-5) (2006–2021)

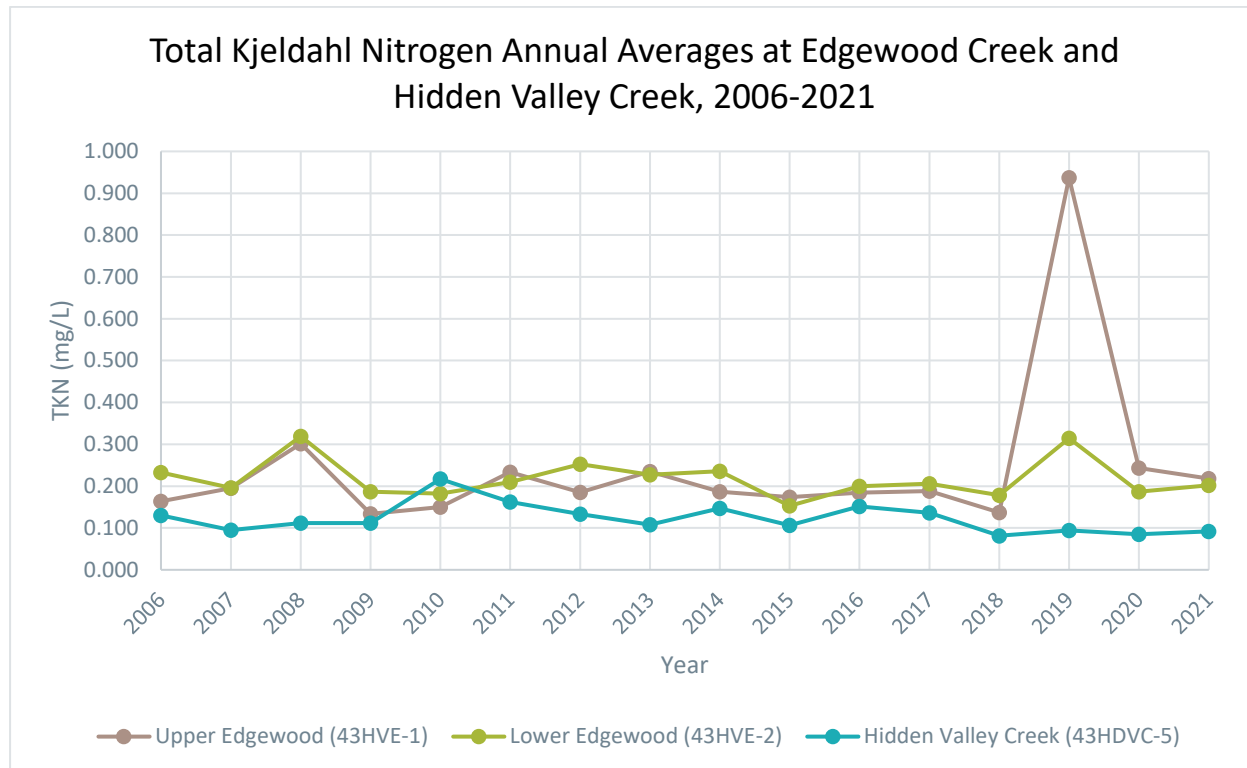


Figure C.11-4 TKN Annual Averages, Edgewood Creek (43HVE-1, 43HVE-2) and Hidden Valley Creek (43HDVC-5) (2006–2021)

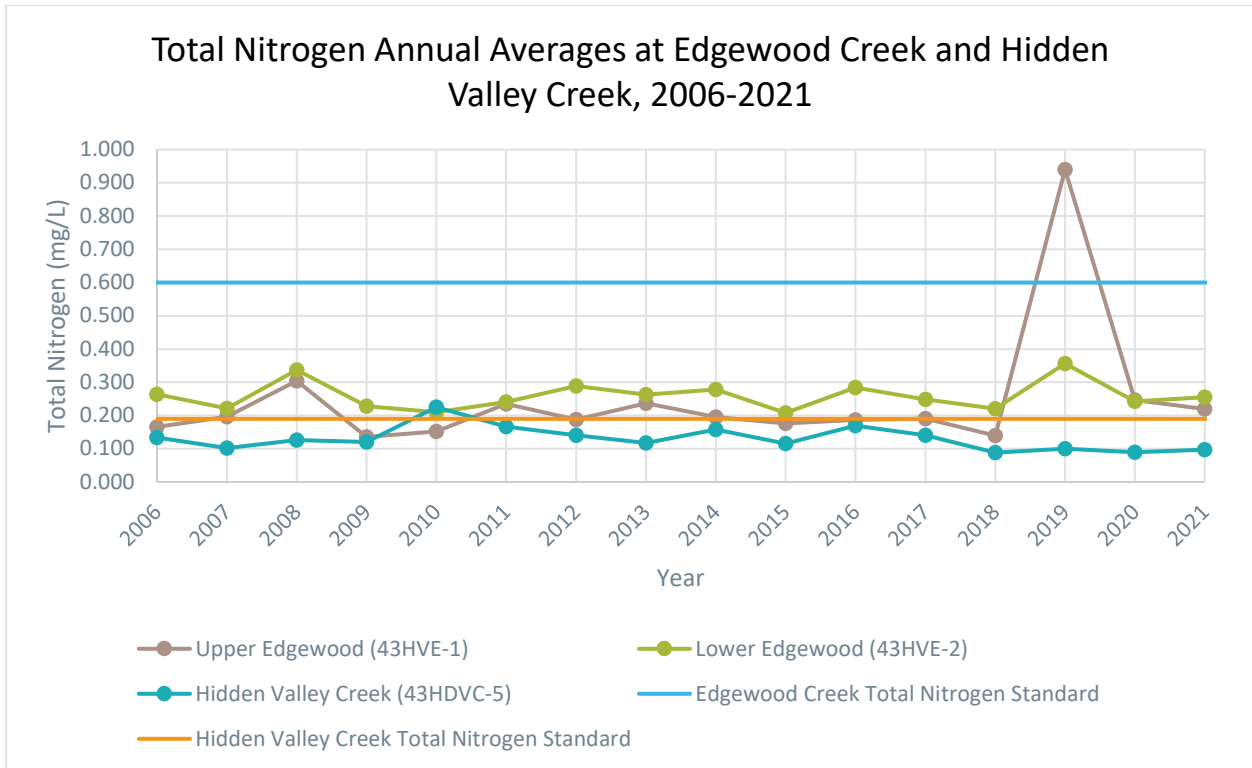


Figure C.11-5 Total Nitrogen Annual Averages, Edgewood Creek (43HVE-1, 43HVE-2) and Hidden Valley Creek (43HDVC-5) (2006–2021)

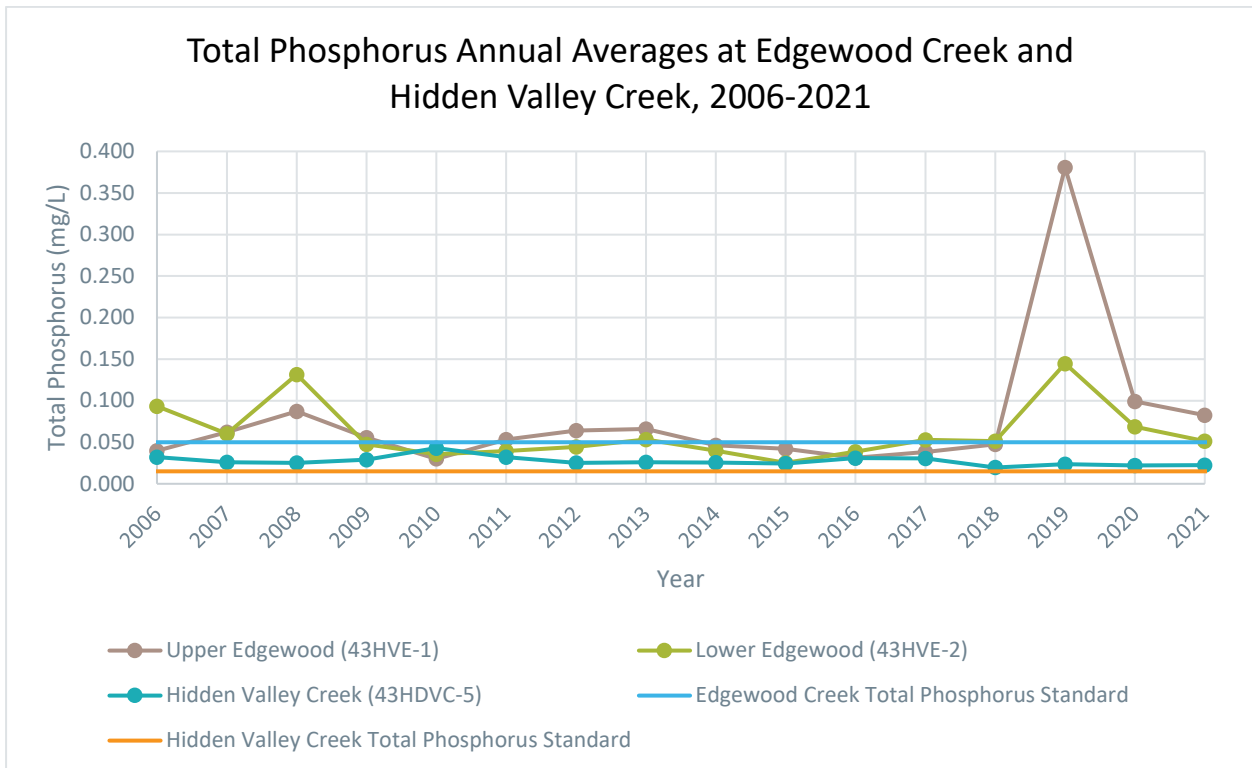


Figure C.11-6 Total Phosphorus Annual Averages, Edgewood Creek (43HVE-1, 43HVE-2) and Hidden Valley Creek (43HDVC-5) (2006–2021)

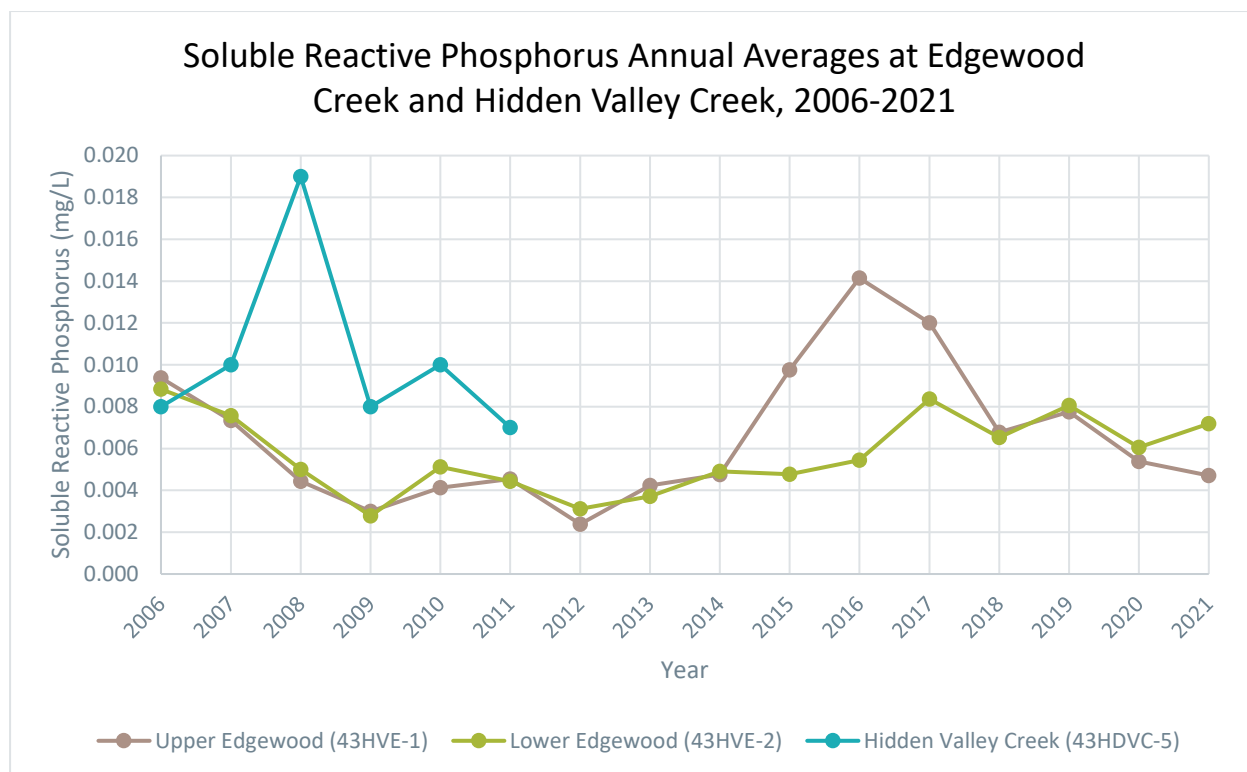


Figure C.11-7 Soluble Reactive Phosphorus Annual Averages, Edgewood Creek (43HVE-1, 43HVE-2) and Hidden Valley Creek (43HDVC-5) (2006–2021)

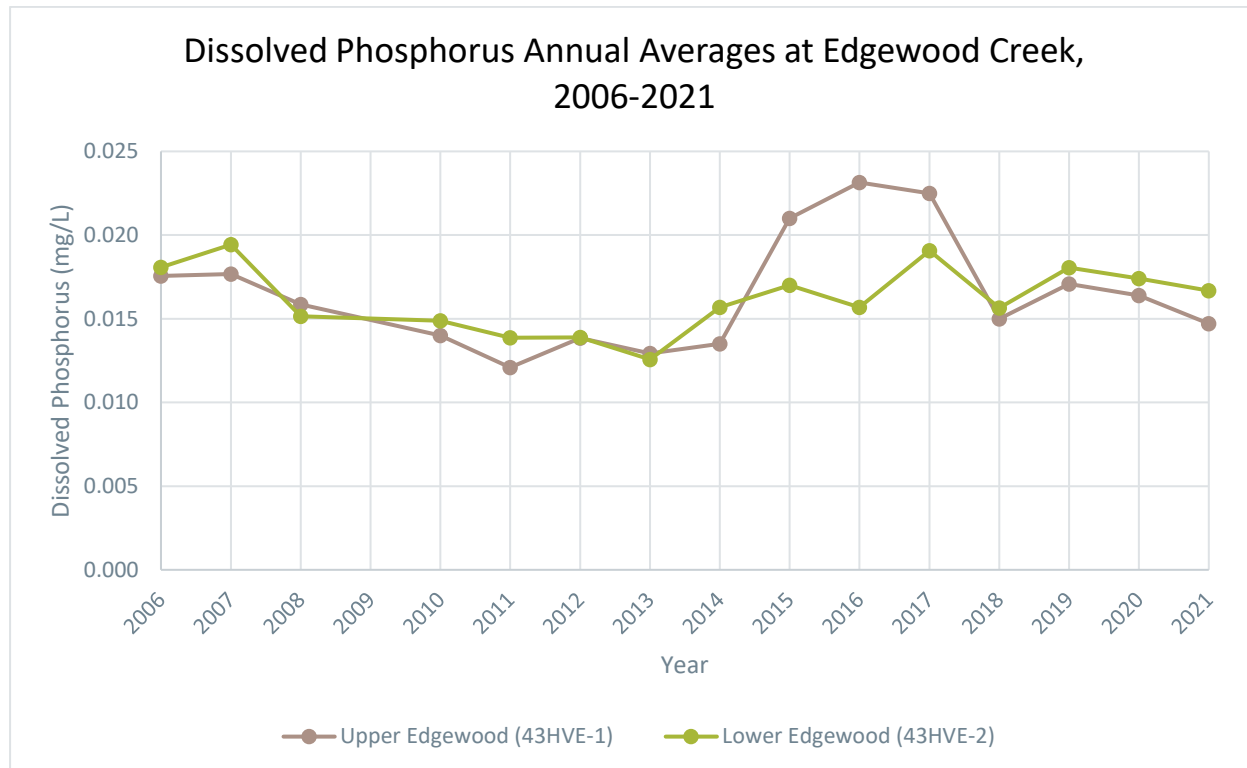


Figure C.11-8 Dissolved Phosphorus Annual Averages, Edgewood Creek (43HVE-1, 43HVE-2) (2006–2021)

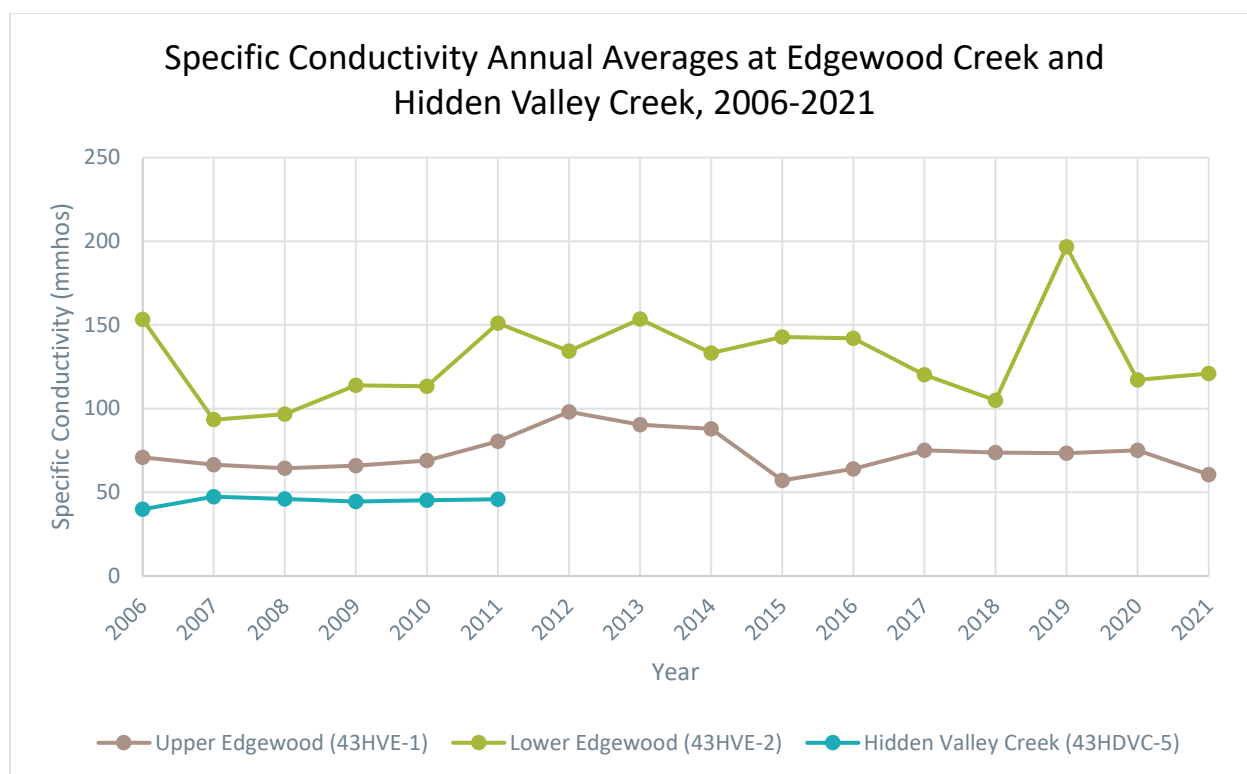


Figure C.11-9 Specific Conductivity Annual Averages, Edgewood Creek (43HVE-1, 43HVE-2) and Hidden Valley Creek (43HDVC-5) (2006–2021)

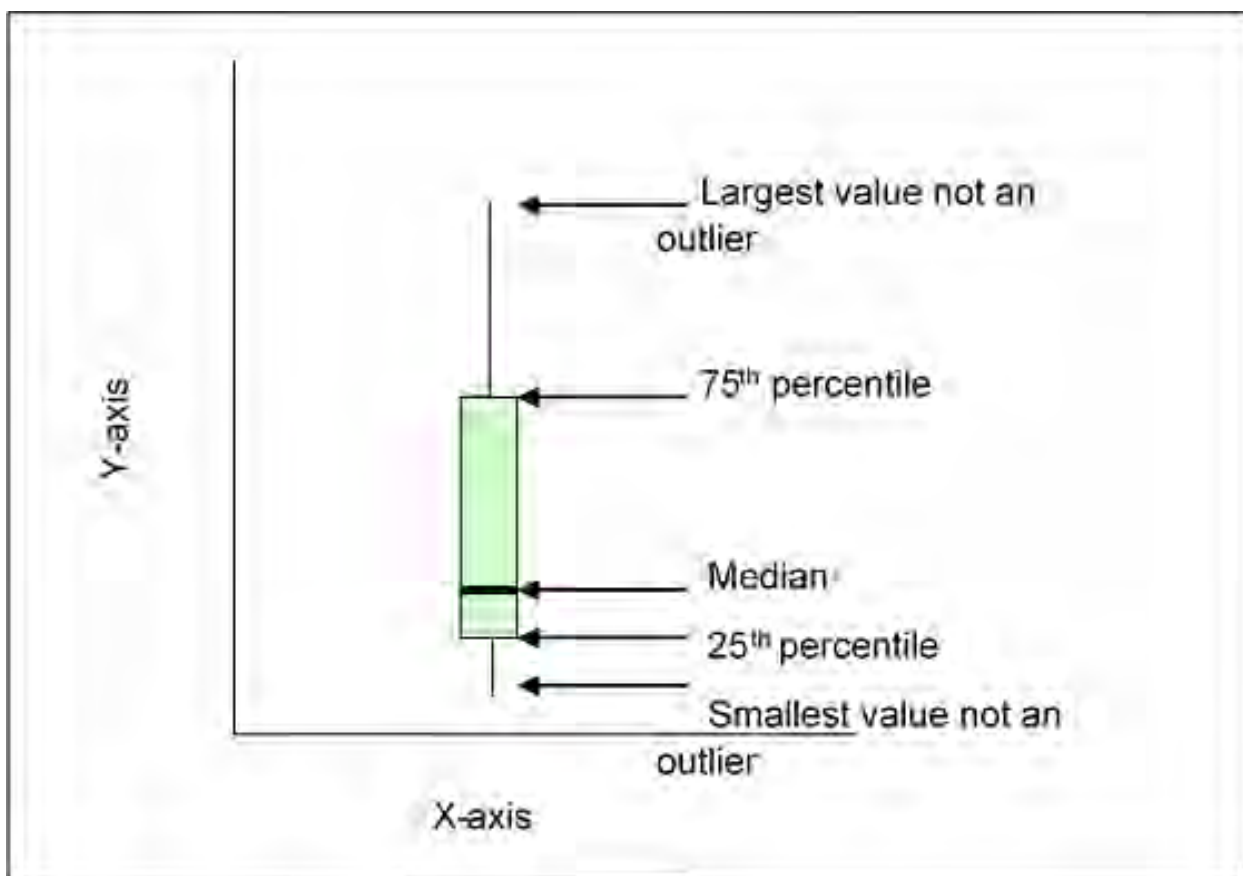


Figure C.12-1 Box and Whisker Legend¹

¹ Past analysis excluded outlier values for suspended sediment, total nitrogen, and total phosphorus, most often the case during the 90's, when averages at Property Line were very high. Therefore, those outliers have continued to be excluded for this analysis for comparison to past reports. Analysis for turbidity and chloride were first conducted for this report, and no values have been excluded as outliers. During instances when Property Line exhibited no flow (WY 2014, WY 2015, WY 2016, and WY 2021), analysis of suspended sediment assumed that no sediment was contributed downstream, thus a "0" value for that date. For all other constituents, the sample date was excluded from analysis.

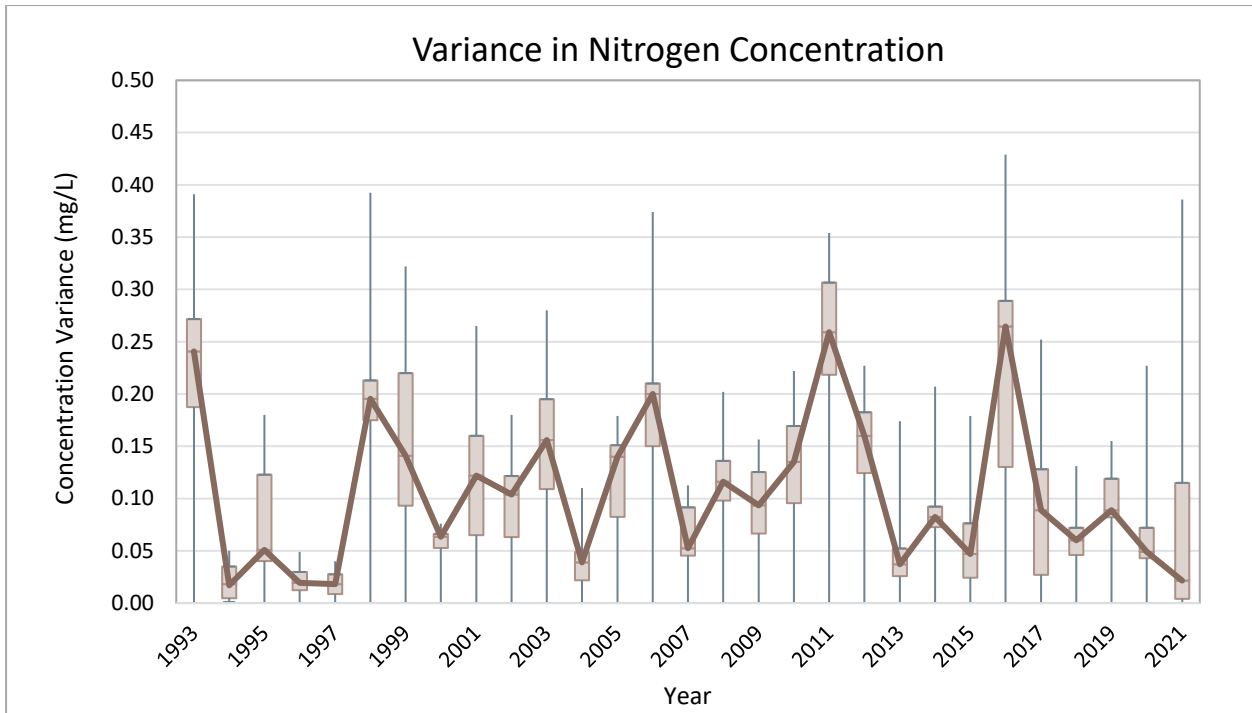


Figure C.12-2 Heavenly and Hidden Valley Creek Total Nitrogen Graphical Comparison (1993–2021)

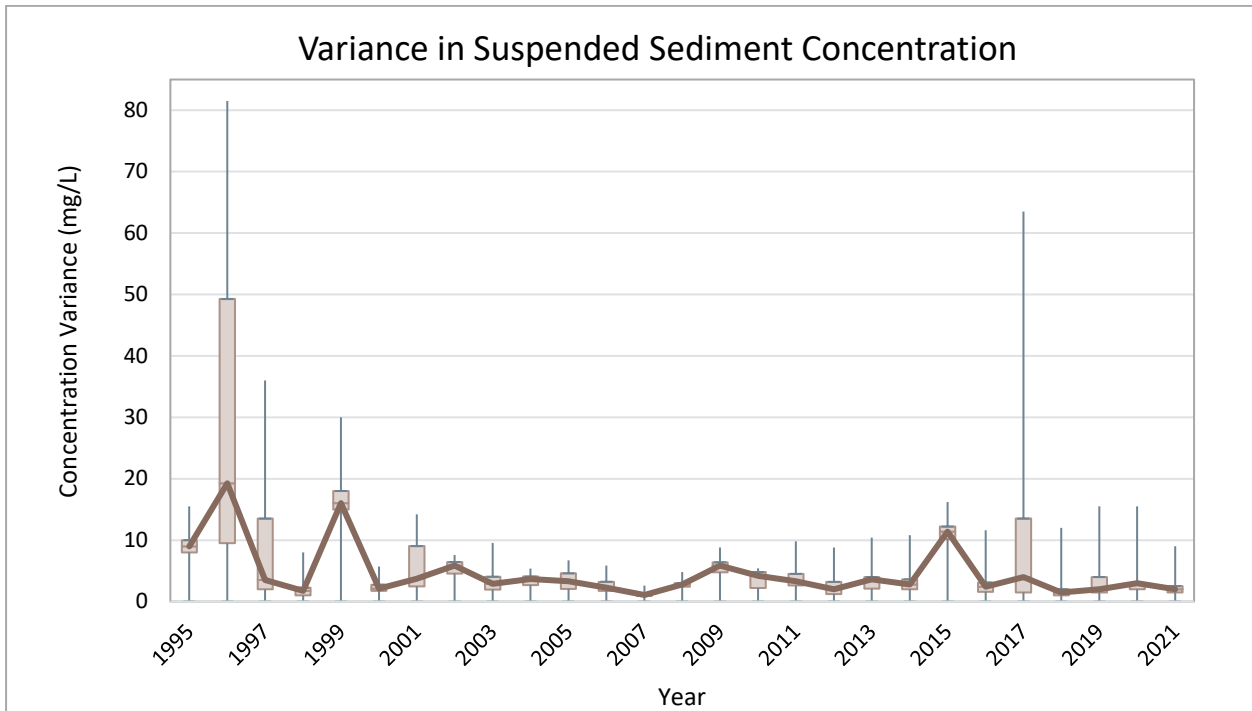


Figure C.12-3 Heavenly and Hidden Valley Creek TSS Graphical Comparison (1995–2021)

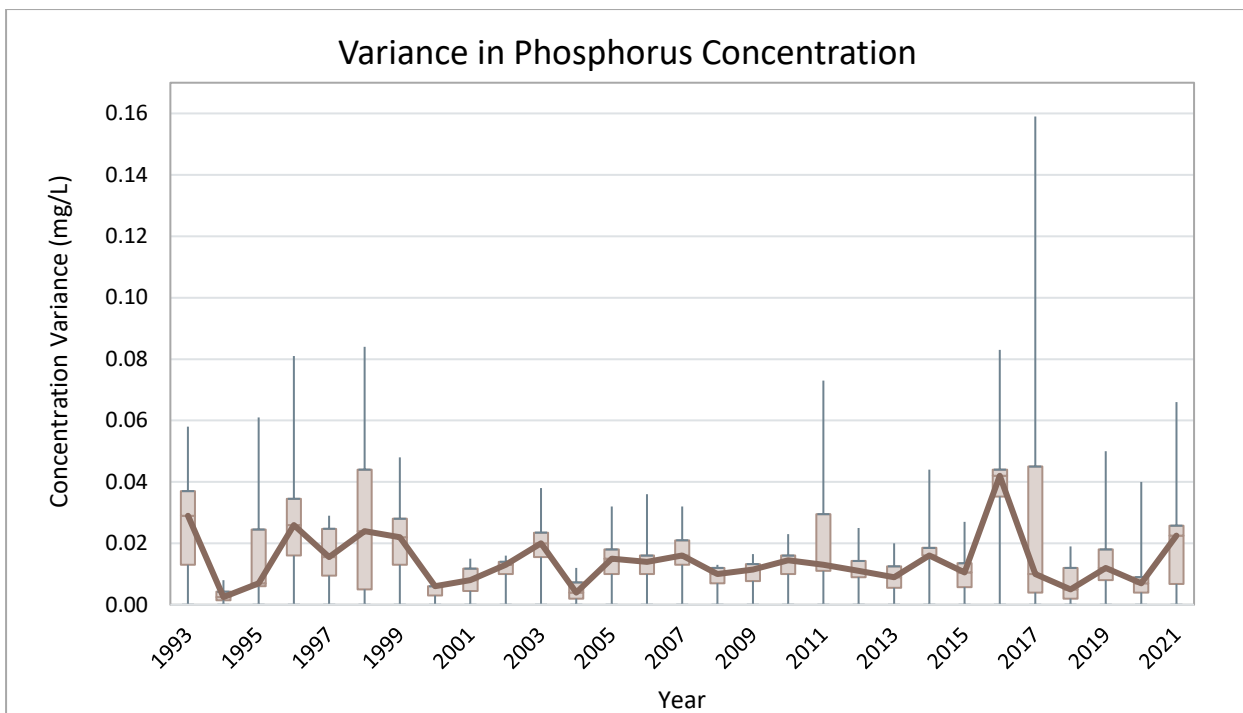


Figure C.12-4 Heavenly and Hidden Valley Creek Total Phosphorus Graphical Comparison (1993–2021)

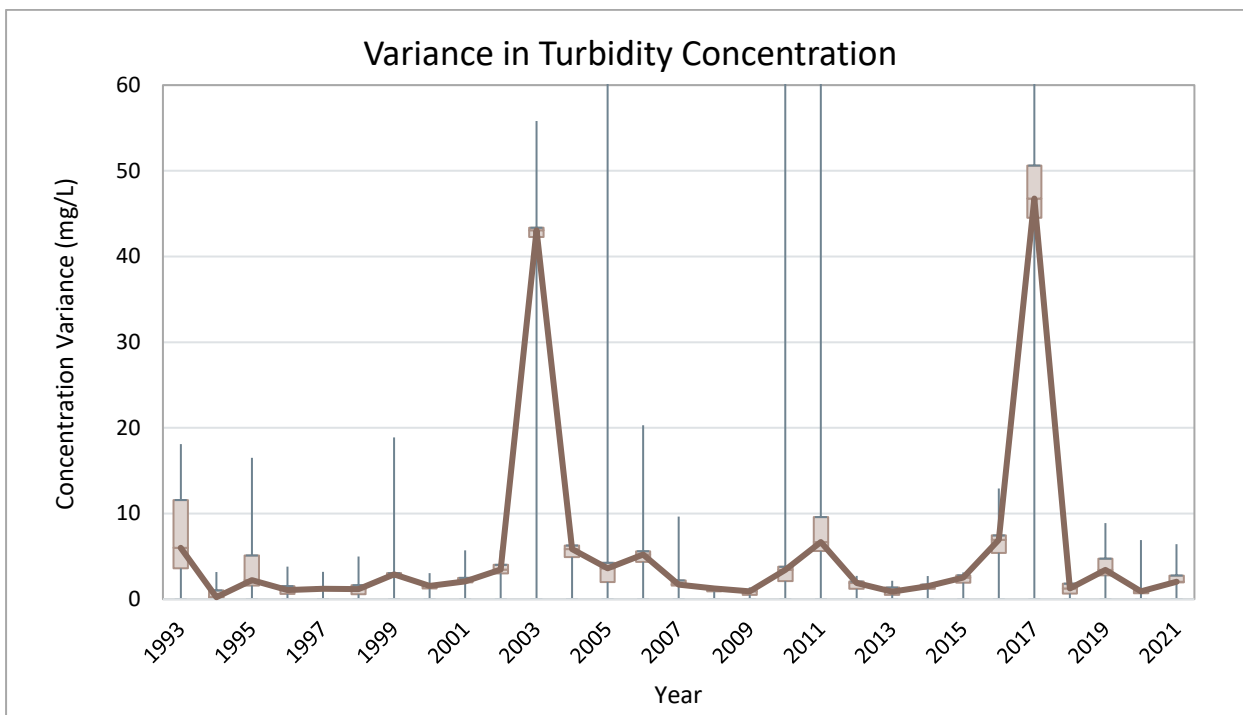


Figure C.12-5 Heavenly and Hidden Valley Creek Turbidity Graphical Comparison (1993–2021)

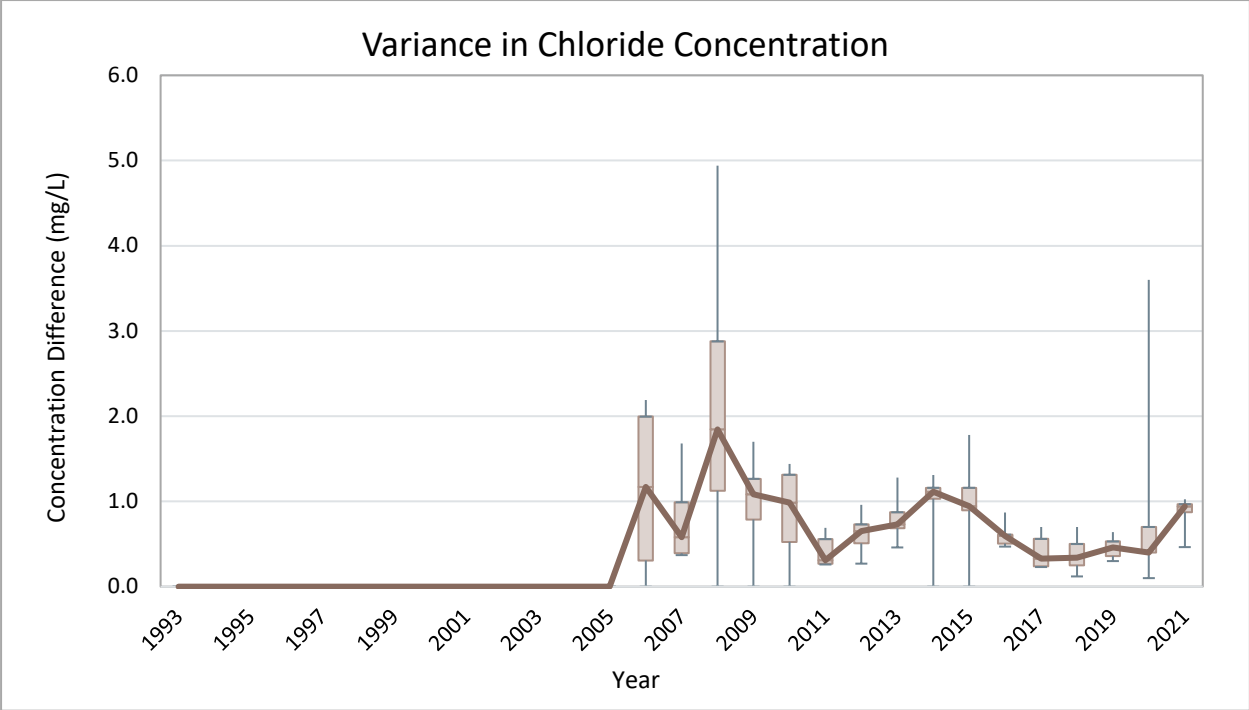


Figure C.12-6 Heavenly and Hidden Valley Creek Chloride Graphical Comparison (2012–2021)

This Page Intentionally Left Blank

Heavenly Mountain Resort
Water Years 2017–2021

APPENDIX

D

RAW WATER QUALITY
CONSTITUENTS CALIFORNIA
FILTER VAULTS, 2017–2021

Appendix D

Raw Water Quality Constituents California Filter Vaults, 2017–2021

D.1 California Base Parking Lot Vault Water Quality Tables (2017–2021)

Table D-1: Water Quality Data for Influent Station 43HVP-1a (North)

Table D-2: Water Quality Data for Influent Station 43HVP-1b (South)

Table D-3: Water Quality Data for Effluent Station 43HVP-2 (Compliance Point)

This Page Intentionally Left Blank

California Parking Lot - StormFitter
Influent (43HVP-1a)

Table D-1	Heavenly Mountain Resort water year 2017 water quality monitoring data from influent station 43HVP-1a (North), California Parking Lot Filter Vault influent point one. This station is located within the CA parking lot.									
Date	Notes ¹	Time	Turbidity (NTU)	Total Phosphorus (mg/L)	Nitrate Nitrogen (mg/L)	Nitrite Nitrogen (mg/L) ³	Total Kjeldahl Nitrogen (mg/L)	Total Nitrogen Calc. (mg/L)	Chloride (mg/L)	Oil & Grease (mg/L)
Lahontan Standards			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
First Quarter WY 2016-2017										
10/14/2016	^{2,3}	13:18	35	0.15	0.22	0.020	1.5	1.8	18	ND
10/27/2016	^{2,4}	13:30	28	0.13	0.080	ND	0.24	0.33	12	ND
12/15/2016	⁵	14:18	55	0.047	0.040	0.020	0.24	0.30	7.1	ND
Second Quarter WY 2016-2017										
No Samples were collected during the Second Quarter of water year 2016-2017.										
Third Quarter WY 2016-2017										
5/4/2017	^{6,7}	14:56	74	0.094	0.45	ND	0.40	0.86	61	ND
Fourth Quarter WY 2016-2017										
9/21/2017	⁸	18:02	23	0.088	0.11	ND	0.33	0.44	12	ND

¹ Reported values analyzed by WetLAB in Reno, NV.

² The matrix spike/matrix spike duplicate (MS/MSD) value for the analysis of TKN were outside acceptance criteria due to probable matrix interference. The reported values should be considered an estimate.

³ The sample collected on 10/14/16 was a grab sample. The automated units did not sample. Also, this storm infiltrated the sacrificial filters only upon inspection.

⁴ The sample collected on 10/27/16 was a grab sample. Visual inspection showed storm water entering both the sacrificial and large filter bays.

⁵ The sample collected on 12/15/16 was a grab sample. Visual inspection showed storm water entering both the sacrificial and large filter bays (Specifically ID4 & ID10). Beginning of large storm event.

⁶ The sample collected on 05/4/2017 was a snow melt runoff grab sample. Visual inspection showed runoff only entering the sacrificial unit from the North Inlet. Sacrificial bays were full of water and appeared to be functioning.

⁷ The matrix spike/matrix spike duplicate (MS/MSD) values for TKN were outside acceptance criteria due to probable matrix interference. The reported result should be considered an estimate.

⁸ Samples collected on 9/21/17 were triggered by the flow sensors collecting composite samples over an approximate one hour time period.

California Parking Lot - StormFitter
Influent (43HVP-1b)

Table D-2	Heavenly Mountain Resort water year 2017 water quality monitoring data from influent station 43HVP-1b (South), California Parking Lot Filter Vault influent point two. This station is located within the CA parking lot.									
Date	Notes ¹	Time	Turbidity (NTU)	Total Phosphorus (mg/L)	Nitrate Nitrogen (mg/L)	Nitrite Nitrogen (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Total Nitrogen Calc. (mg/L)	Chloride (mg/L)	Oil & Grease (mg/L)
Lahontan Standards			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
First Quarter WY 2016-2017										
10/14/2016	²	13:11	39	0.12	0.23	0.017	1.2	1.4	6.4	ND
10/27/2016	³	13:20	50	0.038	0.022	ND	0.24	0.26	1.8	ND
12/15/2016	⁴	14:49	99	0.059	0.073	0.026	0.43	99	15	ND
Second Quarter WY 2016-2017										
No Samples were collected during the Second Quarter of water year 2016-2017.										
Third Quarter WY 2016-2017										
5/4/2017	^{5,6}	14:56	33	0.12	0.17	ND	0.26	0.44	32	2.1
Fourth Quarter WY 2016-2017										
9/21/2017	⁷	17:54	24	0.11	0.075	ND	0.25	0.33	6.4	ND

¹ Reported values analyzed by WetLAB in Reno, NV.

² The sample collected on 10/14/16 was a grab sample. The automated units did not sample. Also, this storm infiltrated the sacrificial filters only upon inspection.

³ The sample collected on 10/27/16 was a grab sample. Visual inspection showed storm water entering both the sacrificial and large filter bays.

⁴ The sample collected on 12/15/16 was a grab sample. Visual inspection showed storm water entering both the sacrificial and large filter bays (Specifically ID4 & ID10). Beginning of large storm event.

⁵ The sample collected on 05/4/2017 was a snow melt runoff grab sample. Visual inspection showed runoff entering both the sacrificial and large filter bay (ID4) from the South Inlet. Sacrificial bays were full of water and appeared to be functioning.

⁶ The matrix spike/matrix spike duplicate (MS/MSD) values for total Phosphorus were outside acceptance criteria due to probable matrix interference. The reported result should be considered an estimate.

⁷ Samples collected on 9/21/17 were triggered by the flow sensors collecting composite samples over an approximate one hour time period.

California Parking Lot - StormFilter
Effluent (43HVP-2)

Table D-3		Heavenly Mountain Resort water year 2017 water quality monitoring data from effluent station 43HVP-2, California Parking Lot Filter Vault effluent point. This station is located within the CA parking lot.								
Date	Notes ²	Time	Turbidity (NTU)	Total Phosphorus (mg/L)	Nitrate Nitrogen (mg/L)	Nitrite Nitrogen (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Total Nitrogen Calc. (mg/L)	Chloride (mg/L)	Oil & Grease (mg/L)
Lahontan Standards ¹			20.0	0.10	N/A	N/A	N/A	0.5	N/A	2.0
First Quarter WY 2016-2017										
10/14/2016	^{3,4}	13:34	59	0.076	0.24	0.018	1.4	1.6	9.2	ND
10/27/2016	^{5,6}	14:17	44	0.033	0.044	ND	ND	0.24	5.4	ND
12/15/2016	⁷	15:03	72	0.071	0.058	0.023	0.35	0.43	12	ND
Second Quarter WY 2016-2017										
No Samples were collected during the Second Quarter of water year 2016-2017.										
Third Quarter WY 2016-2017										
5/4/2017	⁸	15:04	30	0.10	0.17	ND	0.27	0.45	33	2.2
Fourth Quarter WY 2016-2017										
9/21/2017	⁹	18:21	26	0.11	0.11	ND	0.24	0.35	11	ND
Annual Summary		Min	26	0.033	0.044	0.018	0.24	0.24	5.4	ND
		Max	72	0.11	0.24	0.023	1.4	1.6	33	2.2
		# of Samples	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
# of Noncompliance Samples			5.0	1.0	-	-	-	1.0	-	1.0
% of Noncompliance Samples			100%	20%	-	-	-	20%	-	20%

¹ Standards are maximum concentration for discharge to surface waters not to exceed, effective November 30, 2008.

² Reported values analyzed by WetLAB in Reno, NV.

³ The matrix spike/matrix spike duplicate (MS/MSD) value for the analysis of Oil & Grease were outside acceptance criteria due to probable matrix interference. The reported values should be considered an estimate.

⁴ The sample collected on 10/14/16 was a grab sample. The automated units did not sample. Also, this storm infiltrated the sacrificial filters only upon inspection.

⁵ The matrix spike/matrix spike duplicate (MS/MSD) value for the analysis of total Phosphorus were outside acceptance criteria due to probable matrix interference. The reported values should be considered an estimate.

⁶ The sample collected on 10/27/16 was a grab sample. Visual inspection showed storm water entering both the sacrificial and large filter bays.

⁷ The sample collected on 12/15/16 was a grab sample. Visual inspection showed storm water entering both the sacrificial and large filter bays (Specifically ID4 & ID10). Beginning of large storm event.

⁸ The sample collected on 05/4/2017 was a snow melt runoff grab sample. Visual inspection showed runoff entering both the sacrificial and large filter bay (ID4) from the South Inlet and runoff was only entering the sacrificial unit from the North Inlet. No runoff was entering the Large Filter Vault from the North (ID10). Sacrificial vault inspections showed water over the filters which appear to be functioning correctly.

⁹ Samples collected on 9/21/17 were triggered by the flow sensors collecting composite samples over an approximate one hour time period. The outlet sample was collected approximately 15 minutes after the inlet locations providing residence time for filtration through the storm filter system.

California Parking Lot - StormFiltr
Influent (43HVP-1a)

Table D-1		Heavenly Mountain Resort water year 2018 water quality monitoring data from influent station 43HVP-1a (North), California Parking Lot Filter Vault influent point one. This station is located within the CA parking lot.								
Date	Notes ¹	Time	Turbidity (NTU)	Total Phosphorus (mg/L)	Nitrate Nitrogen (mg/L)	Nitrite Nitrogen (mg/L) ³	Total Kjeldahl Nitrogen (mg/L)	Total Nitrogen Calc. (mg/L)	Chloride (mg/L)	Oil & Grease (mg/L)
Lahontan Standards			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
First Quarter WY 2017-2018										
11/15/2017	²	12:02	37	0.053	0.072	0.012	0.49	0.57	23	ND
Second Quarter WY 2017-2018										
No Samples were collected during the Second Quarter of water year 2017-2018.										
Third Quarter WY 2017-2018										
5/24/2018	^{3,4}	14:02	70	0.061	0.31	0.012	0.92	1.2	54	3.4
Fourth Quarter WY 2017-2018										
7/22/2018		18:53	130	0.093	0.17	ND	2.3	2.5	59	2.1

¹ Reported values analyzed by WetLAB in Reno, NV.

² Due to laboratory equipment issues, Nitrate and Nitrite Nitrogen levels were analyzed beyond the acceptable holding times. The reported values should be considered an estimate.

³ The matrix spike/matrix spike duplicate (MS/MSD) values for TKN and TP were outside acceptance criteria due to probable matrix interference. The reported results should be considered an estimate.

⁴ There was insufficient sample available to perform a spike and/or duplicate on the oil and grease analytical batch.

California Parking Lot - StormFitter
Influent (43HVP-1b)

Table D-2		Heavenly Mountain Resort water year 2018 water quality monitoring data from influent station 43HVP-1b (South), California Parking Lot Filter Vault influent point two. This station is located within the CA parking lot.								
Date	Notes ¹	Time	Turbidity (NTU)	Total Phosphorus (mg/L)	Nitrate Nitrogen (mg/L)	Nitrite Nitrogen (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Total Nitrogen Calc. (mg/L)	Chloride (mg/L)	Oil & Grease (mg/L)
Lahontan Standards			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
First Quarter WY 2017-2018										
11/15/2017	^{2, 3}	12:03	40	0.046	0.097	0.013	0.41	0.52	5.7	ND
Second Quarter WY 2017-2018										
No Samples were collected during the Second Quarter of water year 2017-2018.										
Third Quarter WY 2017-2018										
5/24/2018	⁴	13:51	140	0.11	0.13	ND	0.92	1.1	19	3.8
Fourth Quarter WY 2017-2018										
7/22/2018		18:38	180	0.13	0.059	0.053	2.9	3.0	20	2.8

¹ Reported values analyzed by WetLAB in Reno, NV.

² Due to laboratory equipment issues, Nitrate and Nitrite Nitrogen levels were analyzed beyond the acceptable holding times. The reported values should be considered an estimate.

³ The matrix spike/matrix spike duplicate (MS/MSD) values for total Phosphorous were outside acceptance criteria due to probable matrix interference. The reported result should be considered an estimate.

⁴ There was insufficient sample available to perform a spike and/or duplicate on the oil and grease analytical batch.

California Parking Lot - StormFitter
Effluent (43HVP-2)

Table D-3	Heavenly Mountain Resort water year 2018 water quality monitoring data from effluent station 43HVP-2, California Parking Lot Filter Vault effluent point. This station is located within the CA parking lot.									
Date	Notes ²	Time	Turbidity (NTU)	Total Phosphorus (mg/L)	Nitrate Nitrogen (mg/L)	Nitrite Nitrogen (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Total Nitrogen Calc. (mg/L)	Chloride (mg/L)	Oil & Grease (mg/L)
Lahontan Standards ¹			20.0	0.10	N/A	N/A	N/A	0.5	N/A	2.0
First Quarter WY 2017-2018										
11/15/2017	³	12:52	6.7	0.070	0.049	0.014	0.43	0.49	14	ND
Second Quarter WY 2017-2018										
No Samples were collected during the Second Quarter of water year 2017-2018.										
Third Quarter WY 2017-2018										
5/24/2018	^{4,5}	14:02	91	0.043	0.22	0.011	0.76	0.99	33	3.3
Fourth Quarter WY 2017-2018										
7/22/2018	⁶	19:18	100	0.089	0.21	ND	1.9	2.2	36	3.3
Annual Summary		Min	6.7	0.043	0.049	0.011	0.43	0.49	14.0	ND
		Max	100	0.09	0.22	0.014	1.9	2.2	36	3.3
		# of Samples	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
# of Noncompliance Samples			2.0	0.0	-	-	-	2.0	-	2.0
% of Noncompliance Samples			67%	0%	-	-	-	67%	-	67%

¹ Standards are maximum concentration for discharge to surface waters not to exceed, effective November 30, 2008.

² Reported values analyzed by WetLAB in Reno, NV.

³ Due to laboratory equipment issues, Nitrate and Nitrite Nitrogen levels were analyzed beyond the acceptable holding times. The reported values should be considered an estimate.

⁴ The matrix spike/matrix spike duplicate (MS/MSD) values for total Phosphorous were outside acceptance criteria due to probable matrix interference. The reported result should be considered an estimate.

⁵ There was insufficient sample available to perform a spike and/or duplicate on the oil and grease analytical batch.

⁶ The matrix spike/matrix spike duplicate (MS/MSD) values for Oil & Grease were outside acceptance criteria due to probable matrix interference. The reported result should be considered an estimate.

California Parking Lot - StormFitter
Influent (43HVP-1a)

Table D-1	Heavenly Mountain Resort water year 2019 water quality monitoring data from influent station 43HVP-1a (North), California Parking Lot Filter Vault influent point one. This station is located within the CA parking lot.									
Date	Notes ¹	Time	Turbidity (NTU)	Total Phosphorus (mg/L)	Nitrate Nitrogen (mg/L)	Nitrite Nitrogen (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Total Nitrogen Calc. (mg/L)	Chloride (mg/L)	Oil & Grease (mg/L)
Lahontan Standards			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
First Quarter WY 2018-2019										
11/27/2018		16:24	15	0.043	0.17	ND	0.37	0.55	14	2.7
Second Quarter WY 2018-2019										
N/A		No storm filter treatment vault inlet samples were taken due to sustained snow cover over the vault systems during the second quarter.								
Third Quarter WY 2018-2019										
5/16/2019		6:40	63	0.042	0.24	0.011	0.50	0.75	79	ND
Fourth Quarter WY 2018-2019										
9/4/2019		14:57	290	0.310	0.25	ND	2.60	2.9	ND ²	ND ³

¹ Reported values analyzed by WetLAB in Reno, NV.

² In January 2019, EPA changed the methodology reporting limits. The chloride minimum detection reporting limit is now 0.25 mg/L.

³ Due to laboratory issues, there was insufficient sample available to perform a spike and/or duplicate on this analytical batch. The reported results should be considered an estimate.

California Parking Lot - StormFitter
Influent (43HVP-1b)

Table D-2	Heavenly Mountain Resort water year 2019 water quality monitoring data from influent station 43HVP-1b (South), California Parking Lot Filter Vault influent point two. This station is located within the CA parking lot.									
Date	Notes ¹	Time	Turbidity (NTU)	Total Phosphorus (mg/L)	Nitrate Nitrogen (mg/L)	Nitrite Nitrogen (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Total Nitrogen Calc. (mg/L)	Chloride (mg/L)	Oil & Grease (mg/L)
Lahontan Standards			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
First Quarter WY 2018-2019										
11/27/2018		15:56	37	0.016	0.220	ND	0.21	0.43	38	2.4
Second Quarter WY 2018-2019										
N/A		No storm filter treatment vault inlet samples were taken due to sustained snow cover over the vault systems during the second quarter.								
Third Quarter WY 2018-2019										
5/16/2019		6:31	170	0.070	0.07	ND	0.60	0.67	60	ND
Fourth Quarter WY 2018-2019										
9/5/2019		15:45	150	0.170	0.33	ND	2.50	2.83	19	ND ²

¹ Reported values analyzed by WetLAB in Reno, NV.

² Due to laboratory issues, there was insufficient sample available to perform a spike and/or duplicate on this analytical batch. The reported results should be considered an estimate.

California Parking Lot - StormFitter
Effluent (43HVP-2)

Table D-3	Heavenly Mountain Resort water year 2019 water quality monitoring data from effluent station 43HVP-2, California Parking Lot Filter Vault effluent point. This station is located within the CA parking lot.									
Date	Notes ²	Time	Turbidity (NTU)	Total Phosphorus (mg/L)	Nitrate Nitrogen (mg/L)	Nitrite Nitrogen (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Total Nitrogen Calc. (mg/L)	Chloride (mg/L)	Oil & Grease (mg/L)
Lahontan Standards ¹			20	0.10	N/A	N/A	N/A	0.5	N/A	2
First Quarter WY 2018-2019										
11/27/2018		17:09	28	0.06	0.15	ND	0.34	0.51	11	2.4
Second Quarter WY 2018-2019										
N/A		No storm filter treatment vault outlet samples were taken due to sustained snow cover over the vault systems during the second quarter.								
Third Quarter WY 2018-2019										
5/16/2019		7:09	77	0.03	0.14	ND	0.50	0.64	70	ND
Fourth Quarter WY 2018-2019										
9/5/2019		15:45	270	0.19	0.38	ND	2.3	2.68	78	ND ³
Annual Summary		Min	28	0.03	0.14	ND	0.34	0.51	11.0	ND
		Max	270	0.19	0.38	ND	2.30	2.68	78.0	2.4
		# of Samples	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
# of Noncompliance Samples			3.0	1.0	-	-	-	3.0	-	1.0
% of Noncompliance Samples			100%	33%	-	-	-	100%	-	33%

¹ Standards are maximum concentration for discharge to surface waters not to exceed, effective November 30, 2008.

² Reported values analyzed by WetLAB in Reno, NV.

³ Due to laboratory issues, there was insufficient sample available to preform a spike and/or duplicate on this analytical batch. The reported results should be considered an estimate.

California Parking Lot - StormFitter
Influent (43HVP-1a)

Table D-1		Heavenly Mountain Resort water year 2020 water quality monitoring data from influent station 43HVP-1a (North), California Parking Lot Filter Vault influent point one. This station is located within the CA parking lot.								
Date	Notes	Time	Turbidity (NTU)	Total Phosphorus (mg/L)	Nitrate Nitrogen (mg/L)	Nitrite Nitrogen (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Total Nitrogen Calc. (mg/L)	Chloride (mg/L)	Oil & Grease (mg/L)
Lahontan Standards			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
First Quarter WY 2020										
No samples were taken during the first quarter of WY 2020										
Second Quarter WY 2020										
No samples were taken during the second quarter of WY 2020										
Third Quarter WY 2020										
5/18/2020	^{1,2}	7:00	53	0.041	0.14	ND	0.61	0.75	76	ND
Fourth Quarter WY 2020										
No samples were taken during the fourth quarter of WY 2020										

Notes:

¹ The Oil & Grease matrix spike/matrix spike duplicate (MS/MSD) values for the analysis of this parameter were outside acceptance criteria due to probable matrix interference. The reported result should be considered an estimate.

² The Oil & Grease analyte was analyzed for, but was not detected above the level of the reported sample reporting/quantitation limit. The reported result should be considered an estimate.

California Parking Lot - StormFitter
Influent (43HVP-1b)

Table D-2		Heavenly Mountain Resort water year 2020 water quality monitoring data from influent station 43HVP-1b (South), California Parking Lot Filter Vault influent point two. This station is located within the CA parking lot.								
Date	Notes	Time	Turbidity (NTU)	Total Phosphorus (mg/L)	Nitrate Nitrogen (mg/L)	Nitrite Nitrogen (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Total Nitrogen Calc. (mg/L)	Chloride (mg/L)	Oil & Grease (mg/L)
Lahontan Standards			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
First Quarter WY 2020										
No samples were taken during the first quarter of WY 2020										
Second Quarter WY 2020										
No samples were taken during the second quarter of WY 2020										
Third Quarter WY 2020										
5/18/2020	¹	6:40	44	0.030	0.090	ND	0.50	0.59	21	ND
Fourth Quarter WY 2020										
No samples were taken during the fourth quarter of WY 2020										

Notes:

¹ The Oil & Grease analyte was analyzed for, but was not detected above the level of the reported sample reporting/quantitation limit. The reported result should be considered an estimate.

California Parking Lot - StormFitter
Effluent (43HVP-2)

Table D-3		Heavenly Mountain Resort water year 2020 water quality monitoring data from effluent station 43HVP-2, California Parking Lot Filter Vault effluent point. This station is located within the CA parking lot.								
Date	Notes	Time	Turbidity (NTU)	Total Phosphorus (mg/L)	Nitrate Nitrogen (mg/L)	Nitrite Nitrogen (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Total Nitrogen Calc. (mg/L)	Chloride (mg/L)	Oil & Grease (mg/L)
Lahontan Standards ¹			20.0	0.10	N/A	N/A	N/A	0.5	N/A	2.0
First Quarter WY 2020										
No samples were taken during the first quarter of WY 2020										
Second Quarter WY 2020										
No samples were taken during the second quarter of WY 2020										
Third Quarter WY 2020										
5/18/2020	²	7:20	49	0.027	0.13	ND	0.46	0.60	45	ND
Fourth Quarter WY 2020										
No samples were taken during the fourth quarter of WY 2020										
Annual Summary		Min	49	0.027	0.13	ND	0.46	0.60	45.0	0.0
		Max	49	0.027	0.13	ND	0.46	0.60	45.0	0.0
		# of Samples	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
# of Noncompliance Samples			1.0	0.0	-	-	-	1.0	-	0.0
% of Noncompliance Samples			100%	0%	-	-	-	100%	-	0%

Notes:

¹ Standards are maximum concentration for discharge to surface waters not to exceed, effective November 30, 2008.

² The Oil & Grease analyte was analyzed for, but was not detected above the level of the reported sample reporting/quantitation limit. The reported result should be considered an estimate.

California Parking Lot - StormFiltr
Influent (43HVP-1a)

Table D-1		Heavenly Mountain Resort water year 2021 water quality monitoring data from influent station 43HVP-1a (North), California Parking Lot Filter Vault influent point one. This station is located within the CA parking lot.								
Date	Notes	Time	Turbidity (NTU)	Total Phosphorus (mg/L)	Nitrate Nitrogen (mg/L)	Nitrite Nitrogen (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Total Nitrogen Calc. (mg/L)	Chloride (mg/L)	Oil & Grease (mg/L)
Lahontan Standards			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
First Quarter WY 2021										
11/18/2020	^{1, 2}	11:48	76	0.020	0.15	ND	0.83	0.98	34	ND
Second Quarter WY 2021										
No samples were taken during the second quarter of WY 2021										
Third Quarter WY 2021										
5/16/2021	^{2,3}	21:13	390	0.12	0.28	ND	3.3	3.5	280	ND
6/24/2021	⁴	12:39	290	0.47	ND	ND	5.9	5.9	93	2.6
Fourth Quarter WY 2021										
No samples were taken during the fourth quarter of WY 2021										

Notes:

- ¹ The reported Total Phosphorous value is between the laboratory method detection limit and the laboratory practical quantitation limit. The reported result should be considered an estimate.
- ² The Oil & Grease analyte was analyzed for, but was not detected above the level of the reported sample reporting/quantitation limit. The reported result should be considered an estimate.
- ³ Due to sample, matrix dilution was required in order to properly detect and report the analyte Nitrite. The reporting limit has been adjusted accordingly.
- ⁴ The reported Oil & Grease value is between the laboratory method detection limit and the laboratory practical quantitation limit. The reported result should be considered an estimate.

California Parking Lot - StormFitter
Influent (43HVP-1b)

Table D-2		Heavenly Mountain Resort water year 2021 water quality monitoring data from influent station 43HVP-1b (South), California Parking Lot Filter Vault influent point two. This station is located within the CA parking lot.								
Date	Notes	Time	Turbidity (NTU)	Total Phosphorus (mg/L)	Nitrate Nitrogen (mg/L)	Nitrite Nitrogen (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Total Nitrogen Calc. (mg/L)	Chloride (mg/L)	Oil & Grease (mg/L)
Lahontan Standards			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
First Quarter WY 2021										
11/18/2020	¹	11:30	150	0.037	0.085	ND	0.84	0.93	50	ND
Second Quarter WY 2021										
No samples were taken during the second quarter of WY 2021										
Third Quarter WY 2021										
5/16/2021	^{2, 3}	20:59	390	0.095	0.16	ND	2.3	2.4	63	2.9
6/24/2021	¹	12:30	180	0.40	ND	ND	4.7	4.7	39	ND
Fourth Quarter WY 2021										
No samples were taken during the fourth quarter of WY 2021										

Notes:

¹ The Oil & Grease analyte was analyzed for, but was not detected above the level of the reported sample reporting/quantitation limit. The reported result should be considered an estimate.

² The reported Oil and Grease value is between the laboratory method detection limit and the laboratory practical quantitation limit. The reported result should be considered an estimate.

³ The Total Kjeldahl Nitrogen Spike recovery was not calculated. Sample concentration >4X the spike amount; therefore, the spike could not be adequately recovered.

California Parking Lot - StormFitter
Effluent (43HVP-2)

Table D-3		Heavenly Mountain Resort water year 2021 water quality monitoring data from effluent station 43HVP-2, California Parking Lot Filter Vault effluent point. This station is located within the CA parking lot.								
Date	Notes	Time	Turbidity (NTU)	Total Phosphorus (mg/L)	Nitrate Nitrogen (mg/L)	Nitrite Nitrogen (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Total Nitrogen Calc. (mg/L)	Chloride (mg/L)	Oil & Grease (mg/L)
Lahontan Standards ¹			20.0	0.10	N/A	N/A	N/A	0.5	N/A	2.0
First Quarter WY 2021										
11/18/2020	²	12:21	150	0.08	0.12	ND	0.90	1.0	32	ND
Second Quarter WY 2021										
No samples were taken during the second quarter of WY 2021										
Third Quarter WY 2021										
5/16/2021	²	22:02	760	0.63	0.29	ND	2.9	3.2	120	ND
6/24/2021	³	13:30	150	0.27	ND	ND	5.8	5.8	84	3.7
Fourth Quarter WY 2021										
No samples were taken during the fourth quarter of WY 2021										
Annual Summary		Min	150	0.08	0.12	ND	0.90	1.0	32.0	3.7
		Max	760	0.63	0.29	ND	5.80	5.8	120.0	3.7
		# of Samples	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
# of Noncompliance Samples			3.0	2.0	-	-	-	3.0	-	1.0
% of Noncompliance Samples			100%	67%	-	-	-	100%	-	33%

Notes:

¹ Standards are maximum concentration for discharge to surface waters not to exceed, effective November 30, 2008.

² The Oil & Grease analyte was analyzed for, but was not detected above the level of the reported sample reporting/quantitation limit. The reported result should be considered an estimate.

³ The matrix spike/matrix spike duplicate (MS/MSD) values for the analysis of the Oil & Grease parameter were outside acceptance criteria due to probable matrix interference. The reported result should be considered an estimate.

Heavenly Mountain Resort
Water Years 2017–2021

APPENDIX

E

WATER YEAR 2021, ADDITIONAL
ANNUAL REPORTING
INFORMATION

Appendix E

Water Year 2021, Additional Annual Reporting Information

E.1 Facilities Monitoring

E.1.1 Water Year 2021, Application and Recovery Table

E.1.2 Water Year 2021, Huck Salt Application Records

E.1.3 July Monthly Monitoring/Reporting

E.1.4 There were no August CML Reports were completed due to Caldor Fire (USFS closures/mandatory evacuation/ USFS Basecamp in Parking Lot)

E.1.5 September Monthly Monitoring/Reporting

E.1.6 2021 Water Year Salt Application Tracking

E.2 Erosion Control Monitoring

E.2.7 4th Quarter On Mountain Monitoring Log and Photos

E.3 2021 Annual Work List

E.3.8 2021 Annual Work List Completion Status as of 12/5/21

E.4 Vault Inspection Reports

E.4.9 Pacific Stormwater Solutions, LLC Stormwater Inspection Report, Units 3, 4, and 9

E.4.10 Pacific Stormwater Solutions, LLC Stormwater Inspection Report, Units 5, 10, and 11

E.4.11 Pacific Stormwater Solutions, LLC Stormwater Inspection Report, Wildwood Ave

E.5 Facilities Watershed Awareness Training

E.5.12 Facilities and Watershed Awareness Sign-in Sheets

E.5.13 Facilities and Watershed Awareness Presentation

Table E-1 Summary of Deicer Application and Recovery Water Year 2021

Month/Year	Total Amount of Deicer and Abrasives Applied (lbs.)	Total Amount of Deicer and Abrasives Recovered (lbs.)
October 2020	0	0
November 2020	2,222	0
December 2020	9,088	0
January 2021	13,632	0
February 2021	9,997	37,580
March 2021	35,949	0
April 2021	0	64,460
May 2021	404	0
June 2021	0	0
July 2021	0	0
August 2021	0	0
September 2021	0	0
WY 2021 Totals	71,292	102,040

Table E-2 The Location and the Application Amount of Huck Salt (Obtained from the Monthly Monitoring Logs, Water Year 2021)

Month/Year	Top of the Gondola (lbs.)	World Cup Race Course (lbs.)	Terrain Park (lbs.)	Adventure Peak Tubing Area (lbs.)	California Base Parking Lot (lbs.)	Tamarack Lodge Deck (lbs.)	Tram Base Decks (lbs.)	World Cup Foundation Building (lbs.)
October 2020	0	0	0	0	0	0	0	0
November 2020	0	0	0	0	50	0	0	0
December 2020	10	0	0	0	1,166	8	9	0
January 2021	0	0	0	0	750	0	14	0
February 2021	0	0	0	0	380	0	16	0
March 2021	0	0	125	0	280	2	16	0
April 2021	0	0	580	0	0	0	0	0
May 2021	0	0	0	0	0	0	0	0
June 2021	0	0	0	0	0	0	0	0
July 2021	0	0	0	0	0	0	0	0
August 2021	0	0	0	0	0	0	0	0
September 2021	0	0	0	0	0	0	0	0
WY 2021 Totals	10	0	705	0	2,626	10	55	0

Appendix E-2
4th Quarter Erosion Control Monitoring

(MONITORING AND REPORTING PROGRAM) BOARD ORDER NO. R6T-2015-0021
WDID 6A090033000
WASTE DISCHARGE REQUIREMENTS

LOCATION NAME: California Main Lodge

HEAVENLY SKI RESORT
DEICERS and ABARSIVES APPLICATION and RECOVERY

Monthly Summary Report

(MONITORING AND REPORTING PROGRAM) BOARD ORDER NO. R6T-2015-0021
WDID 6A090033000
WASTE DISCHARGE REQUIREMENTS

Quantity of ice control agents and abrasives used on Heavenly property and on CSLT streets. When the Dischargers apply deicers and/or abrasives on parking lots, base facilities, private roads, or City of South Lake Tahoe roads to the California Base area, the Dischargers shall keep a daily log and report a monthly summary of the following to Blair Davidson for Quarterly reporting to LRWQCB:

Month and Year: Jul-21 **Reporter:** Aryn Yancher

Location Name: Heavenly California Base and City of South Lake Tahoe Roads

Total Monthly Application: **0** lbs

Total Monthly Recovery: **0** lbs

Location of Disposal Facilities: Carson Landfill (by Tahoe Refuse)

Aryn Yancher 08/01/21
Employee Signature

**HEAVENLY SKI RESORT
DEICERS and ABRASIVES RECOVERY**

**(MONITORING AND REPORTING PROGRAM) BOARD ORDER NO. R6T-2015-0021
WDID 6A090033000
WASTE DISCHARGE REQUIREMENTS**

DAILY LOG

MONTH/YEAR: Jul-21

LOCATION NAME: Heavenly Upper Lot (15 min, bus drop, tram)

For abrasives or ice control agents that Heavenly Ski Resort (discharger) **removed** from parking lots and roadways, Heavenly Personnel shall record the following in a daily log for weekly submittal to supervisors and monthly submittal to Blair Davidson for input into Quarterly reporting to LRWQCB:

Location Codes:

H/UL – Cal Base Upper Lot

H/LL – Cal Base Lower Lot

H/W – Entrance Road (Wildwood above Sac S - Sand

C/WN CSLT – Wildwood – Needle Peak

C/SR CSLT - Ski Run

C/K CSLT – Keller

C/S CSLT- Sherman Way

C/R CSLT - Regina

Other – **Describe:**

Material Codes

DG - Spec H Sand

NaCl - Salt

Other – **Describe:**

Equipment/Method Used: (first three loads from drainage improvement.
Mechanical Sweeper: Desert Commercial Sweeping

Date	Type of Material	Quantity (lbs)
-------------	-------------------------	-----------------------

Total Monthly RECOVERY Heavenly (lbs?)	0 Sand	0 salt
---	--------	--------

Total Monthly RECOVERY in CSLT (lbs?)	0 Sand	0 salt
--	--------	--------

Submit Monthly to Supervisor.	Time period covered	7/1/2021	to	7/31/2021
--------------------------------------	---------------------	----------	----	-----------

Aryn Yancher 08/01/21

Employee Signature

Supervisor Signature

**HEAVENLY SKI RESORT
CALIFORNIA PARKING LOT, LODGE and ROADS
MONITORING CHECKLIST**

(MONITORING AND REPORTING PROGRAM NO.R6T-2015-0021)

Date: Jul-21 Inspector: Aryn Yancher

Complete the following inspection at the **CA Parking Lot, CA Base Lodge, and associated roads, at least once monthly and after significant storm events**. Turn in Checklists to Supervisor for submittal to Blair Davidson for input into Quarterly reports to LRWQCB.

Were any of the following Observed?

a. Drop Inlets (CA parking Lot and Roads)

- 1) Clogged by Debris, ice, or sediment?
- 2) Runoff movement into the infiltration gallery?
- 3) Damaged by vehicles or snow plow?

b. Drainage Collection System (Ca Parking Lot, Roads)

- 1) Clogged by debris, ice, or sediment?
- 2) Movement of water through pipes, channels and appurtenances impeded?
- 3) Drainage collection system damages?
- 4) Inadequate energy dissipation?

c. Sediment Traps and Vaults (CA Prkng Lot & Roads)

- 1) sediment accumulated in each chamber of trap vaults, or galleries? If Yes, estimate depth and volume.
- 2) Traps and Vaults recently cleaned? List date of last cleaning
- 3) Presence of sheen, foam trash or scum?

d. Erosion Control (CA parking Lot, Lodges, and Maintenance Shops)

- 1) Vegetation appears unhealthy?
- 2) Gully or rill erosion on slopes?
- 3) Sediment buildup at toes of slopes?
- 4) Vegetation damages by vehicles or heavy foot traffic?

Yes	No	Comments
Describe Problems, Locations and Corrective Actions		
	X	
	X	
	X	
Describe Problems, Locations and Corrective Actions		
	X	
X		
	X	
Describe Problem and Corrective Actions		
	X	0" (Cleaned in July)
X		Clean Harbors DIC 07/30/2021 Pacific Stormwater Filters 07/15/2021
	X	
Please Note Locations and Corrective Actions		
	X	
	X	
	X	
	X	

e. Culvert Outlet (west of Wildwood Ave)

- 1) Inadequate energy dissipation
- 2) Trash or debris needs to be removed from

f. Upstream Drainage Diversion (Located on First Ride Run)

- 1) Inadequate energy dissipation
- 2) Trash or debris needs to be removed from drainage way?

g. Spilled Chemicals, Paints, Fuels, Sealants, Oils, Greases, Antifreeze, etc? (all locations)

h. Sediment/Sand Buildup in CA parking Lot?

i. Grease Interceptor Not Operating Properly? (CA Base Lodge)

Please Note Locations and Corrective Actions		
	X	
	X	
Please Note Locations and Corrective Actions		
	X	
	X	
	X	
	X	
	X	

Describe any problems / activities, dates and times of problems/activities and the personnel to which problems were reported:

Filter Replacement on 7/15 and Cleanout Occurred on 7/30/2021.

Upper Cal Lot replacement of degraded asphalt. R&R of 11,600 sq ft (inc 3000 sq ft patches). Lower lot R&R 13000 sq ft. Swept and crackfill & seal 283,500 (whole lot) sq ft.

Improvements made to French Drain (lower lot) and repair of 2 drop inlets

Documentation of resulting actions and dates problems corrected:

INSPECTION PURPOSE AND GOALS:

The purpose of the inspection is to identify actual or potential erosion and surface runoff on the project site and to identify BMP maintenance needs so that corrective measures may be immediately undertaken.

Any erosion, surface runoff problems, wastewater disposal problems, or other adverse conditions, which are found on the subject property, shall be clearly described and the corrective measures proposed by the Dischargers (Heavenly) shall be included in the quarterly monitoring report. **In the event that no such problems are found on the property, a statement certifying this condition must be included for each monthly inspection.**

PLEASE ADD ADDITIONAL INFORMATION IF NECESSARY AND ATTACH PHOTO DOCUMENTATION

[illegible]

NO AUGUST CML Reports were completed due to Caldor Fire (USFS closures/mandatory evacuation/
USFS Basecamp in Parking Lot).

**HEAVENLY SKI RESORT
DEICERS and ABRASIVES APPLICATION**

**(MONITORING AND REPORTING PROGRAM) BOARD ORDER NO. R6T-2015-0021
WDID 6A090033000
WASTE DISCHARGE REQUIREMENTS**

DAILY LOG

MONTH/YEAR: Sep-21

LOCATION NAME: California Main Lodge

For days when Heavenly Ski Resort (discharger) applies abrasives or ice control agents on parking lots and roadways, Heavenly Personnel shall record the following daily use for weekly submittal to supervisors and monthly submittal to Blair Davidson for input into Quarterly reporting to LRWQCB:

Location Codes:

- 1 H/UL – Cal Base Upper Lot
- 2 H/LL – Cal Base Lower Lot
- 3 H/W – Entrance Road (Wildwood above Saddle)
- 4 C/WN CSLT – Wildwood – Needle Peak
- 5 C/SR CSLT - Ski Run
- 6 C/K CSLT – Keller
- 7 C/S CSLT-Sherman Way
- 8 C/R CSLT- Regina
- 9 Other – Describe:

Material Codes

- C – Cinders
- NaCl- Salt
- S - Sand
- Other – Describe:
- B - Brine

<u>Date/Time</u>	<u>Quantity (lbs)</u>	<u>Location Code</u>	<u>Type of Material</u>

Total Monthly APPLICATION Heavenly (lbs?) salt sand

salt sand

Total Monthly APPLICATION in CSLT (lbs?)

Submit Weekly to Supervisor.

Time period covered 9/1/2021 9/30/2021

Employee Signature/DATE

Aryn Yancher 10.01.21

HEAVENLY SKI RESORT
DEICERS and ABARSIVES APPLICATION and RECOVERY

Monthly Summary Report

(MONITORING AND REPORTING PROGRAM) BOARD ORDER NO. R6T-2015-0021
WDID 6A090033000
WASTE DISCHARGE REQUIREMENTS

Quantity of ice control agents and abrasives used on Heavenly property and on CSLT streets. When the Dischargers apply deicers and/or abrasives on parking lots, base facilities, private roads, or City of South Lake Tahoe roads to the California Base area, the Dischargers shall keep a daily log and report a monthly summary of the following to Blair Davidson for Quarterly reporting to LRWQCB:

Month and Year: Sep-21 **Reporter:** Aryn Yancher

Location Name: Heavenly California Base and City of South Lake Tahoe Roads

Total Monthly Application: **0** lbs

Total Monthly Recovery: **0** lbs

Location of Disposal Facilities: Carson Landfill (by Tahoe Refuse)

Aryn Yancher 10/01/21
Employee Signature

**HEAVENLY SKI RESORT
DEICERS and ABRASIVES RECOVERY**

**(MONITORING AND REPORTING PROGRAM) BOARD ORDER NO. R6T-2015-0021
WDID 6A090033000
WASTE DISCHARGE REQUIREMENTS**

DAILY LOG

MONTH/YEAR: Sep-21

LOCATION NAME: Heavenly Upper Lot (15 min, bus drop, tram)

For abrasives or ice control agents that Heavenly Ski Resort (discharger) **removed** from parking lots and roadways, Heavenly Personnel shall record the following in a daily log for weekly submittal to supervisors and monthly submittal to Blair Davidson for input into Quarterly reporting to LRWQCB:

Location Codes:

H/UL – Cal Base Upper Lot

H/LL – Cal Base Lower Lot

H/W – Entrance Road (Wildwood above Sac S - Sand

C/WN CSLT – Wildwood – Needle Peak

C/SR CSLT - Ski Run

C/K CSLT – Keller

C/S CSLT- Sherman Way

C/R CSLT - Regina

Other – **Describe:**

Material Codes

DG - Spec H Sand

NaCl - Salt

Other – **Describe:**

Equipment/Method Used: (first three loads from drainage improvement.
Mechanical Sweeper: Desert Commercial Sweeping

Date	Type of Material	Quantity (lbs)
-------------	-------------------------	-----------------------

Total Monthly RECOVERY Heavenly (lbs?)	0 Sand	0 salt
---	--------	--------

Total Monthly RECOVERY in CSLT (lbs?)	0 Sand	0 salt
--	--------	--------

Submit Monthly to Supervisor.	Time period covered	9/1/2021	to	9/30/2021
--------------------------------------	---------------------	----------	----	-----------

Aryn Yancher 10/01/21

Employee Signature

Supervisor Signature

**HEAVENLY SKI RESORT
CALIFORNIA PARKING LOT, LODGE and ROADS
MONITORING CHECKLIST**

(MONITORING AND REPORTING PROGRAM NO.R6T-2015-0021)

Date: Sep-21 Inspector: Aryn Yancher

Complete the following inspection at the **CA Parking Lot, CA Base Lodge, and associated roads, at least once monthly and after significant storm events**. Turn in Checklists to Supervisor for submittal to Blair Davidson for input into Quarterly reports to LRWQCB.

Were any of the following Observed?

a. Drop Inlets (CA parking Lot and Roads)

- 1) Clogged by Debris, ice, or sediment?
- 2) Runoff movement into the infiltration gallery?
- 3) Damaged by vehicles or snow plow?

b. Drainage Collection System (Ca Parking Lot, Roads)

- 1) Clogged by debris, ice, or sediment?
- 2) Movement of water through pipes, channels and appurtenances impeded?
- 3) Drainage collection system damages?
- 4) Inadequate energy dissipation?

c. Sediment Traps and Vaults (CA Prkng Lot & Roads)

- 1) sediment accumulated in each chamber of trap vaults, or galleries? If Yes, estimate depth and volume.
- 2) Traps and Vaults recently cleaned? List date of last cleaning
- 3) Presence of sheen, foam trash or scum?

d. Erosion Control (CA parking Lot, Lodges, and Maintenance Shops)

- 1) Vegetation appears unhealthy?
- 2) Gully or rill erosion on slopes?
- 3) Sediment buildup at toes of slopes?
- 4) Vegetation damages by vehicles or heavy foot traffic?

Yes	No	Comments
Describe Problems, Locations and Corrective Actions		
Describe Problems, Locations and Corrective Actions		
Describe Problem and Corrective Actions		
	X	Clean Harbors DIC 07/30/2021 Pacific Stormwater Filters 07/15/2021
Please Note Locations and Corrective Actions		

e. Culvert Outlet (west of Wildwood Ave)

- 1) Inadequate energy dissipation
- 2) Trash or debris needs to be removed from

f. Upstream Drainage Diversion (Located on First Ride Run)

- 1) Inadequate energy dissipation
- 2) Trash or debris needs to be removed from drainage way?

g. Spilled Chemicals, Paints, Fuels, Sealants, Oils, Greases, Antifreeze, etc? (all locations)

h. Sediment/Sand Buildup in CA parking Lot?

i. Grease Interceptor Not Operating Properly? (CA Base Lodge)

Please Note Locations and Corrective Actions		
Please Note Locations and Corrective Actions		

Describe any problems / activities, dates and times of problems/activities and the personnel to which problems were reported:

See attached.

Due to the staging of Fire Crews at the parking lot, inspections could not be performed in September

Documentation of resulting actions and dates problems corrected:

INSPECTION PURPOSE AND GOALS:

The purpose of the inspection is to identify actual or potential erosion and surface runoff on the project site and to identify BMP maintenance needs so that corrective measures may be immediately undertaken.

Any erosion, surface runoff problems, wastewater disposal problems, or other adverse conditions, which are found on the subject property, shall be clearly described and the corrective measures proposed by the Dischargers (Heavenly) shall be included in the quarterly monitoring report. **In the event that no such problems are found on the property, a statement certifying this condition must be included for each monthly inspection.**



PLEASE ADD ADDITIONAL INFORMATION IF NECESSARY AND ATTACH PHOTO DOCUMENTATION


[illegible]




Date	Department/Location	Pounds used	Reporter	Month
12/04/20	Activities - Coaster	1.5	John Lanouette	12
12/08/20	Activities - Coaster	3.0	John Lanouette	12
12/17/20	Activities - Coaster	2.0	John Lanouette	12
12/27/20	Activities - Coaster	2.0	John Lanouette	12
12/29/20	Activities - Coaster	1.0	John Lanouette	12
02/26/21	Activities - Coaster	1.0	John Lanouette	02
12/04/20	Base Ops/Snow Removal - CA Base	150.0	Ryan Smith	12
12/08/20	Base Ops/Snow Removal - CA Base	300.0	Ryan Smith	12
12/13/20	Base Ops/Snow Removal - CA Base	75.0	Ryan Smith	12
12/16/20	Base Ops/Snow Removal - CA Base	75.0	Ryan Smith	12
12/17/20	Base Ops/Snow Removal - CA Base	75.0	Ryan Smith	12
12/18/20	Base Ops/Snow Removal - CA Base	75.0	Ryan Smith	12
12/19/20	Base Ops/Snow Removal - CA Base	75.0	Ryan Smith	12
12/22/20	Base Ops/Snow Removal - CA Base	75.0	Ryan Smith	12
12/23/20	Base Ops/Snow Removal - CA Base	75.0	Ryan Smith	12
12/26/20	Base Ops/Snow Removal - CA Base	100.0	Ryan Smith	12
12/31/20	Base Ops/Snow Removal - CA Base	91.0	Ryan Smith	12
01/01/21	Base Ops/Snow Removal - CA Base	25.0	Justin Gross	01
01/04/21	Base Ops/Snow Removal - CA Base	25.0	Justin Gross	01
01/05/21	Base Ops/Snow Removal - CA Base	50.0	Justin Gross	01
01/07/21	Base Ops/Snow Removal - CA Base	100.0	Justin Gross	01
01/12/21	Base Ops/Snow Removal - CA Base	100.0	Justin Gross	01
01/25/21	Base Ops/Snow Removal - CA Base	125.0	Justin Gross	01
01/30/21	Base Ops/Snow Removal - CA Base	325.0	Justin	01
CA Base - January Summary		750.0		
02/01/21	Base Ops/Snow Removal - CA Base	75.0	Justin Gross	02
02/03/21	Base Ops/Snow Removal - CA Base	50.0	Justin Gross	02
02/14/21	Base Ops/Snow Removal - CA Base	255.0	Justin Gross	02
CA Base - February Summary		380.0		
03/12/21	Base Ops/Snow Removal - CA Base	140.0	Justin Gross	03
03/13/21	Base Ops/Snow Removal - CA Base	60.0	Justin Gross	03
03/20/21	Base Ops/Snow Removal - CA Base	80.0	Justin Gross	03
CA Base - March Summary		280.0		
WY 2021 Q4	CA Base - 4th Qtr Summary	0.0	-	7, 8, 9
12/04/20	F&B - Tamarack Lodge Deck	1.5	Dave Davis	12
12/08/20	F&B - Tamarack Lodge Deck	3.0	Dave Davis	12
12/11/20	F&B - Tamarack Lodge Deck	0.5	dave davis	12
12/13/20	F&B - Tamarack Lodge Deck	0.5	dave davis	12
12/22/20	F&B - Tamarack Lodge Deck	0.5	dave davis	12
12/26/20	F&B - Tamarack Lodge Deck	1.0	dave davis	12
12/30/20	F&B - Tamarack Lodge Deck	0.5	dave davis	12
12/31/20	F&B - Tamarack Lodge Deck	0.5	dave davis	12
03/25/21	F&B - Tamarack Lodge Deck	2.0	Dave Davis	03
Tamarack Lodge - March Summary		2.0		
WY 2021 Q4	Tamarack Lodge - 4th Qtr Summary	0.0	-	7, 8, 9
12/01/20	Lift Ops - Tram Top and Bottom	1.0	Rich Mcadon	12
12/04/20	Lift Ops - Tram Top and Bottom	1.0	Rich Mcadon	12
12/05/20	Lift Ops - Tram Top and Bottom	2.0	Rich Mcadon	12
12/28/20	Lift Ops - Tram Top and Bottom	1.0	Rich Mcadon	12
12/31/20	Lift Ops - Tram Top and Bottom	4.0	Rich Mcadon	12
01/04/21	Lift Ops - Tram Top and Bottom	3.0	Alex	01
01/05/21	Lift Ops - Tram Top and Bottom	1.0	Alex	01
01/09/21	Lift Ops - Tram Top and Bottom	1.0	Alex	01
01/12/21	Lift Ops - Tram Top and Bottom	1.0	Alex	01
01/25/21	Lift Ops - Tram Top and Bottom	2.0	Jacob	01
01/26/21	Lift Ops - Tram Top and Bottom	5.0	Alex	01
01/27/21	Lift Ops - Tram Top and Bottom	1.0	Jimmy	01
Tram - January Summary		14.0		
02/03/21	Lift Ops - Tram Top and Bottom	3.0	Scotty Auld	02
02/04/21	Lift Ops - Tram Top and Bottom	2.0	Scotty Auld	02
02/12/21	Lift Ops - Tram Top and Bottom	2.0	Scotty Auld	02
02/17/21	Lift Ops - Tram Top and Bottom	6.0	Scotty Auld	02
02/21/21	Lift Ops - Tram Top and Bottom	1.0	Scotty Auld	02
02/25/21	Lift Ops - Tram Top and Bottom	2.0	Scotty Auld	02
Tram - February Summary		16.0		
03/11/21	Lift Ops - Tram Top and Bottom	2.0	Scotty Auld	03
03/15/21	Lift Ops - Tram Top and Bottom	2.0	Jimmy Price	03
03/18/21	Lift Ops - Tram Top and Bottom	2.0	Alex	03
03/19/21	Lift Ops - Tram Top and Bottom	3.0	Alex	03
03/20/21	Lift Ops - Tram Top and Bottom	3.0	Alex	03
03/23/21	Lift Ops - Tram Top and Bottom	2.0	Alex	03
03/24/21	Lift Ops - Tram Top and Bottom	1.0	Alex	03
03/30/21	Lift Ops - Tram Top and Bottom	1.0	Alex	03
Tram - March Summary		16.0		
WY 2021 Q4	Tram - 4th Qtr Summary	0.0	-	7, 8, 9
03/28/21	Terrain Parks	25.0	David Spurlock	03
03/29/21	Terrain Parks	20.0	David Spurlock	03
03/30/21	Terrain Parks	40.0	David Spurlock	03
03/31/21	Terrain Parks	40.0	David Spurlock	03
Terrain Parks - March Summary		125.0		
04/01/21	Terrain Parks	60.0	David Spurlock	04
04/02/21	Terrain Parks	40.0	David Spurlock	04
04/03/21	Terrain Parks	40.0	David Spurlock	04
04/04/21	Terrain Parks	80.0	David Spurlock	04
04/05/21	Terrain Parks	40.0	David Spurlock	04
04/06/21	Terrain Parks	80.0	David Spurlock	04
04/07/21	Terrain Parks	40.0	David Spurlock	04
04/08/21	Terrain Parks	40.0	David Spurlock	04
04/09/21	Terrain Parks	40.0	David Spurlock	04
04/10/21	Terrain Parks	40.0	David Spurlock	04
04/11/21	Terrain Parks	40.0	David Spurlock	04
04/13/21	Terrain Parks	40.0	David Spurlock	04
Terrain Parks - April Summary		580.0		
WY 2021 Q4	Terrain Parks - 4th Qtr Summary	0.0	-	7, 8, 9

Appendix E-2
4th Quarter On Mountain Monitoring

Heavenly Mountain Resort
Quarter: 4th Year: 2021
Erosion Control and Facilities Maintenance Monitoring
Inspection by: Bryan Hickman

Location	Date	Notes/Observations/Problems Identified	Corrective Measures Taken	Photos
Cal Dam	10/1/2021	Slope stabilization on east side of the reservoir remains effective. 401 WQC marked as historical effective 12/30/21	n/a	
Upper Ridge Run	10/1/2021	Minor overtopping of sediment basins along the roadway at the receiving area of the Cal Dam Sediment Removal Project.	Addition of water bar with check dams and increased capacity of basins.	
Maggie's, HV Creek, and High Five	10/1/2021	All 12", 24", and 36" culverts inspected clear and free of any obstructions.	n/a	

All Mountain	10/1/2021	Mountain roadways used by employees and vendors inspected and in good condition.	Ongoing maintenance taking place, including addition of road base, maintaining water bars. Data provided to USFS as part of annual roads report.	
All Mountain	10/1/2021	Rope lines in place along roadways to prevent unauthorized "off road" driving. Triple rope lines used in Draba areas on Upper Mountain.	Ropes to be removed prior to first snow for winter season.	
Maggie's & Hellwinkles	10/1/2021	Sediment basins and energy dissipaters are in good condition, maintained and cleaned out post storm events	Sediment basins have adequate capacity and are ready for winter	
Creek Area & Groove	10/1/2021	Rock Lined channels are in good shape. Rock Lined ditch at Groove chair has plenty of remaining sediment holding capacity.	Routine maintenance was done on the rock lined ditch around the base terminal of Groove chair.	
Shop Area	10/1/2021	Sediment basins and energy dissipaters are in good condition, maintained and cleaned out post storm events	Sediment basins have adequate capacity and are ready for winter	

Cal Base Parking Lot	9/20/2021	French drain in driveway not functional due to build up of sediment in trench	Crews cleaned out and removes sediment. Functional and ready for winter.	
Boulder Base Parking Lot	9/20/2021	Snow storage basins cleaned out of sediment. Material hauled off.	Sediment basins have adequate capacity and are ready for winter	
All Mountain	10/1/2021	Gullies and rills on slopes and roadways ok. After any major rain events our Trails Maintenance Crews and Heavy Equipment Operators address any problems right away.	Middle Section of Groove Trail identified as a Hot Spot due to riling. Crew performed a "rip and chip" treatment, seeded and irrigated.	
All Mountain	10/1/2021	Stockpiles of soils or road base materials observed on the mountain have proper BMP's.	Stockpiles will be removed before winter.	
Enchanted Forest	10/1/2021	Caldor Fire crews put dozer lines through the Enchanted Forest Ski School area damaging an electrical line and leaving large scars	Electrical crews repaired the damaged power line and Trail Crew fixed the dozer line.	

Appendix E-3
2021-12-05 Completed 2021 Annual Work List

**HEAVENLY MOUNTAIN RESORT
2021 ANNUAL SUMMER WORK LIST
Completed Status**

#	Source*	Location	Treatment	Status
Watershed: CA-1 Heavenly Valley Creek				
1	M	Upper Shop	Maintain existing water bars, ditches, drop inlets and culverts.	Partially Completed – Review 2022
2	M	Powderbowl/Groove Chair Base	Maintain rock-lined ditches at base of Groove Lift and sediment basin at base of Powderbowl Lift.	Completed
3	M	Maggie's Sediment Basins	Maintain and clean out sediment in Maggie's road shoulder sediment basins.	Completed
4	M	Hellwinkel's Sediment Basins	Maintain and clean out sediment in Hellwinkel's road shoulder sediment basins.	Completed
5	P/RM	Cal Dam Snowmaking Pond	Work to be completed is post construction 401 Certification monitoring (Activities completed in 2020, included: sediment removal and placement at low location at Liz's/Ridge Run, stabilization BMPs, and dam face relining for safety.)	Completed
6	P	American Tower Company Cell Tower & Fiber Optic Line Replacement	Third party project – Work to be completed includes gas line connection at the Top of the Gondola and possible fiber relocation near Mombo.	Completed
7	P	NV Energy	Third party project by NV Energy Project – Vault and Power Line Installations	2 nd Year Completed Multi Year Phased Project
8	EH-CA	Groove Erosion Resistance	Improve erosion resistance and drainage stability near summer access road and Groove ski trail.	Completed
9	RM	TOG Water Tank Power	Underground power extension TOG Water Tank	Completed
Watershed: CA-6 Bijou Creek				
10	EH-CA	Cal Base Summer Access	Stabilize summer access road at parking lot entrance and improve erosion resistance behind lodge.	Completed
Watershed: CA-7 Unnamed Creek - Gondola				
		NONE		

*Source Codes	
M	BMP Maintenance
P	Master Plan Implementation Project
RM	Resort Maintenance Project
EH-CA	Erosion Hotspot California
EH-NV	Erosion Hotspot Nevada

Watershed: NV-1 Mott Canyon Creek				
11	M	Galaxy Road Sediment Basins	Maintain and clean out sediment in Galaxy road shoulder sediment basins.	Completed
Watershed: NV-3 Edgewood Creek				
7 cont.	P	NV Energy	Third party project by NV Energy Project – Vault and Power Line Installations	2 nd Year Completed Multi Year Phased Project
11	RM	Boulder Parking Lot	Continue phased approach to parking lot repairs in coordination with Heavenly Base Ops.	3 rd Year Completed Multiyear phased project
Watershed: NV-2 + 5 Daggett Creek				
7 cont.	P	NV Energy	Third party project by NV Energy Project – Vault and Power Line Installations	2 nd Year Completed Multi Year Phased Project
11cont.	M	Galaxy Road Sediment Basins	Maintain and clean out sediment in Galaxy road shoulder sediment basins.	Completed
12	RM	East Peak Lodge Well	Resort maintenance around wellhead for public water system	Completed
13	P	East Peak Snowmaking Well	Resort connection to new NV Energy transformer	Completed

Resort-Wide Annual Maintenance

Installation of rope fencing along roadways and along sensitive areas.
Water quality inspections.
Inspect and maintain roads, apply road base as needed after inspections.
Snowmaking systems repair and maintenance. Repairs to hydrants.
Repair and replace signage damaged by storm events.
Remove marked hazardous trees.

*Source Codes	
M	BMP Maintenance
P	Master Plan Implementation Project
RM	Resort Maintenance Project
EH-CA	Erosion Hotspot Inventory California
EH-NV	Erosion Hotspot Inventory Nevada

Appendix E-4
2021 Vault Inspection Reports

Heavenly Ski Resort Main Lodge Units 3,4 and 9

REPORT CONTENTS

This report contains information regarding the results off the BMP(s) maintenance performed at the Heavenly Ski site.

The following information is provided for each BMP:

Maintenance Date
Maintenance Information
Weather Conditions
BMP Location
BMP Designation, Type and Configuration
Sediment, Water, and Hydrocarbon Levels if present
BMP overall Condition
BMP Components Condition
Additional Comments and Observations
Maintenance Photos
Any further recommended Action

MAINTENANCE SUMMARY

Based on the results of an inspection of BMP(s), the following action was completed:

- ☒ All maintained BMP's are operating within manufacturer's established specifications. Next inspection to take place Spring 2022.
- ☐ Repairs to one or more off the inspected BMPs is required.
- ☒ Full service maintenance completed on one or more of the BMP's. See report specifics for details.

Pacific Stormwater BMP Solutions

Stormwater Maintenance Report

PROJECT INFORMATION

Name Heavenly Main Lodge Unit # 3
Address 1504 Wildwood Dr, South Lake Tahoe, Ca.

MAINTENANCE DETAILS

Field Manager Gordon Clem System ID .03
Date 7/15/2021 GPS Coordinates

Weather Dry

SYSTEM TYPE StormFilter SF
CONFIGURATION Manhole
SIZE

MEDIA TYPE Phoso
CARTRIDGE# 7

Sediment Depth - inlet bay N/A Pronounced Scum Line? Yes
Sediment Depth - Cartridge Bay 4" Excessive Hydrocarbons? No
Sediment Depth - Annular N/A
Water Level - Static 13"

Physical Condition of Unit: Unit appears to be in good working condition.

Field Managers Comments:

Maintenance completed and system is treating runoff as designed. Maintenance included sediment removal and replacement of filters.

Maintenance completed? Yes Repairs Required? No

MAINTENANCE AUTHENTICITY

This hereby certifies that the information contained in this report is accurate and was obtained using accepted industry practices.

By: Gordon Clem

Company: Pacific Stormwater Solutions

Signature: 

Date: 8/10/21

Title: Maintenance Manager

Pacific Stormwater BMP Solutions

Stormwater Maintenance Report

PROJECT INFORMATION

Name Heavenly Main Lodge Unit# 9
Address 1504 Wildwood Dr, South Lake Tahoe, Ca.

MAINTENANCE DETAILS

Inspector Gordon Clem System ID .09
Date 7/15/2021 GPS Coordinates

Weather Dry

SYSTEM TYPE StormFilter SF
CONFIGURATION Manhole
SIZE

MEDIA TYPE Phoso
CARTRIDGE# 7

Sediment Depth - inlet bay N/A

Pronounced Scum Line? No

Sediment Depth - Cartridge Bay 3"

Excessive Hydrocarbons? No

Sediment Depth - Annular N/A

Water Level - Static 12"

Physical Condition of Unit: Unit appears to be in good working condition.

Inspector Comments:

Maintenance completed and system is treating runoff as designed. Maintenance included sediment removal and replacement of filters.

Maintenance completed? Yes

Repairs Required? No

AUTHENTICITY

This hereby certifies that the information contained in this report is accurate and was obtained using accepted industry practices.

By: Gordon Clem

Company: Pacific Stormwater Solutions

Signature: 

Date: 8/10/21

Title: Maintenance Manager

Pacific Stormwater BMP Solutions

Stormwater Maintenance Report

PROJECT INFORMATION

Name Heavenly Main Lodge Unit # 4
Address 1504 Wildwood Dr, South Lake Tahoe, Ca.

MAINTENANCE DETAILS

Inspector Gordon Clem System ID .04
Date 7/15/2021 GPS Coordinates

Weather Dry

SYSTEM TYPE StormFilter SF
CONFIGURATION Vault
SIZE 11x34

MEDIA TYPE ZPG
CARTRIDGE# 93

Sediment Depth - inlet bay 2"

Pronounced Scum Line? Yes

Sediment Depth - Cartridge Bay 1"

Excessive Hydrocarbons? No

Sediment Depth - Annular N/A

Water Level - Static 1"

Physical Condition of Unit: Unit appears to be in good working condition.

Inspector Comments:

Partial maintenance completed with sediment being removed. No filter replacement done at this time due to media is loose and unimpacted.

Maintenance completed? Yes

Repairs Required? No

AUTHENTICITY

This hereby certifies that the information contained in this report is accurate and was obtained using accepted industry practices.

By: Gordon Clem

Company: Pacific Stormwater Solutions

Signature: 

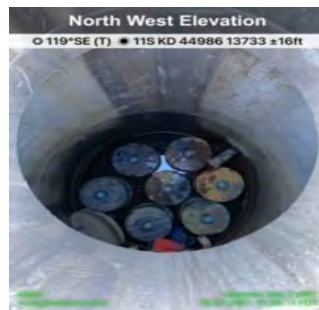
Date: 8/10/21

Title: Maintenance Manager

Pacific Stormwater BMP Solutions

Stormwater Maintenance Report

MAINTENANCE PHOTOS



Unit #3

Cartridge bay
Maintenance completed with new filters installed.

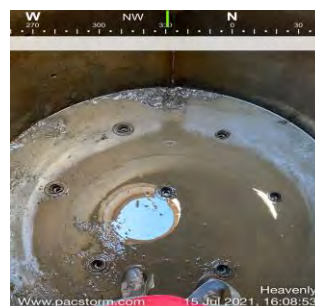
New filters installed



Unit #9



Cartridge bay



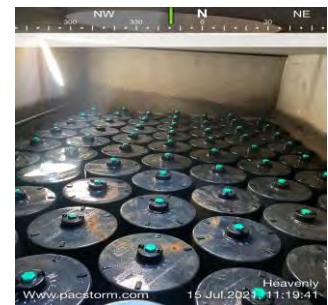
New filters installed



Maintenance completed with new filters installed.



Unit #4



Partial maintenance with sediment removal due to filters are not impacted.

STORMWATER TREATMENT UNIT MAINTENANCE COMPLIANCE 2021



**Heavenly Main Lodge
1504 Wildwood Ave
South Lake Tahoe, Ca.**

Let it be known that on July 15th, 2021 Three CONTECH stormwater Media Filter systems were maintained by a qualified professional at a frequency and in a manner consistent with the manufacturer's guidelines for general inspection and maintenance. All systems are operating as designed. Maintenance was completed on all three units. Recommend next inspection Spring 2022.

Therefore, based on these activities and by signed authorization below, this hereby certifies that the StormFilter Stormwater treatment systems at the above referenced location are currently performing as designed.

CERTIFICATE AUTHORIZATION

A handwritten signature in black ink that reads "Gordon Clem".

Gordon Clem
Maintenance Manager
Pacific Stormwater BMP Solutions
08/10/21

Heavenly Ski Resort Main Lodge Units 5, 10, 11

REPORT CONTENTS

This report contains information regarding the results off the BMP(s) maintenance performed at the Heavenly Ski site.

The following information is provided for each BMP:

Maintenance Date
Maintenance Information
Weather Conditions
BMP Location
BMP Designation, Type and Configuration
Sediment, Water, and Hydrocarbon Levels if present
BMP overall Condition
BMP Components Condition
Additional Comments and Observations
maintenance Photos
Any further recommended Action

MAINTENANCE SUMMARY

Based on the results of an inspection of BMP(s), the following action was completed:

- ☒ All maintained BMP's are operating within manufacturer's established specifications. Next inspection to take place Spring 2022
- ☐ Repairs to one or more off the inspected BMPs is required.
- ☒ Full service maintenance was performed on the following BMP's. See report specifics for details.

Pacific Stormwater BMP Solutions

Stormwater Maintenance Report



PROJECT INFORMATION

Name Heavenly Main Lodge Unit # 5
Address 1504 Wildwood Dr, South Lake Tahoe, Ca.

MAINTENANCE DETAILS

Field Manager Gordon Clem System ID .05
Date 07/15/21 GPS Coordinates

Weather Dry

SYSTEM TYPE StormFilter SF
CONFIGURATION Vault
SIZE 11x34

MEDIA TYPE ZPG
CARTRIDGE# 114

Sediment Depth - inlet bay N/A

Pronounced Scum Line? Yes

Sediment Depth - Cartridge Bay 1"

Excessive Hydrocarbons? No

Sediment Depth - Annular N/A

Water Level - Static 1"

Physical Condition of Unit: Unit appears to be in good working condition.

Field Managers Comments:

Partial maintenance completed. Sediment removed. Power wash internal components. Filter replacement not recommended due to media is loose and unimpacted. Unit is ready for Winter.

Maintenance Required? No

Repairs Required? No

MAINTENANCE AUTHENTICITY

This hereby certifies that the information contained in this report is accurate and was obtained using accepted industry practices.

By: Gordon Clem

Company: Pacific Stormwater Solutions

Signature: *Gordon Clem*

Date: 08/10/21

Title: Maintenance Manager

Pacific Stormwater BMP Solutions

Stormwater Maintenance Report



PROJECT INFORMATION

Name Heavenly Main Lodge **Unit#** 10
Address 1504 Wildwood Dr, South Lake Tahoe, Ca.

MAINTENANCE DETAILS

Inspector Gordon Clem **System ID** .10
Date 07/15/21 **GPS Coordinates**

Weather Dry

SYSTEM TYPE StormFilter SF
CONFIGURATION Vault
SIZE 11x34

MEDIA TYPE ZPG
CARTRIDGE# 93

Sediment Depth - inlet bay 7"

Pronounced Scum Line? Yes

Sediment Depth - Cartridge Bay 3"

Excessive Hydrocarbons? No

Sediment Depth - Annular N/A

Water Level - Static 1"

Physical Condition of Unit: Unit appears to be in good working condition.

Inspector Comments:

Maintenance completed. Sediment and spent filters removed. Power wash internal components and installed manufacturer supplied OEM filters. Inlet bay had 7" of sediment removed. Unit is ready for Winter.

Maintenance Required? No

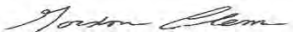
Repairs Required? No

AUTHENTICITY

This hereby certifies that the information contained in this report is accurate and was obtained using accepted industry practices.

By: Gordon Clem

Company: Pacific Stormwater Solutions

Signature: 

Date: 08/10/21

Title: Maintenance Manager

Pacific Stormwater BMP Solutions

Stormwater Maintenance Report



PROJECT INFORMATION

Name Heavenly Main Lodge **Unit #** 11
Address 1504 Wildwood Dr, South Lake Tahoe, Ca.

MAINTENANCE DETAILS

Inspector Gordon Clem **System ID** .11
Date 07/15/21 **GPS Coordinates**

Weather Dry

SYSTEM TYPE StormFilter SF
CONFIGURATION Vault
SIZE 11x34

MEDIA TYPE ZPG
CARTRIDGE# 114

Sediment Depth - inlet bay 2"

Pronounced Scum Line? Yes

Sediment Depth - Cartridge Bay 2.5"

Excessive Hydrocarbons? No

Sediment Depth - Annular N/A

Water Level - Static 1"

Physical Condition of Unit: Unit appears to be in good working condition.

Inspector Comments:

Partial maintenance completed. Sediment removed. Power wash internal components. Filter replacement not recommended due to media is loose and uncompacted. Unit is ready for Winter.

Maintenance Required? Yes

Repairs Required? No

AUTHENTICITY

This hereby certifies that the information contained in this report is accurate and was obtained using accepted industry practices.

By: Gordon Clem

Company: Pacific Stormwater Solutions

Signature: *Gordon Clem*

Date: 8/10/21

Title: Maintenance Manager

Pacific Stormwater BMP Solutions

Stormwater Maintenance Report

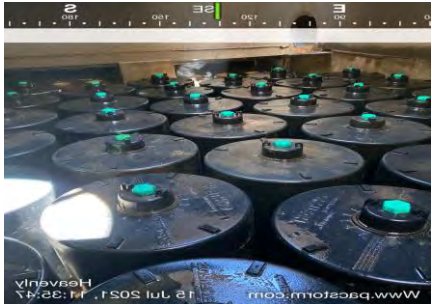
MAINTENANCE PHOTOS



Unit #5



Partial maintenance



No filter replaced



Unit #11



Partial maintenance



No filters replaced



Unit #10



During maintenance



New filters



Maintenance was completed with filter replacements. Inlet bay was cleaned.

STORMWATER TREATMENT UNIT MAINTENANCE COMPLIANCE 2021



**Heavenly Main Lodge
1504 Wildwood Ave
South Lake Tahoe, Ca.**

Let it be known that on July 15th, 2021 Three CONTECH stormwater Media Filter systems were maintained by a qualified professional at a frequency and in a manner consistent with the manufacturer's guidelines for general inspection and maintenance. All systems are operating as designed. Partial maintenance was completed on unit #5 and #11. Maintenance was completed on unit #10 including filter replacement. Recommend next inspection Spring 2022.

Therefore, based on these activities and by signed authorization below, this hereby certifies that the StormFilter Stormwater treatment systems at the above referenced location are currently performing as designed.

CERTIFICATE AUTHORIZATION

A handwritten signature in black ink, appearing to read "Gordon Clem".

Gordon Clem
Maintenance Manager
Pacific Stormwater BMP Solutions
08/10/21

Heavenly Ski Resort Main Lodge Wildwood Ave

REPORT CONTENTS

This report contains information regarding the results off the BMP(s) maintenance performed at the Heavenly Ski site.

The following information is provided for each BMP:

Maintenance Date
Maintenance Information
Weather Conditions
BMP Location
BMP Designation, Type and Configuration
Sediment, Water, and Hydrocarbon Levels if present
BMP overall Condition
BMP Components Condition
Additional Comments and Observations
Maintenance Photos
Any further recommended Action

MAINTENANCE SUMMARY

Based on the results of an inspection of BMP(s), the following action was completed:

- ☒ All inspected BMPs are operating within manufacturer's established specifications. Next inspection to take place Spring 2022
- ☐ Repairs to one or more off the inspected BMPs is required.
- ☒ Maintenance of one or more of the BMP systems completed. See report specifics for details.

Pacific Stormwater BMP Solutions

Stormwater Maintenance Report

PROJECT INFORMATION

Name Heavenly Main Lodge Unit # 11
Address Wildwood Ave, South Lake Tahoe, Ca.

MAINTENANCE DETAILS - WILDWOOD AVE Unit

Field Manager Gordon Clem System ID
Date 07/15/21 GPS Coordinates Wildwood Ave

Weather Dry

SYSTEM TYPE StormFilter SF
CONFIGURATION Vault
SIZE

MEDIA TYPE ZPG
CARTRIDGE# 27

Sediment Depth - inlet bay N/A

Pronounced Scum Line? Yes

Sediment Depth - Cartridge Bay 10"

Excessive Hydrocarbons? No

Sediment Depth - Annular N/A

Water Level - Static 8"

Physical Condition of Unit: Unit appears to be in good working condition.

Field Managers Comments:

Maintenance completed and system is treating runoff as designed. Sediment and static water removed from StormFilter and CDS unit. Manufacturer supplied OEM filters replaced at this time.

Maintenance completed? Yes

Repairs Required? No

MAINTENANCE AUTHENTICITY

This hereby certifies that the information contained in this report is accurate and was obtained using accepted industry practices.

By: Gordon Clem

Company: Pacific Stormwater Solutions

Signature: 

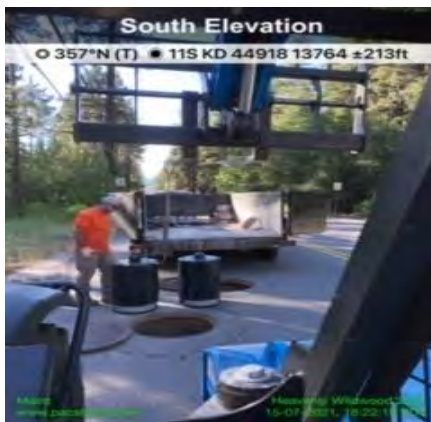
Date: 8/10/21

Title: Maintenance Manager

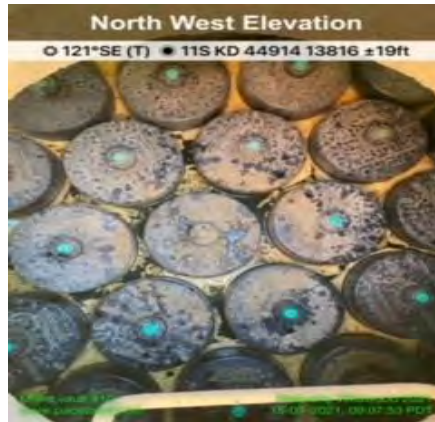
Pacific Stormwater BMP Solutions

Stormwater Maintenance Report

MAINTENANCE PHOTOS



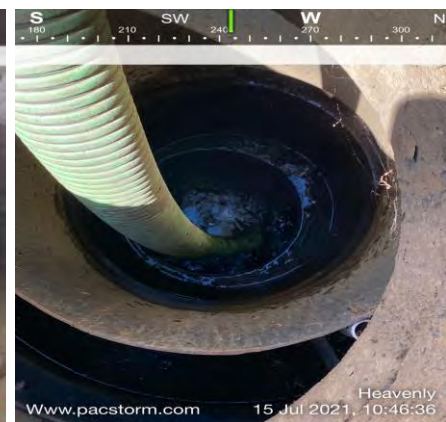
Wildwood unit



Before maintenance



During maintenance



CDS unit had sediment and static water removed.

STORMWATER TREATMENT UNIT MAINTENANCE COMPLIANCE 2021



**Heavenly Main Lodge
1504 Wildwood Ave
South Lake Tahoe, Ca.**

Let it be known that on July 15th, 2021 Wildwood CONTECH stormwater filtration system and One CDS hydrodynamic separator were maintained by a qualified professional at a frequency and in a manner consistent with the manufacturer's guidelines for general inspection and maintenance. System is operating as designed. Full service maintenance with OEM filter replacement was completed.

Recommend next inspection Spring 2022.

Therefore, based on these activities and by signed authorization below, this hereby certifies that the StormFilter Stormwater treatment systems at the above referenced location are currently performing as designed.

CERTIFICATE AUTHORIZATION

Handwritten signature of Gordon Clem.

Gordon Clem
Maintenance Manager
Pacific Stormwater BMP Solutions
8/10/21

Appendix E-5
Facilities Watershed Awareness Training

Week 1
6/1/2021



OUR PARTNERS, WHY BMP'S?, HELLO WINKEL'S, WATTLES
BMP's/Facilities and Watershed Training

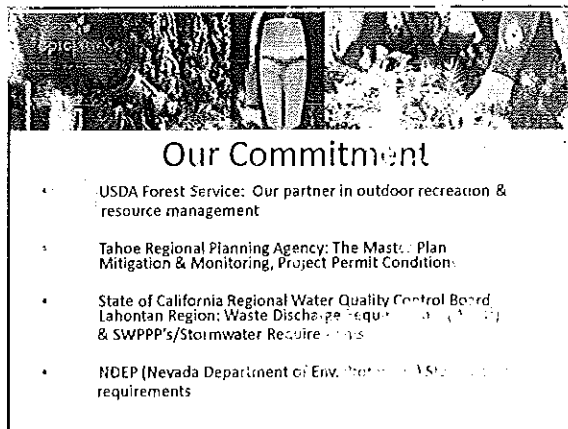
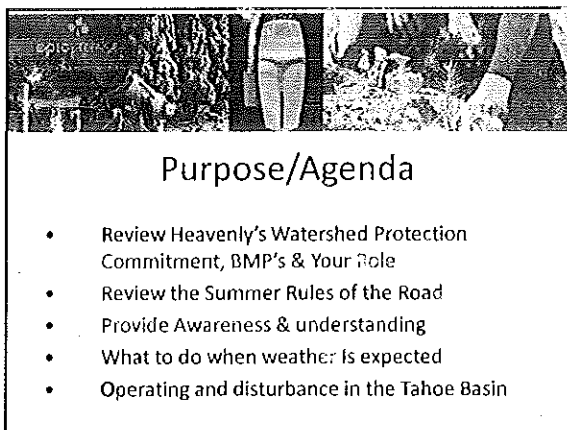
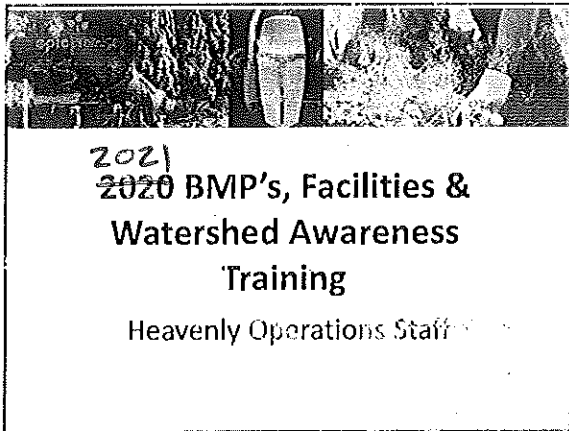
<u>FIRST NAME</u>	<u>LAST NAME</u>	<u>Employee ID</u>
John	Lamarche	216563
Blair	Davidson	214832
David	Caputo	170767
Tim	McCALL	223339
Matt	LightHart	247253
Matt	Entrup	296902
Richard Scott	Scott	222587
Abicht	DON	128681
Kelby	murphy	254772
CONOR	BLAKE	255049
ANASTASIA	MOVER	128648
Kory	Kilgerrall	226447
Gary	Rawlings	128581
KEVIN	HIBBINS	128598
Lyle	Barricatos	128669
Andie	Villanet	128595
Kyle	Nelson	257694
Ross	Brunson	389029
Ryan	Albertson	161603
Mare	Barr	128604
Scott	Rohde	148258
RT	Mitchell	208281
John	Fontanelli	193625
Kevin	Cleland	192249
Sean	Hutchinson	291656
Mitchell	Rittman	242567



BMP's/Facilities and Watershed Training

<u>FIRST NAME</u>	<u>LAST NAME</u>	<u>Employee ID</u>
William	Clarke	129456
David	Hager	200421
Tan	Clark	175145
Vicker	Gutierrez	156012
Joe	Flores	318857
Kyle	Ferguson	242517
Gabe	Docker	312379
Christine	Avenett	218486
Will	Cmin	194601
Sarah	Kozie/5K1	345553
Gordon	Vizcarra	212516
Dave	Zebco	128632
Roger	TAVARES	130274
Epic	BATES	130240
Brad	LEIGH	1130270
Chris	Hansen	148370
Glen	Reed	195512
Marc	Bugg	128604
Jeff	Prich	109626
Paul	Erdmann	214619
Bryan	Hickman	142876

WEEK 1



- TAKES PLACE OF BMP BREAKFAST
- WE WILL COVER A FEW TOPICS PER WEEK FOR THE NEXT FEW WEEKS
- PLEASE SIGN IN, PART OF OUR ANNUAL PERMIT REQUIREMENT.

OUR PARTNERS/REGULATORS

- USFS - TRPA
- LAHONTAN - NDEP



Agency Partners

- TRPA-Taylor Currier (BMP's, code enforcement) and Julie Roll (Senior Planner)
- Lahontan- Dale Payne (Env. Scientist) & Liz vanDiepen (Engineering Geologist)
- Consultant- Jill Sutherland (BMP's 3rd Party Inspectors, w/ RCI)
- LTBMU - Stephanie Heller, Hydrologist US Forest Service

CECILIA REED

THEY ARE REPRESENTED
BY THE FOLLOWING:



TRPA'S REPRESENTATIVE DOWNS
INSPECTIONS.



Erosion Control & BMP's

- Hellwinkel's Steeps Road Maintenance, now able to water steeper sections of road with small watering truck. 5MPH, 4WD Low Required

- Snowmaking Projects

Water Bars/Stabilization & Drainage Improvements, Cal Dam Maintenance.

- Maintain effectiveness of ski run BMP's, including maintaining water bars, Culverts and re-vegetation/soil cover.

- Roads Maintenance and Dust Control

OUR EFFORTS:

THINGS WE DO: BMP's



Hellwinkel's - Low & Slow!



Hellwinkel's: Low & Slow

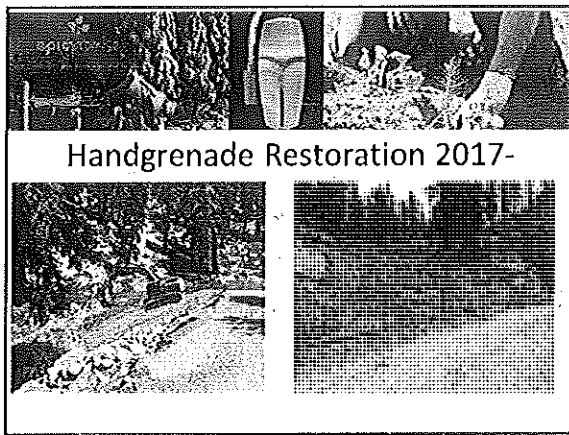
- 5 MPH MAX

- 4x4 Low.

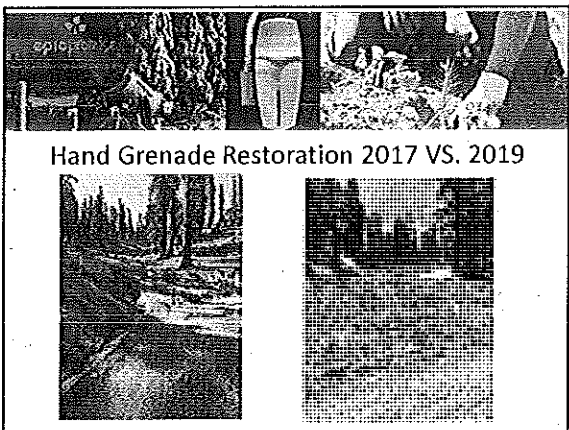
- DO NOT SPIN TIRES

- TAKING VENDORS THAT
WAY.

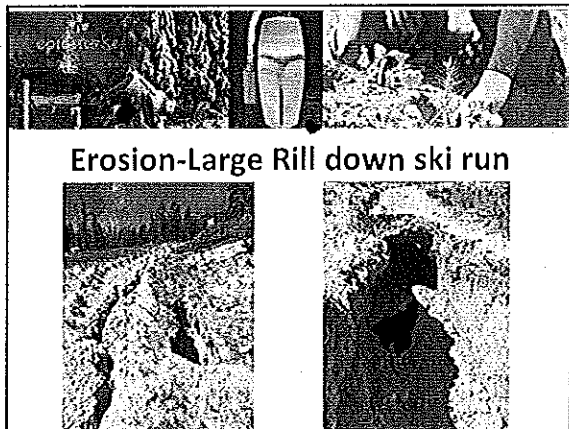
PROX. TO CREEK.



Handgrenade Restoration 2017-

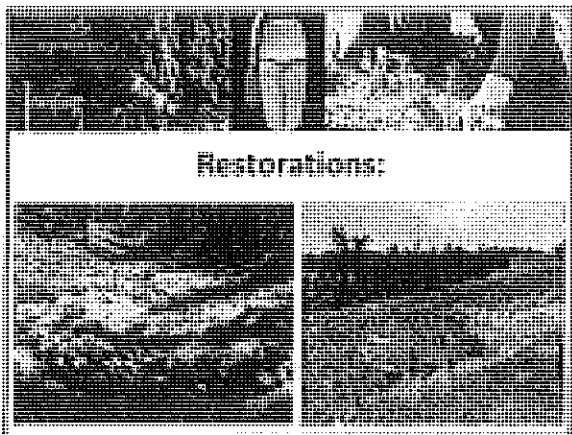


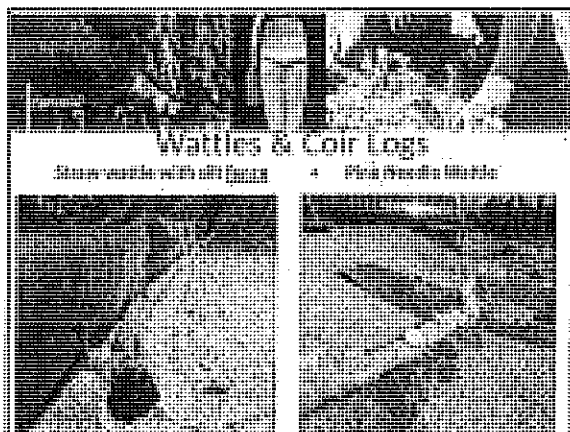
Hand Grenade Restoration 2017 VS. 2019



Erosion-Large Rill down ski run

THIS IS THE KIND OF
STUFF THAT SHOULD
BE REPORTED TO US
AFTER RAIN EVENT





WATTLES:

USED TO COMBAT

EROSION

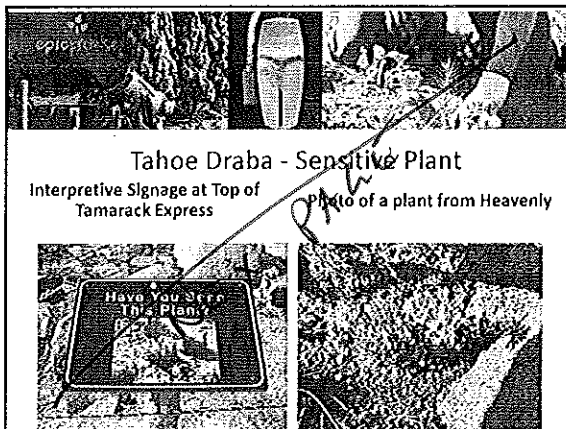
2 TYPES:


STRAW: SHORT TERM

PINE NEEDLES: LONG TERM

ALSO SILT FENCE DEPENDING
ON PROJECT.

PRIOR TO A PROJECT, REACH OUT
AND WE WILL DEVELOP A
BMP PLAN







Pine Needle Wattles

On mountain use for erosion control, and roads materials stockpiles.


Manufacturing by trails crew
Begin in 2011 Phase 1, Phase 2





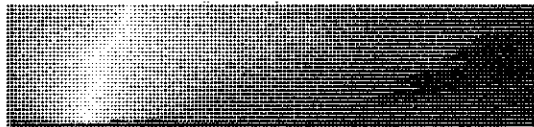
Important takeaways for you to ponder, with regard to BMP's:

- Is it working? (rather than "are we in trouble?")
- Source control – we're trying to stop the "bleeding" at the source rather than chasing it downstream.
- Water flow – its all connected, "Think like a water droplet." Look uphill of problem areas to determine if there is a root cause of the erosion issue...
- Heavenly Prioritization – address the highest risk spot first (e/g/ nearest to creek, most erosive, problem spots, etc)
- Keep Turbid Stormwater out of the water ways



Be especially aware during Thunderstorm activity and listen to weather updates from Central Dispatch on Radio. Contact dispatch if you hear thunder. Shut downs may impacts operations, work sites, and the mountain might be shelter in place.

Major weather "Events" can cause environmental damage
If you see damage occurring Call Dispatch. 530-542-6900 Take a picture if possible.



WEEK 2
6/7/21



WEEDS, DRABA, HOT WORK / FIRE DANGER
BMP's/Facilities and Watershed Training


<u>FIRST NAME</u>	<u>LAST NAME</u>	<u>Employee ID</u>
Kevin	Cleland	192249
Paul	Endmann	214619
Sarah	Kozicki	345553
Gabe	Decker	312379
Ryan	Albertson	161603
Kory	Kolzigewh	221497
Dan	Abicht	128687
Chris	Cadmus	245498
Grandon	Vizenor	212516
Jesse	Zerr	324229
Fouad	Dbovik	240969
Ross	Branson	339087
Lupe	Barrientos	128667
STEVE	CLINE	142875
Kyle	Nelson	257897
CONOR	BLAKE	255049
André	Villaret	128595
Frederick	Newberry	198259
PICK	M'ADON	130254
JIMMY	PRICE	239053
GRAEME	GROVER	128648
Christine	Avenett	218486
David	Caputo	170767
Richard	Sawth	222587
Matt	Lighthart	247203



BMP's/Facilities and Watershed Training

<u>FIRST NAME</u>	<u>LAST NAME</u>	<u>Employee ID</u>
Kyle	Ferguson	248517
Tan	Clark	175145
William	Clark	17456
Jen	Kawarantz	175733
Joe	Flores	318851
Victor	Gubaree	156012
David	Hager	200421
Pat	Hogart	171756
Paul	Bergman	212674
Sean	Hutchinson	291656
Will	Cain	194601
SCOTT	Rohde	148258
Eric	BATES	130290
Mare	Bugg	128604
Curtis	Kezich	128566
David	Boisjone	317274
Chris Williams	Williams	194981
Glen Reed	Reed	195512
Jeff	Reid	125026
John	Fontanelli	193625
Coran	Tennis	129624
Baran	Hickman	142876


[illegible]



Protect Tahoe Draba Populations – Do Not Disturb

Full grown plants-Mostly grow at 9,000-11,000 Ft. Elevation

Draba like to grow in disturbed areas. It usually drops flowers and seeds




DRABA:

WHERE DO WE FIND IT?

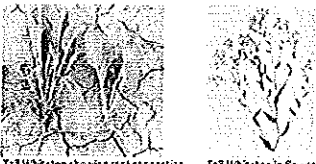
DO NOT DISTURB

- GARTH WILL MARK



Invasive Weeds are known to exist on top of Heavenly Mountain. Siting and treatments by the USFS continue annually and Most are now eradicated. 3 remaining treatment sites.

Tall Whitetop Identification: Tall whitetop (also called perennial pepperweed) has many stems. It reproduces from rhizomes (root, the under ground stem) and from seed. In fact, this species is common in many of the roundabouts, as well as, low, wet areas.



Tall Whitetop showing root connections Tall Whitetop in flower


INVASIVE WEEDS:

- CLEAN VENDORS

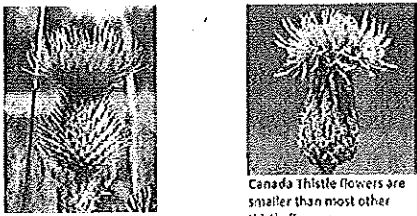
TRUCKS.

TALL WHITE TOP: MUST BE

SPRAYED - CANT BE PULLED



Bull Thistle Canada Thistle



Bull Thistle flower **Canada Thistle flowers are smaller than most other thistle flowers**

THISTLES: BULL: PURPLE

CANADA: REDISH/PURPLE

BULL: 2 YEAR CYCLE

YR 1: LOW SPIKEY ON GROUND. FLIP OVER

YR 2: TALL w/ BUDS. GET RID OF BUDS.



USFS Wildlife Trash Management and Education Program:

- As a condition of the approved EIS for the Epic Discovery Program a wildlife trash management and education plan is implemented annually and reviewed by Heavenly and the US Forest Service (TBMU). The Heavenly Mountain Resort Master Redevelopment Plan (2015) includes a number of Operations and Maintenance Measures as part of the Mitigation and Monitoring Plan. 7.5-21 BIO 8: Wildlife Trash Management and Education Program.
- A number of the activities at Heavenly Mountain Resort are located at the Top of The Gondola/Adventure Peak. As part of the Epic Discovery Project Implementation the resort shall create and implement a trash management and education program. The goal of this program is for timely removal of refuse from deposit points, education of our guests and staff about proper waste management, and to keep any interactions between humans and wildlife to a minimum.
- Animal resistant "bear box" receptacles are in place @ TOG in summer.

USFS WILDLIFE TRASH

MANAGEMENT PLAN:

- REVIEWED w/ USFS ANNUALLY
- GOAL IS TO LIMIT INTERACTIONS BETWEEN HUMANS AND WILDLIFE
- BEAR BOXES @ TOG
- TAKE TRASH OFF HILL, DON'T LEAVE IT IN TRUCKS



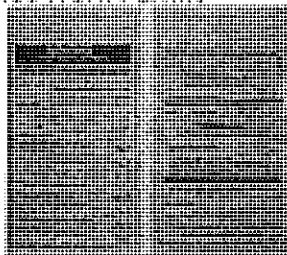
Heavenly Hot Work Permit

Required for any hot work outside of a designated weld shop. Proper tools in trucks, fire caches on hill.

Know the PAL code for the day.

Issued by Kevin Higgins, Bryan Hickman, David Rasmussen, & Curtis Keith.

Must be posted on site.



- NEEDED ANYTIME WORK IS DONE OUTSIDE OF A "DESIGNATED HOT WORK AREA"

- KEVIN, CURTIS, HICKMAN TO ISSUE & NOTIFY H&S

- KNOW THE PAL CODE

A, B, C - OK

D - DONE BY 1 - DEPENDS ON TYPE OF WORK

EV - NO HOT WORK

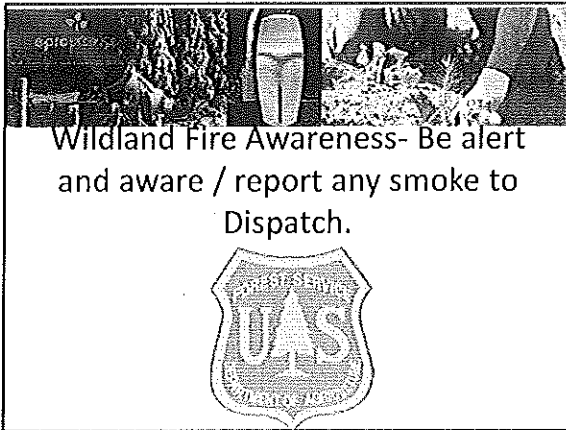
- LIFT CLASS FOR ANYONE INVOLVED w/ H.W.



Absolutely NO SMOKING

- Due to EXTREME fire danger, smoking is prohibited on the mountain.
- This includes Smoking in Heavenly company or 3rd Party vehicles.

EE'S, VENDORS, GUESTS

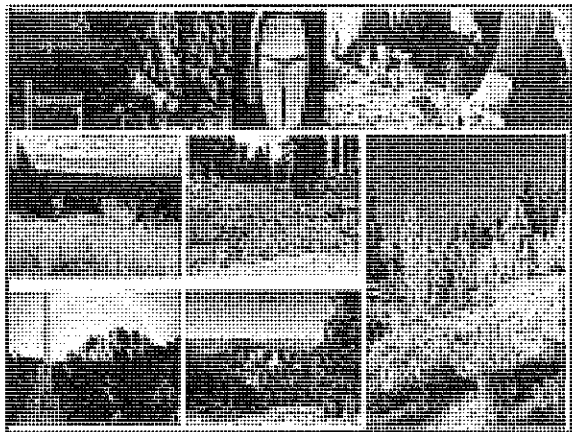


Wildland Fire Awareness- Be alert
and aware / report any smoke to
Dispatch.

UAS

FIRE HOSES/NOZZLES WILL
BE PROVIDED FOR MTN.
TRUCKS IN THE COMING
WEEKS.

SEE SNOWMAKING



WEEK 3
6/14/21



SUMMER RULES OF THE ROAD / RAIN SHUTDOWN
BMP's/Facilities and Watershed Training

FIRST NAME	LAST NAME	Employee ID
Ross	Branson	339089
CONOR	BLAKE	255049
Jesse	Zerr	324229
Kory	Fitzgerald	221447
Forrest Atkins	Dejeu	240969
Kevin	HIGGINS	128598
Sebastian	Johnson	214419
Richard	SCOTT	222582
GRAEME	GROVER	128648
STEPHEN	CLINE	142875
Chris Hamner	Hamner	148370
Lupe Barrientos	Barrientos	128669
Andre Atkins	Villare+	128525
Matt Atkins	Entrup	296902
Curtis	Keziah	128566
Don	Abicht	128681
ERIC	BATES	130290
Marc	Bugg	128604
BRAD	LEIGH	130272
Colton	Terry	129624
Chris Williams	Chris	194981
Paul	Erasmus	214619
Christine	Arenett	210406
Bryan	Hickman	142876

Week 3
6/14/21



BMP's/Facilities and Watershed Training

<u>FIRST NAME</u>	<u>LAST NAME</u>	<u>Employee ID</u>
Jen	Kawaguchi	175733
Blair	Davidson	214832
Ian	Clark	175145
Bill	Clark	129456
Joe	Flores	318857
Jen	Meuzel Cumbria	130211
Paul	Bergman	312619
Vicki	Gutierrez	156012
Matt	Collins	230360
Sean	Hutchinson	291656
Ryan	Albertson	161603
Gabe	Decker	312379
Paul	Endmann	214619
Chris	Williams	194981
Kevin	Oleand	192249
Sarah Kozlowski	Kozlowski	345553
Jef	Rued	129826
RJ Mitchell	Mitchell	208281
John	Fontanelli	193625
David	Bouye	317274
JIMMY	PRICE	239053
Will	Chin	194601
Ryan	McAdon	130254
Frederick	Newberry	198259



Summer Rules of the Road

- Drive on Designated Roads only, DO NOT Park on Vegetation
- Park only in Designated Parking Areas
- If you see someone not complying, tell your supervisor
- Just because you drive an ATV/Rhino does not mean you can drive, onto a ski slope or down a decommissioned road or Ski Trail. This will create unnecessary disturbance and erosion.
- When accessing the mountain all vehicles MUST be in 4WD to prevent erosion on the roads, and stay at or below 20 mph. Be especially aware of Fugitive Dust
- All Vehicles must call 530-542-6900 upon entering and exiting through a mountain gates

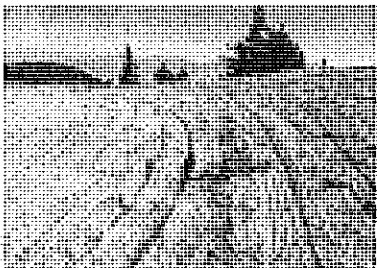



More Summer Rules of the Road

- Stay out of erosion control project areas
- Report anything that looks like an obvious erosion, Water Quality, or sediment problem to your supervisor.
- All outside contractors and vendors must have a Mountain Access Permit issued by the Central Dispatch Dept., except utilities.
- Prior to accessing the mountain roads anyone from outside of the Tahoe Basin will need to spray the bottom of their vehicle to prevent the spread of invasive weeds. Heavenly may require proof.
- If you don't see a mountain access permit, stop them & ask to see their permit. If you see Utility trucks Like SW Gas or Liberty, ask them if they need any guidance or direction.




Steve's Road - Von Schmitt's





Summer Rules of the Road


- Park in Designated Areas only
- Stay within footprint of road.
- Never Park on Vegetation, don't Idle!
- Never pull down ropes unless you have permission from Heavenly Mt. Ops
- Keep speeds to a minimum to reduce dust



Rain Shut Down Process Information:

- View current custom Weather Forecast and Construction Activity Guidelines. Be sure to listen to Dispatch.
- The weather forecast should be checked daily on the NOAA forecast:
- www.noaa.gov (South Lake Tahoe, CA)
- Days with 10% - 49% Chance of Rain or a Chance of Thunderstorms – Tier 1, Be prepared to Shut-Down active construction sites w/in 1 Hour
- Days with 50% or More Chance of Rain – Tier 2, Be prepared to Shut-Down Site immediately.

CHECK IN BEFORE STARTING
A PROJECT. HAVE BMPs
ON SITE.



Construction Rain Shut Down Process

- Know the Weather Forecast
- Listen closely to the radio
- Grading Operations and Exposed Soils—Pay attention to your work sites. Button up sites at end of each shift
- Stockpile BMP's supplies
- Vehicle Access-open and closed roads
- BMP Inspections – Pre & Post Storm—Take Pictures!



2021 BMP's, Facilities & Watershed Awareness Training

Heavenly Operations Staff



Purpose/Agenda

- Review Heavenly's Watershed Protection Commitment, BMP's & Your Role
- Review the Summer Rules of the Road
- Provide Awareness & understanding
- What to do when weather is expected
- Operating and disturbance in the Tahoe Basin



Our Commitment

- USDA Forest Service: Our partner in outdoor recreation & resource management
- Tahoe Regional Planning Agency: The Master Plan, Mitigation & Monitoring, Project Permit Conditions
- State of California Regional Water Quality Control Board, Lahontan Region: Waste Discharge Requirements (WDRs) & SWPPP's/Stormwater Requirements.
- NDEP (Nevada Department of Env. Protection) Stormwater requirements



Erosion Control & BMP's

- Hellwinkel's Steeps Road Maintenance, now able to water steeper sections of road with small watering truck. 5MPH, 4WD Low Required

- Snowmaking Projects

Water Bars/Stabilization & Drainage Improvements, Cal Dam Maintenance.

- Maintain effectiveness of ski run BMP's, including maintaining water bars, Culverts and re-vegetation/soil cover.

- Roads Maintenance and Dust Control



el's Low & Slow





Handgrenade Restoration 2017-





Hand Grenade Restoration 2017 VS. 2019





Erosion-Large Rill down ski run





Restorations:





Wattles & Coir Logs

Straw wattle with silt fence

Pine Needle Wattle





Tahoe Draba - Sensitive Plant



Photo of a plant from Heavenly

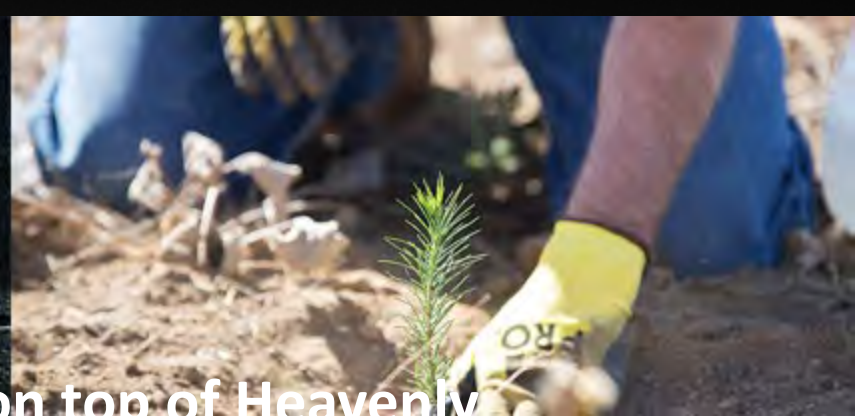
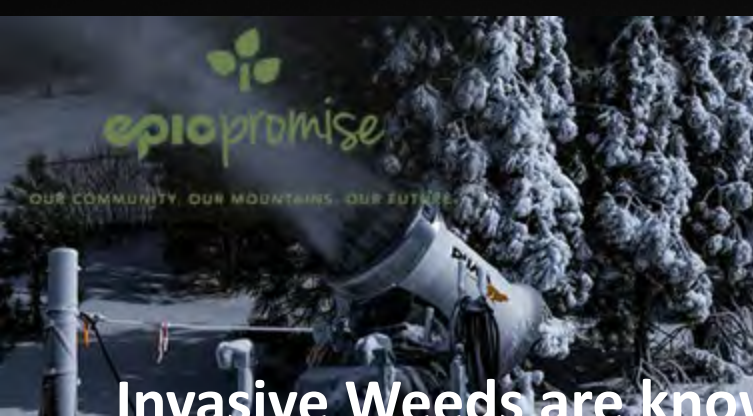




Protect Tahoe Draba Populations – Do Not Disturb

Full grown plants-Mostly grow above 9,000 Ft. Elevation





Invasive Weeds are known to exist on top of Heavenly Mountain and Meadows. Treatments by the USFS continue annually and more are planned. 3 remaining treatment sites.

Tall Whitetop Identification: Tall whitetop (also called perennial pepperweed) has many stems. It reproduces from rhizomes (root-like under-ground stems) and from seed. In Truckee, this species is common in many of the roundabouts, as well as, low, wet areas.



Tall Whitetop showing root connection



Tall Whitetop in flower



Bull Thistle



Bull Thistle flower

Canada Thistle



Canada Thistle flowers are smaller than most other thistle flowers



Pine Needle Wattles

On mountain use for erosion





Important takeaways for you to ponder, with regard to BMP's:

- Is it working? (rather than “are we in trouble?”)
- Source control – we’re trying to stop the “bleeding” at the source rather than chasing it downstream.
- Water flow – its all connected, “Think like a water droplet.” Look uphill of problem areas to determine if there is a root cause of the erosion issue...
- Heavenly Prioritization – address the highest risk spot first (e/g/ nearest to creek, most erosive, problem spots, etc)
- Keep Turbid Stormwater out of the water ways



Be especially aware during Thunderstorm activity and listen to weather updates from Central Dispatch on Radio. Contact dispatch if you hear thunder. Shut downs may impacts operations, work sites, and the mountain might be shelter in place.

Major weather “Events” can cause environmental damage
If you see damage occurring Call Dispatch. 530-542-6900 Take a picture if possible.





Summer Rules of the Road

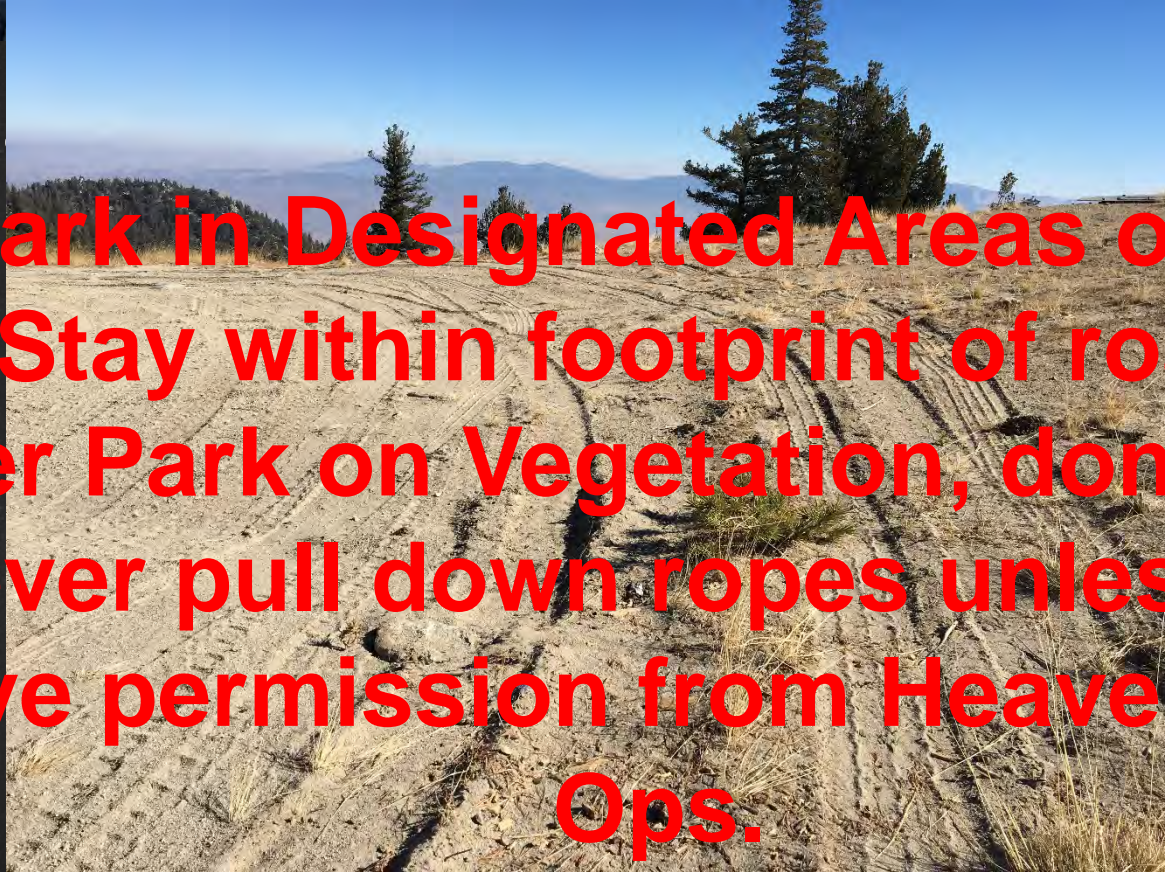
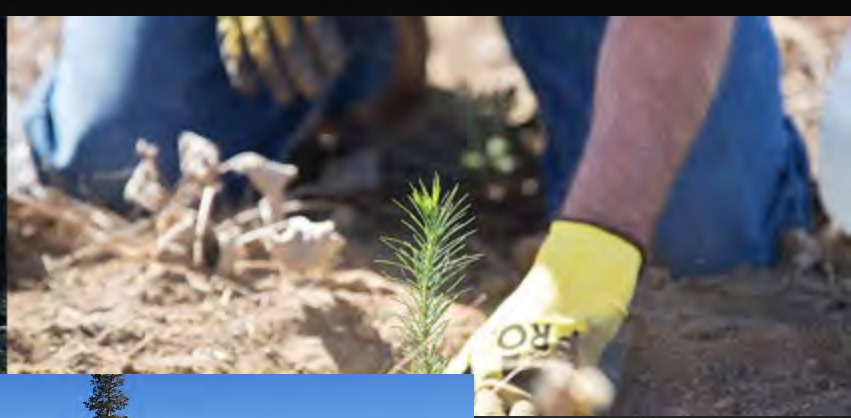
- Drive on Designated Roads only, DO NOT Park on Vegetation
- Park only in Designated Parking Areas
- If you see someone not complying, tell your supervisor
- Just because you drive an ATV/Rhino does not mean you can drive, onto a ski slope or down a decommissioned road or Ski Trail. This will create unnecessary disturbance and erosion.
- When accessing the mountain all vehicles MUST be in 4WD to prevent erosion on the roads, and stay at or below 20 mph. Be especially aware of Fugitive Dust
- All Vehicles must call 530-542-6900 upon entering and exiting through a mountain gates



More Summer Rules of the Road

- Stay out of erosion control project areas
- Report anything that looks like an obvious erosion, Water Quality, or sediment problem to your supervisor.
- All outside contractors and vendors must have a Mountain Access Permit issued by the Central Dispatch Dept., except utilities.
- Prior to accessing the mountain roads anyone from outside of the Tahoe Basin will need to spray the bottom of their vehicle to prevent the spread of invasive weeds. Heavenly may require proof.
- If you don't see a mountain access permit, stop them & ask to see their permit. If you see Utility trucks Like SW Gas or Liberty, ask them if they need any guidance or direction.





- Park in Designated Areas only
- Stay within footprint of road.
- Never Park on Vegetation, don't Idle!
- Never pull down ropes unless you have permission from Heavenly Mt. Ops.
- Keep speeds to a minimum to reduce dust.



Rain Shut Down Process Information:

- View current custom Weather Forecast and Construction Activity Guidelines. Be sure to listen to Dispatch.
- The weather forecast should be checked daily on the NOAA forecast:
- www.noaa.gov (South Lake Tahoe, CA)
- **Days with 10% - 49% Chance of Rain or a Chance of Thunderstorms – Tier 1, Be prepared to Shut-Down active construction sites w/in 1 Hour**
- **Days with 50% or More Chance of Rain – Tier 2, Be prepared to Shut-Down Site immediately.**



Construction Rain Shut Down Process

- Know the Weather Forecast
- Listen closely to the radio
- Grading Operations and Exposed Soils—Pay attention to your work sites. Button up sites at end of each shift
- Stockpile BMP's supplies
- Vehicle Access-open and closed roads
- BMP Inspections – Pre & Post Storm—Take Pictures!



USFS Wildlife Trash Management and Education Program:

- As a condition of the approved EIS for the Epic Discovery Program a wildlife trash management and education plan is implemented annually and reviewed by Heavenly and the US Forest Service LTBMU. The Heavenly Mountain Resort Master Redevelopment Plan (2015) includes a number of Operations and Maintenance Measures as part of the Mitigation and Monitoring Plan. 7.5-21 BIO 8: Wildlife Trash Management and Education Program.
- A number of the activities at Heavenly Mountain Resort are located at the Top of The Gondola/Adventure Peak. As part of the Epic Discovery Project implementation the resort shall create and implement a trash management and education program. The goal of this program is for timely removal of refuse from deposit points, education of our guests and staff about proper waste management, and to keep any interactions between humans and wildlife to a minimum.
- Animal resistant “bear box” receptacles are in place @ TOG in summer.



Required for any hot work outside of a designated weld shop. Proper tools in trucks, Fire caches on hill.

Know the PAL code for the day.

Issued by Kevin Higgins, Bryan Hickman & Curtis Kezich.

Must be posted on site.

VAIL RESORTS
HEALTH & SAFETY
PERMIT

PERMIT REQUIRED FOR ANY UNDESIGNATED WELDING AND CUTTING OPERATIONS

Is a trained fire watch in position? ☐ yes ☐ no ☐ n/a

Is a confined space? ☐ yes ☐ no ☐ n/a

If "yes", this is a Permit-Required Confined Space Entry. Hot Work Permit must be displayed with Confined Space Entry Permit.

Precautions for Hot Work in Permit-Required Confined Spaces

Mandatory Forced-Air Ventilation ☐ yes ☐ no ☐ n/a

Continuous Air-Quality Monitoring ☐ OR ☐ n/a

Historical Monitoring Data can be provided (data must have been collected during similar Hot Work activities) ☐ yes ☐ no ☐ n/a

Gas Cylinders outside of Space & secured ☐ yes ☐ no ☐ n/a

Cylinders OFF & hoses CLEARED during breaks ☐ yes ☐ no ☐ n/a

The area of operations has been examined and all appropriate precautions have been taken.

Work authorized by: _____

Signature: _____

Date: _____ Time: _____

This permit is valid for a single shift up to a 12-hour duration

Sep-10

FIRE WATCH

A TRAINED FIRE WATCH MUST BE EMPLOYED IF OPERATIONS OCCUR WITHIN 35' OF COMBUSTIBLE MATERIAL.

FIRE WATCH REQUIREMENTS:

Fire suppression equipment on site
Current (annual) training with suppression equipment
Current (annual) training in emergency procedures
Remain on site for 1 1/2 hour after operations conclude

Is a trained fire watch in position? ☐ yes ☐ no ☐ n/a

→ **CONFINED SPACE ?** ☐ yes ☐ no ←

If "yes", this is a Permit-Required Confined Space Entry. Hot Work Permit must be displayed with Confined Space Entry Permit.

Precautions for Hot Work in Permit-Required Confined Spaces

Mandatory Forced-Air Ventilation ☐ yes ☐ no ☐ n/a

Continuous Air-Quality Monitoring ☐ OR ☐ n/a

Historical Monitoring Data can be provided (data must have been collected during similar Hot Work activities) ☐ yes ☐ no ☐ n/a

Gas Cylinders outside of Space & secured ☐ yes ☐ no ☐ n/a

Cylinders OFF & hoses CLEARED during breaks ☐ yes ☐ no ☐ n/a

The area of operations has been examined and all appropriate precautions have been taken.

Work authorized by: _____

Signature: _____

Date: _____ Time: _____

This permit is valid for a single shift up to a 12-hour duration

Sep-10



Absolutely NO SMOKING

- Due to EXTREME fire danger, smoking is prohibited on the mountain.
- This includes Smoking in Heavenly company or 3rd Party vehicles.



Wildland Fire Awareness- Be alert
and aware of any smoke to





Heavenly Mountain Resort
Water Years 2017–2021

APPENDIX

F

2021 ANNUAL ROADWAY
MAINTENANCE MAPPING AND
WORK LISTS

Appendix F

2021 Annual Roadway Maintenance Mapping and Work Lists

- F.1 2021 Summer Road Maintenance Compliance Letter**
- F.2 2021 Summer Road Maintenance Report**
- F.3 Heavenly Road Maintenance Map**

This Page Intentionally Left Blank

From: [Blair Davidson](#)
To: michael.gabor@usda.gov
Cc: [Frederick Newberry](#); [Bryan Hickman](#); [Anthony D"angelo](#); [Chris Donley](#)
Subject: Heavenly Roads Maintenance Report 2021
Date: Wednesday, November 10, 2021 5:01:28 PM
Attachments: [image001.png](#)
[2021 Heavenly Roads Maintenance Report.xlsx](#)

Hi Mike,

Attached you will find the annual road maintenance report for Heavenly roads. Most of this work was completed during the 2021 summer season.

I apologize for the delay in getting this to you. Frank Papandrea left Heavenly in March and we are trying our best to pick up where he left off. Thanks to Chris at Cardno for reminding us of this submission.

Please let us know if you need any additional information.

Thank you,

Blair Davidson

Mountain Operations | Senior Administrative Assistant

Heavenly Mountain Resort

Cell: (949)887-7812 (**try first*) | Office: (530)542-5194 | Internal: x6269

Office Hours: Monday - Friday 7:30am – 4:00pm

The information contained in this message is confidential and intended only for the use of the individual or entity named above, and may be privileged. Any unauthorized review, use, disclosure, or distribution is prohibited. If you are not the intended recipient, please reply to the sender immediately, stating that you have received the message in error, then please delete this e-mail. Thank you.

Summer 2021

Road Section	Road	Distance	Treatment
NV			
NV Gate to Titos Corner	13N53B	0.1	Water Bar Maintenance & Road Base where needed
Titos	13N53.5	0.2	Water Bar Maintenance & Road Base where needed- NVE Tree Maintenance
Chute to Midway Switchbacks	13N53	0.4	Water Bar Maintenance & Road Base where needed- NVE Tree Maintenance
*Titos to base of NB	13N53C	0.3	Inspect, minor maintenance- no road base needed
Stage switchbacks	13N53	0.6	Water Bar Maintenance & Road Base where needed- NVE Tree Maintenance
NV Trail Stage to EP	13N53	0.8	Water Bar Maintenance & Road Base where needed- NVE Tree Maintenance
Pepis/Comet to base EP to top NB	13N54	0.5	Water Bar Maintenance & Road Base where needed
T7 Road	13N54	0.2	Inspect, minor maintenance- no road base needed- NVE Powerline project
Steve's & Crossover	13N54	0.9	Inspect, minor maintenance- no road base needed- NVE Powerline project
Power Station Road	13N53A	0.4	Inspect, minor maintenance- no road base needed
Galaxy	13N53E.1	1.2	Water Bar Maintenance & Road Base/Drain Rock where needed
Orion's	13N52B	0.6	Water Bar Maintenance & Road Base where needed
Top of Dipper Road	13N52F	0.2	Water Bar Maintenance & Road Base
Total		6.4	
CA			
Groove RD to Upper Shop	12N41	0.6	Water Bar Maintenance, Sed pond cleanout & Road Base where needed
Maggies- Creek to Cal Dam	12N40	0.9	Water Bar Maintenance, Sed pond cleanout & Road Base where needed
Cal Dam to Sky Deck	12N40	0.3	Inspect, minor maintenance- no road base needed
Hellwinkle's	12N40	0.4	BMPs, Road Base, compaction and water
LCT to VS/TOG	12N40	1.4	Water Bar Maintenance & Road Base where needed
TOG Tam to Coaster	12N40.5	0.2	Compaction of walking trails. Water Bar @ Tube hill
Upper CA- Ridge	13N52	1.2	Water Bar Maintenance, Grade work & Road Base
Upper CA Switchbacks	13N52i	0.33	Grade, compaction and BMPs (Woods Trail to Upper Ridge Run)
Roundabout			
Top WC-Pistol	12N40	0.7	Water Bar Maintenance & Road Base where needed
Pistol-Cut	12N40	1.1	Water Bar Maintenance & Road Base where needed
Cut-Creek	12N40	0.5	Water Bar Maintenance & Road Base where needed, V-ditch cleanout
Total		7.63	

	ML4
Roads Improved	0
Roads Maintained	14.03
Roads Decommissioned	0



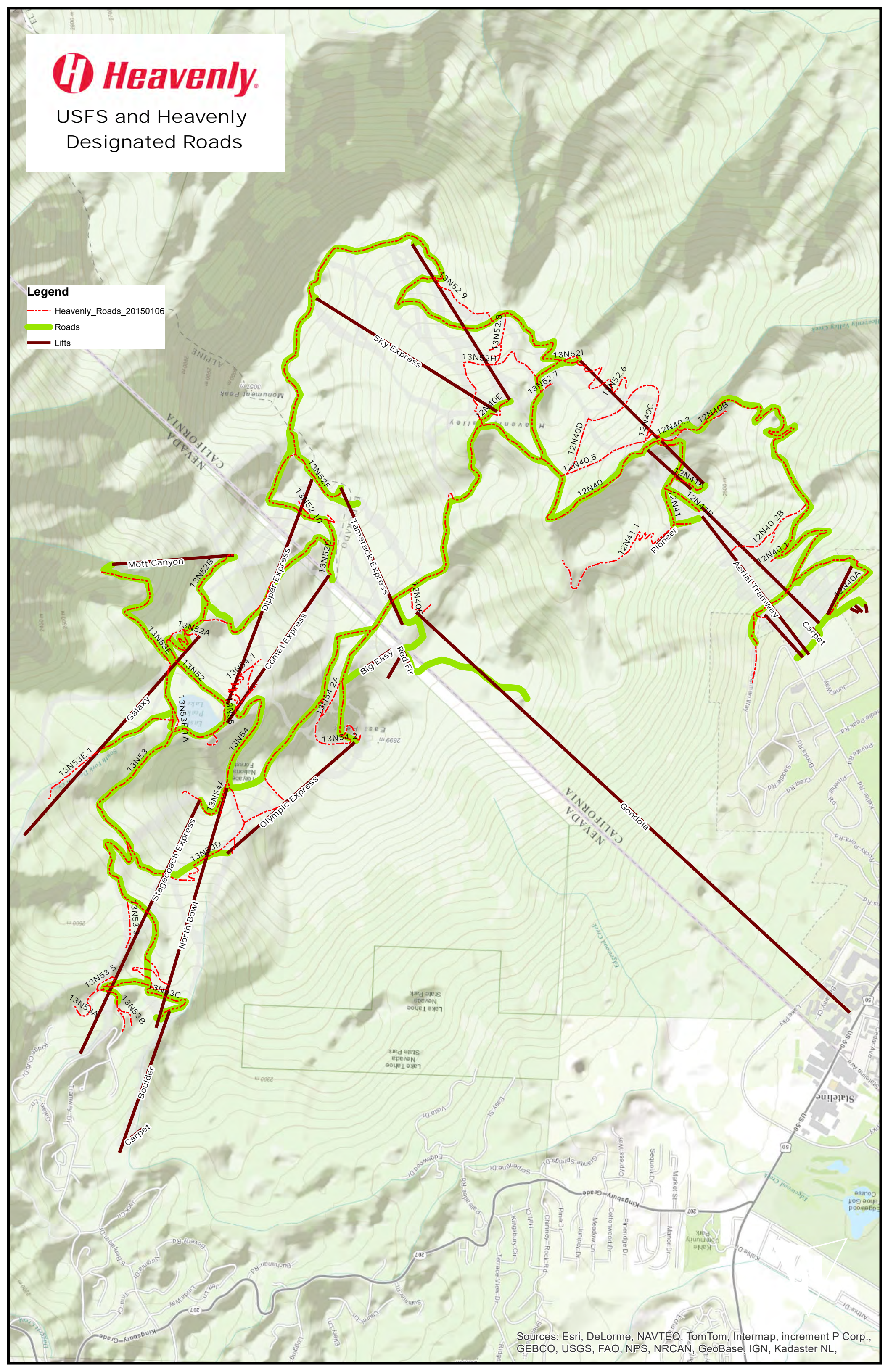
USFS and Heavenly Designated Roads

Legend

Heavenly_Roads_20150106

Roads

Lifts



Heavenly Mountain Resort
Water Years 2017–2021

APPENDIX

G

WATER YEAR 2021, 4TH QUARTER
LABORATORY ANALYSIS

Appendix G

Water Year 2021, 4th Quarter Laboratory Analysis

- G.1 Laboratory Analytical Report – Excelchem Laboratories, Inc. (4th Quarter)**
- G.2 Laboratory Analytical Report – High Sierra (4th Quarter)**
- G.3 Laboratory Analytical Report – WET Lab (Filter Vault 3rd Quarter Amended Report)**

This Page Intentionally Left Blank

EXCELCHEM
Laboratories, Inc.
A Silver State Analytical Company
1135 W Sunset Boulevard
Suite A
Rocklin, CA 95765
Phone# 916-543-4445
Fax# 916-543-4449



ELAP Certificate No. : 2119

29 July 2021

Michelle Hochrein

Cardno

5496 Reno Corporate Drive

Reno, NV 89511

RE: Heavenly

Work order number:2107097

Enclosed are the results of analyses for samples received by the laboratory on 07/15/21 12:54. All Quality Control results are within acceptable limits except where noted as a case narrative. If you have any questions concerning this report, please feel free to contact the laboratory.

Sincerely,

A handwritten signature in black ink, appearing to read 'JC' or 'J. Cox', is written over a horizontal line.

Joshua Cox, Lab Director

Excelchem Laboratories, Inc.

Cardno
5496 Reno Corporate Drive
Reno, NV 89511

Project: Heavenly
Project Number: E320404110
Project Manager: Michelle Hochrein

Date Reported:
07/29/21 08:30

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
HDVC-5	2107097-01	Water	07/13/21 10:30	07/15/21 12:54
HVC-3	2107097-02	Water	07/13/21 11:20	07/15/21 12:54
HVC-2	2107097-03	Water	07/13/21 13:00	07/15/21 12:54
HVC-1a	2107097-04	Water	07/13/21 13:15	07/15/21 12:54
BPC-4	2107097-05	Water	07/13/21 12:10	07/15/21 12:54

Excelchem Laboratories, Inc.



Laboratory Representative

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Excelchem Laboratories, Inc.

Cardno
5496 Reno Corporate Drive
Reno, NV 89511

Project: Heavenly
Project Number: E320404110
Project Manager: Michelle Hochrein

Date Reported:
07/29/21 08:30

Analyte	Result	Reporting Limit	Units	Batch	Date Prepared	Date Analyzed	Method	Notes
---------	--------	--------------------	-------	-------	------------------	------------------	--------	-------

Excelchem Laboratories, Inc.



Laboratory Representative

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Excelchem Laboratories, Inc.

Cardno	Project:	Heavenly	Date Reported:
5496 Reno Corporate Drive	Project Number:	E320404110	07/29/21 08:30
Reno, NV 89511	Project Manager:	Michelle Hochrein	

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
---------	--------	--------------------	-------	----------------	------------------	------	----------------	-----	--------------	-------

Excelchem Laboratories, Inc.

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.



Laboratory Representative

Excelchem Laboratories, Inc.

Cardno	Project:	Heavenly	Date Reported:
5496 Reno Corporate Drive	Project Number:	E320404110	07/29/21 08:30
Reno, NV 89511	Project Manager:	Michelle Hochrein	

Notes and Definitions

ND Analyte not detected at reporting limit.
NR Not reported

Excelchem Laboratories, Inc.

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.


Laboratory Representative

Excelchem Laboratories, Inc.

Cardno
5496 Reno Corporate Drive
Reno, NV 89511

Project: Heavenly
Project Number: E320404110
Project Manager: Michelle Hochrein

Date Reported:
07/29/21 08:30

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST											
Excelchem Laboratories, Inc. 1135 W. Sunset Blvd. Suite A Rocklin, CA 95765 Ph: 916-543-4445 Fx: 916-543-4449			Project Manager: Michelle Hochrein		Company/Address: 5496 Reno Corporate Drive Reno, NV 89511		Billing Address: Same		Project Name: Heavenly		
Phone #: 775-828-4362 Fax #: Project Number/P.O.#: E320404110			Project Location: Heavenly		Sample Name and Signature: M.H. JB		Project Number/P.O.#: E320404110		Project Location: Heavenly		
Electronic Data Deliverables Request: <input checked="" type="checkbox"/> PDF/Standard Report <input type="checkbox"/> EDD <input type="checkbox"/> Geotracker (Global ID) <input type="checkbox"/> Other (please specify)			Email Address: michelle.hochrein@cardno.com chris.donley@cardno.com		Project Location: Heavenly		Sample Name and Signature: M.H. JB		Project Number/P.O.#: E320404110		
Sample ID	Sampling Date	Time	Container	Method Preserved	Matrix	ACID	ICE	NONE/OTHER	WATER	SOIL	AIR
HQVC-5	7/3/21	10:30	VOA								
HVC-3	7/3/21	11:20	GLASS								
HVC-2	7/3/21	13:00	SLEEVE								
HVC-1a	7/3/21	13:15	PLASTIC								
BPC-4	7/3/21	12:10									
Requested TAT:											
BIN 2107097 BIN 55A L Vegas											
LAB USE ONLY:											
Bin#											
Due Date:											
Work Order:											
Remarks/Notes:											
Received by: (sign and print) Michelle Hochrein 7/13/21 9am											
Relinquished by: (sign and print) Michelle Hochrein 7/15/21 12:54 PM											
Received by Laboratory: (sign and print) Kate Alvarado 7/15/21 12:54 PM											

Excelchem Laboratories, Inc.

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Laboratory Representative

Excelchem Laboratories, Inc.

Cardno
5496 Reno Corporate Drive
Reno, NV 89511

Project: Heavenly
Project Number: E320404110
Project Manager: Michelle Hochrein

Date Reported:
07/29/21 08:30

Sample Integrity

WORK ORDER: 2107097

Date Received: 7/15/21

Company Name: Cardno
New Client: Y ☒

Section 1 – Sample Arrival Information

Sample Transport: ONTRAC UPS USPS Walk-In EXCELCHEM Courier ☒ Fed-Ex Other: _____
Transported In: ☒ Ice Chest ☐ Box ☐ Hand
Packing materials: Bubble Wrap Foam Packing Peanuts Paper Other: _____
Has chilling process begun? ☒ Y ☐ N Samples Received: Chilled to Touch / ☒ Ambient / ☐ On Ice
Temperature of Samples (°C): 25.2 Ice Chest Temperature(s) (°C): 24.0

Section 2 – Bottle/Analysis Info.

	Yes	No	N/A	Comments
Did all bottles arrive unbroken and intact?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Did all bottle labels agree with COC?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Were correct containers used for the tests requested?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Were correct preservations used for the tests requested?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Was a sufficient amount of sample sent for tests indicated?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Were bubbles present in VOA Vials?: (Volatile Methods Only)	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Is there head space in the VOA vials? (Volatile Methods Only)	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

Section 3– COC Information

	Yes	No	Comments		Yes	No
COC Received	<input checked="" type="checkbox"/>	<input type="checkbox"/>		Analysis Requested	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Date Sampled	<input checked="" type="checkbox"/>	<input type="checkbox"/>		Samples arrived within holding time	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Time Sampled	<input checked="" type="checkbox"/>	<input type="checkbox"/>		Hold times less than 72 hours	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Sample ID	<input checked="" type="checkbox"/>	<input type="checkbox"/>		Client Name	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Rush Turn Around Time	<input type="checkbox"/>	<input checked="" type="checkbox"/>		Client Contact Information	<input checked="" type="checkbox"/>	<input type="checkbox"/>

SHORT HOLD LIST (<72 hours)

pH	Chlorine	Corrosivity	Coliform	Dissolved Oxygen	Odor	Nitrate	Nitrite	Ortho-phosphate
MB	Asbestos	Settable Solids	Turbidity	Biochemical Oxygen Demand	HPC	Color	Tedlars	Ammonia/TKN (unpreserved)
As								

Section 4 – Comments / Discrepancies

Client notified of discrepancies: Yes / No Notified by:

Comments:

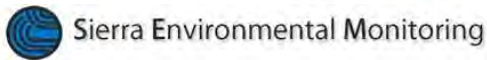
Bin Number/ Location:	SSAL vegis
COC Scanned/Attached by:	SV
Samples labeled by:	SV
Sample labels reviewed by:	SV

Filled out by:

Kate Albertson

Date: 7/15/21

Time: 12:55



July 28, 2021

Joe Trapasso
Excelchem Laboratories, Inc.
1135 W. Sunset Blvd. Suite A
Rocklin, CA 95765

Lab ID:

☒ Las Vegas, NV (NV930, CA3029)
☐ Reno, NV (NV015, CA2990)

Project: 2107097

Workorder No.: 21070906

Dear Joe Trapasso:

Silver State Labs-Las Vegas received 5 sample(s) on 7/20/2021 for the analyses presented in the following report.

There were no problems with the analytical events associated with this report unless noted below. Analytical results reported as non-detect (ND) in the result field are below the Practical Quantification Limit (PQL). Analytical results above the PQL are reported as the measured value in the results field.

Quality control data is within laboratory defined or method specified acceptance limits except if noted.

If you have any questions regarding these tests results, please feel free to call.

Sincerely,

David Frohnen, PE
President
3626 E. Sunset Road, Suite 100
Las Vegas, NV 89120

3626 East Sunset Road, Suite 100, Las Vegas, NV 89120 - Tel: 702-873-4478
1135 Financial Blvd, Reno, NV 89502 - Tel: 775-857-2400
1250 Lamoille Hwy, Suite 629, Elko, NV 89801 - Tel: 775-778-9828
11275 Sunrise Gold Circle, Unit V, Rancho Cordova, CA 95742 - Tel: 916-975-7492
1440 S. State College Blvd., Suite 4-J, Anaheim, CA 92806 - Tel: 714-426-0366

ssalabs.com



Silver State Labs-Las Vegas
3626 E. Sunset Road, Suite 100
Las Vegas, NV 89120
(702) 873-4478 FAX: (702) 873-7967
www.ssalabs.com

Analytical Report

WO#: 21070906

Date Reported: 7/28/2021

CLIENT: Excelchem Laboratories, Inc.

Collection Date: 7/13/2021 10:30:00 AM

Project: 2107097

Lab ID: 21070906-01

Matrix: WATER

Client Sample ID: HDVC-5

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
----------	--------	-----	------	-------	----	---------------

ANIONS-CWA (CL, F, NO2, NO3, SO4)

EPA 300.0

Analyst: DB

Chloride

0.197

0.100

mg/L

1

7/21/2021 2:38:00 AM

**Qualifiers:
(Qual)**

DF Dilution Factor.
MCL Maximum Contaminant Level.
PQL Practical Quantitation Limit.

H Holding times for preparation or analysis exceeded.
ND Not Detected at the PQL.

Original



Silver State Labs-Las Vegas
3626 E. Sunset Road, Suite 100
Las Vegas, NV 89120
(702) 873-4478 FAX: (702) 873-7967
www.ssalabs.com

Analytical Report

WO#: 21070906

Date Reported: 7/28/2021

CLIENT: Excelchem Laboratories, Inc.

Collection Date: 7/13/2021 11:20:00 AM

Project: 2107097

Lab ID: 21070906-02

Matrix: WATER

Client Sample ID: HVC-3

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
----------	--------	-----	------	-------	----	---------------

ANIONS-CWA (CL, F, NO2, NO3, SO4)

EPA 300.0

Analyst: DB

Chloride

1.07

0.100

mg/L

1

7/21/2021 2:59:00 AM

**Qualifiers:
(Qual)**

DF Dilution Factor.
MCL Maximum Contaminant Level.
PQL Practical Quantitation Limit.

H Holding times for preparation or analysis exceeded.
ND Not Detected at the PQL.

Original



Silver State Labs-Las Vegas
3626 E. Sunset Road, Suite 100
Las Vegas, NV 89120
(702) 873-4478 FAX: (702) 873-7967
www.ssalabs.com

Analytical Report

WO#: 21070906

Date Reported: 7/28/2021

CLIENT: Excelchem Laboratories, Inc.

Collection Date: 7/13/2021 1:00:00 PM

Project: 2107097

Lab ID: 21070906-03

Matrix: WATER

Client Sample ID: HVC-2

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
----------	--------	-----	------	-------	----	---------------

ANIONS-CWA (CL, F, NO2, NO3, SO4)

EPA 300.0

Analyst: DB

Chloride	1.19	0.100		mg/L	1	7/21/2021 3:20:00 AM
----------	------	-------	--	------	---	----------------------

**Qualifiers:
(Qual)**

DF Dilution Factor.
MCL Maximum Contaminant Level.
PQL Practical Quantitation Limit.

H Holding times for preparation or analysis exceeded.
ND Not Detected at the PQL.

Original



Silver State Labs-Las Vegas
3626 E. Sunset Road, Suite 100
Las Vegas, NV 89120
(702) 873-4478 FAX: (702) 873-7967
www.ssalabs.com

Analytical Report

WO#: 21070906

Date Reported: 7/28/2021

CLIENT: Excelchem Laboratories, Inc.

Collection Date: 7/13/2021 1:15:00 PM

Project: 2107097

Lab ID: 21070906-04

Matrix: WATER

Client Sample ID: HVC-1a

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
----------	--------	-----	------	-------	----	---------------

ANIONS-CWA (CL, F, NO2, NO3, SO4)

EPA 300.0

Analyst: DB

Chloride	0.644	0.100		mg/L	1	7/21/2021 3:41:00 AM
----------	-------	-------	--	------	---	----------------------

**Qualifiers:
(Qual)**

DF Dilution Factor.
MCL Maximum Contaminant Level.
PQL Practical Quantitation Limit.

H Holding times for preparation or analysis exceeded.
ND Not Detected at the PQL.

Original



Silver State Labs-Las Vegas
3626 E. Sunset Road, Suite 100
Las Vegas, NV 89120
(702) 873-4478 FAX: (702) 873-7967
www.ssalabs.com

Analytical Report

WO#: 21070906

Date Reported: 7/28/2021

CLIENT: Excelchem Laboratories, Inc.

Collection Date: 7/13/2021 12:10:00 PM

Project: 2107097

Lab ID: 21070906-05

Matrix: WATER

Client Sample ID: BPC-4

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
----------	--------	-----	------	-------	----	---------------

ANIONS-CWA (CL, F, NO2, NO3, SO4)

EPA 300.0

Analyst: DB

Chloride	31.0	0.100		mg/L	1	7/21/2021 4:02:00 AM
----------	------	-------	--	------	---	----------------------

**Qualifiers:
(Qual)**

DF Dilution Factor.
MCL Maximum Contaminant Level.
PQL Practical Quantitation Limit.

H Holding times for preparation or analysis exceeded.
ND Not Detected at the PQL.

Original

Excelchem

Project Manager: Joe Trapasso

Company/Address: See above

Project Number/P.O.#: 2107097

Project Location: Rocklin, CA

1135 W. Sunset Blvd. Suite A

Rocklin, CA 95765

Ph: 916-543-4445 Fax: 916-543-4449

Phone #: See above

Fax #: See above

Project Name: 2107097

Sampler Signature:

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST

Electronic Data Deliverables Request:

☒ .PDF

☐ Geotracker (Global ID)

☐ Other (please specify)

Email Address:

JoeT@excelchem.net

Please Invoice To:

Finance@excelchem.net

ANALYSIS REQUEST

Page of

Blind#:

Due Date:

Work Order:

LAB USE ONLY:

DUE:

Sample ID

Date Time

Sampling

Container

Method Preserved

Matrix

21070906-1A

HVC-5 1A

HVC-3 2A

HVC-2 3A

HVC-1a 4A

BPC-4 5A

VOA Clear

jar 4 oz

Amber 1 ltr

poly

HCl

HNO3

ICE/NONE

Na2S2O3

Drinking Water

WATER

SOIL

LL Chloride

Relinquished by:

Excel Chem

Date

7/14/21 16:44

Received by:

Relinquished by:

Date

Received by Laboratory:

7/20 1420

Remarks/Condition of Sample:

SSAL Vegas

Bill To:

EXCELCHEM
Laboratories, Inc.
A Silver State Analytical Company
1135 W Sunset Boulevard
Suite A
Rocklin, CA 95765
Phone# 916-543-4445
Fax# 916-543-4449



ELAP Certificate No. : 2119

05 October 2021

Michelle Hochrein

Cardno

5496 Reno Corporate Drive

Reno, NV 89511

RE: Heavenly

Work order number:2109142

Enclosed are the results of analyses for samples received by the laboratory on 09/22/21 12:45. All Quality Control results are within acceptable limits except where noted as a case narrative. If you have any questions concerning this report, please feel free to contact the laboratory.

Sincerely,

A handwritten signature in black ink, appearing to read 'JC', is written over a horizontal line.

Joshua Cox, Lab Director

Excelchem Laboratories, Inc.

Cardno
5496 Reno Corporate Drive
Reno, NV 89511

Project: Heavenly
Project Number: E32140300
Project Manager: Michelle Hochrein

Date Reported:
10/05/21 10:10

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
HVC-2	2109142-01	Water	09/20/21 11:30	09/22/21 12:45
HVC-1A	2109142-02	Water	09/20/21 11:50	09/22/21 12:45
BPC-4	2109142-03	Water	09/20/21 13:25	09/22/21 12:45

Excelchem Laboratories, Inc.



Laboratory Representative

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Excelchem Laboratories, Inc.

Cardno	Project:	Heavenly	Date Reported:
5496 Reno Corporate Drive	Project Number:	E32140300	10/05/21 10:10
Reno, NV 89511	Project Manager:	Michelle Hochrein	

Analyte	Result	Reporting Limit	Units	Batch	Date Prepared	Date Analyzed	Method	Notes
---------	--------	--------------------	-------	-------	------------------	------------------	--------	-------

Excelchem Laboratories, Inc.



Laboratory Representative

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Excelchem Laboratories, Inc.

Cardno	Project:	Heavenly	Date Reported:
5496 Reno Corporate Drive	Project Number:	E32140300	10/05/21 10:10
Reno, NV 89511	Project Manager:	Michelle Hochrein	

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
---------	--------	--------------------	-------	----------------	------------------	------	----------------	-----	--------------	-------

Excelchem Laboratories, Inc.



Laboratory Representative

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Excelchem Laboratories, Inc.

Cardno	Project:	Heavenly	Date Reported:
5496 Reno Corporate Drive	Project Number:	E32140300	10/05/21 10:10
Reno, NV 89511	Project Manager:	Michelle Hochrein	

Notes and Definitions

ND Analyte not detected at reporting limit.
NR Not reported

Excelchem Laboratories, Inc.



Laboratory Representative

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Excelchem Laboratories, Inc.

Cardno
5496 Reno Corporate Drive
Reno, NV 89511

Project: Heavenly
Project Number: E32140300
Project Manager: Michelle Hochrein

Date Reported:
10/05/21 10:10

Sample Integrity

WORK ORDER: 2109142

Date Received: 9/22/21

Company Name: Cardno
New Client: Y

Section 1 – Sample Arrival Information

Sample Transport: ONTRAC UPS USPS Walk-In EXCELCHEM Courier Ced-Ex Other: _____
Transported In: Ice Chest Box Hand
Packing materials: Bubble Wrap Foam Packing Peanuts Paper Other: _____
Has chilling process begun? Y N Samples Received: Chilled to Touch / Ambient / On Ice
Temperature of Samples (°C): 9.6 Ice Chest Temperature(s) (°C): 11.0

Section 2 – Bottle/Analysis Info.

	Yes	No	N/A	Comments
Did all bottles arrive unbroken and intact?	<u>X</u>			
Did all bottle labels agree with COC?	<u>X</u>			
Were correct containers used for the tests requested?	<u>X</u>			
Were correct preservations used for the tests requested?	<u>X</u>			
Was a sufficient amount of sample sent for tests indicated?	<u>X</u>			
Were bubbles present in VOA Vials?: (Volatile Methods Only)			<u>X</u>	
Is there head space in the VOA vials? (Volatile Methods Only)			<u>X</u>	

Section 3– COC Information

	Yes	No	Comments		Yes	No
COC Received	<u>X</u>			Analysis Requested	<u>X</u>	
Date Sampled	<u>X</u>			Samples arrived within holding time	<u>X</u>	
Time Sampled	<u>X</u>			Hold times less than 72 hours		<u>X</u>
Sample ID	<u>X</u>			Client Name	<u>X</u>	
Rush Turn Around Time		<u>X</u>		Client Contact Information	<u>X</u>	

SHORT HOLD LIST (<72 hours)

pH	Chlorine	Corrosivity	Coliform	Dissolved Oxygen	Odor	Nitrate	Nitrite	Ortho-phosphate
MB	Asbestos	Settable Solids	Turbidity	Biochemical Oxygen Demand	HPC	Color	Tedlars	Ammonia/TKN (unpreserved)
As								

Section 4 – Comments / Discrepancies

Client notified of discrepancies: Yes / No Notified by:

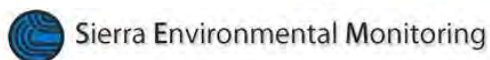
Comments:

Bin Number/ Location:	SUB
COC Scanned/Attached by:	PC
Samples labeled by:	PC
Sample labels reviewed by:	PC

Filled out by:

Patrick Clark

Date: 9/22/21
Time: 12:50



September 28, 2021

Joe Trapasso
Excelchem Laboratories, Inc.
1135 W. Sunset Blvd. Suite A
Rocklin, CA 95765

Lab ID:

☒ Las Vegas, NV (NV930, CA3029)
☐ Reno, NV (NV015, CA2990)

Project: 2109142

Workorder No.: 21091109

Dear Joe Trapasso:

Silver State Labs-Las Vegas received 3 sample(s) on 9/23/2021 for the analyses presented in the following report.

There were no problems with the analytical events associated with this report unless noted below. Analytical results reported as non-detect (ND) in the result field are below the Practical Quantification Limit (PQL). Analytical results above the PQL are reported as the measured value in the results field.

Quality control data is within laboratory defined or method specified acceptance limits except if noted.

If you have any questions regarding these tests results, please feel free to call.

Sincerely,

A handwritten signature in black ink that reads "Michael Mitchell".

Michael Mitchell
Laboratory Director
3626 E. Sunset Road, Suite 100
Las Vegas, NV 89120

3626 East Sunset Road, Suite 100, Las Vegas, NV 89120 - Tel: 702-873-4478
1135 Financial Blvd, Reno, NV 89502 - Tel: 775-857-2400
1250 Lamoille Hwy, Suite 629, Elko, NV 89801 - Tel: 775-778-9828
11275 Sunrise Gold Circle, Unit V, Rancho Cordova, CA 95742 - Tel: 916-975-7492
1440 S. State College Blvd., Suite 4-J, Anaheim, CA 92806 - Tel: 714-426-0366

ssalabs.com



Silver State Labs-Las Vegas
3626 E. Sunset Road, Suite 100
Las Vegas, NV 89120
(702) 873-4478 FAX: (702) 873-7967
www.ssalabs.com

Analytical Report

WO#: 21091109

Date Reported: 9/28/2021

CLIENT: Excelchem Laboratories, Inc.

Collection Date: 9/20/2021 11:30:00 AM

Project: 2109142

Lab ID: 21091109-01

Matrix: WATER

Client Sample ID HVC-2

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS-CWA (CL, F, NO2, NO3, SO4)				EPA 300.0	Analyst: DB	
Chloride	1.35	0.100		mg/L	1	9/25/2021 6:41:00 AM

Qualifiers:
(Qual)

* Value exceeds Maximum Contaminant Level.
H Holding times for preparation or analysis exceeded.
ND Not Detected at the PQL.

DF Dilution Factor.
MCL Maximum Contaminant Level.
PQL Practical Quantitation Limit.

Original



Silver State Labs-Las Vegas
3626 E. Sunset Road, Suite 100
Las Vegas, NV 89120
(702) 873-4478 FAX: (702) 873-7967
www.ssalabs.com

Analytical Report

WO#: 21091109

Date Reported: 9/28/2021

CLIENT: Excelchem Laboratories, Inc.

Collection Date: 9/20/2021 11:50:00 AM

Project: 2109142

Lab ID: 21091109-02

Matrix: WATER

Client Sample ID HVC-1A

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
----------	--------	-----	------	-------	----	---------------

ANIONS-CWA (CL, F, NO2, NO3, SO4)

EPA 300.0

Analyst: DB

Chloride	0.452	0.100		mg/L	1	9/25/2021 8:04:00 AM
----------	-------	-------	--	------	---	----------------------

**Qualifiers:
(Qual)**

* Value exceeds Maximum Contaminant Level.
H Holding times for preparation or analysis exceeded.
ND Not Detected at the PQL.

DF Dilution Factor.
MCL Maximum Contaminant Level.
PQL Practical Quantitation Limit.

Original



Silver State Labs-Las Vegas
3626 E. Sunset Road, Suite 100
Las Vegas, NV 89120
(702) 873-4478 FAX: (702) 873-7967
www.ssalabs.com

Analytical Report

WO#: 21091109

Date Reported: 9/28/2021

CLIENT: Excelchem Laboratories, Inc.

Collection Date: 9/20/2021 1:25:00 PM

Project: 2109142

Lab ID: 21091109-03

Matrix: WATER

Client Sample ID BPC-4

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
ANIONS-CWA (CL, F, NO2, NO3, SO4)				EPA 300.0	Analyst: DB	
Chloride	27.2	0.100		mg/L	1	9/25/2021 8:25:00 AM

**Qualifiers:
(Qual)**

* Value exceeds Maximum Contaminant Level.
H Holding times for preparation or analysis exceeded.
ND Not Detected at the PQL.

DF Dilution Factor.
MCL Maximum Contaminant Level.
PQL Practical Quantitation Limit.

Original



Silver State Labs-Las Vegas
3626 E. Sunset Road, Suite 100
Las Vegas, NV 89120
(702) 873-4478 FAX: (702) 873-7967
www.ssalabs.com

QC SUMMARY REPORT

WO#: 21091109

28-Sep-21

Client: Excelchem Laboratories, Inc.

Project: 2109142

TestCode: ANIONS-CWA

Sample ID: ICB 210924-1	SampType: ICB	TestCode: ANIONS-CWA	Units: mg/L	Prep Date: 9/24/2021	RunNo: 58531						
Client ID: ICB	Batch ID: R58531	TestNo: E300.0		Analysis Date: 9/24/2021	SeqNo: 1421199						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	ND	0.100									

Sample ID: ICV 210924-1 5 ppm	SampType: ICV	TestCode: ANIONS-CWA	Units: mg/L	Prep Date: 9/24/2021	RunNo: 58531						
Client ID: ICV	Batch ID: R58531	TestNo: E300.0		Analysis Date: 9/24/2021	SeqNo: 1421200						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	5.20	0.100	5.000	0	104	90	110				

Sample ID: MB 210924-1	SampType: MBLK	TestCode: ANIONS-CWA	Units: mg/L	Prep Date: 9/24/2021	RunNo: 58531						
Client ID: PBW	Batch ID: R58531	TestNo: E300.0		Analysis Date: 9/24/2021	SeqNo: 1421201						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	ND	0.100									

Sample ID: LCS 210924-1 5 ppm	SampType: LCS	TestCode: ANIONS-CWA	Units: mg/L	Prep Date: 9/24/2021	RunNo: 58531						
Client ID: LCSW	Batch ID: R58531	TestNo: E300.0		Analysis Date: 9/24/2021	SeqNo: 1421202						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	5.07	0.100	5.000	0	101	90	110				

Qualifiers: * Value exceeds Maximum Contaminant Level.
ND Not Detected at the PQL.

H Holding times for preparation or analysis exceeded.

MCL Maximum Contaminant Level.

Original



Silver State Labs-Las Vegas
3626 E. Sunset Road, Suite 100
Las Vegas, NV 89120
(702) 873-4478 FAX: (702) 873-7967
www.ssalabs.com

QC SUMMARY REPORT

WO#: 21091109

28-Sep-21

Client: Excelchem Laboratories, Inc.

Project: 2109142

TestCode: ANIONS-CWA

Sample ID: LCS 210924-1 5 ppm	SampType: LCS	TestCode: ANIONS-CWA	Units: mg/L	Prep Date: 9/24/2021	RunNo: 58531						
Client ID: LCSW	Batch ID: R58531	TestNo: E300.0		Analysis Date: 9/24/2021	SeqNo: 1421202						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

Sample ID: 21091135-01BDUP	SampType: DUP	TestCode: ANIONS-CWA	Units: mg/L	Prep Date: 9/24/2021	RunNo: 58531						
Client ID: BatchQC	Batch ID: R58531	TestNo: E300.0		Analysis Date: 9/24/2021	SeqNo: 1421204						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	303	0.100						302.3	0.117	10	

Sample ID: 21091135-01BMS		SampType: MS		TestCode: ANIONS-CWA Units: mg/L		Prep Date: 9/24/2021			RunNo: 58531		
Client ID: BatchQC		Batch ID: R58531		TestNo: E300.0		Analysis Date: 9/24/2021			SeqNo: 1421205		
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	304	0.100	5.000	302.3	40.4	90	110				S

Sample ID: CCV-210924-1 5 ppm	SampType: CCV	TestCode: ANIONS-CWA	Units: mg/L	Prep Date: 9/24/2021	RunNo: 58531						
Client ID: CCV	Batch ID: R58531	TestNo: E300.0		Analysis Date: 9/24/2021	SeqNo: 1421215						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	5.08	0.100	5.000	0	102	90	110				

Qualifiers: * Value exceeds Maximum Contaminant Level.
ND Not Detected at the PQL.

H Holding times for preparation or analysis exceeded.

MCL Maximum Contaminant Level.

Original



Silver State Labs-Las Vegas
3626 E. Sunset Road, Suite 100
Las Vegas, NV 89120
(702) 873-4478 FAX: (702) 873-7967
www.ssalabs.com

QC SUMMARY REPORT

WO#: 21091109

28-Sep-21

Client: Excelchem Laboratories, Inc.

Project: 2109142

TestCode: ANIONS-CWA

Sample ID: CCB-210924-1	SampType: CCB	TestCode: ANIONS-CWA	Units: mg/L	Prep Date: 9/24/2021	RunNo: 58531						
Client ID: CCB	Batch ID: R58531	TestNo: E300.0		Analysis Date: 9/24/2021	SeqNo: 1421216						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	ND	0.100									

Sample ID: 21091188-01B DUP		SampType: DUP		TestCode: ANIONS-CWA		Units: mg/L		Prep Date: 9/24/2021		RunNo: 58531	
Client ID: BatchQC		Batch ID: R58531		TestNo: E300.0				Analysis Date: 9/24/2021		SeqNo: 1421218	
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	13.5	0.100						13.51	0.219	10	

Sample ID: 21091188-01B MS	SampType: MS	TestCode: ANIONS-CWA	Units: mg/L	Prep Date: 9/24/2021	RunNo: 58531						
Client ID: BatchQC	Batch ID: R58531	TestNo: E300.0		Analysis Date: 9/24/2021	SeqNo: 1421219						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	18.4	0.100	5.000	13.51	98.0	90	110				

Sample ID: CCV-210924-1 5 ppm	SampType: CCV	TestCode: ANIONS-CWA	Units: mg/L	Prep Date: 9/25/2021	RunNo: 58531						
Client ID: CCV	Batch ID: R58531	TestNo: E300.0		Analysis Date: 9/25/2021	SeqNo: 1421229						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	5.04	0.100	5.000	0	101	90	110				

Qualifiers: * Value exceeds Maximum Contaminant Level.
ND Not Detected at the PQL.

H Holding times for preparation or analysis exceeded.

MCL Maximum Contaminant Level.

Original



Silver State Labs-Las Vegas
3626 E. Sunset Road, Suite 100
Las Vegas, NV 89120
(702) 873-4478 FAX: (702) 873-7967
www.ssalabs.com

QC SUMMARY REPORT

WO#: 21091109

28-Sep-21

Client: Excelchem Laboratories, Inc.

Project: 2109142

TestCode: ANIONS-CWA

Sample ID: CCV-210924-1 5 ppm	SampType: CCV	TestCode: ANIONS-CWA	Units: mg/L	Prep Date: 9/25/2021	RunNo: 58531						
Client ID: CCV	Batch ID: R58531	TestNo: E300.0		Analysis Date: 9/25/2021	SeqNo: 1421229						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

Sample ID: CCB-210924-1	SampType: CCB	TestCode: ANIONS-CWA	Units: mg/L	Prep Date: 9/25/2021	RunNo: 58531						
Client ID: CCB	Batch ID: R58531	TestNo: E300.0		Analysis Date: 9/25/2021	SeqNo: 1421230						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	ND	0.100									

Sample ID: CCV-210924-1 5 ppm	SampType: CCV	TestCode: ANIONS-CWA	Units: mg/L	Prep Date: 9/25/2021	RunNo: 58531						
Client ID: CCV	Batch ID: R58531	TestNo: E300.0		Analysis Date: 9/25/2021	SeqNo: 1421244						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	5.09	0.100	5.000	0	102	90	110				

Sample ID: CCB-210924-1	SampType: CCB	TestCode: ANIONS-CWA	Units: mg/L	Prep Date: 9/25/2021	RunNo: 58531						
Client ID: CCB	Batch ID: R58531	TestNo: E300.0		Analysis Date: 9/25/2021	SeqNo: 1421245						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	ND	0.100									

Qualifiers: * Value exceeds Maximum Contaminant Level.
ND Not Detected at the PQL.

H Holding times for preparation or analysis exceeded.

MCL Maximum Contaminant Level.

Original



Silver State Labs-Las Vegas
3626 E. Sunset Road, Suite 100
Las Vegas, NV 89120
(702) 873-4478 FAX: (702) 873-7967
www.ssalabs.com

QC SUMMARY REPORT

WO#: 21091109

28-Sep-21

Client: Excelchem Laboratories, Inc.

Project: 2109142

TestCode: ANIONS-CWA

Sample ID: CCV-210924-1 5 ppm	SampType: CCV	TestCode: ANIONS-CWA Units: mg/L				Prep Date: 9/25/2021		RunNo: 58531			
Client ID: CCV	Batch ID: R58531	TestNo: E300.0				Analysis Date: 9/25/2021		SeqNo: 1421249			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	5.09	0.100	5.000	0	102	90	110				

Sample ID: CCB-210924-1	SampType: CCB	TestCode: ANIONS-CWA Units: mg/L				Prep Date: 9/25/2021		RunNo: 58531			
Client ID: CCB	Batch ID: R58531	TestNo: E300.0				Analysis Date: 9/25/2021		SeqNo: 1421250			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	ND	0.100									

Qualifiers: * Value exceeds Maximum Contaminant Level.
ND Not Detected at the PQL.

H Holding times for preparation or analysis exceeded.

MCL Maximum Contaminant Level.

Original

Excelchem

1135 W. Sunset Blvd. Suite A
Rocklin, CA 95765
Ph: 916-543-4445 Fx: 916-543-4449

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: Joe Trapasso

Phone #: See above

Electronic Data Deliverables Request:

☒ .PDF

Geotracker (Global ID)

Other (please specify)

Email Address:

JoeT@excelchem.net

Please Invoice To:

Finance@excelchem.net

Company/Address: See above

Fax #: See above

Project Number/P.O.#: 2109142

Project Name: 2109142

ANALYSIS REQUEST

Page of

Project Location: Rocklin, CA

Sampler Signature:

Bin#:

Due Date:

Work Order:

Sample ID

21091109-

Sampling Date Time

VOA Clear
jar 4 oz
Amber 1 ltr
poly

Method Preserved
HCl
HNO3
ICE/NONE
Na2S2O3
Drinking Water
WATER
SOIL

LL Chloride

DUE: STANDARD

LAB USE ONLY:

HVC-2 1A

9/20/2021 11:30

X

X

X

X

HVC-1A 2A

9/20/2021 11:50

X

X

X

X

BPC-4 3A

9/20/2021 13:25

X

X

X

X

Relinquished by:

Excelchem

Date

9/22/21 1600

Received by:

Remarks/Condition of Sample:

SSAL Vegas

Relinquished by:

Date

Received by Laboratory:

9/23 1100

Bill To:

ANALYSIS REPORT													
Client:	Cardno - Heavenly Water Quality Sampling						Lab:	High Sierra Water Lab					
	295 Highway 50, Suite 1							Collin Strassenburgh					
	PO Box 1533							PO Box 64					
	Zephyr Cove, NV 89448							Oakland, OR 97462					
	(775) 588-9069							Phone (530) 205-7720					
								E-mail: collin@highsierrawaterlab.com					
	E-mail: chris.donley@cardno.com												
Report Date: 7/13/2021 (file name: HV071321.xls)													
Site	ID	Date	Time	NO3/NO2-N	SRP-P	DP-P	TP-P	TKN	TSS	Cond	Turbidity		
				(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(mg/L)	(µs/cm)	(ntu)		
Sky Meadows	HVC-1a	7/13/21	13:15	14			24	111	3.5		1.94		
Below Patsy's	HVC-2	7/13/21	13:00	46			21	78	1.0		0.40		
Property Line	HVC-3	7/13/21	11:20	2			25	57	1.0		0.53		
Hidden Valley Creek	HDVC-5	7/13/21	10:30	-			-	-	-		-		
Bijou Park Creek	BPC-4	7/13/21	12:10	390			90	171	6.5		15.5		
Edgewood Below	HVE-2	7/13/21	14:25	99	7	19	60	213	10	144.1	6.66		

ANALYSIS REPORT												
Client:		Cardno - Heavenly Water Quality Sampling					Lab:		High Sierra Water Lab			
	295 Highway 50, Suite 1							Collin Strassenburgh				
	PO Box 1533							PO Box 64				
	Zephyr Cove, NV 89448							Oakland, OR 97462				
	(775) 588-9069							Phone (530) 205-7720				
								E-mail: collin@highsierrawaterlab.com				
	E-mail: chris.donley@cardno.com											
Report Date: 9/20/2021 (file name: HV092021.xls)												
Site	ID	Date	Time	NO3/NO2-N	SRP-P	DP-P	TP-P	TKN	TSS	Cond	Turbidity	
				(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(mg/L)	(µs/cm)	(ntu)	
Sky Meadows	HVC-1a	9/20/21	11:50	3			43	104	8.5		11.7	
Below Patsy's	HVC-2	9/20/21	11:30	8			127	392	29.5		28.1	
Bijou Park Creek	BPC-4	9/20/21	12:45	199			171	239	20.0		21.6	
Edgewood Below	HVE-2	9/20/21	13:25	32	11	13	66	356	26	142	18.5	

12/20/2021

Cardno
PO Box 1533
Zephyr Cove, NV 89448
Attn: Parker Johnson

OrderID: 21060889
Amended

Dear: Parker Johnson

This is to transmit the attached analytical report. The analytical data and information contained therein was generated using specified or selected methods contained in references, such as Standard Methods for the Examination of Water and Wastewater, online edition, Methods for Determination of Organic Compounds in Drinking Water, EPA-600/4-79-020, and Test Methods for Evaluation of Solid Waste, Physical/Chemical Methods (SW846) Third Edition.

The samples were received by WETLAB-Western Environmental Testing Laboratory in good condition on 6/25/2021. Additional comments are located on page 2 of this report.

This report has been generated to amend the result for the Total Nitrogen calculation and the date of analysis for Total Kjeldahl Nitrogen for sample 21060889-003. If you should have any questions or comments regarding this report, please do not hesitate to call.

Sincerely,



Cory Baker
QA Specialist



McKenna Oh
Project Manager

McKennaO@wetlaboratory.com
(775) 200-9876

SPARKS

475 E. Greg Street, Suite 119
Sparks, Nevada 89431
tel (775) 355-0202
fax (775) 355-0817
EPA LAB ID: NV00925 - ELAP No: 2523

ELKO

1084 Lamoille Hwy
Elko, Nevada 89801
tel (775) 777-9933
fax (775) 777-9933
EPA LAB ID: NV00926

LAS VEGAS

3230 Polaris Ave. Suite 4
Las Vegas, Nevada 89102
tel (702) 475-8899
fax (702) 622-2868
EPA LAB ID: NV00932

Western Environmental Testing Laboratory

Report Comments

Cardno - 21060889 Amended

Specific Report Comments

None

Report Legend

- B -- The analysis of the method blank revealed concentrations of the target analyte above the reporting limit. The client results were greater than ten times the blank amount or non-detect; therefore, the data was not impacted.
- D -- Due to the sample matrix dilution was required in order to properly detect and report the analyte. The reporting limit has been adjusted accordingly.
- HT -- Sample analyzed beyond the accepted holding time
- J -- The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit. The reported result should be considered an estimate.
- K -- The TPH Diesel Concentration reported here likely includes some heavier TPH Oil hydrocarbons reported in the TPH Diesel range as per EPA 8015.
- L -- The TPH Oil Concentration reported here likely includes some lighter TPH Diesel hydrocarbons reported in the TPH Oil range as per EPA 8015.
- M -- The matrix spike/matrix spike duplicate (MS/MSD) values for the analysis of this parameter were outside acceptance criteria due to probable matrix interference. The reported result should be considered an estimate.
- N -- There was insufficient sample available to perform a spike and/or duplicate on this analytical batch.
- NC -- Not calculated due to matrix interference
- QD -- The sample duplicate or matrix spike duplicate analysis demonstrated sample imprecision. The reported result should be considered an estimate.
- QL -- The result for the laboratory control sample (LCS) was outside WETLAB acceptance criteria and reanalysis was not possible. The reported data should be considered an estimate.
- S -- Surrogate recovery was outside of laboratory acceptance limits due to matrix interference. The associated blank and LCS surrogate recovery was within acceptance limits
- SC -- Spike recovery not calculated. Sample concentration >4X the spike amount; therefore, the spike could not be adequately recovered
- U -- The analyte was analyzed for, but was not detected above the level of the reported sample reporting/quantitation limit. The reported result should be considered an estimate.

General Lab Comments

Per method recommendation (section 4.4), Samples analyzed by methods EPA 300.0 and EPA 300.1 have been filtered prior to analysis.

The following is an interpretation of the results from EPA method 9223B:

A result of zero (0) indicates absence for both coliform and Escherichia coli meaning the water meets the microbiological requirements of the U.S. EPA Safe Drinking Water Act (SDWA). A result of one (1) for either test indicates presence and the water does not meet the SDWA requirements. Waters with positive tests should be disinfected by a certified water treatment operator and retested.

Per federal regulation the holding time for the following parameters in aqueous/water samples is 15 minutes: Residual Chlorine, pH, Dissolved Oxygen, Sulfite.

SPARKS

475 E. Greg Street, Suite 119
Sparks, Nevada 89431
tel (775) 355-0202
fax (775) 355-0817
EPA LAB ID: NV00925 - ELAP No: 2523

ELKO

1084 Lamoille Hwy
Elko, Nevada 89801
tel (775) 777-9933
fax (775) 777-9933
EPA LAB ID: NV00926

LAS VEGAS

3230 Polaris Ave. Suite 4
Las Vegas, Nevada 89102
tel (702) 475-8899
fax (702) 622-2868
EPA LAB ID: NV00932

Western Environmental Testing Laboratory

Analytical Report

Cardno

Date Printed: 12/20/2021

PO Box 1533

OrderID: 21060889

Zephyr Cove, NV 89448

Amended

Attn: Parker Johnson

Phone: (775) 588-9069 Fax: (775) 588-9219

PO\Project: Heavenly

Customer Sample ID: HVP-1A (NORTH)

Collect Date/Time: 6/24/2021 12:39

WETLAB Sample ID: 21060889-001

Receive Date: 6/25/2021 14:46

Analyte	Method	Results	Units	DF	RL	Analyzed	LabID
---------	--------	---------	-------	----	----	----------	-------

General Chemistry

Total Phosphorous as P	SM 4500-P E	0.47	mg/L	1	0.020	6/28/2021	NV00925
Total Suspended Solids (TSS)	SM 2540D	300	mg/L	1	10	6/29/2021	NV00925
Total Nitrogen	Calc.	5.9	mg/L	1	0.61	7/1/2021	NV00925
Turbidity (Nephelometric)	EPA 180.1	290	NTU	30	3.0	6/25/2021	NV00925
Oil & Grease (HEM)	EPA 1664	2.6	J mg/L	1	2.0	7/7/2021	NV00925

Anions by Ion Chromatography

Chloride	EPA 300.0	93	mg/L	1	1.0	6/25/2021	NV00925
Nitrate Nitrogen	EPA 300.0	ND	mg/L	1	0.15	6/25/2021	NV00925
Nitrite Nitrogen	EPA 300.0	ND	mg/L	1	0.060	6/25/2021	NV00925

Flow Injection Analyses

Total Kjeldahl Nitrogen	EPA 351.2	5.9	mg/L	1	0.40	7/1/2021	NV00925
-------------------------	-----------	-----	------	---	------	----------	---------

Customer Sample ID: HVP-1B (SOUTH)

Collect Date/Time: 6/24/2021 12:30

WETLAB Sample ID: 21060889-002

Receive Date: 6/25/2021 14:46

Analyte	Method	Results	Units	DF	RL	Analyzed	LabID
---------	--------	---------	-------	----	----	----------	-------

General Chemistry

Total Phosphorous as P	SM 4500-P E	0.40	mg/L	1	0.020	6/28/2021	NV00925
Total Suspended Solids (TSS)	SM 2540D	200	mg/L	1	10	6/29/2021	NV00925
Total Nitrogen	Calc.	4.7	mg/L	1	0.41	7/1/2021	NV00925
Turbidity (Nephelometric)	EPA 180.1	180	NTU	30	3.0	6/25/2021	NV00925
Oil & Grease (HEM)	EPA 1664	ND	U mg/L	1	2.0	7/7/2021	NV00925

Anions by Ion Chromatography

Chloride	EPA 300.0	39	mg/L	1	1.0	6/25/2021	NV00925
Nitrate Nitrogen	EPA 300.0	ND	mg/L	1	0.15	6/25/2021	NV00925
Nitrite Nitrogen	EPA 300.0	ND	mg/L	1	0.060	6/25/2021	NV00925

Flow Injection Analyses

Total Kjeldahl Nitrogen	EPA 351.2	4.7	mg/L	0.5	0.20	7/1/2021	NV00925
-------------------------	-----------	-----	------	-----	------	----------	---------

DF=Dilution Factor, RL = Reporting Limit (minimum 3X the MDL), ND = Not Detected <RL or <MDL (if listed)

Page 3 of 5

SPARKS

475 E. Greg Street, Suite 119
 Sparks, Nevada 89431
 tel (775) 355-0202
 fax (775) 355-0817
 EPA LAB ID: NV00925 - ELAP No: 2523

ELKO

1084 Lamoille Hwy
 Elko, Nevada 89801
 tel (775) 777-9933
 fax (775) 777-9933
 EPA LAB ID: NV00926

LAS VEGAS

3230 Polaris Ave. Suite 4
 Las Vegas, Nevada 89102
 tel (702) 475-8899
 fax (702) 622-2868
 EPA LAB ID: NV00932

Customer Sample ID: HVP-2 (OUTLET)

Collect Date/Time: 6/24/2021 13:30

WETLAB Sample ID: 21060889-003

Receive Date: 6/25/2021 14:46

Analyte	Method	Results	Units	DF	RL	Analyzed	LabID
<u>General Chemistry</u>							
Total Phosphorous as P	SM 4500-P E	0.27	mg/L	1	0.020	7/1/2021	NV00925
Total Suspended Solids (TSS)	SM 2540D	220	mg/L	1	10	6/29/2021	NV00925
Total Nitrogen	Calc.	5.8	mg/L	1	0.61	7/2/2021	NV00925
Turbidity (Nephelometric)	EPA 180.1	150	NTU	30	3.0	6/25/2021	NV00925
Oil & Grease (HEM)	EPA 1664	3.7	M mg/L	1	2.7	7/7/2021	NV00925
<u>Anions by Ion Chromatography</u>							
Chloride	EPA 300.0	84	mg/L	1	1.0	6/25/2021	NV00925
Nitrate Nitrogen	EPA 300.0	ND	mg/L	1	0.15	6/25/2021	NV00925
Nitrite Nitrogen	EPA 300.0	ND	mg/L	1	0.060	6/25/2021	NV00925
<u>Flow Injection Analyses</u>							
Total Kjeldahl Nitrogen	EPA 351.2	5.8	mg/L	1	0.40	7/2/2021	NV00925

SPARKS

475 E. Greg Street, Suite 119
Sparks, Nevada 89431
tel (775) 355-0202
fax (775) 355-0817
EPA LAB ID: NV00925 - ELAP No: 2523

ELKO

1084 Lamoille Hwy
Elko, Nevada 89801
tel (775) 777-9933
fax (775) 777-9933
EPA LAB ID: NV00926

LAS VEGAS

3230 Polaris Ave. Suite 4
Las Vegas, Nevada 89102
tel (702) 475-8899
fax (702) 622-2868
EPA LAB ID: NV00932

Western Environmental Testing Laboratory

QC Report

QCBatchID	QCType	Parameter	Method	Result	Actual	% Rec	Units
QC21061131	Blank 1	Chloride	EPA 300.0	ND			mg/L
		Nitrate Nitrogen	EPA 300.0	ND			mg/L
		Nitrite Nitrogen	EPA 300.0	ND			mg/L
QC21061166	Blank 1	Total Phosphorous as P	SM 4500-P E	ND			mg/L
QC21061214	Blank 1	Turbidity (Nephelometric)	EPA 180.1	ND			NTU
QC21061252	Blank 1	Total Suspended Solids (TSS)	SM 2540D	ND			mg/L
QC21070034	Blank 1	Total Phosphorous as P	SM 4500-P E	ND			mg/L
QC21070045	Blank 1	Total Kjeldahl Nitrogen	EPA 351.2	ND			mg/L
QC21070272	Blank 1	Oil & Grease (HEM)	EPA 1664	ND			mg/L

QCBatchID	QCType	Parameter	Method	Result	Actual	% Rec	Units
QC21061131	LCS 1	Chloride	EPA 300.0	10.1	10.0	101	mg/L
		Nitrate Nitrogen	EPA 300.0	1.94	2.00	97	mg/L
		Nitrite Nitrogen	EPA 300.0	0.512	0.500	102	mg/L
QC21061166	LCS 1	Total Phosphorous as P	SM 4500-P E	0.266	0.250	107	mg/L
QC21061214	LCS 1	Turbidity (Nephelometric)	EPA 180.1	5.00	5.00	100	NTU
QC21061252	LCS 1	Total Suspended Solids (TSS)	SM 2540D	202	200	101	mg/L
QC21061252	LCS 2	Total Suspended Solids (TSS)	SM 2540D	199	200	100	mg/L
QC21070034	LCS 1	Total Phosphorous as P	SM 4500-P E	0.279	0.250	112	mg/L
QC21070045	LCS 1	Total Kjeldahl Nitrogen	EPA 351.2	1.01	1.00	101	mg/L
QC21070272	LCS 1	Oil & Grease (HEM)	EPA 1664	16.0	20.0	80	mg/L

QCBatchID	QCType	Parameter	Method	Duplicate Sample	Sample Result	Duplicate Result	Units	RPD
QC21061214	Duplicate 1	Turbidity (Nephelometric)	EPA 180.1	21060889-001	293	295	NTU	<1%
QC21061252	Duplicate 1	Total Suspended Solids (TSS)	SM 2540D	21060839-005	ND	ND	mg/L	<1%
QC21061252	Duplicate 2	Total Suspended Solids (TSS)	SM 2540D	21060861-001	24.0	23.0	mg/L	4 %

QCBatchID	QCType	Parameter	Method	Spike Sample	Sample Result	MS Result	MSD Result	Spike Value	Units	MS %Rec	MSD %Rec	RPD %
QC21061131	MS 1	Chloride	EPA 300.0	21060862-003	80.0	105	105	5	mg/L	99	98	<1
		Nitrate Nitrogen	EPA 300.0	21060862-003	6.17	16.6	16.5	2	mg/L	105	103	<1
		Nitrite Nitrogen	EPA 300.0	21060862-003	ND	D 2.51	2.46	0.5	mg/L	100	98	2
QC21061131	MS 2	Chloride	EPA 300.0	21060853-001	11.7	16.4	16.5	5	mg/L	94	95	<1
		Nitrate Nitrogen	EPA 300.0	21060853-001	0.687	2.73	2.75	2	mg/L	102	103	<1
		Nitrite Nitrogen	EPA 300.0	21060853-001	ND	0.481	0.484	0.5	mg/L	96	97	<1
QC21061166	MS 1	Total Phosphorous as P	SM 4500-P E	21060771-002	0.138	0.383	0.385	0.25	mg/L	98	99	<1
QC21061166	MS 2	Total Phosphorous as P	SM 4500-P E	21060878-001	0.026	QD 0.242	0.302	0.25	mg/L	87	110	22
QC21070034	MS 1	Total Phosphorous as P	SM 4500-P E	21060921-006	0.039	0.324	0.323	0.25	mg/L	114	113	<1
QC21070034	MS 2	Total Phosphorous as P	SM 4500-P E	21070001-001	0.356	0.596	0.571	0.25	mg/L	96	86	4
QC21070045	MS 1	Total Kjeldahl Nitrogen	EPA 351.2	21060763-001	0.256	0.763	0.727	0.5	mg/L	101	94	5
QC21070045	MS 2	Total Kjeldahl Nitrogen	EPA 351.2	21060878-001	0.089	J 0.606	0.578	0.5	mg/L	103	98	5
QC21070272	MS 1	Oil & Grease (HEM)	EPA 1664	21060889-003	3.70	M 5.70		10	mg/L	NC	NA	NA

DF=Dilution Factor, RL = Reporting Limit (minimum 3X the MDL), ND = Not Detected <RL or <MDL (if listed)

Page 5 of 5

SPARKS

475 E. Greg Street, Suite 119
Sparks, Nevada 89431
tel (775) 355-0202
fax (775) 355-0817
EPA LAB ID: NV00925 - ELAP No: 2523

ELKO

1084 Lamoille Hwy
Elko, Nevada 89801
tel (775) 777-9933
fax (775) 777-9933
EPA LAB ID: NV00926

LAS VEGAS

3230 Polaris Ave. Suite 4
Las Vegas, Nevada 89102
tel (702) 475-8899
fax (702) 622-2868
EPA LAB ID: NV00932



Page of

PWS/Project Number

Email

Spl
No

Sample Matrix Key** DW = Drinking Water WW = Wastewater SW = Surface Water MW = Monitoring Well SD = Solid/Sludge SO = Soil HW = Hazardous Waste OTHER: _____

***SAMPLE PRESERVATIVES:** 1=Unpreserved 2=H₂SO₄ 3=NaOH 4=HCl 5=HNO₃ 6=Na₂S₂O₃ 7=ZnOAc+NaOH 8=HCl/VOA Vial

301.2E

Heavenly Mountain Resort
Water Years 2017–2021

APPENDIX

H

STREAM CONDITION INVENTORY
(SCI) RIPARIAN DATA &
DISCUSSION

Appendix H

Stream Condition Inventory (SCI) Riparian Data & Discussion

H.1 Riparian Condition Monitoring Data

H.1.1 Monitoring Results – Stable Functional Channel

SCI monitoring measures channel stability and functionality through measurement of channel type, bank and cross-section geometry, channel gradient, and streambank stability. The permanent monumented cross-sections at each monitoring reach provide a consistent location to evaluate the functionality of the channel and changes over time. Along with longitudinal profiles and streambank stability assessments, comparisons of these data over time can help assess channel stability. Three cross-sections were established within each of the 10 monitoring reaches prior to 2006 and continue to be used. Where monumented pins cannot be located, a new pin is established using global positioning system (GPS) points and photographs to best replicate the previous location. The cross-sections were located in fast-water habitats and were oriented perpendicular to flow. At each cross-section, headpins were established along the left and right streambanks (viewed in the downstream direction) and a measuring tape was run horizontally across the channel from the left bank monument to the right bank monument. Channel stability and channel functionality, as measured through various assessments, are discussed below.

H.1.2 Channel Type

Channel classification and known characteristics of monitored reaches are summarized below in Table H-1. Channel classification and gradient dictate specific SCI data to be collected at each reach, as discussed in detail below.

Table H-1 Rosgen Stream Classifications and Characteristics of Monitored Reaches

Rosgen Stream Classification	Typical Characteristics ¹	Monitored Reaches
Aa+	Very steep gradient (>10 percent), well entrenched, and confined. Typically characterized by a step/pool morphology with capacity for debris transport.	Upper Edgewood (EC-1) Upper Daggett (DC-1)
A	Steep gradient (4–10%), entrenched, and cascading step/pool morphology with attendant plunge or scour pools. Typically has high energy to transport sediment and relatively low in-channel sediment storage capacity.	Property Line (HVC-3) Lower Hidden Valley (HDVC-2) Lower Daggett (DC-2)
B	Moderate gradient, moderately entrenched, channel is dominated by riffles with infrequently spaced pools, with stable banks and a stable profile. Often with a structurally controlled valley side-slope that limits the development of a wide floodplain.	Patsy's (HVC-2)
C	Low gradient, meandering, characterized by alternating and linked riffles and pools. An alluvial channel with broad, well-defined floodplains in narrow to wide valleys.	Sky Meadows (HVC-1) Upper Hidden Valley (HDVC-1)
G	Entrenched, narrow, and deep, with step/pool channel morphology with low to moderate sinuosity. Typically exhibits very high bank erosion rates and a high sediment supply.	Lower Edgewood (EC-2)

¹ Adapted from Rosgen 1996

California Project Reaches

The Sky Meadows reach (HVC-1) is the upper-most monitoring reach on Heavenly Valley Creek and was established by the USFS in 1996. It is a perennial reach that falls under the “C” type channel under the Rosgen classification system. This channel type has not changed since 2006. Because the mean surface water gradient is less than 2 percent, with surface flow present during 2019 monitoring, all SCI measurements were recorded along this reach.

The Patsy’s reach (HVC-2) is the second downstream monitoring reach located on Heavenly Valley Creek and was established by the USFS in 1996. This reach exhibits the characteristics of a Rosgen “B” type channel. The channel type has not changed since 2006. Because this reach has a water surface gradient greater than 2 percent, bank angle and stream shore depth are not measured. During 2019 monitoring, all other SCI measurements were recorded, as the stream was flowing during monitoring.

The Property Line reach (HVC-3) downstream of Heavenly’s boundaries was established in 2001 to detect temporal changes in channel morphology resulting from cumulative impacts. This reach exhibits Rosgen “A” type channel characteristics. In 2006, the classification was changed from a “B” type to an “A” type channel due to the steepness of the reach, although some attributes fit both channel types (such as its stable banks and moderate entrenchment). Bank angle and stream shore depth are not recorded because this reach has a water surface gradient greater than 2 percent. During 2019 monitoring, all other SCI measurements were recorded, as the stream was flowing.

California Reference Reaches

The Upper Hidden Valley reach (HDVC-1) is located in the headwaters area of Hidden Valley Creek. Established in 1996, HDVC-1 is a reference reach undisturbed by ski resort activities and is comparable to the Sky Meadows reach (HVC-1) on Heavenly Valley Creek. The Upper Hidden Valley reach (HDVC-1) exhibits the characteristics of a Rosgen “C” type channel. The channel type has not changed since 2006. The channel was dry during 2006 monitoring; thus, the full SCI monitoring protocol could not be completed. On subsequent inventory dates the stream has been flowing. Bed profile gradient was reported in 2006, as there was no water present in the channel to measure surface water gradient. Bank angle and stream shore depth measurements are recorded because this reach has a gradient of less than 2 percent. The stream had active flow in 2009, 2011, 2015, and 2019.

The Lower Hidden Valley reach (HDVC-2) was established in 2001 as a reference site for the Property Line reach (HVC-3). While both reaches have similar gradient, canopy cover, adjacent streamside vegetation types, elevations, and bankfull widths, Heavenly Valley and Hidden Valley Creeks have dissimilar flow regimes. The discharge in Heavenly Valley Creek is influenced by the California Dam (snowmaking pond just below the Sky Meadows reach), while Hidden Valley Creek flows are not regulated. The Lower Hidden Valley reach (HDVC-2) exhibits Rosgen “A” type channel characteristics. In 2006, the classification was changed from a “B” type channel to an “A” type channel due to the steepness of the reach, although some attributes fit both types (such as stable banks and moderate entrenchment). Bank angle and stream shore depth are not recorded because this reach has a water surface gradient of greater than 2 percent. During 2019 monitoring, all other SCI measurements were recorded, as the stream was flowing.

Nevada Project Reaches

The Edgewood Creek watershed has been the location of multiple restoration projects. The restoration project in the portion of Edgewood Creek including the Upper Edgewood reach (EC-1) is referred to as the North Bowl Restoration Stream Environment Project. Phase 1 (the downstream two-thirds of the project) of the North Bowl Restoration Stream Environment Project was completed in 2006. Other activities in 2006 included installation of gabion structures for gully improvements upstream of the restoration project and installation of BMPs on the road that descends from Boulder Parking Lot along Edgewood Creek. Phase 2 of the North Bowl Restoration Stream Environment Project was completed in

the summer of 2007. Phase 2 involved the installation of additional gabion structures, strategic placement of large woody debris, and vegetation establishment. For a more thorough description, please reference the *Final Edgewood Watershed Assessment and Enhancement Plan: Upper Edgewood Creek* (Swanson Hydrology and Geomorphology 2006).

Edgewood Creek at the Upper Edgewood reach (EC-1) exhibits Rosgen “Aa+” type channel characteristics. The channel resembles a gully, and the step/pool morphology is a result of a large number of downed trees in the channel (Rosgen 1996) and the installed gabion structures. As the stream is a high-gradient stream at this location, only a longitudinal bed profile and cross-section analysis is conducted. Water has not been present during any SCI monitoring events; therefore, much of the SCI data cannot be collected, according to the protocols. The three permanent cross-sections extend across the entire valley floor width and were selected in 2006 to avoid construction disturbance; thus, any cross-sectional data collected prior to 2006 are not comparable to data collected after 2006. Because of the restoration construction and gabion basket placement, information such as bankfull width and entrenchment is difficult to reliably identify and therefore is not recorded.

Edgewood Creek below the Boulder Parking Lot (EC-2) exhibits characteristics of a Rosgen “G” type channel and underwent restoration in 2007. Restoration activities included repair of a head-cut and channel incision by constructing plunge pools and riparian planting. The restoration occurred directly upstream of EC-2 and extended down to the upstream cross-section of the riparian monitoring reach. A vault treatment system was installed in the Boulder Parking Lot in 2005. Pebble counts have not been completed regularly along this reach because the majority of the bed sediment is less than 8 millimeters (mm) (gravel or sand). A pebble count was conducted in 2019 and confirmed these results.

The Upper Daggett Creek reach (DC-1) exhibits characteristics of a Rosgen “Aa+” type channel. Typical characteristics of this reach include a step/pool morphology with chutes and waterfalls (Rosgen 1996). Mean bank angle and mean shore depth are not measured as the stream gradient is 2 percent.

The Lower Daggett reach (DC-2) exhibits characteristics of a Rosgen “A” type channel. It is similar to an “Aa+” type channel in terms of several channel characteristics, yet has a smaller channel slope (Rosgen 1996). Mean bank angle and mean shore depth are not measured as the stream gradient is 2 percent.

The Mott Creek reach (MC-1) exhibits characteristics of a Rosgen “Aa+” type channel. As discussed in Chapter 5.3, LTBMU does not feel the establishment of an SCI monitoring reach is necessary in the Mott Creek watershed due to the boulder-dominated stability of the channel. No further discussion of this site is included in this report.

H.1.3 Bankfull Channel Geometry

Bankfull stage is identified in the field in order to determine the associated channel characteristics such as bankfull width, bankfull depth, and bankfull width-to-depth ratio, and as input to the entrenchment ratio. The bankfull stage is not readily apparent at some of the steep channel sites that lack a well-defined floodplain surface. In such cases, best professional judgment was used to identify other bankfull indicators such as break in bank slope, vegetation, changes in sizes of bank materials, water stains or lichen lines on substrate, and scour lines or undercut banks.

Bankfull width is the width of the channel at the bankfull stage elevation, measured at the permanent monumented cross-sections. The bankfull widths for each of the monumented cross-sections in the monitoring reaches are reported in Tables H-2 through H-5.

Overall, bankfull widths have remained generally consistent at each site over the full monitoring period (2006–2019). The bankfull widths at some cross-sections at Sky Meadows (HVC-1) and Upper Hidden Valley Creek (HDVC-1) increased slightly in 2019 or stabilized following an increase in 2015. Increases may indicate a slight decline in condition at these locations, although these findings were not consistent across the entire monitoring reach. Other cross-sections appeared stable or improving. Bankfull width measurements were taken in 2015 at Upper Edgewood (EC-1) despite the presence of water and despite

restoration features that prevented accurate bankfull stage identification (bankfull stage was not recorded during any other monitoring events). The Lower Edgewood reach (EC-2) showed a slight decrease (considered an improvement) in bankfull width measurements in both 2015 and 2019.

Table H-2 Bankfull Widths (m) – Heavenly Valley Creek

Year	HVC-1 (Sky Meadows)				HVC-2 (Patsy's)				HVC-3 (Property Line)			
	XS-1	XS-2	XS-3	Mean	XS-1	XS-2	XS-3	Mean	XS-1	XS-2	XS-3	Mean
2006	1.2	1.5	1.5	1.4	1.3	2.0	1.7	1.7	2.6	3.1	2.6	2.7
2009	1.7	1.5	1.7	1.6	1.7	1.9	1.8	1.8	2.4	4.0	2.7	3.1
2011	1.7	1.7	1.8	1.7	1.5	2.4	1.7	1.9	2.6	4.0	2.7	3.1
2015	2.4	1.3	2.6	2.1	1.7	2.1	1.9	1.9	2.3	4.3	2.5	3.0
2019	2.1	2.1	2.7	2.3	1.2	1.7	1.5	1.5	1.9	4.4	2.0	2.8

Table H-3 Bankfull Widths (m) – Hidden Valley Creek

Year	HDVC-1 (Upper Hidden Valley Creek)				HDVC-2 (Lower Hidden Valley Creek)			
	XS-1	XS-2	XS-3	Mean	XS-1	XS-2	XS-3	Mean
2006	2.3	NA ¹	1.1	1.7	4.4	2.2	2.9	3.2
2009	1.9	NA ¹	1.7	1.8	4.5	2.3	2.9	3.2
2011	2.0	NA ¹	1.6	1.8	4.6	2.4	3.0	3.3
2015	2.0	1.8	2.1	2.0	4.5	2.4	3.5	3.5
2019	1.1	2.8	1.7	1.9	3.7	2.0	3.7	3.1

¹ XS-2 could not be located in 2006, 2009, or 2011. Since at least 2011, the channel has moved so that one headpin is now located within the current stream channel.

Table H-4 Bankfull Widths (m) – Edgewood Creek

Year	EC-1 (Upper Edgewood)				EC-2 (Lower Edgewood)			
	XS-1	XS-2	XS-3	Mean	XS-1	XS-2	XS-3 ¹	Mean
2006	NA ²				4.4	0.9	1.8	2.4
2008	NA ²				3.4	0.7	2.7	2.3
2009	NA ²				4.0	0.7	2.4	2.4
2010	NA ²				4.0	0.9	2.8	2.6
2011	NA ²				3.9	0.9	2.6	2.5
2015	11.6	10.4	10.2	10.7	4.4	0.6	2.1	2.4
2019	NA ²				3.4	0.5	1.2	1.7

¹ XS-3 was relocated in 2008 due to restoration activities destroying the permanent monument; therefore, 2006 data should not be used for comparison. The new location is directly below the rock grade control structure constructed as part of the Lower Edgewood Restoration Project completed in 2007.

² Only longitudinal bed profile and cross-section analysis are conducted at Edgewood Creek, apart from the 2015 monitoring. Bankfull indicators have been manipulated due to restoration (e.g., gabion installation), and field observations are unreliable.

Table H-5 Bankfull Widths (m) – Daggett Creek

Year	DC-1 (Upper Daggett Creek)				DC-2 (Lower Daggett Creek)			
	XS-1	XS-2	XS-3	Mean	XS-1	XS-2	XS-3	Mean
2006	2.0	2.4	3.5	2.6	1.2	3.2	2.1	2.2
2009	2.7	2.4	2.4	2.5	1.8	3.0	0.8	1.9
2015	2.7	2.1	2.1	2.3	1.1	2.4	2.4	2.0
2019	2.4	2.4	1.6	2.1	0.8	2.1	0.5	1.1

The slight variation in bankfull widths over the period of record for all three cross-sections at Upper Daggett Creek indicates that the reach is in a stable condition. After an increase in bankfull width at Lower Daggett Creek (DC-2) XS-3 in 2015, the bankfull width decreased. This may suggest stabilization of the system or may be related to nearby disturbance from the replacement of Galaxy chairlift Tower 7. Slight decreases in bankfull width at the other cross-sections indicate improvements over time.

Another characterization of bankfull channel geometry is the width-to-depth ratio, which is the ratio of bankfull channel width to the mean bankfull channel depth. The width-to-depth ratio describes the distribution of available energy within a channel and the ability of discharge events to move sediment. It also describes channel cross-section shape. Comparing changes in width-to-depth ratios over time can be used to interpret shifts in channel stability. In channels with high width-to-depth ratios, the distribution of energy is generally placed near the bank. Hydraulic stress against banks increases as the width-to-depth ratio increases; thus, bank erosion may similarly increase in systems with unstable banks. This is a common metric used to characterize stream morphology and aquatic habitat. The width-to-depth ratio based on survey data for each of the monumented cross-sections is reported in Tables H-6 through H-9.

Table H-6 Bankfull Width-to-Depth Ratios – Heavenly Valley Creek

Year	HVC-1 (Sky Meadows)				HVC-2 (Patsy's)				HVC-3 (Property Line)			
	XS-1	XS-2	XS-3	Mean	XS-1	XS-2	XS-3	mean	XS-1	XS-2	XS-3	Mean
2006	8.5	8.2	5.9	7.5	4.4	4.9	8.5	5.9	8.3	24.4	8.0	13.6
2009	9.3	8.5	9.9	9.3	6.3	4.7	6.9	5.9	9.2	24.4	7.7	13.7
2011	4.9	9.8	12.2	9.0	4.9	6.0	7.7	6.2	15.6	32.7	8.6	19.0
2015	7.1	10.1	18.9	12.0	6.2	5.4	7.5	6.4	9.6	28.9	7.3	15.3
2019	7.0	10.1	32.4	16.5	2.4	7.7	5.9	5.3	4.6	21.8	5.2	10.5

The width-to-depth ratio for the Sky Meadows reach (HVC-1) has remained low over the period of record. There has been a consistent increase in the width-to-depth ratio at XS-3 across the years. Floodplain sediment deposition at Sky Meadows XS-3 covered headpins after 2006, and this section of stream appears to be morphing into a wide, braided channel that encompasses a larger portion of the meadow, resulting in large changes of channel geometry. While these changes show the system is not necessarily stable, flow is spreading out and accessing a larger portion of the meadow, which is overall a positive change. The bankfull width-to-depth ratios at XS-1 and XS-2 have remained stable over time.

The width-to-depth ratios at Patsy's reach (HVC-2) have fluctuated only slightly across the years, which likely indicates channel stability. In 2019, width-to-depth ratios decreased at both XS-1 and XS-3, while increasing at XS-2. The increase at XS-2, accompanied by the decreased in bankfull width, indicates that some incision may be occurring at this location, and should be monitored closely.

The width-to-depth ratios at the Property Line reach (HVC-3) have also been relatively consistent over the period of record, and although width-to-depth ratios throughout the reach were notably higher in 2011, ratios decreased slightly in both 2015 and 2019.

Table H-7 Bankfull Width-to-Depth Ratios – Hidden Valley Creek

Year	HDVC-1 (Upper Hidden Valley Creek)				HDVC-2 (Lower Hidden Valley Creek)			
	XS-1	XS-2	XS-3	Mean	XS-1	XS-2	XS-3	Mean
2006	43.7	NA ¹	9.9	26.8	25.0	5.7	18.7	16.5
2009	53.9	NA ¹	9.8	31.9	19.7	5.2	13.1	12.7
2011	14.9	NA ¹	8.6	11.7	23.1	7.1	21.6	17.3
2015	5.9	9.2	15.0	10.0	16.6	7.0	20.3	14.6
2019	8.8	18.1	12.5	13.1	9.0	6.8	14.5	10.1

¹ XS-2 could not be located in 2006, 2009, or 2011. Since at least 2011, the channel has moved so that one headpin is now located within the current stream channel.

The width-to-depth ratios at the Upper Hidden Valley Creek reach (HDVC-1) increased at both XS-1 and XS-2 between 2015 and 2019, but the ratio has decreased dramatically at XS-1 over the period of record, indicating overall improvement since 2006. While bankfull width at XS-1 has been declining since 2006, the entrenchment ratio has increased (Table H-11) and the cross-sectional area has decreased (Figure H-9) since 2015, indicating that any incision that may have been occurring is stabilizing. Comparison of ratios at XS-2 is inconclusive, since data are missing from prior years.

The width-to-depth ratios at the Lower Hidden Valley reach (HDVC-2) have either remained stable or improved, as indicated by a decrease in the ratio.

Table H-8 Bankfull Width-to-Depth Ratios – Edgewood Creek

Year	EC-1 (Upper Edgewood)				EC-2 (Lower Edgewood)			
	XS-1	XS-2	XS-3	Mean	XS-1	XS-2	XS-3 ¹	Mean
2006	NA ²				18.8	0.8	9.0	9.5
2008	NA ²				16.1	0.6	9.5	8.7
2009	NA ²				15.7	1.4	8.2	8.4
2010	NA ²				17.3	1.8	11.4	10.1
2011	NA ²				20.0	1.4	15.7	12.3
2015	27.0	12.5	9.0	16.2	25.8	1.1	9.4	12.1
2019	NA ²				19.9	1.8	5.6	9.1

¹ XS-3 was relocated in 2008 due to restoration activities destroying the permanent monument; therefore, 2006 data should not be used for comparison. The new location is directly below the rock grade control structure constructed as part of the Lower Edgewood Restoration Project completed in 2007.

² Only longitudinal bed profile and cross-section analysis are conducted at Edgewood Creek, apart from the 2015 monitoring. Bankfull indicators have been manipulated due to restoration (e.g., gabion installation), and field observations are unreliable.

Bankfull width-to-depth ratios cannot be compared over time at Upper Edgewood reach (EC-1), with only 1 year's data available. Width-to-depth ratios at the Lower Edgewood reach (EC-2) indicate a trend of increased values between 2006 and 2015, although 2019 values declined. Bankfull channel widths at the Lower Edgewood reach have declined over time (Table H-4), particularly between 2015 and 2019. Channel depths have also decreased, likely due to sediment deposition correlated with restoration efforts on the stream. The decrease in depths has further decreased width-to-depth ratios, most dramatically at XS-3, which was within the restoration project footprint.

Table H-9 Bankfull Width-to-Depth Ratios – Daggett Creek

Year	DC-1 (Upper Daggett Creek)				DC-2 (Lower Daggett Creek)			
	XS-1	XS-2	XS-3	Mean	XS-1	XS-2	XS-3	Mean
2006	7.3	9.7	20.5	12.5	2.3	47.7	5.1	18.3
2009	10.4	11.5	7.4	9.7	8.8	69.0	6.9	28.2
2015	4.7	12.7	9.7	9.0	14.5	33.0	16.4	21.3
2019	19.7	13.3	6.4	13.1	11.0	22.7	3.8	12.5

The width-to-depth ratios at the Upper Daggett reach (DC-1) varied by cross-section between 2006 and 2019, most notably at XS-1 and XS-3. The ratio at XS-1 increased dramatically between 2015 and 2019. Channel widths were stable at XS-1; therefore, the increased ratio is due to increased depths and potentially incision. At XS-3, the ratio declined only slightly between 2015 and 2019, but it has declined dramatically since monitoring began in 2006 and is correlated in a decrease in channel width.

The width-to-depth ratios at the Lower Daggett reach (DC-2) showed an increasing trend between 2006 and 2015, but declined in 2019, largely dominated by changes at XS-2 and XS-3. Between 2015 and 2019, both channel width and depth declined at all cross-sections, showing improvement over past data, but not being indicative of a stable system.

One more characterization of bankfull channel geometry is the entrenchment ratio, which is calculated as the ratio of the floodprone width (measured in the field at twice the maximum bankfull depth) to bankfull width. The objective of this measurement is to measure the degree of likely connection between the channel and floodplain. Larger entrenchment ratios are indicative of greater floodplain connectivity, although some reaches will have inherently low connectivity depending on channel geometry and gradient. The entrenchment ratios for the monumented cross-sections along each reach is reported in Tables H-10 through H-13.

Table H-10 Entrenchment Ratios – Heavenly Valley Creek

Year	HVC-1 (Sky Meadows)				HVC-2 (Patsy's)				HVC-3 (Property Line)			
	XS-1	XS-2	XS-3	Mean	XS-1	XS-2	XS-3	mean	XS-1	XS-2	XS-3	Mean
2006	2.0	1.7	3.0	2.2	2.8	3.4	2.1	2.7	2.0	2.5	1.9	2.2
2009	2.2	2.0	1.5	1.9	2.1	2.5	2.2	2.2	2.3	2.1	2.1	2.2
2011	2.2	1.9	2.0	2.0	2.5	3.1	2.2	2.6	1.9	2.2	2.2	2.1
2015	1.5	2.3	1.4	1.7	4.4	3.3	4.4	4.0	2.5	2.5	2.0	2.3
2019	20.0	6.2	7.8	11.3	4.7	2.0	4.8	3.8	3.5	2.7	2.4	2.9

Entrenchment ratios at Sky Meadows have increased over time, most dramatically between 2015 and 2019. This was qualitatively evident in the field, as the channel appeared to be spreading out across a larger portion of the meadow and creating braids, rather than being confined to a single channel. This may be related to sediment deposition in the channel, which may have raised the channel bottom and forced flow out on to the floodplain more regularly during the runoff season. Entrenchment ratios at the other Heavenly Valley Creek sites (Patsy's and Property Line) remained fairly consistent between 2006 and 2019, indicating stability of the floodplain connectivity.

Table H-11 Entrenchment Ratios – Hidden Valley Creek

Year	HDVC-1 (Upper Hidden Valley Creek)				HDVC-2 (Lower Hidden Valley Creek)			
	XS-1	XS-2	XS-3	mean	XS-1	XS-2	XS-3	mean
2006	3.0	NA ¹	1.7	2.3	1.2	2.1	1.6	1.6
2009	1.2	NA ¹	1.4	1.3	1.4	2.4	1.9	1.9
2011	1.2	NA ¹	1.4	1.3	1.4	2.0	1.8	1.7
2015	4.8	9.3	4.9	6.3	1.6	2.1	2.1	1.9
2019	4.8	14.1	7.0	8.6	1.7	2.1	2.1	2.0

¹ XS-2 could not be located in 2006, 2009, or 2011. Since at least 2011, the channel has moved so that one headpin is now located within the current stream channel.

Entrenchment ratios at the Hidden Valley Creek sites remained fairly consistent from 2006 to 2019, aside from a large increase at XS-2 at Upper Hidden Valley Creek, which may only be due to the limited data available. However, entrenchment ratios also increased at XS-3 (upstream of XS-2), and it is possible Upper Hidden Valley Creek is undergoing similar changes as Sky Meadows, where sediment deposition in the channel is creating greater floodplain connectivity. However, minor topography and thalweg depth measurements can create larger ratio values as the floodplain width is calculated as two times this measured depth. These minor measured undulations can increase the floodplain width value substantially and thus increase the entrenchment ratio. Regardless, consistent trends of increased entrenchment ratios indicate a trend of less entrenchment at all cross-sections. Lower Hidden Valley Creek exhibited nearly identical entrenchment ratios compared to 2019, and relatively fixed ratios across the entire monitoring period, indicating long-term stability across the reach.

Table H-12 Entrenchment Ratios – Edgewood Creek

Year	EC-1 (Upper Edgewood)				EC-2 (Lower Edgewood)			
	XS-1	XS-2	XS-3	Mean	XS-1	XS-2	XS-3 ¹	mean
2006	NA ²				2.4	12.0	5.0	6.5
2008	NA ²				2.9	15.8	2.7	7.1
2009	NA ²				2.7	16.5	3.1	7.4
2010	NA ²				2.7	13.6	2.6	6.3
2011	NA ²				2.8	12.5	2.8	6.0
2015	3.3	4.9	4.6	4.3	2.4	16.8	3.5	7.6
2019	NA ²				3.2	20.6	4.4	9.4

¹ XS-3 was relocated in 2008 due to restoration activities destroying the permanent monument, therefore 2006 data should not be used for comparison. The new location is directly below the rock grade control structure constructed as part of the Lower Edgewood Restoration Project completed in 2007.

² Only longitudinal bed profile and cross-section analysis are conducted at Edgewood Creek, apart from the 2015 monitoring date. Bankfull indicators have been manipulated due to restoration (e.g. gabion installation) and field observations are unreliable.

The 2015 measurements marked the first time in the reporting period that this metric was measured at Upper Edgewood Creek, despite unreliable measures of bankfull width, and entrenchment ratios cannot be compared over time with only one year's data. Entrenchment ratios at the Lower Edgewood Creek sites remained fairly consistent from 2006 to 2019, with slight improvements in floodplain connectivity in the recent past. Overall, entrenchment ratios at Lower Edgewood Creek indicate stability.

Table H-13 Entrenchment Ratios – Daggett Creek

Year	DC-1 (Upper Daggett Creek)				DC-2 (Lower Daggett Creek)			
	XS-1	XS-2	XS-3	mean	XS-1	XS-2	XS-3	mean
2006	15.6	6.0	4.0	8.6	17.1	3.7	5.7	8.8
2009	6.7	5.3	5.0	5.6	8.0	3.9	14.4	8.8
2015	11.8	4.6	5.1	7.2	10.9	4.0	3.9	6.3
2019	10.7	3.9	5.9	6.8	10.2	4.5	13.9	9.5

Entrenchment ratios at Upper Daggett Creek have fluctuated slightly during the reporting period, but have remained fairly consistent, particularly between 2015 and 2019. These trends likely indicate overall stability at Upper Daggett Creek across the years. The Lower Daggett reach entrenchment ratios at XS-1 and XS-2 have remained stable over the past several survey dates, while XS-1 decreased dramatically in 2015, it increased again in 2019 to levels observed in 2009.

H.1.4 Cross-Section Geometry

Cross-section elevations were surveyed with either an auto-level or total station along the ground surface, including the left and right edge of water surfaces, breaks in slope, apparent location of bankfull stage, and at notable changes in vegetation or substrate. All elevations were recorded as relative to the left bank headpin. Photographs of each cross-section were taken during each survey.

The bankfull area geometry of Sky Meadows (HVC-1) cross-sections remained generally similar between 2006 and 2009. Beginning in 2011, observations indicated the bankfull channel cross-sectional area at XS-1 doubled from approximately 3 square feet to over 6 square feet. This change appears to have stabilized between 2011 and 2019. Based on the 2019 observations, the bankfull area at XS-2 has increased over time, and while the bankfull area at XS-3 has decreased over time, it could be characterized as relatively stable (Figure H-1). As discussed in Chapter H.1.3, 2019 observations show the channel through the low-gradient meadow appears to be widening, braiding, and experiencing deposition, resulting in a greater bankfull area.

The net scour/fill change from 2006 to 2019 (Figure H-2) was small at XS-2 and XS-3; however, both the channel area and net fill/scour at XS-1 has increased over time relative to the 2006 observations. It appears that this section of the reach is both widening and becoming more incised, although incision rates appeared to be stabilizing in 2019. This cross-section is directly above the California Dam snowmaking pond.

Conversely, upstream XS-3 has experienced sediment deposition (or fill) over time. As discussed in Chapter H.1.3, 2019 observations show the channel through the low-gradient meadow appears to be widening, braiding, and experiencing deposition, resulting in a greater bankfull area. This entire reach is within in a meadow, located where the stream slope decreases as it enters the lower gradient meadow, dissipating energy and allowing sediment deposition. The channel exhibits evidence of lateral channel migration, particularly at the upstream section, that is natural for alluvial meadow channels, whereby bank erosion on one side of the channel is offset by sediment fill on the other. At XS-3, the repeat surveys suggest that both lateral migration and some aggradation have occurred. Across the entire reporting period, the channel shifted laterally and bed elevations have shifted slightly, having experienced both scour and fill.

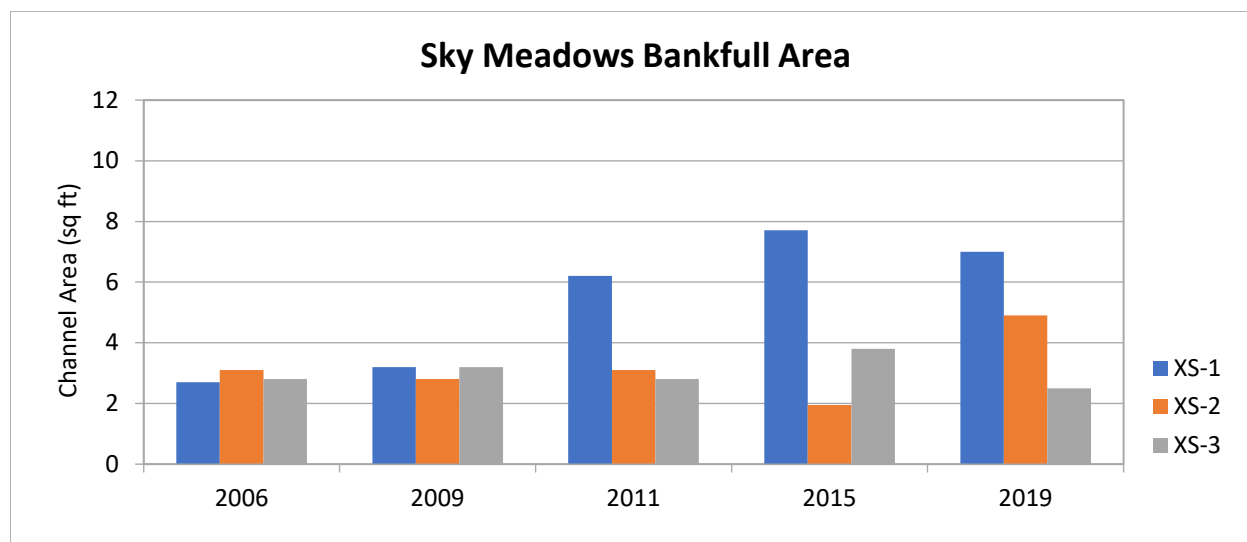
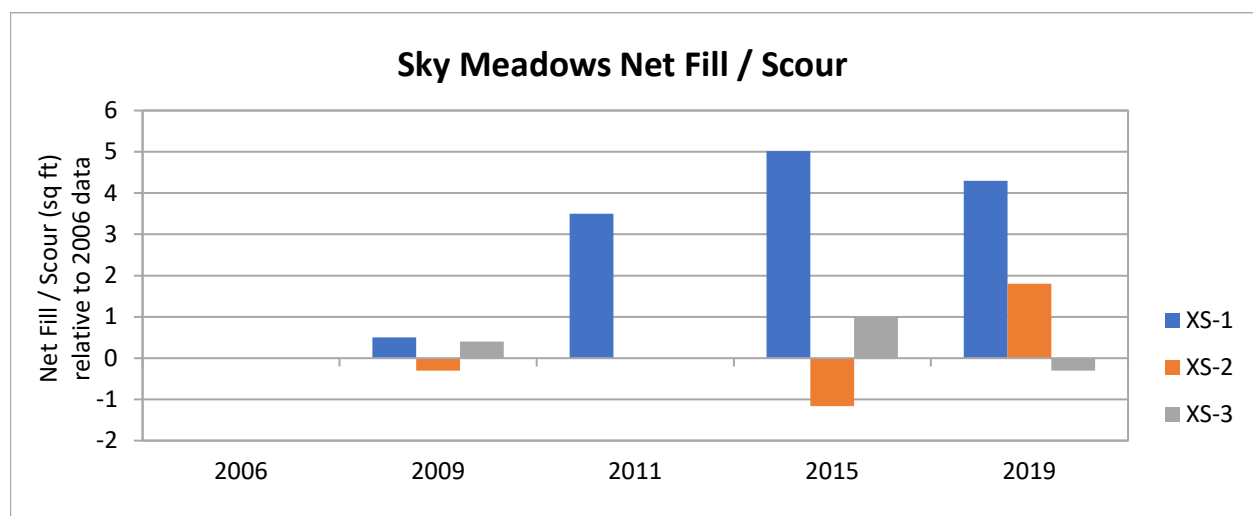


Figure H-1 Bankfull Area – Sky Meadows



Note: No change in net fill/scour was observed for XS-2 and XS-3 in 2011, thus reporting of “0” values

Figure H-2 Net Fill/Scour – Sky Meadows

The bankfull area geometry of Patsy’s (HVC-2) XS-1 and XS-3 have remained very similar between 2006 and 2019 (Figure H-3). XS-2 shifted dramatically in 2019, having experienced substantial deposition (Figure H-4), bringing it more line with the bankfull sizes of XS-1 and XS-3. The natural alignment and size of XS-2 may have been suitable for the deposition of material that was moved downstream.

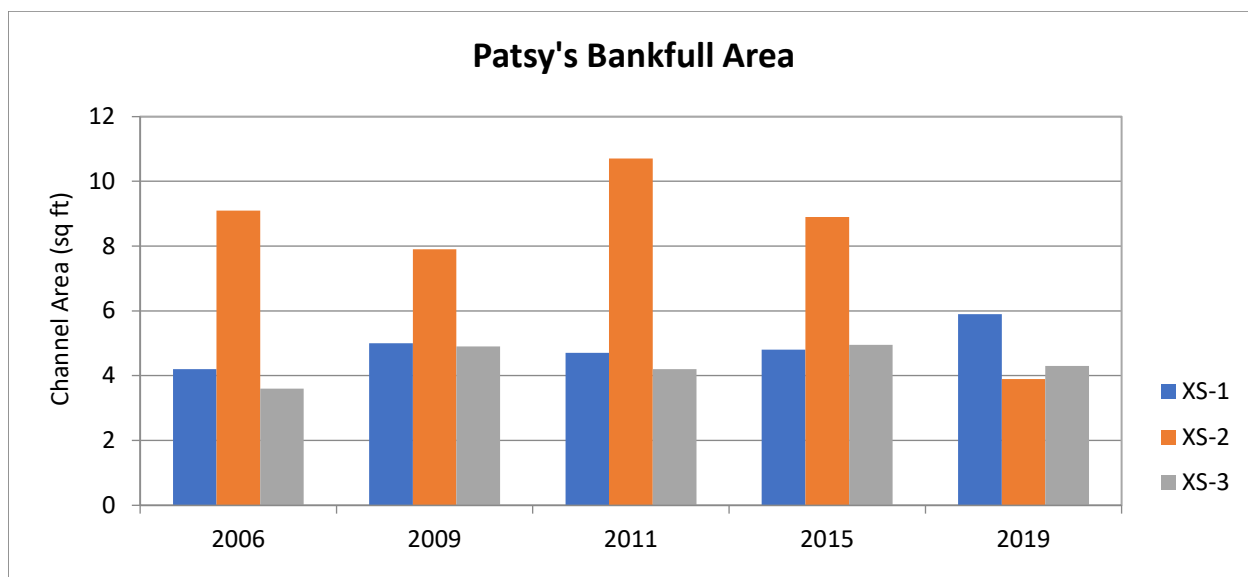


Figure H-3 Bankfull Area – Patsy's

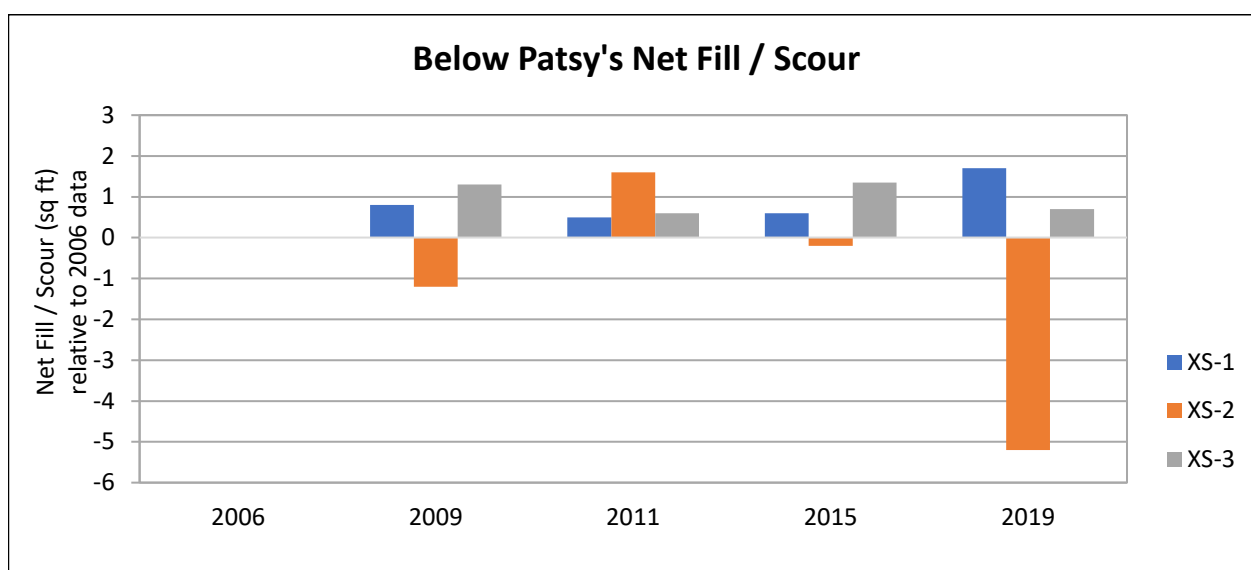


Figure H-4 Net Fill/Scour – Patsy's

The bankfull area geometry of Property Line (HVC-3) XS-1 and XS-3 has remained consistent over time (Figure H-5) compared to 2006 data. XS-2 has experienced scour over the reporting period, particularly between 2015 and 2019 (Figure H-6). Little to no scour has occurred at XS-3 over the period of record. Fill and scour values in 2015 and 2009 at XS-1 and XS-3 are similar, suggesting a potential link in these values during low-flow water conditions (drought).

XS-1 and XS-2 show a rise in the channel bed between 2009 and 2011, but the channel bed dropped in 2015 and 2019. XS-1 and XS-2 also indicate some lateral migration. In the past, the thalweg at XS-2 was at the approximate center of the channel, but in 2015 and 2019, the thalweg was located along the left bank, increasingly so for each monitoring year and so much so that in 2019, the headpin was under water. Sediment is being deposited along the right bank and aggrading the channel. Sediment deposit is likely due to downed logs in the reach that are slowing water velocities, allowing sediment and fine

material to fall out. An angled downed log at XS-2 has also created a step-pool at the cross-section transect line.

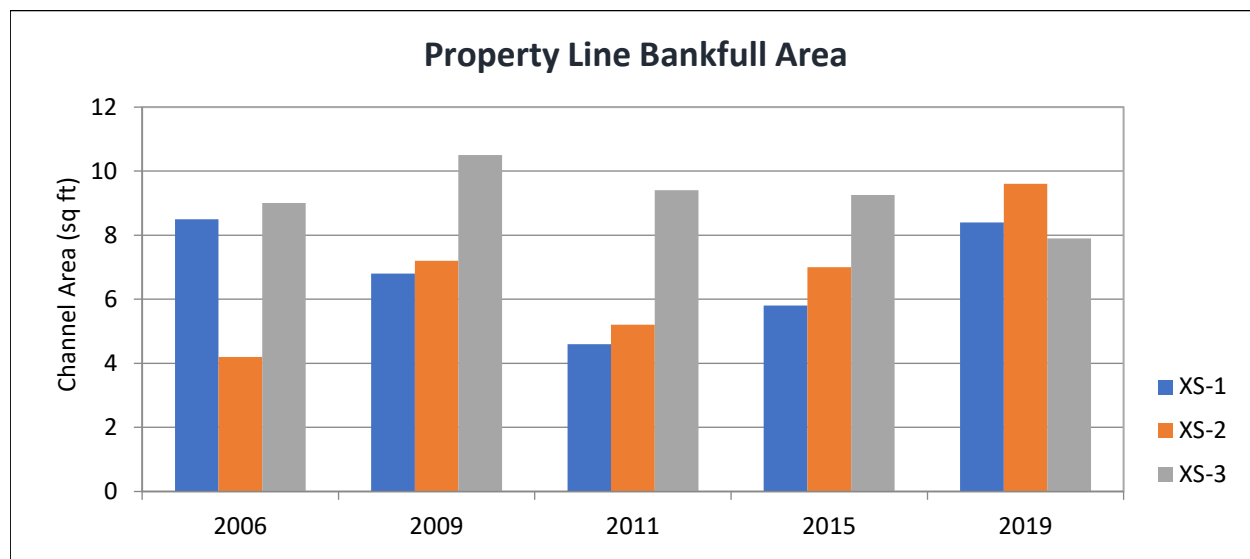


Figure H-5 Bankfull Area – Property Line

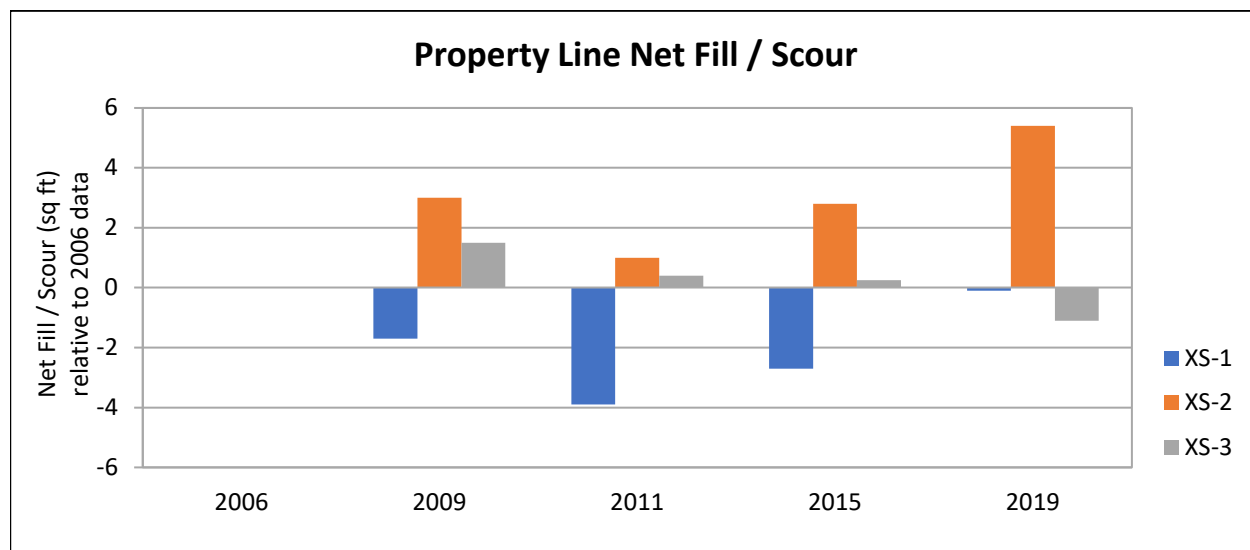
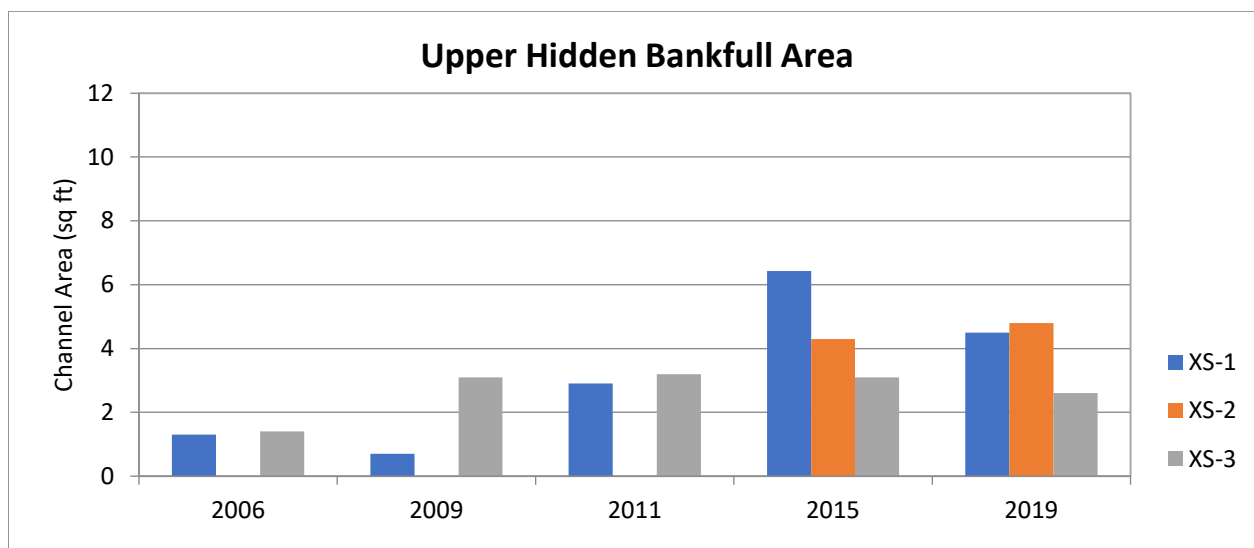


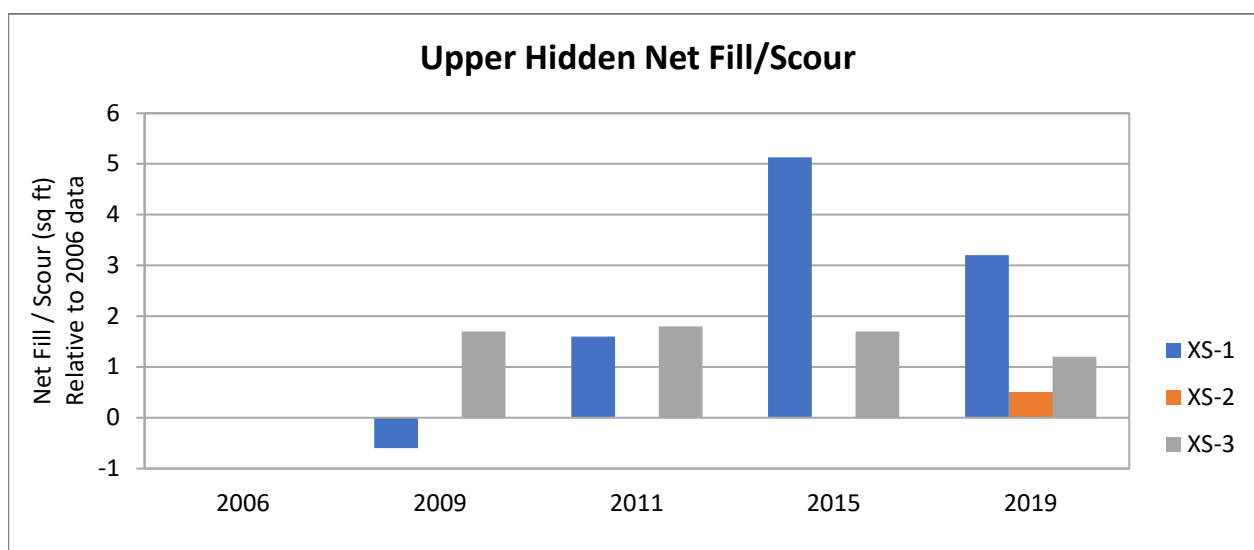
Figure H-6 Net Fill/Scour – Property Line

The Upper Hidden Valley Creek reference reach (HDVC-1) cross-sections showed some variability and have typically exhibited scour, but only XS-1 and XS-3 have been located reliably in the past. Data from XS-2 are only available for 2015 and 2019. The bankfull area at all cross-sections at Upper Hidden Valley Creek is very small but increased over time at XS-1 and XS-2 (Figure H-7). The net scour/fill changes indicate that scour at all cross-sections has occurred, even though the absolute magnitude has been small (Figure H-8). XS-1 has demonstrated the most variability.



Note: Data for XS-2 is not included for monitoring years when the headpins could not be located.

Figure H-7 Bankfull Area – Upper Hidden Valley Creek



Note: Data for XS-2 are not included for monitoring years when the headpins could not be located. Net fill/scour for XS-2 is compared to 2015 data.

Figure H-8 Net Fill/Scour – Upper Hidden Valley Creek

The Lower Hidden Valley Creek reference reach (HDVC-2) cross-sections have some differences across cross-sections, since XS-1 and XS-2 are larger than XS-3. However, all three exhibited similar changes in channel area over time, with the exception of changes in 2019 (Figure H-9). The net scour/fill changes indicate that scour was dominant relative to 2006, except at XS-2, which experienced scour in 2009, followed by deposition in 2019. Scour at XS-1 and XS-3 has increased over time (Figure H-10).

The channel shape and elevations have shown minor variability at Lower Hidden Valley Creek between 2006 and 2019, primarily with bed elevation decreasing trends at XS-1. XS-2 bed elevations are relatively stable, while XS-3 elevations have decreased slightly. Limited lateral channel migrations have occurred at all locations.

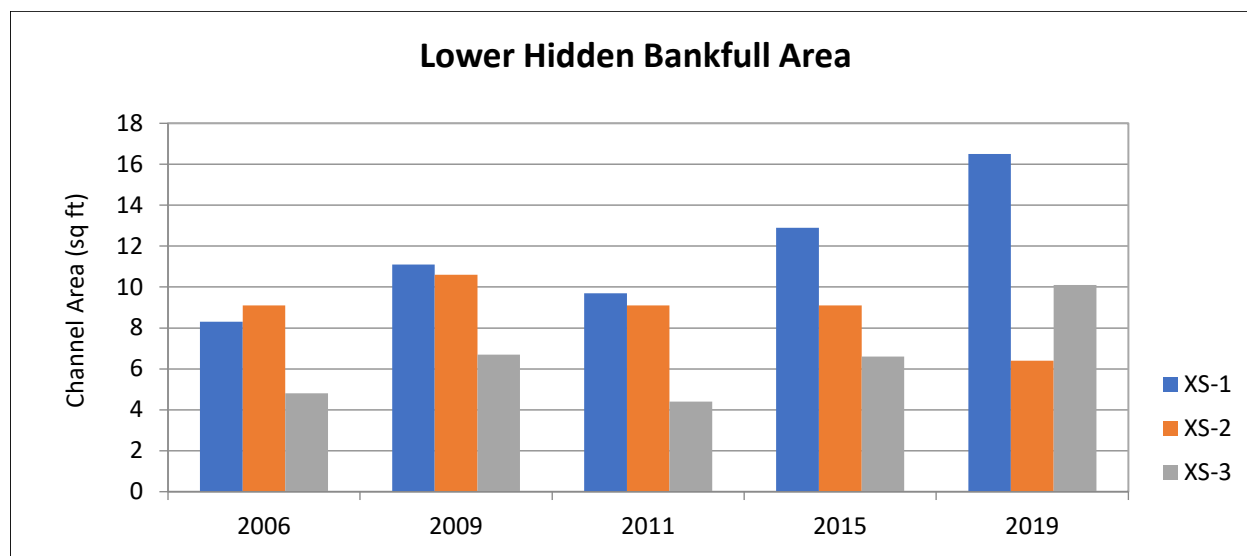
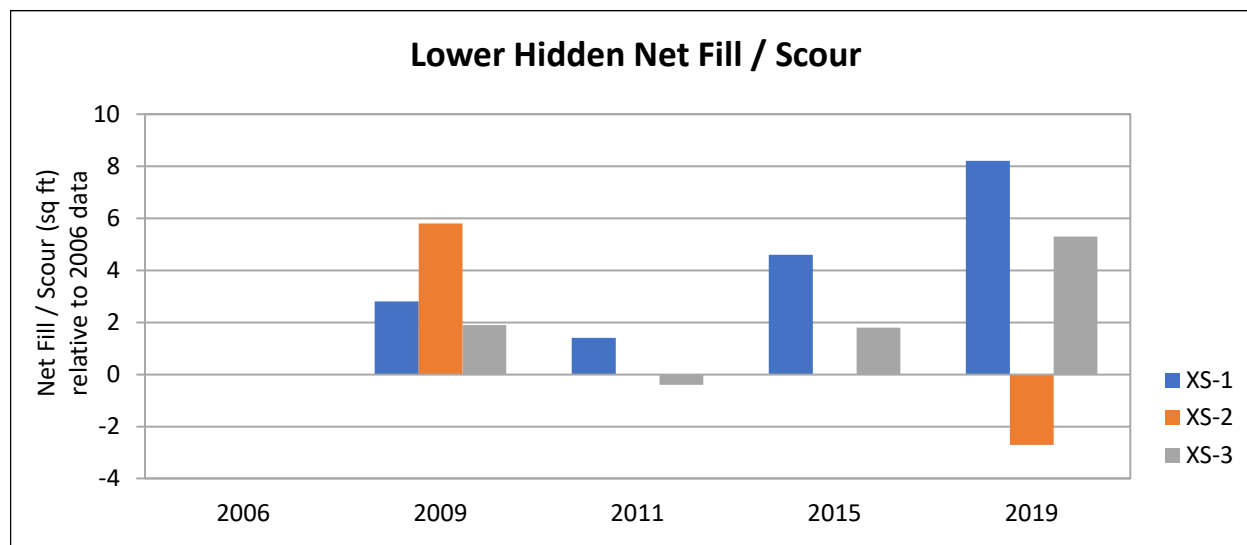


Figure H-9 Bankfull Area – Lower Hidden Valley Creek

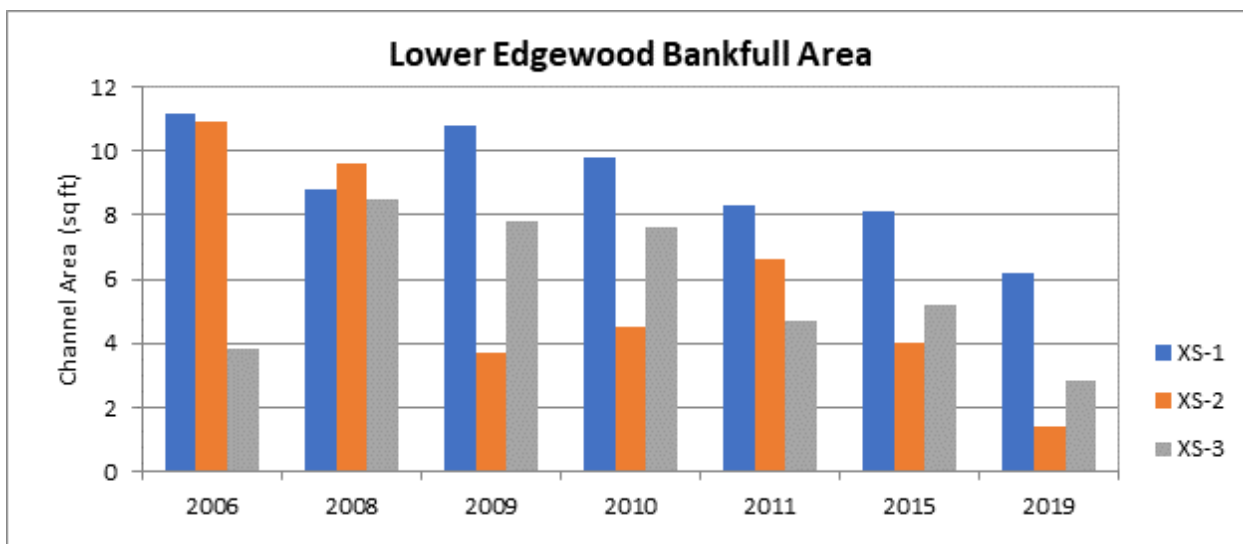


Note: No change in net fill/scour was observed for XS-2 in 2011 and 2015, thus reporting of “0” values

Figure H-10 Net Fill/Scour – Lower Hidden Valley Creek

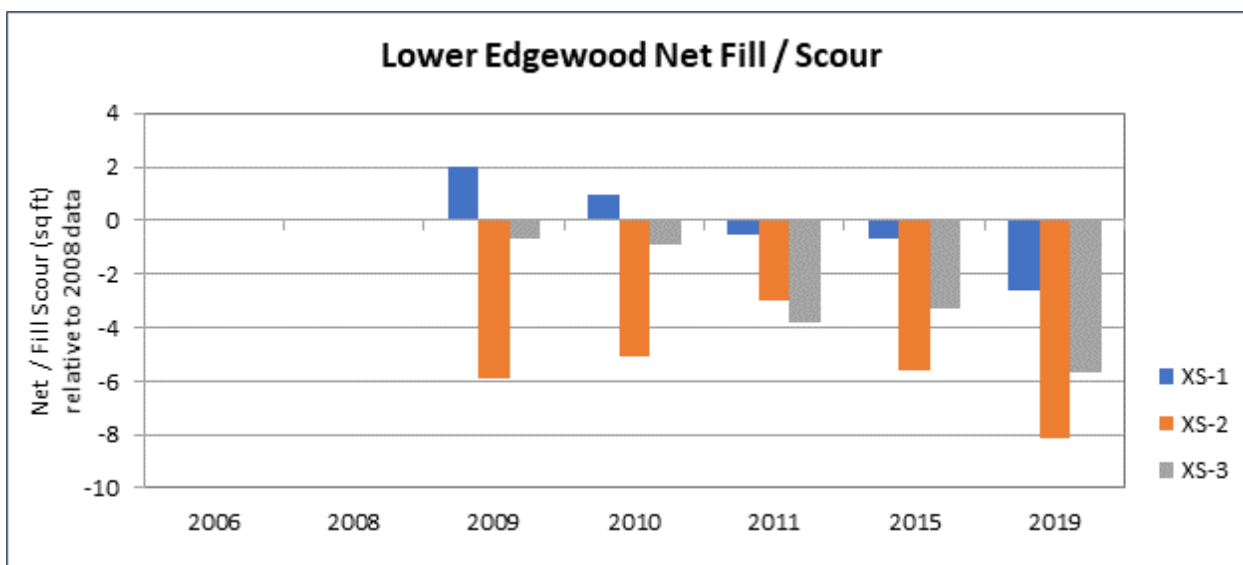
Channel cross-section geometry for Upper Edgewood Creek (EC-1) is not included, as bankfull measurements were only recorded in 2015 and the past restoration project makes it difficult to reliably identify bankfull indicators. Comparison of cross-section topography shows that the channel location has not moved laterally. The bankfull geometry at Lower Edgewood Creek (EC-2) cross-sections varies by cross-section and surveyed years since 2006; however, only comparisons between post-restoration data should be made (2008 data and later; Figure H-11). Changes at XS-1 include minimal scour changes during the first part of the monitoring period (Figure H-12), followed by increasing deposition. XS-2 and XS-3 have experienced a larger volume of deposition since the 2008 restoration effort. Continued deposition has reduced the channel area at all cross-sections over time, potentially encouraging water to access the floodplain under a greater number of flow regimes. The dominant substrate in EC-2 is small particles (fine gravel or sand) that is readily mobilized and allows the channel to adjust to varied flow and

sediment supply by vertical changes. The channel may migrate depending on flow, sand volumes, and vegetation.



Note: 2006 data not shown.

Figure H-11 Bankfull Area – Lower Edgewood



Note: Comparisons made to 2008, since XS-3 was relocated after 2006. 2006 data not shown.

Figure H-12 Net Fill/Scour – Lower Edgewood

The channel cross-section geometry of Upper Daggett (DC-1) saw an increase in area at XS-1 in 2015 due to channel widening, with a slight decrease in bankfull channel area at XS-2 and XS-3 (Figure H-13); however, XS-1 stabilized to pre-2015 conditions in 2019, and XS-2 and XS-3 remained consistent. The 2015 net scour/fill compared to the 2006 area increased substantially at XS-1, but deposition was observed at all three cross-sections in 2019 (Figure H-14). Emergency repairs of East Peak Dam in early summer 2015 created uncontrolled runoff, which may have altered flows into Daggett Creek (increased volume, velocity, and scour), potentially accounting for cross-sectional changes seen during surveys later in 2015.

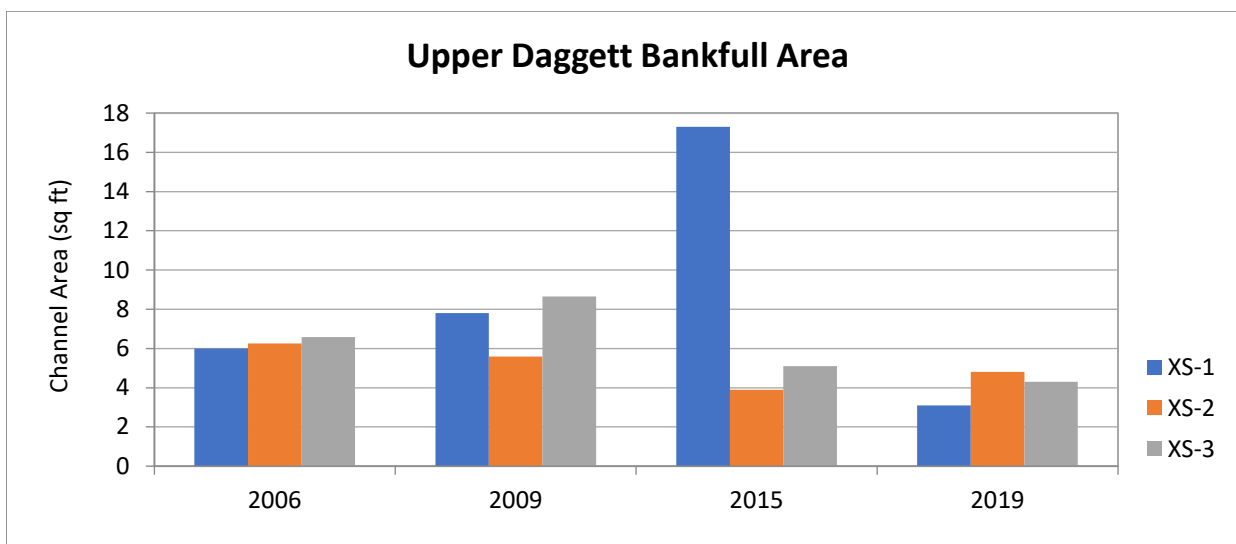


Figure H-13 Bankfull Area – Upper Daggett

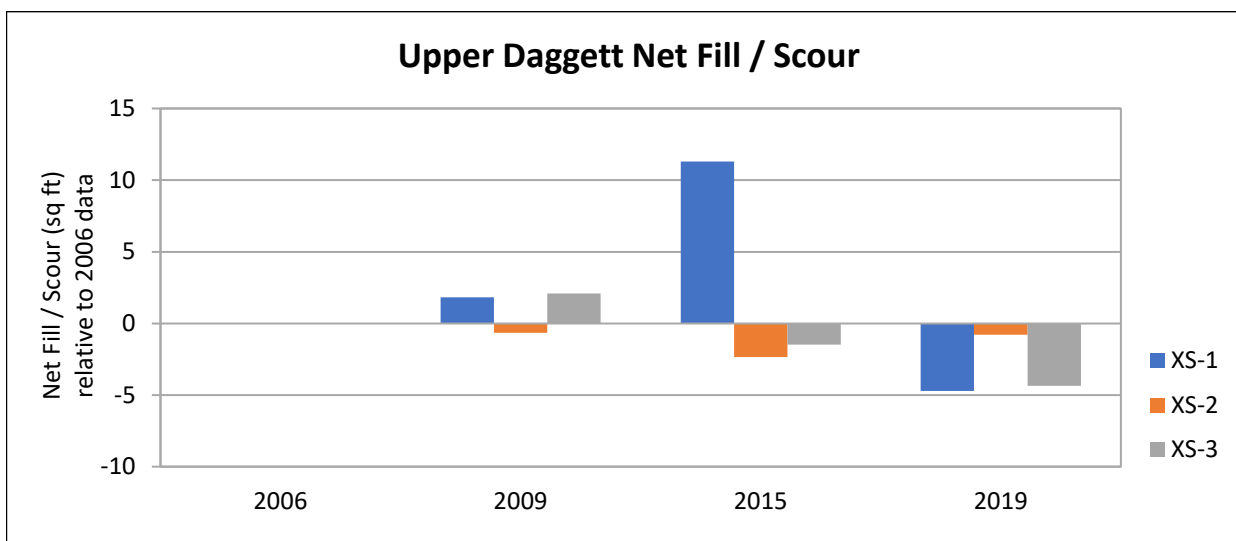


Figure H-14 Net Fill/Scour – Upper Daggett

The channel cross-section geometry at Lower Daggett Creek (DC-2) varies by cross-section following 2006 for XS-1 and XS-3 (Figure H-15). The bankfull channel area at XS-2 is very small, and has remained fairly consistent over the monitoring period. XS-3 and XS-1 channel area was relatively large in 2006, and both have experienced substantial deposition (Figure H-16) and both channel areas have drastically reduced in size. However, depositional rates appear to have tapered off and stabilized over time.

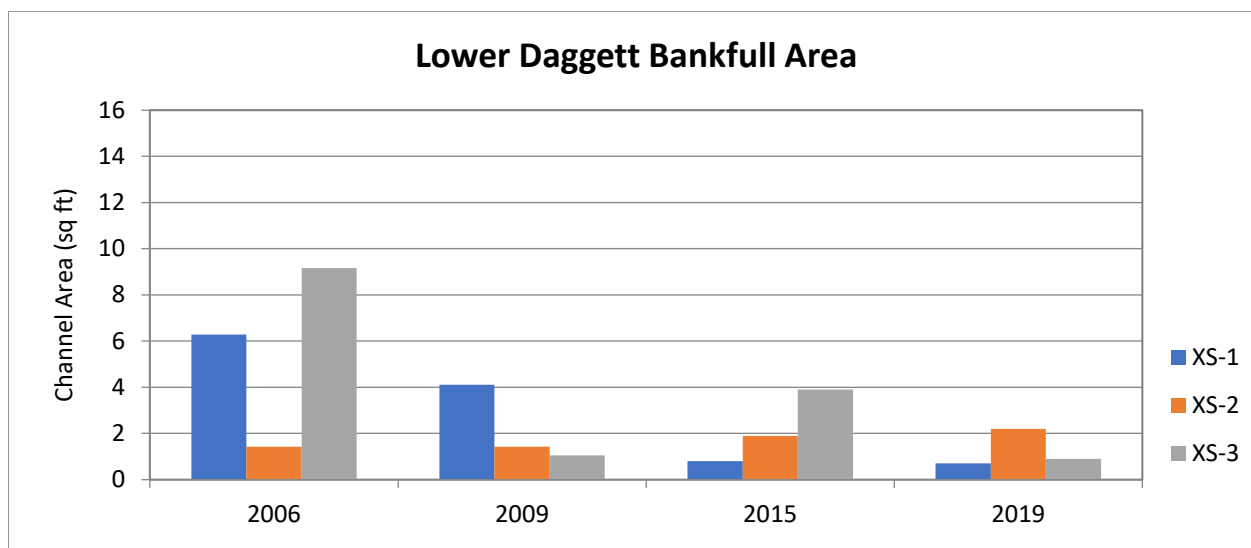


Figure H-15 Bankfull Area – Lower Daggett

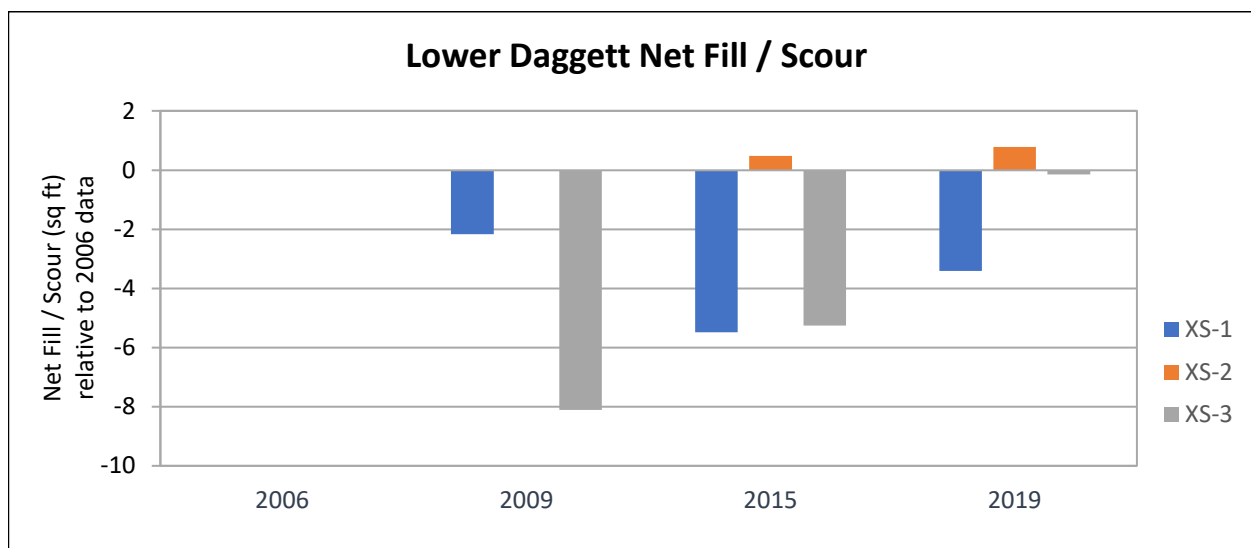


Figure H-16 Net Fill/Scour – Lower Daggett

H.1.5 Channel Gradient

The channel gradient surveys measured the water surface slope if flow was present or streambed slope (along the thalweg) if the channel was dry. Surveys were conducted with either an auto-level or total station through each of the three cross-sections within each site extending several bankfull widths upstream and downstream of the bounding cross-sections.

Minor differences from year to year at some cross-sections may reflect changes in the start/end locations of the profiles and whether or not the channel was dry at the time of survey. In 2015, pins were added at the upper and lower most cross-sections to provide consistent starting and ending points for future measurements. In 2015, both water surface and bed elevations began to be measured.

The channel gradients in all of the Heavenly Valley Creek monitoring reaches have remained consistent over the monitoring period, within the same range of gradient across the entire reporting period (Tables

H-14). No profile steepening from net down-cutting, knickpoint establishment, or knickpoint migration is apparent, and in all instances, the profile change was equal or less than 1 percent since 2006.

The gradient at Upper Hidden Valley Creek has remained stable over time (Table H-15). The gradient at Lower Hidden Valley Creek has fluctuated over time (within 2 percent), but the 2019 gradient was nearly identical to the originally observed 2006 gradient.

The gradient at Upper Edgewood Creek has remained stable over time and has only fluctuated within 1 percent (Table H-16). Only minimal gradient fluctuation would be expected, due to the volume of restoration and gabion basket installations that control gradation. The gradient at Lower Edgewood Creek has fluctuated more drastically, between 9.1 percent and 4.9 percent (when only looking at data following restoration in 2007).

The gradient at Upper Daggett Creek has only fluctuated between about 2 percent, and is trending toward a lower gradient, perhaps due to deposition along the channel (Table H-17). The gradient at Lower Daggett Creek has fluctuated more (between 5.1 percent and 8.1 percent), although the creek has often been dry during sampling, and thus comparing the bed surface slope to water surface slope may not be an appropriate comparison.

The larger variability in water surface slopes (Lower Hidden Valley Creek, Lower Edgewood Creek, and Lower Daggett Creek) may solely be due to the inherent variability in channel survey methods. Because there are no permanent start and end points at the middle cross-section for the longitudinal profile survey, changes from year to year can be due to surveying different habitat units at the start and end points, which are exaggerated in steep channels over shorter distances. As such, it is recommended that the longitudinal survey methodology be refined, which is discussed further in the recommendations section.

Table H-14 Heavenly Valley Creek Water Surface Slopes (%)

Year	HVC-1 (Sky Meadows)	HVC-2 (Patsy's)	HVC-3 (Property Line)
2006	1.1	4.5	5.9
2009	1.2	4.2	4.7
2011	1.3	4.2	5.0
2015	0.8	3.3	5.7
2019	1.3	3.5	5.3

Table H-15 Hidden Valley Creek Water Surface Slopes (%)

Year	HDVC-1 (Upper Hidden Valley Creek)	HDVC-2 (Lower Hidden Valley Creek)
2006	0.6 ¹	9.4
2009	1.5	8.6
2011	1.0	8.9
2015	0.9	7.3
2019	1.0	9.3

¹ Upper Hidden Valley Creek channel was dry in 2006. Reported value is the bed slope rather than water surface slope.

Table H-16 Edgewood Creek Water Surface Slopes (%)

Year	EC-1 (Upper Edgewood) ^{1, 2}	EC-2 (Lower Edgewood)
2006	15.1	5.6
2008	14.8	6.2
2009	14.8	4.9
2010	14.8	5.9
2011	14.8	6.2
2015	14.8	9.1
2019	14.4	7.2

¹ All Upper Edgewood profiles are of the bed slope.

² 2006–2015 channel slopes are based on complete longitudinal profile survey as opposed to the average of local slopes at each monumented cross-section, which is typical for 2015 and all other sites.

Table H-17 Daggett Creek Water Surface Slopes (%)

Year	DC-1 (Upper Daggett Creek)	DC-2 (Lower Daggett Creek)
2006	14.3	8.1 ¹
2009	12.3	7.2
2015	11.7	5.7
2019	12.1	5.1 ¹

¹ Lower Daggett Creek channel was dry. Reported value is the bed slope rather than water surface slope.

H.1.6 Streambank Stability

Streambank stability is a measure of the vulnerability of streambanks to erosion. Streambank stability was measured along the entire length of a monitoring reach at equally spaced intervals. Observations on streambank stability were recorded using a 1, 2, and 3 ranking system as follows: 1 = stable, 2 = vulnerable, and 3 = unstable. Stable streambanks were identified as having 75 percent or more cover of living plants and/or other stability components that are not easily eroded (such as binding roots, rocks, and logs). Stable banks show no indicator of instability (e.g., erosion). Vulnerable banks have 75 percent or more cover, but have one or more instability indicators. Unstable banks have less than 75 percent cover and have instability indicators. Unstable streambanks are often bare, or nearly bare, and are composed of particle sizes too small or non-cohesive to resist erosion at high flows. Figures below include a percentage of banks rated as “1.”

The percent of stable banks has been variable in most reaches since 2006, with a similar pattern from year to year. Stability improvements may be due to increased vegetation growth, which typically occurs during wetter than normal years; however, flows during those years may also be higher and contribute to increased scouring. Drought conditions from 2012 to 2015 resulted in decreased flows and in some instances no flow conditions (Property Line at Heavenly Valley Creek). Changes in stability may also be related to volume of large woody debris (LWD) within the channel, particularly directly adjacent to banks. LWD in the majority of monitoring reaches has increased since 2006, and LWD continues to be redistributed by high flow events.

The percent of stable banks along Heavenly Valley Creek varied over time at each of the three reaches (Figure H-17). Stability increased from 2006 to 2009, substantially at Sky Meadows and Patsy’s reaches, and only slightly at Property Line reach; however, results from 2011 and 2019 show decreases in streambank stability. The Property Line reach experienced an increase in stability in 2015, from 4 percent

in 2011 to 29 percent in 2015. The Patsy's and Sky Meadows reaches have experienced slight declines in stability since 2009 and 2011.

The Sky Meadows reach exhibits the most stable streambank measurements over the monitoring period, with the average percentage of stability at 72 percent. The stability at Sky Meadows is likely associated with the high vegetation cover (primarily graminoids) present in the meadow complex. The Patsy's reach stability average over the monitoring period is 61 percent, while the Property Line reach stability average over the same time frame is 32 percent. The reason for the decline in stability at the Property Line reach in 2011 is uncertain, although it may be due to variability in surveyors across the years. It is possible that differences in LWD (LWD observed in 2011 was 50 percent of that observed in 2009) and/or rock material along the banks and/or aggradation changes occurred during higher flows in 2011. Stability at the Property Line reach increased in 2015, but the reach experienced a slight decline again in 2019. Drought conditions from 2012 to 2015 likely account for the decreased stability and vegetation cover at both the Sky Meadows and Patsy's reaches; however, stability at these reaches continued to decline through 2019, despite above-average or average precipitation conditions preceding 2019. Stability at the Property Line reach increased in 2015, but experienced a slight decline again in 2019.

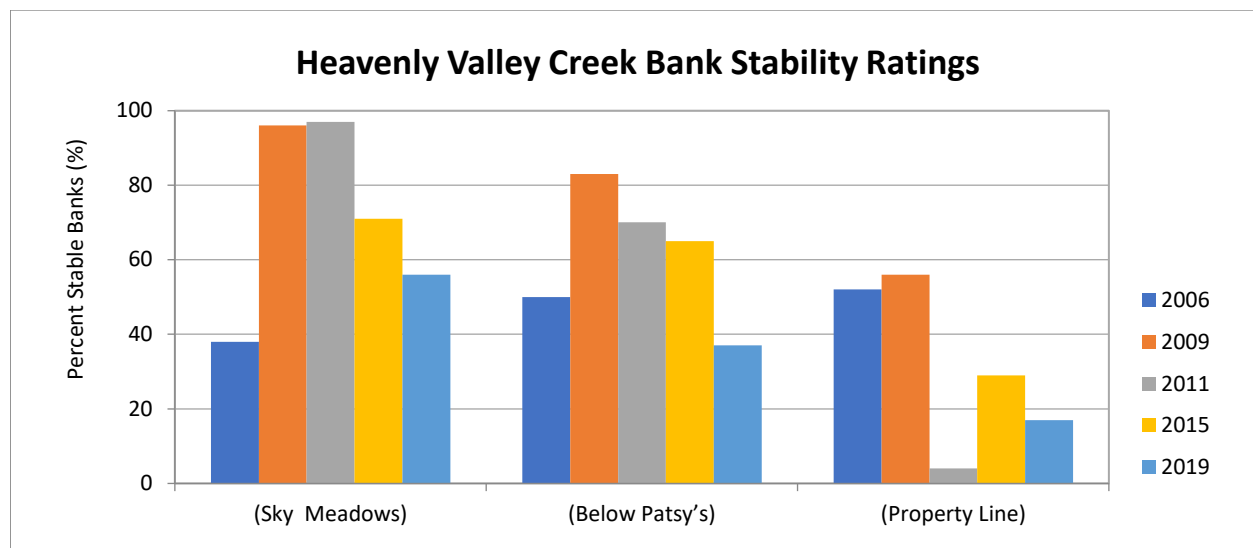


Figure H-17 Bank Stability – Heavenly Valley Creek

The percent of stable banks along Hidden Valley Creek varied over time at the two reaches (Figure H-18), but similar to Heavenly Valley Creek, all stability ratings were the highest in 2009 (86 percent at Upper Hidden Valley Creek and 79 percent at Lower Hidden Valley Creek). The Lower Hidden Valley Creek reference reach displays a similar pattern to the Property Line reach, with a decline of stability in 2011, followed by subsequent increases in 2015. Stability increased at both reference reach locations in 2015; however, the increase did not meet or exceed the 2006 observations. Stability at both reaches also experienced a decline in 2019.

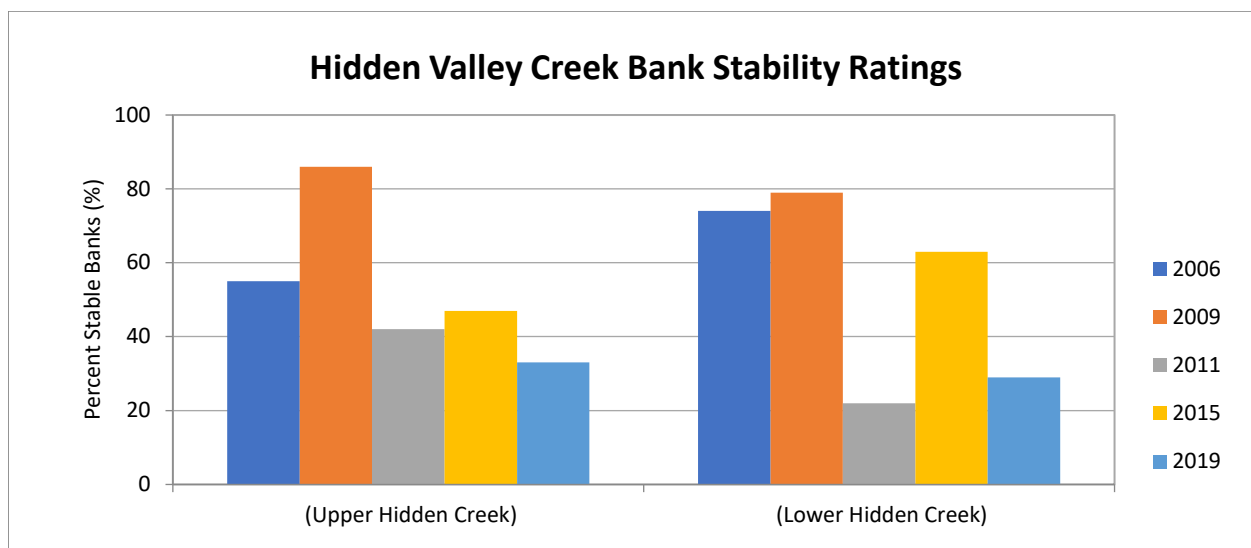


Figure H-18 Bank Stability – Hidden Valley Creek

The percent of stable banks along Lower Edgewood Creek varied over time and has steadily decreased since its peak in 2009 (Figure H-19). The Lower Edgewood stability chart correlates with the Patsy’s reach along Heavenly Valley Creek, which showed an initial improvement in stability in 2009, followed by a slow decline. Stability measurements were not collected along Upper Edgewood Creek, with the exception of 2015. Should future measurements be collected at Upper Edgewood Creek, 2015 will be used as the baseline for comparison.

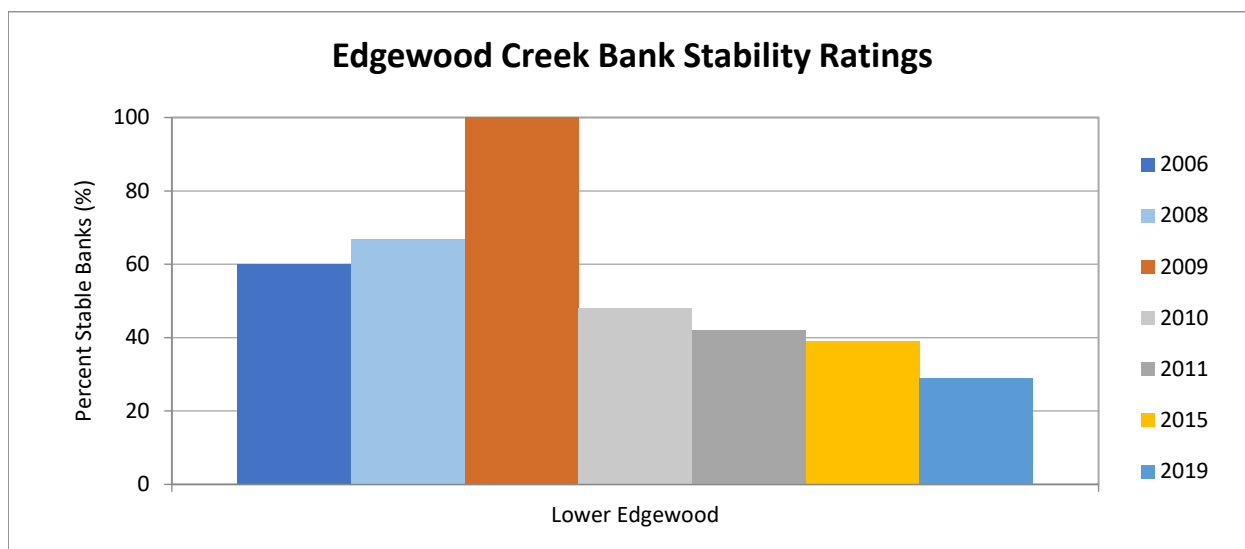


Figure H-19 Bank Stability – Lower Edgewood Creek

The percent of stable banks along Upper Daggett Creek (Figure H-20) displayed the same pattern of increased stability between 2006 and 2009 and decreased stability in 2015. Bank stability observations further declined (by over 50 percent) in 2019.

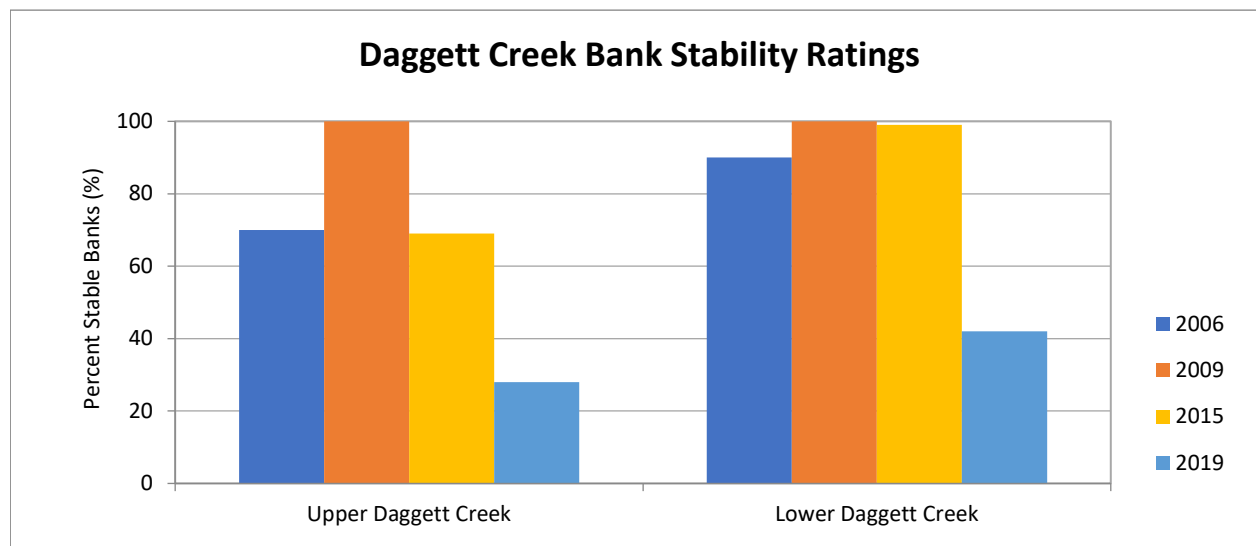


Figure H-20 Bank Stability – Daggett Creek

H.2 Monitoring Results – Quality Aquatic Habitat

SCI monitoring also measures the quality of aquatic habitat based on channel characteristics. Quality aquatic habitat can be an indicator of overall watershed health and water quality. Improvements in measures of aquatic habitats often have correlations with improvements in water quality.

H.2.7 Habitat Types

Habitat types were classified along entire monitoring reaches to describe the spatial distribution of fast- and slow-water habitat units. Fast water (riffles and runs) and slow water (pools) are important core attributes because they are the base stratification of physical habitats that support aquatic life. The habitat types were measured and described based on stationing established along each monitoring reach.

All of the monitoring reaches are dominated by fast-water habitats (Figures H-21 to H-28), with the highest percentages of fast water typically in the higher gradient reaches. Observations of slow water increased at nearly all monitoring reaches in 2019. Of the reaches with greater than 5 percent channel slopes, Property Line and Upper Daggett reaches have relatively more slow-water habitat than the other steep reaches. Some increase in slow-water habitats is documented over time, but it may be related to interpretations of habitat affected by flow at the time of observation. Other increases of slow water may be due to sediment deposition or increases in LWD across the reach. Slow water at the Sky Meadows reach has been increasing over time, which is consistent with other observations of meadow sediment deposition and channel braiding. Upper Edgewood Creek has been dry during monitoring; therefore, it is not included in this metric. Lower Edgewood habitat types have been surveyed for 2015 and 2019 only, as water was present during those years.

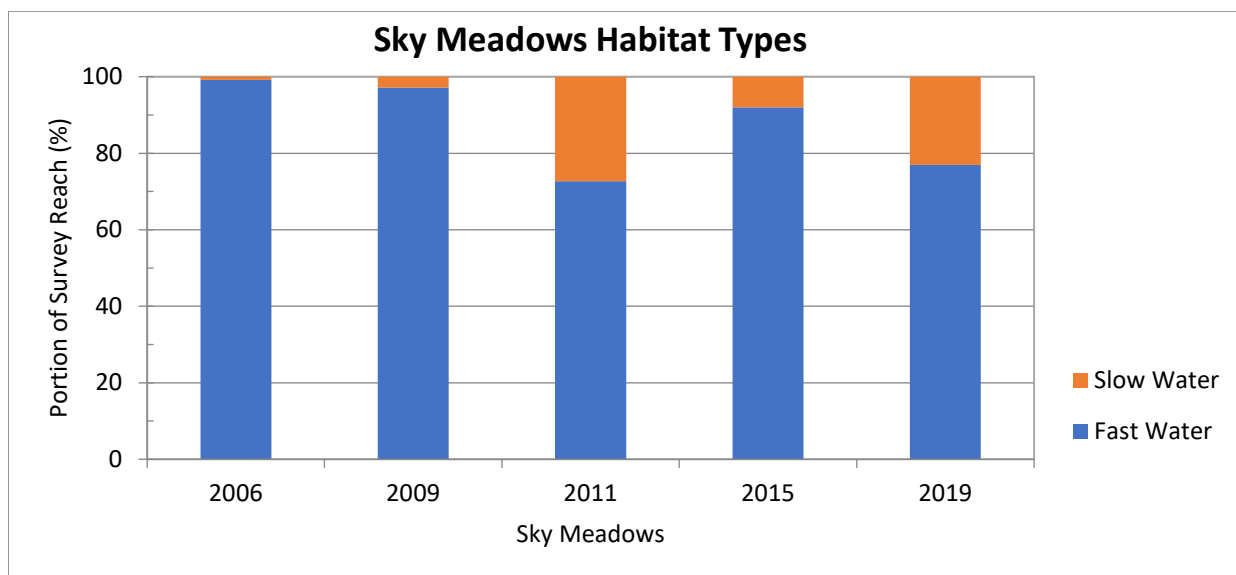


Figure H-21 **Habitat Types – Sky Meadows**

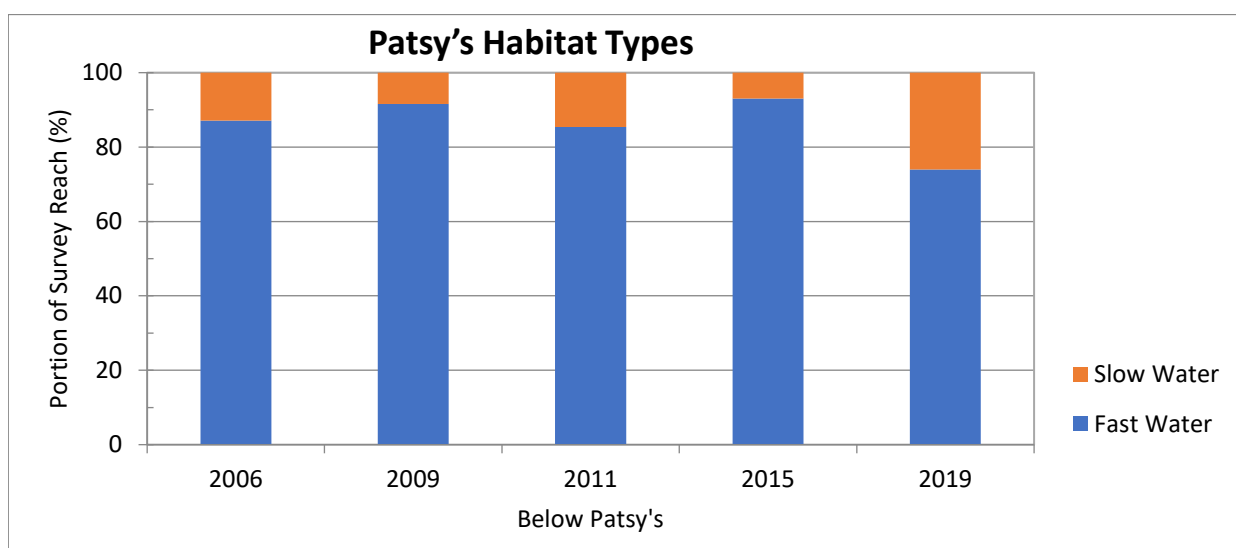
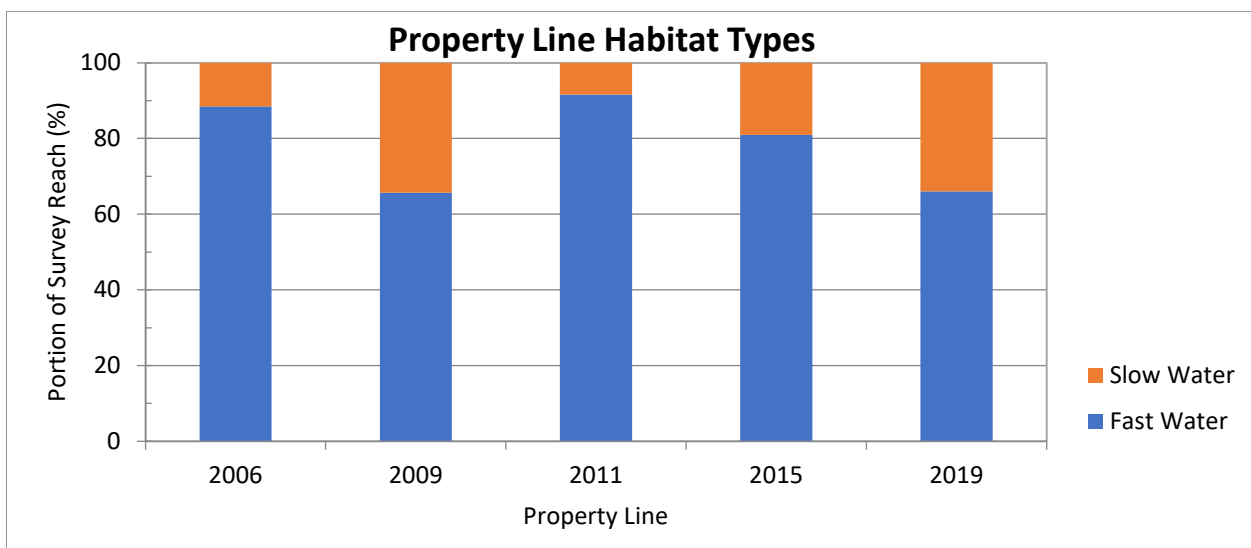


Figure H-22 **Habitat Types – Patsy's**



Note: Property Line reach lengths varied greatly during the beginning of the reporting period, which may account for some variability.

Figure H-23 **Habitat Types – Property Line**

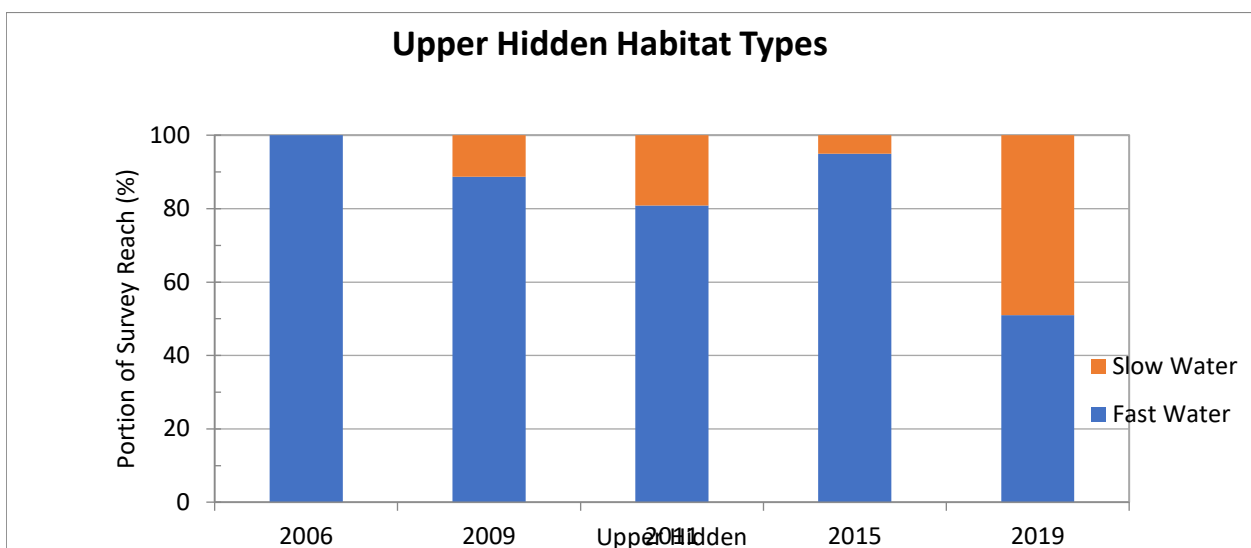


Figure H-24 **Habitat Types – Upper Hidden Valley Creek**

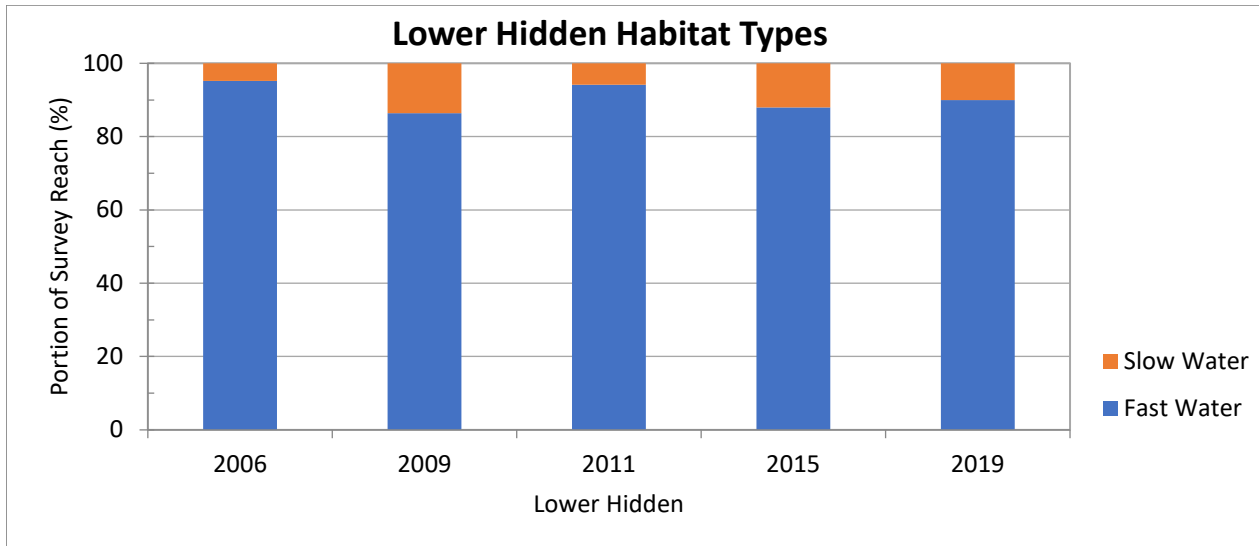


Figure H-25 Habitat Types – Lower Hidden Valley Creek

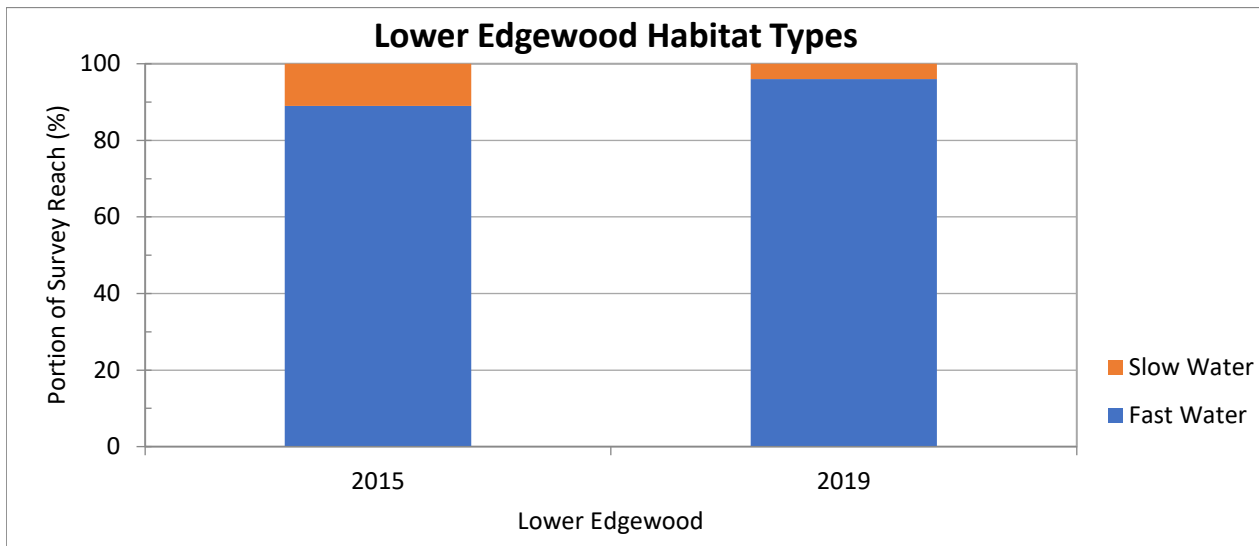


Figure H-26 Habitat Types – Lower Edgewood

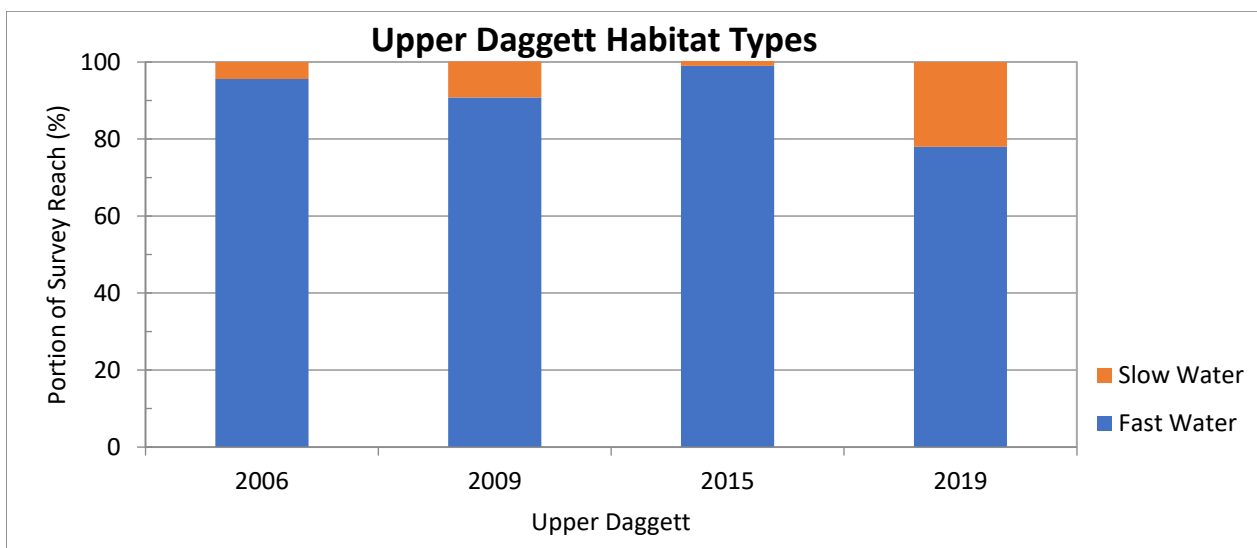


Figure H-27 Habitat Types – Upper Daggett

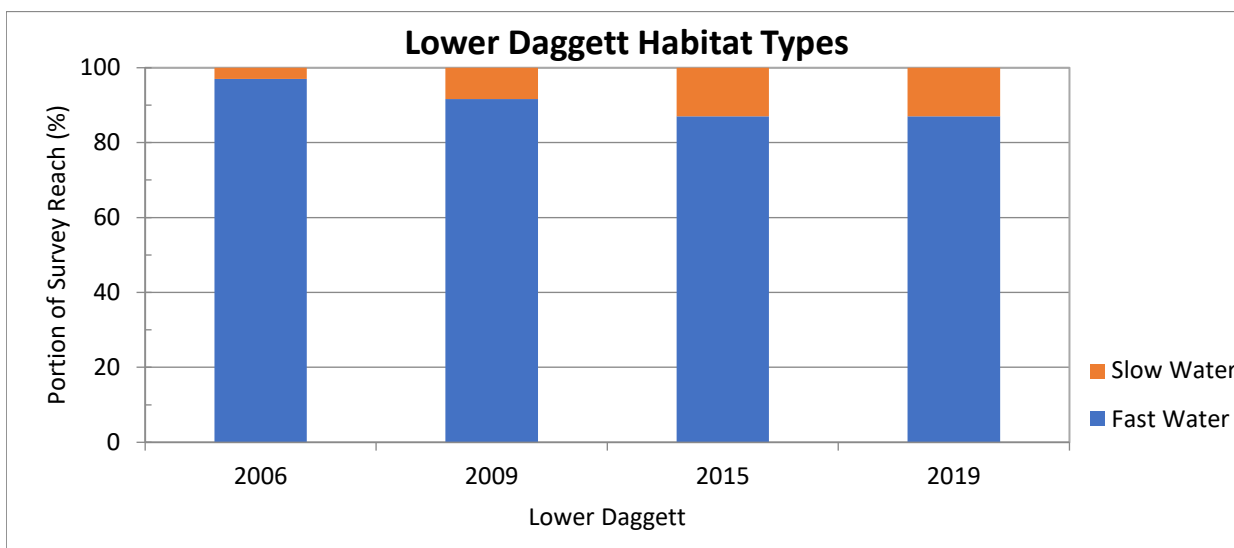


Figure H-28 Habitat Types – Lower Daggett

H.2.8 Pools

The objectives of pool measurements include quantifying the number of pools in each reach, determining the range of residual pool depths within the monitoring segment, and documenting whether wood is a factor in pool formation. The number of pools per 100 feet of reach has been additionally calculated, to account for any changes in reach length by monitoring year. Residual pool depth was measured to characterize pools because it corrects for possible variability in pool depths that results from differences in the stage at the time of observation. Residual pool depth was determined by identifying the point of zero flow elevation on the controlling riffle downstream and then measuring the depth from the bottom of the pool up to the point of zero flow elevation. Pools were identified on the basis of three key criteria: (1) flow (slow or no velocity during summer low flows), (2) morphology (hydraulic control at the pool tail, usually a concave longitudinal profile, and (3) dimension (length is greater than the wetted width, depth is greater than non-pools, and the maximum depth is more than twice the pool tail depth). To be considered a pool, the slow water must occupy most of stream width and include the thalweg. Backwater and side water

pools were not measured. At each pool, the depth at the deepest point was measured along with the pool tail crest depth.

The number of pools, pool length, and residual pool depths increased over time at the Sky Meadows and Property Line reaches along Heavenly Valley Creek (Tables H-18 and H-20). The number of pool and length increased at the Patsy's reach, but the residual pool depth remained fairly consistent (Table H-19). The number of pools observed at Upper Hidden Valley Creek has increased over time, while the mean lengths and depths have remained fairly constant (Table H-21). Observations of pools at Lower Hidden Valley Creek have remained relatively consistent over time (Table H-22). While the number of pools at Lower Edgewood and Upper Daggett Creeks have increased over time, the mean lengths and depths have remained fairly constant over time (Table H-23 and H-24). It is difficult to identify pool trends at Lower Daggett, due to the limited volume of data available, as a result of no flow conditions during the time of surveys (Table H-25). In general, surveys in 2011 at all sites documented pools of both greater length and depth, which followed a winter of greater-than-average precipitation. Pool measurements were taken in 2006 after an average precipitation WY (42.6 inches of precipitation were measured from October 1–September 30). SNOTEL annual precipitation totals are graphically shown in Appendix B. The 2009 and 2015 pool measurements were taken during drought years when the average precipitation values were 28.4 and 22.6 inches, respectively. The 2011 measurements followed the WY with the most precipitation, in which 56.8 inches of precipitation were recorded, and surveys at all sites documented pools of both greater length and depth. While the increased flow in the channel at the time of the 2011 surveys does not affect the residual pool depth calculation, the increased flows may have led to increases in sediment transport. The spatial pattern of sediment transport at reaches and between sites may have resulted in deepening of some pools and shallowing of others. Surveys completed in 2019, following an above-average precipitation year, generally documented a greater number of pools and increased mean lengths and depths, and correlated with greater percentages of slow water. The data trends suggest that surveys done following dry WYs and lack of sediment transport are typically correlated with fewer pool observations, while surveys done following above-average precipitation winters were correlated with more pool observations and greater mean lengths and depths.

Table H-18 Pool Length (m) and Residual Pool Depth (cm) – Sky Meadows

HVC-1 (Sky Meadows)				
Year	Number of Pools (n)	Number of Pools per 100 ft. of Channel (n)	Mean Pool Length (m)	Mean Pool Residual depth (cm)
2006	1	0.2	1.5	18.3
2009	3	0.4	2.1	18.3
2011	17	2.4	3.4	27.4
2015	3	0.6	3.3	16.7
2019	8	1.7	4.7	31.3

Table H-19 Pool Length (m) and Residual Pool Depth (cm) – Patsy’s

HVC-2 (Patsy’s)				
Year	Number of Pools (n)	Number of Pools per 100 ft. of Channel (n)	Mean Pool Length (m)	Mean Pool Residual depth (cm)
2006	18	1.4	2.8	27.4
2009	19	1.4	1.8	18.3
2011	17	1.3	3.4	33.5
2015	10	0.8	3.0	31.2
2019	30	2.3	3.9	26.3

Table H-20 Pool Length (m) and Residual Pool Depth (cm) – Property Line

HVC-3 (Property Line)				
Year	Number of Pools (n)	Number of Pools per 100 ft. of Channel (n)	Mean Pool Length (m)	Mean Pool Residual depth (cm)
2006	2	1.0	3.5	9.1
2009	24	3.3	3.1	18.3
2011	12	1.0	2.7	37.5
2015	24	2.0	2.3	41
2019	20	1.5	4.9	34.4

Note: Property Line reach lengths varied greatly during the beginning of the reporting period. Number of pools per 100 feet of channel standardizes that variability.

Table H-21 Pool Length (m) and Residual Pool Depth (cm) – Upper Hidden Valley Creek

HDVC-1 (Upper Hidden Valley Creek)				
Year	Number of Pools (n)	Number of Pools per 100 ft. of Channel (n)	Mean Pool Length (m)	Mean Pool Residual depth (cm)
2006	-	-	-	-
2009	4	0.59	2.3	21.3
2011	11	1.48	3.9	24.4
2015	4	0.57	1.5	19.8
2019	37	5.29	3.2	20.3

Note: Due to lack of flow at Upper Hidden Valley Creek in 2006, pools were not measured

Table H-22 Pool Length (m) and Residual Pool Depth (cm) – Lower Hidden Valley Creek

HDVC-2 (Lower Hidden Valley Creek)				
Year	Number of Pools (n)	Number of Pools per 100 ft. of Channel (n)	Mean Pool Length (m)	Mean Pool Residual depth (cm)
2006	4	0.68	2.1	24.4
2009	16	3.06	1.8	18.3
2011	4	0.54	3.3	24.4
2015	15	1.76	2.5	20.8
2019	9	1.06	3.4	25.8

Table H-23 Pool Length (m) and Residual Pool Depth (cm) – Lower Edgewood Creek

EC-2 (Lower Edgewood Creek)				
Year	Number of Pools (n)	Number of Pools per 100 ft. of Channel (n)	Mean Pool Length (m)	Mean Pool Residual depth (cm)
2015	8	2.29	1.6	18.5
2019	3	0.86	1.7	19.9

Table H-24 Pool Length (m) and Residual Pool Depth (cm) – Upper Daggett Creek

DC-1 (Upper Daggett Creek)				
Year	Number of Pools (n)	Number of Pools per 100 ft. of Channel (n)	Mean Pool Length (m)	Mean Pool Residual depth (cm)
2006	7	0.88	1.5	18.3
2009	8	1.33	2.1	33.5
2015	12	1.85	2.0	21.2
2019	26	4.00	1.9	22.0

Table H-25 Pool Length (m) and Residual Pool Depth (cm) – Lower Daggett Creek

DC-2 (Lower Daggett Creek)				
Year	Number of Pools (n)	Number of Pools per 100 ft. of Channel (n)	Mean Pool Length (m)	Mean Pool Residual depth (cm)
2006	2	0.54	N/A	N/A
2009	5	1.20	0.4	27.3
2015	3	0.64	2.4	21.3
2019	-	-	-	-

Note: Detailed pool measurements for pools in 2006, and no measurements of pools were taken during 2019, under no flow conditions.

H.2.9 Pool Tail Fines

Pool tail surface fine sediment is measured along with the residual pool depths at each identified pool in each reach. The objective of this measurement is to quantify the percentage of fine sediment less than 2 mm (silt and clay size material) on the pool tail substrate. Measurements were taken at each pool tail using a grid designed by the USFS. The grid is a 14 x 14-inch square frame with 49 line-intersections and one corner, totaling 50 intersecting points. Three random tosses of the grid were done at each pool tail, space allowing. If the pool tail was too narrow, only one toss was made. Within the area where the grid fell, the survey crew counted and recorded the number of grid intersections lying above substrate 2 mm or less. Each counted intersection represents 2 percent fines. The number of intersects counted was multiplied by two to reveal a percentage of fines within the pool tail.

The variability of the pool tail fines data is somewhat consistent with the changes in hydrology and associated sediment transportation/deposition patterns from year-to-year, with greater observations of fines following dry years (2009, 2015) and fewer observations of fines following wet years (2006, 2011, 2019). It is possible that fines are mobilized in wet years, thus distributing fines across the entire reach more evenly, and during dry years, lower flows concentrate fines at the tails of pools. Tables H-26 through H-29 list the measured pool tail fine values collected over the reporting period. Data on pool tail fines were not collected at Lower Edgewood until 2015. Surface water was not present at Upper Edgewood during any survey, so it was not possible to survey for pool fines. The 2019 surveys documented a lower percentage of pool tail fines at all locations, with the exception on Lower Daggett and Lower Edgewood, which have exhibited consistent patterns of pool tail fines across the reporting period.

Table H-26 Pool Tail Fines (Percent) – Heavenly Valley Creek

Heavenly Valley Creek			
Year	HVC-1 (Sky Meadows)	HVC-2 (Patsy's)	HVC-3 (Property Line)
2006	80	63	48
2009	64	63	71
2011	70	12	61
2015	99	63	41
2019	29	16	27

Note: Property Line reach lengths varied greatly during the beginning of the reporting period.

Table H-27 Pool Tail Fines (Percent) – Hidden Valley Creek

Hidden Valley Creek		
Year	HDVC-1 (Upper Hidden Valley Creek)	HDVC-2 (Lower Hidden Valley Creek)
2006	N/A	N/A
2009	34	73
2011	62	13
2015	40	59
2019	17	13

Table H-28 Pool Tail Fines (Percent) – Daggett Creek

Daggett Creek		
Year	DC-1 (Upper Daggett Creek)	DC-2 (Lower Daggett Creek)
2006	59	70
2009	74	89
2015	66	76
2019	23	69

Table H-29 Pool Tail Fines (Percent) – Edgewood Creek

Year	EC-2 (Lower Edgewood Creek)
2015	89
2019	98

H.2.10 Particle Size Distribution

In 2015, particle size distribution surveys began to be conducted in conjunction with the timing of BMI sampling, rather than during SCI. For all data collected in 2015 and prior, particle size distribution measurements on the streambed surface were conducted at the four riffles in each reach that were sampled for BMI during the previous sampling years. At each marked and counted riffle location, measurements were collected from the streambed along ten equally spaced transects that were oriented perpendicular to streamflow. A minimum of ten particles were selected along each transect using the blind touch method and were measured using a gravelometer. The median particle size and associated particle size class for the reach was determined from the pebble counts, and are reported here. Revised BMI sampling methodology (following SWAMP protocols) was instituted for surveys since 2016. The protocol dictates that five particles are measured with a gravelometer at the 21 evenly spaced transects, oriented perpendicular to flow, throughout the reach regardless of habitat type. Particles were selected for measurement using the blind touch method at evenly spaced points within the wetted width of each transect. The median particle size and associated particle size class for the reach was determined from the pebble counts, and are reported here. Since monitoring protocols changed slightly in 2016, results across the monitoring period are not directly comparable; however, it's generally expected that the median particle size (reported here) would be similar, regardless of monitoring protocol. Current protocols that dictate measurements are taken evenly across a reach, regardless of habitat type, suggesting that it would be possible that average measurements would tend to be finer particles (as a greater number of pools may be sampled), compared to previous protocols that only sample riffles. With the change of protocol to sample particle sizes during BMI surveys, particles were only sampled at Sky Meadows and Upper Hidden Valley Creek reaches in 2016, as the other sites were not included in BMI surveys that year. This change in BMI protocol and survey frequency is discussed further in Chapter 5.1.1 and Chapter H.6.1.

The median particle diameter varies somewhat at the sites from year to year, but not usually by more than a few mm (Tables H-30 through H-33). The Heavenly Valley Creek sites vary from very coarse gravels to coarse gravel at the Patsy's and Property Line reaches (with one instance of fine gravel at Property Line in 2018, likely as a result of sediment movement throughout the reach during the 2017 well-above-average precipitation year), and from coarse gravel to very fine gravel at the Sky Meadows reach. Sky Meadows reach has exhibited a decline in average particle size and class across the monitoring period. Particle classes at the Patsy's and Property Line reaches have remained fairly constant.

The Upper Hidden Valley Creek reach median particle class has declined from medium gravel to fine or very fine gravel over the monitoring period, while Lower Hidden Valley Creek has fluctuated consistently between coarse and very coarse gravel.

Particle size measurements were taken at Upper Edgewood in 2015; however, particle size measurements were not collected following that date, as BMI surveys are not conducted at this reach, and only topographic data are collected. Particle size measurements have also been inconsistently collected at Lower Edgewood, although observations have consistently trended toward small particle size, including very fine gravel or sand.

Table H-30 Median Particle Diameter Class (mm) – Heavenly Valley Creek

Heavenly Valley Creek						
Year	HVC-1 (Sky Meadows)		HVC-2 (Patsy's)		HVC-3 (Property Line)	
	Average Size (mm)	Average Class	Average Size (mm)	Average Class	Average size (mm)	Average Class
2006	16.8	gravel (coarse)	34.5	gravel (very coarse)	21.5	gravel (coarse)
2009	13.0	gravel (medium)	26.5	gravel (coarse)	22.0	gravel (coarse)
2011	11.8	gravel (medium)	33.0	gravel (very coarse)	33.0	gravel (very coarse)
2015	17.0	gravel (coarse)	25.2	gravel (coarse)	26.6	gravel (coarse)
2016 ¹	3.1	gravel (very fine)	-	-	-	-
2018	3.4	gravel (very fine)	26.7	gravel (coarse)	8.0	gravel (fine)
2019	7.3	gravel (fine)	51.3	gravel (very coarse)	18.2	gravel (coarse)

¹ Survey data collected at Sky Meadows only in 2016 as part of the new SWAMP BMI collection protocol.

Table H-31 Median Particle Diameter Class (mm) – Hidden Valley Creek

Hidden Valley Creek				
Year	HDVC-1 (Upper Hidden Valley Creek)		HDVC-2 (Lower Hidden Valley Creek)	
	Average Size (mm)	Average Class	Average Size (mm)	Average Class
2006*	10.0	gravel (medium)	34.3	gravel (very coarse)
2009	10.5	gravel (medium)	19.8	gravel (coarse)
2011	13.0	gravel (medium)	29.3	gravel (coarse)
2015	11.9	gravel (medium)	33.6	gravel (very coarse)
2016 ¹	6.5	gravel (fine)	-	-
2018	3.2	gravel (very fine)	51.5	gravel (very coarse)
2019	5.8	gravel (fine)	27.3	gravel (coarse)

¹ Survey data collected at Upper Hidden Valley Creek only in 2016 as part of the new SWAMP BMI collection protocol.

Table H-32 Median Particle Diameter Class (mm) – Edgewood Creek

Year	EC-1 (Upper Edgewood Creek)		EC-2 (Lower Edgewood Creek)	
	Average Size (mm)	Average Class	Average Size (mm)	Average Class
2015	7.8	gravel (fine)	3.8	gravel (very fine)
2018 ¹	-	-	-	-
2019 ²	-	-	0.062 - 2	sand

¹ Only California monitoring sites were sampled in 2018, as associated with BMI sample collections.

² Only longitudinal bed profile and cross-section analysis was conducted at Edgewood Creek in 2019.

Table H-33 Median Particle Diameter Class (mm) – Daggett Creek

Year	DC-1 (Upper Daggett Creek)		DC-2 (Lower Daggett Creek)	
	Average Size (mm)	Average Class	Average Size (mm)	Average Class
2006 ¹	9.5	gravel (medium)	9.5	gravel (medium)
2009 ¹	9.5	gravel (medium)	9.5	gravel (medium)
2015 ¹	6.0	gravel (fine)	6.0	gravel (fine)
2018 ²	-	-	-	-
2019	38.1	gravel (very coarse)	6.0	gravel (fine)

¹ Determined from field notes, rather than actual measurements.

² Only California monitoring sites were sampled in 2018, as associated with BMI sample collections.

Particle size measurement have not been collected consistently at Daggett Creek in the past, and the data provided here have mostly been compiled from field notes. No information was collected along the Daggett Creek reaches in 2011. However, particle sizes at both Daggett Creek reaches appears to have remained consistent over the monitoring period—fluctuating between fine to very coarse gravel.

H.2.11 Large Woody Debris/Total Wood

LWD characterizes the abundance of woody debris that can influence channel morphology and stability. Current protocols define LWD as longer than one-half the bankfull width and located within a portion of the bankfull width of the channel. However, in 2006, definitions of LWD also included a minimum diameter measurement. Therefore, following 2006, most reaches have much larger wood tallies in 2009 and 2015, and 2006 observations were noted qualitatively, rather than quantitatively. Field observers noted more downed trees in the area in 2009 than in 2006 (from natural causes, as no cut trees or stumps were noted). The larger snowpack and increased runoff in the spring of 2011 may have mobilized woody debris. In general, woody debris is considered beneficial, as LWD can enhance channel stability and habitat complexity. This report also includes a calculation of LWD per 100 feet of channel, in order to standardize across years of varying reach lengths (as occurred at the Property Line reach at the beginning of the monitoring period) and allow comparisons of LWD across reaches (Tables H-34 through H-37).

In 2001, due to ski area management, much of the LWD had been removed from the reach at Sky Meadows (USFS 2001). Qualitative observations of LWD in 2006 indicated an increase in LWD, and LWD quantitatively increased substantially in 2009, followed by a decline in 2011. LWD counts stabilized between 2015 and 2019 at 6 to 7 pieces per 100 feet of reach. Similar trends were observed at Patsy's reach, and counts have stabilized at 1 to 12 pieces per 100 feet of reach. More variability has been observed at the Property Line reach, with observations on the high end (84 pieces per 100 feet) in 2009, to stabilizing at 27 to 29 pieces per 100 feet between 2015 and 2019. Overall, observations of LWD at Upper Hidden and Lower Hidden Valley Creek reaches have remained relatively consistent.

Two years of data from Lower Edgewood show a large increase (more than 50 percent) of LWD. LWD per 100 feet of channel has increased over time at both the Upper and Lower Daggett Creek reaches. In general, lower elevation, forested sites exhibited higher volumes of LWD (Property Line, Lower Hidden, and Lower Edgewood), whereas high-elevation, meadow sites (Sky Meadows, Upper Hidden) had lower volumes of LWD.

Table H-34 Total Wood – Heavenly Valley Creek

Year	HVC-1 (Sky Meadows)		HVC-2 (Patsy's)		HVC-3 (Property Line)	
	# of pieces	pieces/100 ft	# of pieces	pieces/100 ft	# of pieces	pieces/100 ft
2006 ¹	10	2	57	4	16 ²	8
2009	54	7	270	20	618	84
2011	18	3	79	6	524	42
2015	29	6	144	11	342	29
2019	31	7	155	12	356	27

¹ Qualitative observations taken from field notes.

² Field notes for 2006 have just 4 aggregate LWD.

Table H-35 Total Wood – Hidden Valley Creek

Year	HDVC-1 (Upper Hidden Valley Creek)		HDVC-2 (Lower Hidden Valley Creek)	
	# of pieces	pieces/100 ft	# of pieces	pieces/100 ft
2006 ¹	22	3	164	28
2009	63	9	167	32
2011	50	7	316	42
2015	96	14	207	24
2019	42	6	291	34

¹ Qualitative observations taken from field notes.

Table H-36 Total Wood – Edgewood Creek

Year	EC-2 (Lower Edgewood Creek)	
	# of pieces	pieces/100 ft
2015	153	44
2019	320	91

Table H-37 Total Wood – Daggett Creek

Year	DC-1 (Upper Daggett Creek)		DC-2 (Lower Daggett Creek)	
	# of pieces	pieces/100 ft	# of pieces	pieces/100 ft
2006 ¹	29	4	15	4
2009	49	8	24	6
2015	76	12	68	14
2019	130	20	132	26

¹ Qualitative observations taken from field notes.

H.2.12 Stream Shading

Stream shading measures the average canopy cover in each monitoring reach. Stream shading was measured at the same 50 equally spaced transects used to assess streambank stability. At each of the 50 transects, stream shading was measured using a Solar Pathfinder. The Solar Pathfinder was oriented to the south at approximately 0.3 m above the water surface. Looking at the reflection of the sky in the Solar Pathfinder dome along the August or September sun path (depending on time of surveys), the field crew was able to add up the shaded sections to yield the percent shade for each transect. An average for stream shading across each reach is included in Tables H-38 through H-41.

The percent mean stream shading has remained relatively consistent by site and reach over the years, with the exception of Daggett Creek, which experienced a large increase of downed trees between 2006 and 2009. This may be a result of trees along the project reach being downed due to natural causes during this time (high wind events). Lower Daggett has remained consistent since that time, but shading at Upper Daggett has increased over time to near 2006 levels.

Table H-38 Mean Stream Shading (%) – Heavenly Valley Creek

Year	HVC-1 (Sky Meadows)	HVC-2 (Patsy's)	HVC-3 (Property Line)
2006	37	73	84
2009	30	75	87
2011	29	80	92
2015	24	80	92
2019	32	82	93

Table H-39 Mean Stream Shading (%) – Hidden Valley Creek

Year	HDVC-1 (Upper Hidden Valley Creek)	HDVC-2 (Lower Hidden Valley Creek)
2006	58	87
2009	51	88
2011	51	89
2015	41	92
2019	53	90

Table H-40 Mean Stream Shading (%) – Edgewood Creek

Year	EC-2 (Lower Edgewood)
2006	92
2008	93
2009	95
2010	89
2011	92
2015	94
2019	93

Table H-41 Mean Stream Shading (%) – Daggett Creek

Year	DC-1 (Upper Daggett Creek)	DC-2 (Lower Daggett Creek)
2006	86	61
2009	51	32
2015	80	33
2019	72	36

H.2.13 Streambank Angle

Streambank angle measures the dominant angle of the streambank between the bottom of the bank and the bankfull stage. Measurements were collected at the same 50 transects used to assess streambank stability and stream shading. At each transect, each bank was measured for an angle using a clinometer. These measurements are only made for streams with gradient less than 2 percent. Therefore, only observation at Sky Meadows and Upper Hidden Valley Creek reaches were recorded. Edgewood Creek, Daggett Creek, the lower reaches along Heavenly Valley Creek, and Lower Hidden Valley Creek all exhibited gradients greater than 2 percent. No substantial changes in streambank angle were noted at the reaches from year to year (Table H-42); however, Sky Meadows has experienced a slight increasing trend in streambank angle since 2009.

Table H-42 Mean Streambank Angle (degree)

Year	Heavenly Valley Creek HVC-1 (Sky Meadows)	Hidden Valley Creek HDVC-1 (Upper Hidden Valley Creek)
2006	107	128
2009	94	115
2011	111	118
2015	125	125
2019	122	112

H.2.14 Streamshore Water Depth

Streamshore water depth was measured at each of the 50 equally spaced transects along the entire channel reach, on each bank. At each transect and each bank, the water depth was measured at the water's edge. If the bank angle was equal to or less than 90 degrees (some range of undercut), the water depth was measured (in centimeters) using a measuring tape. If the bank angle was greater than 90 degrees the bank shore depth was recorded as zero. Greater streamshore depths are indicative of undercut banks. Similar to streambank angle, these measurements are only made for streams with gradients less than 2 percent (Sky Meadows and Upper Hidden Valley Creek; Table H-43). The streamshore depth at Upper Hidden Valley Creek has remained constant over the years, fluctuating between 2.3 and 3.3 cm, with the exception of 2019, where it increased to 5.6 cm. This is correlated with an increase in the number of pools throughout the reach, which are likely to have greater streamshore depth. Sky Meadows, which did not exhibit a large increase in pools in 2019, had a smaller increase in streamshore depth, which was most similar to 2006 and 2009 values.

Table H-43 Mean Shore Depth (cm)

Year	Heavenly Valley Creek HVC-1 (Sky Meadows)	Hidden Valley Creek* HDVC-1 (Upper Hidden Valley Creek)
2006	5.9	2.6
2009	5.8	3.3
2011	7.0	3.3
2015	3.8	2.3
2019	5.2	5.6

H.2.15 Aquatic Fauna

As recommended in the last comprehensive report, due to a lack of consistent methods and varied observers from year to year and the fact that the aquatic fauna observations are not considered useful or reliable, data for this metric has not been collected and reported.

This Page Intentionally Left Blank

Heavenly Mountain Resort
Water Years 2017–2021

APPENDIX

I

TRACTION SAND ANALYSIS –
JULY 2021



WETLAB

WESTERN ENVIRONMENTAL
TESTING LABORATORY

Specializing in Soil, Hazardous Waste and Water Analysis.

475 E. Greg Street #119 | Sparks, Nevada 89431 | www.WETLaboratory.com
tel (775) 355-0202 | fax (775) 355-0817
1084 Lamoille Highway | Elko, Nevada 89801
tel (775) 777-9933 | fax (775) 777-9933
3230 Polaris Ave., Suite 4 | Las Vegas, Nevada 89102
tel (702) 475-8899 | fax (702) 776-6152

WETLAB Order ID. 21040195

Sparks Control # _____

Elko Control # _____

LV Control # _____

Report

Due Date

Page 1 of 1

Client **Cardno, Inc.**

Address **295 Hwy 50, Suite 1**

City, State & Zip **Zephyr Cove, NV 89448**

Contact **Michelle Hochrein**

Phone **775 335 2389**

Collector's Name **F. Papandrea**

Fax

PWS/Project Name **Heavenly**

P.O. Number

PWS/Project Number

Email **michelle.hochrein@cardno.com**

Billing Address (if different than Client Address)

Company

Address

City, State & Zip

Contact

Phone

Fax

Email **michelle.hochrein@cardno.com**

Turnaround Time Requirements

Standard ☒

5 Day* (25%) ☐

72 Hour* (50%) ☐

48 Hour* (100%) ☐

24 Hour* (200%) ☐

*Surcharges Will Apply

Samples Collected From
Which State?

NV ☐ CA ☒

Other ☐

Report Results Via

Compliance Monitoring?

Yes ☒ No ☐

PDF ☒ EDD ☐

Report to Regulatory Agency?

Yes ☒ No ☐

Standard QC Required?

Yes ☒ No ☐

Analyses Requested

SAMPLE ID/LOCATION	DATE	TIME	PRES TYPE	S A M P L E S	NO. OF C O N T A I N E R S	Total Moisture Content Method CTM 226	Turbidity Method Caltrans (attached) Method CTM 217	Sand Equivalent Method CTM 217	Durability Method CTM 229	Gradation Method CTM 202	Spl. No.
Heavenly Cinders			N/A	SO	1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
X											
X											
X											
X											
X											
X											
X											
X											

Instructions/Comments/Special Requirements:

See attached CalTrans methodology for turbidity analysis

Sample Matrix Key**

DW = Drinking Water WW = Wastewater SW = Surface Water MW = Monitoring Well SD = Solid/Sludge SO = Soil HW = Hazardous Waste OTHER: _____

*SAMPLE PRESERVATIVES: 1=Unpreserved 2=H2SO4 3=NaOH 4=HCl 5=HNO3 6=Na2S2O3 7=ZnOAc+NaOH 8=HCl/VOA Vial

Temp	Custody Seal	# of Containers	DATE	TIME	Samples Relinquished By	Samples Received By
16.1 °C	Y N None	1	4/7/21	1005	<i>[Signature]</i>	<i>[Signature]</i>
°C	Y N None					
°C	Y N None					
°C	Y N None					

WETLAB'S Standard Terms and Conditions apply unless written agreements specify otherwise. Payment terms are Net 30.

Client/Collector attests to the validity and authenticity of this (these) sample(s) and, is (are) aware that tampering with or intentionally mislabeling the sample(s) location, date or time of collection may be considered fraud and subject to legal action (NAC445.0636).

To the maximum extent permitted by law, the Client agrees to limit the liability of WETLAB for the Client's damages to the total compensation received, unless other agreements are made in writing. This limitation shall apply regardless of the cause of action or legal theory pled or asserted.

WETLAB will dispose of samples 90 days from sample receipt. Client may request a longer sample storage time for an additional fee. Please contact your Project Manager for details.

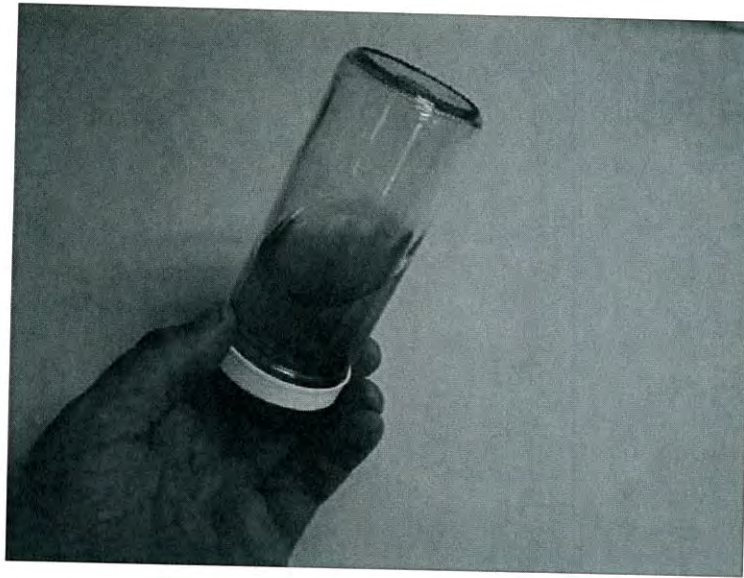
6. Obtain the turbidity measurement of the sample following the procedures specified by the manufacturer of the specific turbidimeter being used.
7. Repeat the above procedure three times and calculate an average value from the three measurements.

F. Quality Assurance Procedures

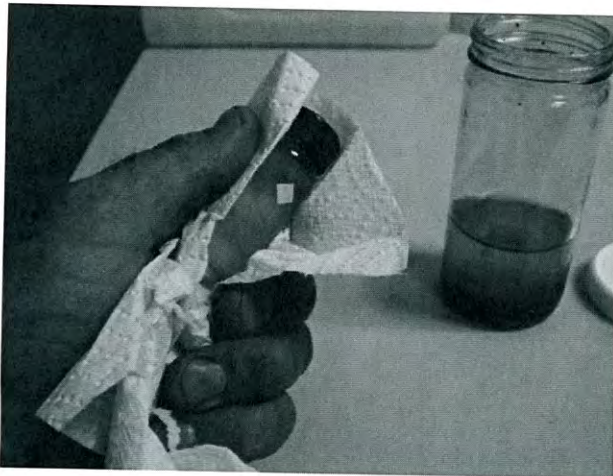
1. Turbidimeter Verification of Accuracy and Calibration:
 - a. Follow the manufacturer's instructions to perform all recommended maintenance procedures and verify that the instrument is accurate to the specified limits for the measurement range of interest.
 - b. If necessary, calibrate the instrument per the manufacturer's instructions using calibration standards appropriate for the measurement range of interest.
 - c. Document all verification and calibration procedures and measurements and include with the reported test results.

G. Troubleshooting

1. Consult the instrument manufacturer for additional guidance if the suggestions below do not remedy the problem.
2. For erratic readings:
 - a. Check voltage of the batteries and replace if needed.
 - b. There may be bubbles in the system: tap the sample chamber system to dislodge bubbles.
3. For unusually high or low turbidity readings:
 - a. See 2b: Bubbles
 - b. There may be fouling of optical surfaces: clean with a lint-free cloth or toothbrush.
4. If readings at first appear stable and then begin to increase inexplicably:
 - a. Check for moisture condensation on the cell wall
 - b. Wipe cell dry with a soft, lint-free cloth.
 - c. Apply a thin veneer of silicon oil (if compliant with manufacturer's instructions).
5. If blank samples or calibration standards do not read accurately:
 - a. Check that the cells are oriented as instructed.
 - b. Check the age/expiration of the calibration solutions.
 - c. Check the accuracy against another instrument.



Mixing the abrasives with the water by gently inverting the sample jar. The inversion process is repeated twice with a 10-minute soaking period in between.



Withdrawing a sub-sample and obtaining the turbidity measurement

7/23/2021

Cardno
PO Box 1533
Zephyr Cove, NV 89448
Attn: Michelle Hochrein

OrderID: 21040195

Dear: Michelle Hochrein

This is to transmit the attached analytical report. The analytical data and information contained therein was generated using specified or selected methods contained in references, such as Standard Methods for the Examination of Water and Wastewater, online edition, Methods for Determination of Organic Compounds in Drinking Water, EPA-600/4-79-020, and Test Methods for Evaluation of Solid Waste, Physical/Chemical Methods (SW846) Third Edition.

The samples were received by WETLAB-Western Environmental Testing Laboratory in good condition on 4/7/2021. Additional comments are located on page 2 of this report.

If you should have any questions or comments regarding this report, please do not hesitate to call.

Sincerely,



Jennifer Delaney
QA Manager



McKenna Oh
Project Manager

McKennaO@wetlaboratory.com
(775) 200-9876

SPARKS

475 E. Greg Street, Suite 119
Sparks, Nevada 89431
tel (775) 355-0202
fax (775) 355-0817
EPA LAB ID: NV00925 - ELAP No: 2523

ELKO

1084 Lamoille Hwy
Elko, Nevada 89801
tel (775) 777-9933
fax (775) 777-9933
EPA LAB ID: NV00926

LAS VEGAS

3230 Polaris Ave. Suite 4
Las Vegas, Nevada 89102
tel (702) 475-8899
fax (702) 622-2868
EPA LAB ID: NV00932

Western Environmental Testing Laboratory

Report Comments

Cardno - 21040195

Specific Report Comments

None

Subcontracting Comments

The analysis for Various AASHTO Method was performed by Black Eagle Consulting, Inc of Reno, NV. Their report is attached.

Report Legend

- B -- Blank contamination; Analyte detected above the method reporting limit in an associated blank
- D -- Due to the sample matrix dilution was required in order to properly detect and report the analyte. The reporting limit has been adjusted accordingly.
- HT -- Sample analyzed beyond the accepted holding time
- J -- The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit. The reported result should be considered an estimate.
- K -- The TPH Diesel Concentration reported here likely includes some heavier TPH Oil hydrocarbons reported in the TPH Diesel range as per EPA 8015.
- L -- The TPH Oil Concentration reported here likely includes some lighter TPH Diesel hydrocarbons reported in the TPH Oil range as per EPA 8015.
- M -- The matrix spike/matrix spike duplicate (MS/MSD) values for the analysis of this parameter were outside acceptance criteria due to probable matrix interference. The reported result should be considered an estimate.
- N -- There was insufficient sample available to perform a spike and/or duplicate on this analytical batch.
- NC -- Not calculated due to matrix interference
- QD -- The sample duplicate or matrix spike duplicate analysis demonstrated sample imprecision. The reported result should be considered an estimate.
- QL -- The result for the laboratory control sample (LCS) was outside WETLAB acceptance criteria and reanalysis was not possible. The reported data should be considered an estimate.
- S -- Surrogate recovery was outside of laboratory acceptance limits due to matrix interference. The associated blank and LCS surrogate recovery was within acceptance limits
- SC -- Spike recovery not calculated. Sample concentration >4X the spike amount; therefore, the spike could not be adequately recovered
- U -- The analyte was analyzed for, but was not detected above the level of the reported sample reporting/quantitation limit. The reported result should be considered an estimate.

General Lab Comments

Per method recommendation (section 4.4), Samples analyzed by methods EPA 300.0 and EPA 300.1 have been filtered prior to analysis.

The following is an interpretation of the results from EPA method 9223B:

A result of zero (0) indicates absence for both coliform and Escherichia coli meaning the water meets the microbiological requirements of the U.S. EPA Safe Drinking Water Act (SDWA). A result of one (1) for either test indicates presence and the water does not meet the SDWA requirements. Waters with positive tests should be disinfected by a certified water treatment operator and retested.

Per federal regulation the holding time for the following parameters in aqueous/water samples is 15 minutes: Residual Chlorine, pH, Dissolved Oxygen, Sulfite.

SPARKS

475 E. Greg Street, Suite 119
Sparks, Nevada 89431
tel (775) 355-0202
fax (775) 355-0817
EPA LAB ID: NV00925 - ELAP No: 2523

ELKO

1084 Lamoille Hwy
Elko, Nevada 89801
tel (775) 777-9933
fax (775) 777-9933
EPA LAB ID: NV00926

LAS VEGAS

3230 Polaris Ave. Suite 4
Las Vegas, Nevada 89102
tel (702) 475-8899
fax (702) 622-2868
EPA LAB ID: NV00932

Western Environmental Testing Laboratory

Analytical Report

Cardno**PO Box 1533****Zephyr Cove, NV 89448****Attn:** Michelle Hochrein**Phone:** (775) 588-9069 **Fax:** (775) 588-9219**PO\Project:** Heavenly**Date Printed:** 7/23/2021**OrderID:** 21040195**Customer Sample ID:** Heavenly Cinders**Collect Date/Time:** 3/23/2021**WETLAB Sample ID:** 21040195-001**Receive Date:** 4/7/2021 10:05

Analyte	Method	Results	Units	DF	RL	Analyzed	LabID
---------	--------	---------	-------	----	----	----------	-------

Subcontracted Analyses

Various AASHTO Method	N/A	See Attached	1
-----------------------	-----	--------------	---

SPARKS

475 E. Greg Street, Suite 119
Sparks, Nevada 89431
tel (775) 355-0202
fax (775) 355-0817
EPA LAB ID: NV00925 - ELAP No: 2523

ELKO

1084 Lamoille Hwy
Elko, Nevada 89801
tel (775) 777-9933
fax (775) 777-9933
EPA LAB ID: NV00926

LAS VEGAS

3230 Polaris Ave. Suite 4
Las Vegas, Nevada 89102
tel (702) 475-8899
fax (702) 622-2868
EPA LAB ID: NV00932

LABORATORY TEST DATA SUMMARY TABLE

Project: Testing as Ordered Project Number: 0630-01-1
Client: Western Environmental Testing Laboratory
Log Number: 8652 Date Sampled: 3/23/21 Sampled By: Client
Date Received: 7/19/21 Date Tested: 7/19/21 Tested By: GH / DF
Sample Identification: WETLAB Job ID: 21040195-001
Supplier / Sample Source: Heavenly Cinders

TEST DATA

Sieve Size	Percent Passing
3/8"	100
No. 4	95
8	65
16	29
30	13
50	6
100	3
200	2.1
Atterberg Limits	NOT TESTED
Moisture Content (%)	0.2
Sand Equivalent (%)	96
Durability Index (%)	82




FOR INFORMATIONAL PURPOSES ONLY
TESTS PERFORMED IN ACCORDANCE WITH CALTRANS METHODS



BLACK EAGLE CONSULTING, INC.
1345 CAPITAL BOULEVARD, SUITE A
RENO, NEVADA 89502-7140
PHONE (775) 359-6600
FAX (775) 359-7766

Respectfully Submitted By: _____


Diane Frias
Assistant Laboratory Manager
Date: July 21, 2021

This Page Intentionally Left Blank

Heavenly Mountain Resort
Water Years 2017–2021

APPENDIX

J

BIJOU PARK CREEK
EVALUATION REPORT

Appendix J

Bijou Park Creek Evaluation Report

J.1 Bijou Park Creek Evaluation Report (Catalyst, January 2017)

Provided under separate cover

This Page Intentionally Left Blank

Heavenly Mountain Resort
Water Years 2017–2021

APPENDIX

K

COMMENT LETTER TO 2018
INTEGRATED 303(D) AND 305(B)
ASSESSMENT REPORT

Appendix K

Comment Letter to 2018 Integrated CWA Section 303(D) & 305(B) Assessment and Draft Integrated Report

K.1 Comment Letter to 2018 Integrated CWA Section 303(D) & 305(B) Assessment and Draft Integrated Report



August 14, 2019

Lahontan Regional Water Quality Control Board

Attn: Jennifer Watts and Ed Hancock

2501 Lake Tahoe Blvd.

South Lake Tahoe CA 96150

RE: Comments-2018 Integrated Report: Heavenly Mountain Resort Comments on the Lahontan Regional Water Quality Control Board's Clean Water Act Section 303(D) and 305(B) Assessment and Draft Integrated Report

Dear Ms. Watts and Mr. Hancock:

Heavenly Valley Limited Partnership DBA as Heavenly Mountain Resort (Heavenly, a subsidiary of Vail Resorts) appreciates the opportunity to comment on the Lahontan Regional Water Quality Control Board (Regional Board) draft *2018 Clean Water Act Sections 303(D) and 305(B) Assessment* issued June 2019, in preparation for submittal of the final "Integrated Report" to the State Water Resources Control Board.

Heavenly is a permittee under Order No. R6T-2015-0021. Heavenly has worked actively for more than three decades with the Regional Board and the United States Forest Service, Lake Tahoe Basin Management Unit, to reduce sediment, nutrients, and other loads from the facility, including successful operation of a stormwater runoff treatment system from its California Base parking lot, which discharges to Bijou Park Creek. These efforts have been very successful, and Heavenly remains committed to continued stewardship of water resources.

Based on a review of the information contained in the water body "Fact Sheets" and lines of evidence (LOE) provided by the Regional Board in support of Appendix H (Draft California 2018 Integrated Report (303(d) List/305(b) Report), Heavenly would direct the Regional Board's consideration to more recent data than was considered, and to corresponding comments.

Bijou Park Creek, New Listing: Iron (Category 5A, Completion Year 2028)

The fact sheet states "that this creek has naturally high levels of iron. Though this creek has naturally high levels of iron, ambient concentrations for this creek have not been established at this time." In the 2012 Fact Sheet, the Regional Board used these same lines of evidence to recommend that Bijou Park Creek **not** be listed for iron. Therefore, Heavenly requests the Regional Board staff return to its 2012 conclusion that the lines of evidence do **not** support placing Bijou Park Creek on the section 303(d) list for iron.

If, however, the Regional Board decides to include Bijou Park Creek as impaired for Iron, Heavenly requests the water segment be listed as Category 4B rather than Category 5A. Heavenly believes that the resources required to develop and implement a TMDL to address a pollutant such as iron, for which the levels are naturally high, would be more effectively utilized to address existing TMDLs addressing pollutants with documented anthropogenic sources.

Bijou Park Creek, New Listing: Oil and Grease (Category 5A, Completion Year 2028)

The Fact Sheet uses data from Heavenly's discharge monitoring reports from October 2007 to September 2009 to reach its conclusion. The data from this time period were collected during the optimization of the below-ground stormwater treatment system and the automated sampler system for Heavenly's California Base Area Parking Lot. At the Regional Board's request, Heavenly worked closely with the Regional Board on the design, installation, and optimization of these systems because Heavenly was the first discharger in the basin to install an automated sampling system for the treatment unit. There was a long period of trouble-shooting this first-in-the-basin system, and both the Regional Board and Heavenly agreed that the data from this time period were not reliable for decision making purposes. However, the data from this period are referenced in the Fact Sheet as the LOE to list Bijou Park Creek as a Category 5a impaired water segment.

Heavenly's 2016 report to the Board, prepared by Catalyst Environmental Solutions *Bijou Park Creek Evaluation Report Heavenly Mountain Resort* included a lengthy demonstration that the system (and other best management practices) had been successfully implemented at the California Base Parking Lot. Since 2016, Heavenly has been submitting discharge monitoring reports on a quarterly basis to the Regional Board, which provide an abundance of more current and reliable data for the Board's assessment of this segment of Bijou Park Creek. These data indicate oil and grease concentrations in this segment of Bijou Park Creek at or near the detection limit of 2.0 mg/L (maximum: 3.3 mg/L). The water quality objective cited in the Fact Sheet for oil and grease is as follows:

Waters shall not contain oils, greases, waxes or other materials in concentrations that result in a visible film or coating on the surface of the water or on objects in the water, that cause nuisance, or that otherwise adversely affect the water for beneficial uses (Lahontan Region Water Quality Control Plan).

The discharges from the system, however, are well below levels that produce visible films or coatings on the water surface. The Lahontan limit is at the detection limit for this constituent; minor exceedances (less than 3.3 mg/L) are within the 30 percent uncertainty that certified laboratories must meet.

Heavenly Creek (source to USFS Boundary), Benthic Community Effects (Category 5A, completion year 2031)

Appendix A lists Heavenly Creek as a proposed addition to the 303(d) List for Benthic Community Effects. The Fact Sheet States:

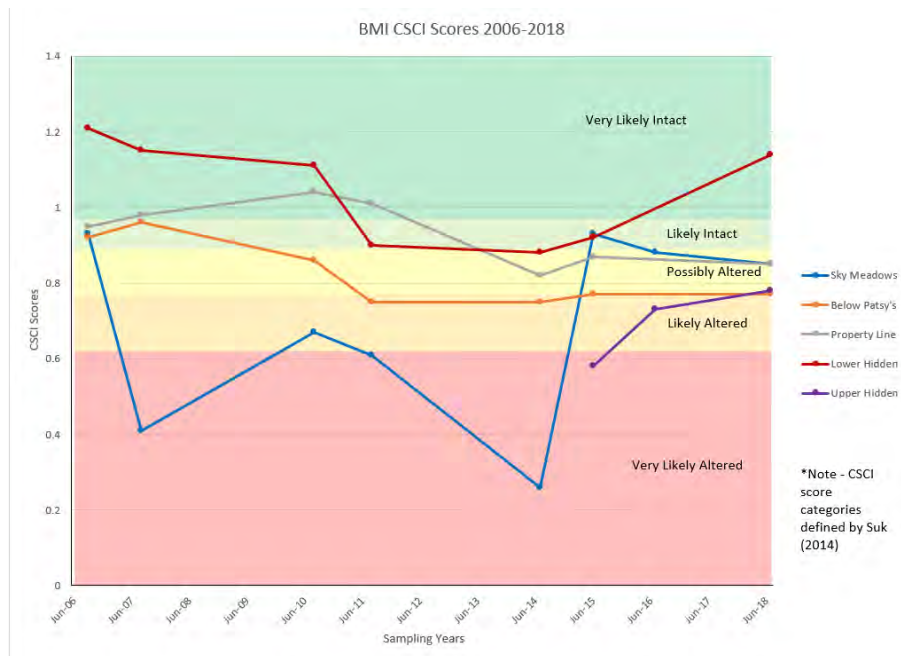
Based on the readily available data and information, the weight of evidence indicates that there is sufficient justification for placing Benthic Community Effects in this waterbody segment on the CWA section 303(d) List.

However, Appendix E states that Heavenly Creek Benthic Community Effects are under Category 3, which are water segments "...with water quality information that is insufficient to determine an appropriate decision recommendation, but the available data and information that does exist indicate beneficial uses may be potentially threatened."

Heavenly has worked closely with the Regional Board on gathering and interpreting the benthic macroinvertebrate (BMI) data in Heavenly Creek, and in identifying the causes of the measured impairments. Benthic macroinvertebrate data are sensitive to water quality, temperature, and physical habitat, which are in turn dependent on both natural and anthropogenic change. In addition, the analysis methods and metrics used by the State Board in conducting the analysis have changed over time, further complicating a straightforward trend analysis.

The Heavenly Mountain Resort Epic Discovery EIR/EIS/EIS, for which the Regional Board was the CEQA lead agency, included a detailed review of BMI data and the potential causes of impairment. The review concluded “it is not certain that fine sediment is the primary or only source of impairment in the Sky Meadows reach. Several of the fine-sediment intolerant taxa screened are also intolerant to stream temperatures greater than 13 degrees Celsius.” Heavenly agrees with Appendix E that data exists that indicate impairment of the benthic community at this location, and that the information is insufficient to support a decision recommendation owing to a lack of clear cause of the impairment. Among the many potential causes, cycles of drought and wet years (which are clearly natural causes) have a profound effect on the health of the benthic community.

The chart below shows Sky Meadows, which had some of its highest quality benthic community health scores after the recent drought (2015 scores), perhaps due both to greater temperatures and lesser degrees of erosion. Benthic community data from the undisturbed reference reach, Upper Hidden Valley Creek, are also showing similar variability, further suggesting natural causes for the observed impairments.



The Regional Board’s 2015 EIR/EIS/EIS also cites a regional study to reach the same conclusion of uncertainty for other Lake Tahoe Basin streams with similar conditions to Sky Meadows:

“BMI data collected and analyzed in 2009 and 2010 from 85 sites located within 29

watersheds of the Lake Tahoe Basin (Stream Condition Assessment of the Lake Tahoe Basin in 2009 and 2010 using the River Invertebrate Prediction and Classification System (RIVPACS). Habitat analysis of “marginal” or “impaired” sites in this report identified possible causative stressors of the degraded conditions. For higher elevation low gradient sites, like the Sky Meadows reach, very open canopy conditions with limited riparian shade are typical. Open meadow areas are typically more exposed to solar radiation and higher stream temperatures than stream segments with shade created by riparian shrubs and trees. Thick riparian canopy, in addition to providing shade, also drop-leaf litter providing a base for the BMI food web. Streams with very low flows, like Sky meadows can experience elevated stream temperatures and low dissolved oxygen levels. Additional data collection and interpretation completed as part of the ongoing Environmental Monitoring Program is warranted to further identify potential habitat stressors that may be contributing to impaired biotic condition in the Sky Meadows Reach. This will inform adaptive management strategies, and track improvement in both physical and biological metrics.”

Based on this recent and thorough analysis by the Regional Board, and a finding of uncertainty regarding an appropriate decision, Heavenly agrees that listing to Category 3 may be appropriate. Heavenly requests that the Regional Board clarify the listing category, presumably to listing Category 3, based on this information.

Heavenly Creek (source to USFS Boundary), Chloride, do not delist (Category 5A completion year 2028)

The Fact Sheet (Appendix H) states that in 2006 this waterbody segment was listed for exceedances of chloride for a non-contact recreation beneficial use. Based on data reported by Heavenly to the Board, while chloride concentrations have exceeded the state standard over the past eight monitoring years in Heavenly Creek, the chloride readings are also above the state standard at Hidden Valley Creek. This topic was discussed in both the Regional Board’s 2015 EIR/EIS/EIS for Heavenly’s Epic Discovery Project, and in Heavenly Mountain Resort’s Bijou Park Creek Evaluation Report. In both cases, the reports note that the causes for these increased chloride concentrations are uncertain and require further investigation. Winter application of salts is one plausible cause and is likely a basin-wide concern. However, the amount of data available, using Category 3 Criteria, “is insufficient to determine an appropriate decision recommendation, but the available data and information that does exist indicate beneficial uses may be potentially threatened.” This statement is supported by the Fact Sheet statement that “a minimum of 26 samples is needed for application of Table 3.1. The placeholder LOEs used for the original listing based on protection of REC are still valid and the recommendation is Do Not Delist.” Based on this information, Heavenly respectfully requests the Board modify the listing of Heavenly Creek as a Category 3.

Concluding Remarks

Thank you for the opportunity to provide comments on the Lahontan Regional Water Quality Control Board's Clean Water Act Section 303(d) and 305(b) Assessment and Draft Integrated Report. Heavenly is dedicated to improving water quality in all receiving waters within the Lake Tahoe basin, and supports policies that effectively utilize existing efforts

and prioritize feasible solutions to meet water quality objectives within the basin. Please contact Frank Papandrea, Heavenly's Environmental Compliance and Sustainability Manager, at 775-586-2315 if you have any questions or need additional information.

DocuSigned by:  88703E1EA6B0471...	8/13/2019
<hr/>	
MIKE GOAR	Date
VICE PRESIDENT AND C.O.O.	
VR HEAVENLY, I, ITS GENERAL PARTNER	

About Cardno

Cardno is an ASX-200 professional infrastructure and environmental services company, with expertise in the development and improvement of physical and social infrastructure for communities around the world. Cardno's team includes leading professionals who plan, design, manage, and deliver sustainable projects and community programs. Cardno is an international company listed on the Australian Securities Exchange [ASX:CDD].

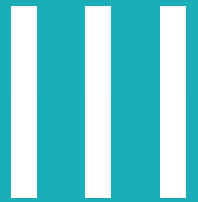
Cardno Zero Harm

Cardno
ZERO
HARM
EVERY JOB. EVERY DAY.

At Cardno, our primary concern is to develop and maintain safe and healthy conditions for anyone involved at our project worksites. We require full compliance with our Health and Safety Policy Manual and established work procedures and expect the same protocol from our subcontractors. We are committed to achieving our Zero Harm goal by continually improving our safety systems, education, and vigilance at the workplace and in the field. Safety is a Cardno core value and through strong leadership and active employee participation, we seek to implement and reinforce these leading actions on every job, every day

Heavenly Mountain Resort
Mitigation and Monitoring Plan Annual Report
(October 2020 – September 2021)

APPENDIX



2021 WATERSHED MAINTENANCE
RESTORATION PROGRAM (WMRP)
UPDATED ANNUAL WORK LIST

**HEAVENLY MOUNTAIN RESORT
2021 ANNUAL SUMMER WORK LIST
Completed Status**

#	Source*	Location	Treatment	Status
Watershed: CA-1 Heavenly Valley Creek				
1	M	Upper Shop	Maintain existing water bars, ditches, drop inlets and culverts.	Partially Completed – Review 2022
2	M	Powderbowl/Groove Chair Base	Maintain rock-lined ditches at base of Groove Lift and sediment basin at base of Powderbowl Lift.	Completed
3	M	Maggie's Sediment Basins	Maintain and clean out sediment in Maggie's road shoulder sediment basins.	Completed
4	M	Hellwinkel's Sediment Basins	Maintain and clean out sediment in Hellwinkel's road shoulder sediment basins.	Completed
5	P/RM	Cal Dam Snowmaking Pond	Work to be completed is post construction 401 Certification monitoring (Activities completed in 2020, included: sediment removal and placement at low location at Liz's/Ridge Run, stabilization BMPs, and dam face relining for safety.)	Completed
6	P	American Tower Company Cell Tower & Fiber Optic Line Replacement	Third party project – Work to be completed includes gas line connection at the Top of the Gondola and possible fiber relocation near Mombo.	Completed
7	P	NV Energy	Third party project by NV Energy Project – Vault and Power Line Installations	2 nd Year Completed Multi Year Phased Project
8	EH-CA	Groove Erosion Resistance	Improve erosion resistance and drainage stability near summer access road and Groove ski trail.	Completed
9	RM	TOG Water Tank Power	Underground power extension TOG Water Tank	Completed
Watershed: CA-6 Bijou Creek				
10	EH-CA	Cal Base Summer Access	Stabilize summer access road at parking lot entrance and improve erosion resistance behind lodge.	Completed
Watershed: CA-7 Unnamed Creek - Gondola				
		NONE		

*Source Codes	
M	BMP Maintenance
P	Master Plan Implementation Project
RM	Resort Maintenance Project
EH-CA	Erosion Hotspot California
EH-NV	Erosion Hotspot Nevada

Watershed: NV-1 Mott Canyon Creek				
11	M	Galaxy Road Sediment Basins	Maintain and clean out sediment in Galaxy road shoulder sediment basins.	Completed
Watershed: NV-3 Edgewood Creek				
7 cont.	P	NV Energy	Third party project by NV Energy Project – Vault and Power Line Installations	2 nd Year Completed Multi Year Phased Project
11	RM	Boulder Parking Lot	Continue phased approach to parking lot repairs in coordination with Heavenly Base Ops.	3 rd Year Completed Multiyear phased project
Watershed: NV-2 + 5 Daggett Creek				
7 cont.	P	NV Energy	Third party project by NV Energy Project – Vault and Power Line Installations	2 nd Year Completed Multi Year Phased Project
11cont.	M	Galaxy Road Sediment Basins	Maintain and clean out sediment in Galaxy road shoulder sediment basins.	Completed
12	RM	East Peak Lodge Well	Resort maintenance around wellhead for public water system	Completed
13	P	East Peak Snowmaking Well	Resort connection to new NV Energy transformer	Completed

Resort-Wide Annual Maintenance

Installation of rope fencing along roadways and along sensitive areas.
Water quality inspections.
Inspect and maintain roads, apply road base as needed after inspections.
Snowmaking systems repair and maintenance. Repairs to hydrants.
Repair and replace signage damaged by storm events.
Remove marked hazardous trees.

*Source Codes	
M	BMP Maintenance
P	Master Plan Implementation Project
RM	Resort Maintenance Project
EH-CA	Erosion Hotspot Inventory California
EH-NV	Erosion Hotspot Inventory Nevada

Heavenly Mountain Resort
Mitigation and Monitoring Plan Annual Report
(October 2020 – September 2021)

APPENDIX

IV

USFS WILDLIFE
TRASH MANAGEMENT AND
EDUCATION PROGRAM



USFS Wildlife Trash Management and Education Program:

As a condition of the approved 2015 EIS for the Epic Discovery Program a wildlife trash management and education plan will be implemented annually and reviewed by Heavenly and the US Forest Service LTBMU. The Heavenly Mountain Resort Master Development Plan (2015) includes a number of Operations and Maintenance Measures as part of the Mitigation and Monitoring Plan. 7.5-21 BIO 8: Wildlife Trash Management and Education Program.

A number of summer activities at Heavenly Mountain Resort are located at the Top of The Gondola, known as Adventure Peak. As part of the Epic Discovery Project implementation the resort shall create and implement the trash management and education program. The goal of this program is for timely removal of refuse from deposit points, and the education of our guests and staff about proper solid waste management.

Deposit points where animal proof receptacles are located:

1. Bottom of the Gondola steps/Interpretive Welcome Center(1)
2. Base of Tamarack Express lift (1)
3. Top of the Blue Streak Zip Line/ Top of Tamarack Chair (1)
4. The Bottom of the Big Easy Chair area, gear on area near cowboy fence (1)
5. The Bottom of the Coaster (1)
6. The Base of the Rock Climbing Wall (1)
7. The Base of the Tubing Lift viewing area (1)
8. NW side of Tamarack Lodge (1)
9. Viewing area of the Bear Cave Challenge Course (1)
10. Kiddy Zip area (1)
11. Mid-Station Observation Deck of the Gondola (Existing), + 2 additional Dual Bear Boxes

Wildlife proof receptacles in and around Adventure Peak will be serviced each day of operations. This will be handled by the Adventure Peak Staff, Mountain Dining and Lift Operations personnel. Daily servicing of all refuse will help this program succeed. All refuse will be disposed in a wildlife proof dumpster behind Tamarack Lodge. South Tahoe Refuse will provide a dumpster and service it weekly. At anytime the dumpster is full, trash will be transported down to the CA Base dumpsters. Since 2013 all CA Base dumpsters are animal proof containers and have significantly reduced any wildlife incidents.

Bear Bins are deployed annually before summer operations and activities begin. These bins will be relocated from winter storage for summer implementation. Bear Bins are stored at the East Peak Canopy Tour gear up deck over winter.

Future Expansion into Sky Meadows and East Peak Lake/Lodge to be developed as these regions are built out.

Heavenly Mountain Resort
Mitigation and Monitoring Plan Annual Report
(October 2020 – September 2021)

APPENDIX

V

2021 WATER USE BALANCE REPORT

Heavenly Mountain Resort

Water Use Report, 2020-21 Operating Year

Heavenly Mountain Resort is furnishing this report on water usage during the 2020-21 Operating Year (9/1/2020 to 8/31/2021).



Snowmaking Water Usage

The Heavenly Mountain Resort snowmaking system consumed a total of 151 million gallons of water during the 2020-21 operating year to cover a total of 322 acres of terrain. The distribution of water sources and water consumption is described below:

Total Snowmaking Water Use--California	88.50	million gallons
Total Snowmaking Water Use--Nevada	62.93	million gallons
Net Total Snowmaking Water Use	151.43	million gallons
Water Supplied in California	61.63	million gallons
Water Used in California	88.50	million gallons
Net Surplus (flow out of California)	-26.87	million gallons
Water Supplied in Nevada	89.80	million gallons
Water Used in Nevada	62.93	million gallons
Difference (Flow out of Nevada)	26.87	million gallons
Water Supplied In Basin	61.63	million gallons
Water Used in Basin	95.67	million gallons
Difference (flow out of Basin)	-34.05	million gallons
Water Supplied Out of Basin	89.80	million gallons
Water Used Out of Basin	55.75	million gallons
Difference (flow into Basin)	34.05	million gallons
Water Purchased--STPUD	55.95	million gallons
Water Purchased--KGID	28.19	million gallons
TOTAL WATER PURCHASED	84.15	million gallons

Table 1 provides a breakdown of water usage between California and Nevada, along with the net transfer of water between the States.

Table 1...2020-21 Water Usage Summary--Inter State Transfers					
Pumping Region	MG used	In California		In Nevada	
		% of acre-ft	Water (MG)	% of acre-ft	Water (MG)
Cal Base	38.2	100%	38.2	0%	0.0
Cal Dam	37.8	100%	37.8	0.0%	0.0
E. Peak	75.4	16.6%	12.5	83.4%	62.9
Total	151.4		88.5		62.9
Water Supply- (Purchased + Recharge)			61.6		89.8
InterState Water Transfer			26.9		-26.9

Table 2a provides a breakdown of water usage between in-basin and out of basin regions, along with the net inter-basin transfer of water.

Table 2a...2020-21 Water Usage Summary--Inter Basin					
Pumping Region	MG used	In Basin		Out of Basin	
		% of acre-ft	Water (MG)	% of acre-ft	Water (MG)
Cal Base	38.2	100%	38.2	0%	0.0
Cal Dam	37.8	100.0%	37.8	0.0%	0.0
E. Peak--CA	12.5	10.6%	1.3	89.4%	11.2
Total California	88.5		77.3		11.2
E. Peak--NV	62.9	29.2%	18.3	70.8%	44.6
Total Nevada	62.9		18.3		44.6
TOTAL SNOWMAKING	151.4		95.7		55.8
Water Supply			61.6		89.8
Inter Basin Water Transfer			34.0		-34.0

Table 2b further breaks down the Nevada water use within 4 water right quadrants as listed below:

Table 2b...2020-21 Water Usage Summary--Inter Basin					
Pumping Region	MG used	In Basin		Out of Basin	
		% of acre-ft	Water (MG)	% of acre-ft	Water (MG)
Cal Base	38.2	100%	38.2	0%	0.0
Cal Dam	37.8	100%	37.8	0%	0.0
E. Peak--CA	12.5	11%	1.3	89%	11.2
Total California	88.5		77.3		11.2
Quadrant A	7.6	12.0%	7.6		
Quadrant B	36.5			58%	36.5
Quadrant C	7.9			13%	7.9
Quadrant D	11.0	18%	11.0		
Total Nevada	62.9		18.6		44.3
TOTAL SNOWMAKING	151.4		95.9		55.5
Water Supply			61.6		89.8
Inter Basin Water Transfer			34.3		-34.3

Quadrants:

A - Within Tahoe Basin and south of the southern boundary of section 25, 26, 27 T. 13 N. R 18 E. and section 30 T. 13. N., R. 19 E.

B - Outside of Tahoe Basin and south of the southern boundary of section 25, 26, 27 T. 13 N. R 18 E. and section 30 T. 13. N., R. 19 E.

C - Outside of Tahoe Basin and North of the southern boundary of section 25, 26, 27 T. 13 N. R 18 E. and section 30 T. 13. N., R. 19 E.

D - Within Tahoe Basin and North of the southern boundary of section 25, 26, 27 T. 13 N. R 18 E. and section 30 T. 13. N., R. 19 E.

The following attachments provide documentation and calculations procedures used in determining these values:

Attachment 1....Map of Existing Meter Locations

Attachment 2....Schematic of Water Transfers

Attachment 3....California Snowmaking Trails

Attachment 4....Nevada Snowmaking Trails and Water Right Quadrants

Calculation Procedures

Water allocation calculations for Heavenly Mountain Resort are complicated by the fact that snowmaking occurs in both Nevada and California, as well as inside and outside the TRPA boundary. While the snowmaking piping distribution system for the entire resort is interlinked, there are 3 basic sub-regions:

1. Cal Base This region consists of the acreage on the California side falling below Cal Dam. This entire region falls within the State of California and within the Tahoe Basin.
2. Cal Dam This region consists of acreage on the California side that is above Cal Dam. This entire region falls within the State of California and within the Tahoe Basin.
3. East Peak This region consists of acreage above and below East Peak Lake. The region is predominantly in Nevada, though some trails serviced at the top fall inside California. A majority of this terrain is out of the Tahoe Basin, but 25% lies inside the Basin.

Attachment 2 provides a schematic of pumping operations, meter readings, and the calculation procedure for interstate water transfers. These calculations consist of performing a water balance between the STPUD and KGID supplies, water entering and exiting reservoirs, and a flowmeter installed on the existing transfer line between the Cal Dam and East Peak systems.

The methodology used this analysis to track inter-basin water usage involves calculating the total water usage within the 3 major sub-regions (Lower Cal, Cal Dam, and East Peak) and then allocating water

proportionally based on snowmaking terrain within that region that falls inside and outside the Tahoe basin. Since different trails require different design depths of snow, the allocation is based on the trail acreage x design depth for each trail, as detailed in Attachments 3 and 4. The same methodology is used to allocate East Peak water between California and Nevada. No changes have been made in the metering locations, configuration, or calculation procedure from the previous year.

The trail data provided in Attachment 4 indicates that 16.6% of the East Peak design acre-ft of snow coverage occurs in California. Therefore, 16.6% of the total 75.4 MG used for snowmaking in the East Peak sub-region is calculated to fall in California (12.5 MG) while 83.4% is calculated to fall in Nevada (62.9 MG)¹. Of this 62.9 MG of East Peak water that is used in Nevada, 29.2% of the design acre-ft of snow production occurs within the Tahoe Basin. Therefore 29.2% of the 62.9 million gallons of water used in this sub-region are calculated to be used within the Basin (18.3 MG) while 70.8% are calculated to be used outside the basin (44.6 MG)².

Available Data Notice

The Heavenly snowmaking data server was damaged in the early fall of 2021 due to power instabilities caused by the Caldor fire. Unfortunately the database was not able to be retrieved. The last back-up was from the end of March so that data from 4/1 to 10/1 is missing from the snowmaking files. During this period, records from purchase data was used to calculate transfers. A new server was installed and activated by 10/1 to ensure that data was collected prior to the initiation of snowmaking operations.

Revised Operating Procedures

The calculations indicate that a net of 34.0 million gallons of water was transferred into the basin during 2020-21 snowmaking season, while 26.9 MG was transferred from Nevada to California. Future net transfers will be minimized by further balancing water supplies during the season and managing summer irrigation practices.

Respectfully Submitted,

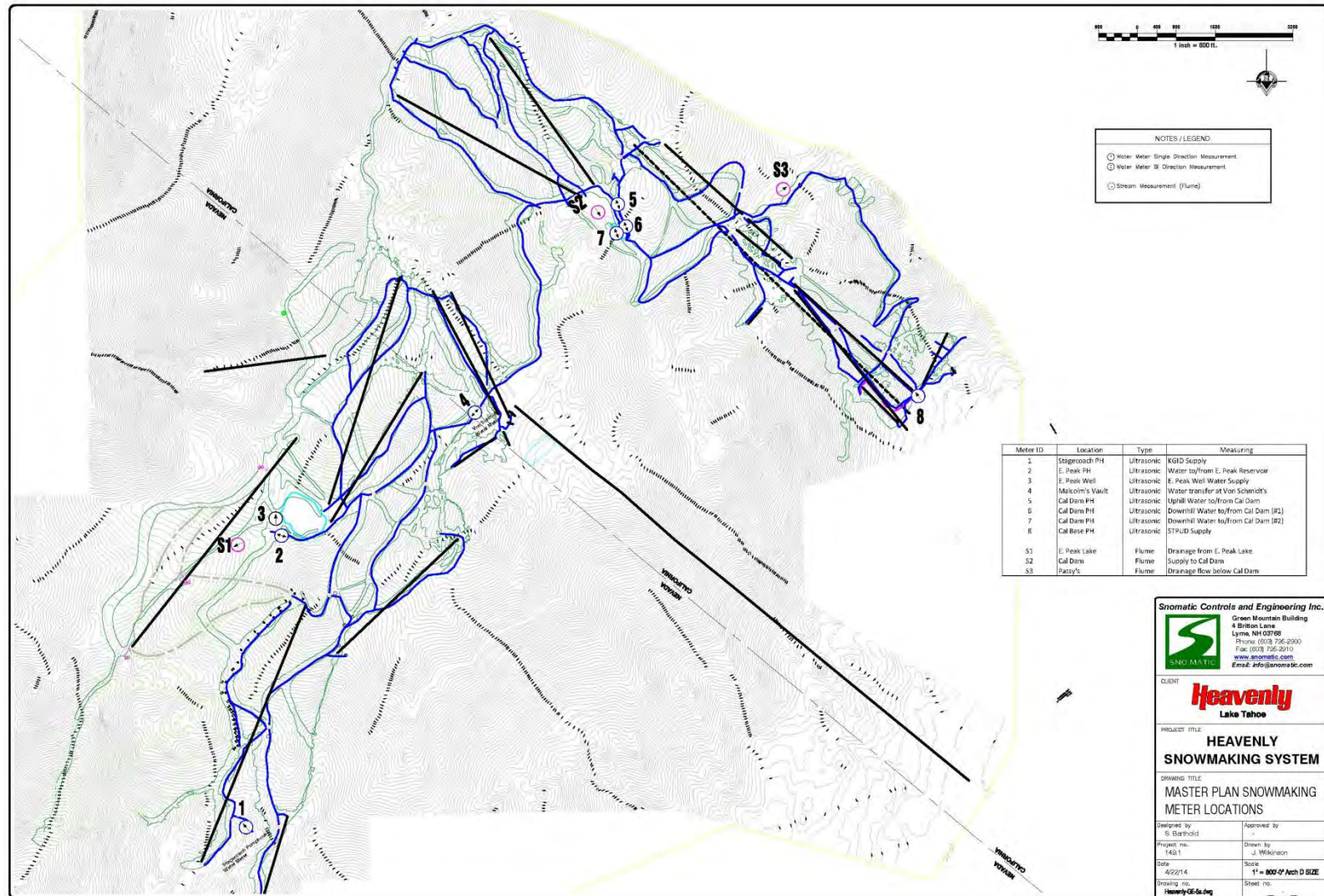
A handwritten signature in black ink, appearing to read "Scott Barthold". The signature is fluid and cursive, with the first name "Scott" and last name "Barthold" clearly distinguishable.

Scott Barthold, PE
Sno.matic Controls and Engineering, Inc.

¹ Refer to Table 1 for calculation

² Refer to Table 2a/b for calculation

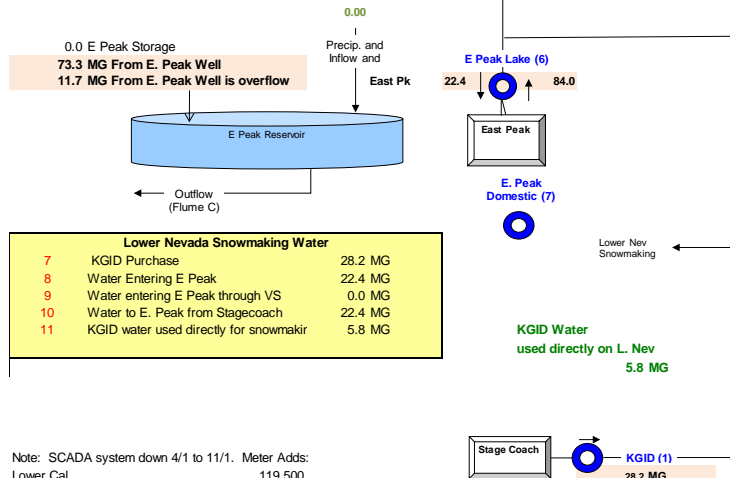
Attachment 1...Existing meter locations



Attachment 2---Schematic

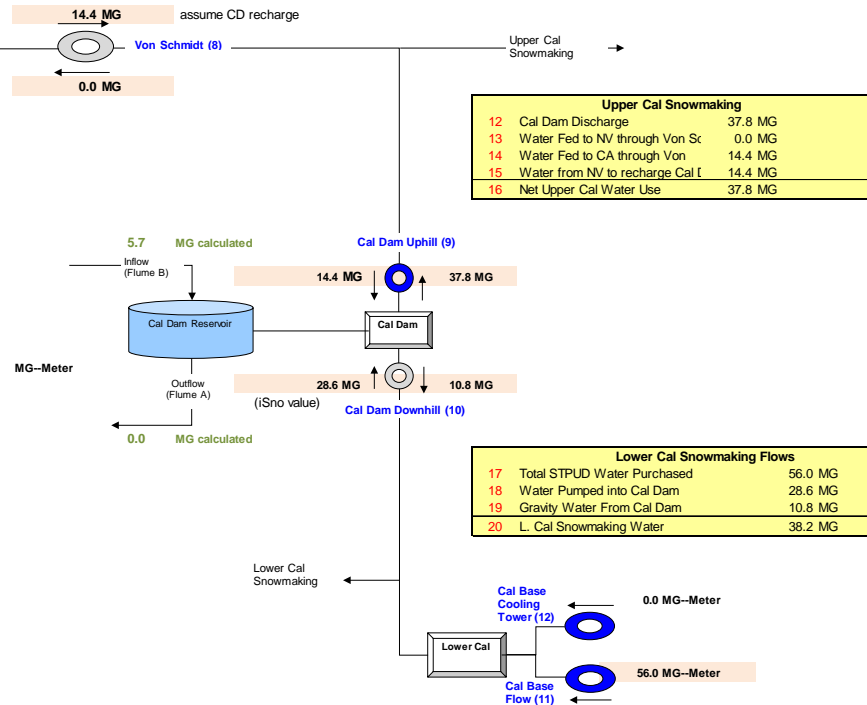
Attachment 2

Nevada Snowmaking Water		
1	Water Pumped by E Peak pumps	84.0 MG
2	Water Sent to Cal Dam via Von Schm	14.4 MG
3	KGID Water used directly for SM	5.8 MG
4	Total Nevada Snowmaking Water	75.4 MG
5	STPUD Water transferred to Nevada	0.0 MG
6	KGID and Inflow water used in NV	75.4 MG



Note: SCADA system down 4/1 to 11/1. Meter Adds:
 Lower Cal 119,500
 Stagecoach 5,392,269
 East Peak W 18,125,050

Heavenly Mountain Resort Snowmaking Water Usage
 2020-21 Water Transfers
 Snowmaking Year (9/1/20 to 8/31/21)



Upper Cal Snowmaking		
12	Cal Dam Discharge	37.8 MG
13	Water Fed to NV through Von Schm	0.0 MG
14	Water Fed to CA through Von Schm	14.4 MG
15	Water from NV to recharge Cal Dam	14.4 MG
16	Net Upper Cal Water Use	37.8 MG

Lower Cal Snowmaking Flows		
17	Total STPUD Water Purchased	56.0 MG
18	Water Pumped into Cal Dam	28.6 MG
19	Gravity Water From Cal Dam	10.8 MG
20	L. Cal Snowmaking Water	38.2 MG

Calculation Notes

- | | |
|---|---|
| <p>1 From E. Peak Meter</p> <p>2 Based on Cal Dam meter reading (entering pond)</p> <p>3 Calculated by Equation 11</p> <p>4 Water Pumped by E. Peak - water sent to CA + KGID water used directly for snowmaking = Nevada SM water</p> <p>5 Water entering E. Peak -(Water Pumped via KGID - KGID water used directly on L. Nevada)</p> <p>6 Total Nevada water - transfer to Cal Dam = KGID and Inflow water used in NV</p> <p>7 Provided by KGID flowmeter reading</p> <p>8 Based on E. Peak Meter Reading</p> <p>9 From Equation 5</p> <p>10 Total Water into E. Peak (from meter) - water transferred to E. Peak from Von Schmidt = water transferred from Stage coach</p> <p>11 Water purchased from KGID - water transferred from KGID to E. Peak = KGID water used directly for snowmaking</p> | <p>12 Read from Cal Dam uphill meter</p> <p>13 From Equation 5</p> <p>14 Cal Dam Uphill meter reading (reverse flow)</p> <p>15 Cal Dam Uphill meter reading (reverse flow)</p> <p>16 (Water Pumped from Cal Dam - water transferred to NV) + (Water pumped from E Peak into CA - water entering Cal Dam)</p> <p>17 From Cal Base Flowmeter</p> <p>18 From Cal Dam downhill meter</p> <p>19 From Cal Dam Downhill Meter</p> <p>20 Water Pumped from L. Cal - Water delivered to Cal Dam + gravity water running back down to lower Cal</p> |
|---|---|

ATTACHMENT 3---CALIFORNIA SNOWMAKING ACREAGE							
2007 Master Plan Amendment Trail #	Trail Name		2007 Master Plan Amendment Snowmaking Action (1)	Acreage (acres)	Acre ft. / Acre (2)	Acre ft. (3)	Sub Region
California In Basin.... 'pod' trails							
B1	EAST BOWL -THE FACE		EXISTING	16.3	5	81.3	Cal Base
B2	GUNBARREL		EXISTING	8.2	5	40.8	Cal Base
D1	WORLD CUP		EXISTING	6.0	2.7	16.1	Cal Base
E1	PATSY'S		EXISTING	7.9	2.7	21.4	Cal Dam
G1	MAGGIES		EXISTING	8.4	2.7	22.7	Cal Dam
G2	CAT TRACK		EXISTING	1.0	2.7	2.7	Cal Dam
G5	MOMBO MEADOWS		EXISTING	4.1	2.7	11.1	Cal Dam
G6	MOMBO		EXISTING	1.0	2.7	2.6	Cal Dam
G7	LOWER MOMBO		EXISTING	2.5	2.7	6.7	Cal Dam
H9	CANYON - SKY CANYON		EXISTING	6.1	2.7	16.5	Cal Dam
H10	JACKPOT (RUSUTSU)		EXISTING	4.3	2.7	11.6	Cal Dam
H11	HIGH ROLLER (STEAMBOAT)		EXISTING	3.3	2.7	8.9	Cal Dam
I1	LIZ'S		EXISTING	9.6	2.7	25.9	Cal Dam
I3	UPPER ELLIE'S / ELLIE'S	check of power at top	EXISTING	12.4	2.7	33.5	Cal Dam
K1	PERFECT RIDE (WEST BOWL)		EXISTING	8.7	2.7	23.4	Cal Base
*L1	LOWER SKI SCHOOL	DMZ	EXISTING	2.3	2.7	6.2	Cal Base
M1	CHILDRENS SKI CENTER	Enchanted Forest	EXISTING	0.9	2.7	2.4	Cal Base
N1	PIONEER PLATTER PULL		EXISTING	2.4	2.7	6.5	Cal Dam
O1	LEARN TO SKI CENTER		EXISTING	1.4	2.7	3.7	Cal Dam
*GG1	(UPR.) CALIFORNIA TRAIL		EXISTING	7.4	2.7	20.0	E. Peak
**GG2	SAM'S DREAM		EXISTING - UNBUILT	4.3	4	17.1	E. Peak
*GG3	TAMARACK RETURN		EXISTING	0.7	2.7	2.0	E. Peak
*GG6	CASCADE		EXISTING	8.0	2.7	21.7	E. Peak
*HH1	EASY STREET (1/2)		EXISTING	3.4	2.7	9.2	E. Peak
HH2	EASY STREET II (1/2)		EXISTING	2.1	2.7	5.6	E. Peak
B3	PISTOL		REMOVE	0.0	5	0.0	
B4	WEST BOWL		REMOVE	0.0	5	0.0	
E2	GROOVE		EXISTING	3.8	2.7	10.2	Cal Dam
G3	SWING TRAIL		NO ACTION	0.0	0	0.0	
G4	WATERFALL		RETAIN	3.5	5	17.4	
G8	POWDERBOWL		RETAIN	3.5	4	14.1	
G9	NEW - POWDERBOWL 2 (Gladed)		NEW	1.9	2.7	5.1	
H1	WOODS TRAIL		NO ACTION	0.0	0	0.0	
H2	BETTY'S SWING		NO ACTION	0.0	0	0.0	
H3	RIDGE BOWL		NO ACTION	0.0	0	0.0	
H4	RIDGE CHUTE		NO ACTION	0.0	0	0.0	
H5	HIGH ROLLER (BETTY'S RUN)		RETAIN	12.7	5	63.4	
H6	DOUBLE DOWN (BETTY'S BOWL)		RETAIN	0.0	0	0.0	
H7	LOWER BETTY'S	Soldiers	RETAIN	0.0	0	0.0	
H8	BETTY'S CUTOFF		NO ACTION	0.0	0	0.0	
H12	NEW - BETTY'S CUTOFF		NO ACTION	0.0	0	0.0	
H13	NEW - BETTY'S ESCAPE		NO ACTION	0.0	0	0.0	
I2	ELLIE'S SWING - EXTENSION		RETAIN	3.4	2.7	9.2	
I4	NEW - SKIWAYS 1 (GLADED)		NO ACTION	0.0	0	0.0	
I5	NEW - SKIWAYS 2 (GLADED)		NO ACTION	0.0	0	0.0	
GG5	49ER		RETAIN	1.6	4	6.3	
California In-Basin...non 'pod' transport trails							
1	ROUND-A-BOUT		EXISTING	15.6	2.7	42.1	Cal Base
2	RIDGE RUN		EXISTING	1.7	2.7	4.5	Cal Dam
3	LOWER RIDGE RUN		EXISTING	15.9	2.7	42.9	Cal Dam
5	CALIFORNIA TRAIL		EXISTING	5.5	2.7	14.9	Cal Dam
5A	NEW - CAL. TRAIL ALTERNATIVE		NEW	1.7	2.7	4.5	
10	VON SCHMIDT'S (1/4)		RETAIN	1.2	2.7	3.3	
**11	VON SCHMIDT'S - MEADOW		RETAIN	4.1	2.7	11.1	
1	ROUND-A-BOUT - REALIGNMENT		NEW	1.6	2.7	4.2	
4	SKYLINE TRAIL		RETAIN	2.8	2.7	7.6	
12	NEW - MAGGIES CANYON (GLADED)		NO ACTION	0.0	0	0.0	
In Basin Total--Master Plan				212.8		680.1	
In Basin Total--Cal Base Existing				57.9		212.4	
In Basin Total--Cal Dam Existing				91.2		246.2	
In Basin Total--E. Peak Existing			170.7	21.6		58.4	
California Out of Basin 'pod' trails							
V4	BIG DIPPER (1/5)		EXISTING	3.7	2.7	10.0	E. Peak
V8	ORION'S (1/2)		EXISTING	8.4	2.7	22.6	E. Peak
*V10	METEOR (1/2) - (GLADED)		EXISTING - UNBUILT	2.9	2.7	7.8	
*V11	METEOR II (1/3) - (GLADED)		REMOVE	0.0	2.7	0.0	
V7	DIPPER BOWL (1/2)		NO ACTION	0.0	2.7	0.0	
GG4	SAND DUNES		RETAIN	3.0	2.7	8.0	
V1	MILKY WAY BOWL (2/3)		NO ACTION	0.0	0	0.0	
V3	DIPPER KNOB	The Road	RETAIN	1.2	2.7	3.2	
Out of Basin Total--Master Plan				19.1		51.6	
Out of Basin Total--Cal Base Existing				0.0		0.0	
Out of Basin Total--Cal Dam Existing				0.0		0.0	
Out of Basin Total--E. Peak Existing				12.1		32.6	
California Total--Master Plan				231.9		731.8	
California Total--Existing				182.8		549.6	
Cal Base Total Existing				57.9		212.4	
Cal Dam Total Existing				91.2		246.2	
E Peak Total Existing				33.7		91.0	
Cal Base Existing---% In Basin				100%		100%	
Cal Dam Existing---% In of Basin				100%		100%	
E Peak Existing---% In Basin				64%		64%	
Notes:							
(1) Action proposed: EXISTING = currently exists, RETAIN =approved in MP (96) - retain in MPA (04), REMOVE =approved in MP (96) - remove in MPA (04), NEW =not considered in MP (96) - proposed in MP							
(2) Acre feet of water needed per acre of ski run to achieve complete snow coverage. 2.7 indicates a ski run will require 2.7 acre feet of water per ski run acre per year to achieve snow coverage of ground cover case for a ski season.							
(3) Total acre feet of water required for complete snow coverage of the ski run for a ski season. This number is calculated by multiplying the Snowmaking Acreage by the Acre ft/Acre column.							
(4) Change from Master Plan (1996) Approved to Master Plan Amendment (2007) Proposed build out.							
(5) Additional water requirements of Master Plan Amendment (2007) from Master Plan (1996).							
* All or partially implemented since adoption of the Master Plan in 1996.							
** Approved to be implemented but not yet constructed.							

ATTACHMENT 4--NEVADA SNOWMAKING ACREAGE							
2007 Master Plan Amended Facilities - Snowmaking at Buildout							
2007 Master Plan Amendment Trail #	Trail Name		2007 Master Plan Amendment Snowmaking Action (1)	Acres (2)	Acres ft. / Acre (2)	Acres ft. (3)	
Nevada In Basin 'pod' trails							
Q1	BOULDER (EDGEWOOD) BOWL		EXISTING	17.2	4	68.9	E. Peak
S1	OLYMPIC DOWNHILL (3/5)		EXISTING	15.5	2.7	41.8	E. Peak
X1	BOULDER SKI SCHOOL		EXISTING	2.8	2.7	7.6	E. Peak
*HH1	EASY STREET (1/2)	Assume this is Big Easy	EXISTING	3.4	2.7	9.2	E. Peak
S2	BOULDER CHUTE (075)		RETAIN	2.7	4	11.0	
S3	NORTH BOWL		RETAIN	7.8	5	38.9	
S4	UPPER NORTH BOWL		EXISTING	4.2	5	21.0	E. Peak
S8	NEW - NORTH BOWL 2	Cloud Nine	NEW	5.1	2.7	13.8	
S9	NEW - NORTH BOWL 3 (Gladed)	Pines	NEW	8.1	2.7	22.0	
S10	NEW - NORTH BOWL 4 (Gladed)	Bohemian Grove	NEW	7.8	2.7	21.2	
HH2	EASY STREET II (1/2)	Tubing Hill	EXISTING	2.1	5	10.3	E. Peak
(wasn't on snowmaking plan)							
Nevada In Basin non 'pod' transport trails							
9	STEVE'S		EXISTING	0.5	2.7	1.4	E. Peak
10	VON SCHMIDT'S (1/4)		RETAIN	1.2	2.7	3.3	
NV In Basin Total--Master Plan				78.5		270.3	
NV In Basin Existing Total (all E. Peak)				45.7		160.1	
Nevada Out of Basin 'pod' trails							
R2	(UPPER) STAGECOACH	Lower Downhill	EXISTING	4.2	4	16.6	E. Peak
S1	OLYMPIC DOWNHILL (2/5)		EXISTING	10.3	2.7	27.9	E. Peak
S5	CROSSOVER		EXISTING	6.7	2.7	18.1	E. Peak
V4	BIG DIPPER (4/5)		EXISTING	14.8	2.7	40.0	E. Peak
V6	ORION'S BELT		EXISTING - NOT EX 2017	1.1	2.7	2.9	E. Peak
V8	ORION'S (1/2)		EXISTING	8.4	2.7	22.6	E. Peak
V9	LOWER ORION'S		EXISTING	2.9	2.7	7.8	E. Peak
*V10	METEOR (1/2) - (GLADED)		EXISTING - UNBUILT	2.9	2.7	7.8	E. Peak
W3	LITTLE DIPPER		EXISTING	10.4	5	52.2	E. Peak
W4	COMET		EXISTING	14.2	2.7	38.3	E. Peak
Z1	NEW - WELLS FARGO 1		NEW	5.4	2.7	14.5	
Z2	NEW - WELLS FARGO 2		RETAIN	8.3	2.7	22.4	
Z3	NEW - WELLS FARGO 3		NEW	11.4	2.7	30.7	
Z4	NEW - WELLS FARGO 4		RETAIN	12.8	2.7	34.6	
Z5	NEW - WELLS FARGO 5		NEW	2.8	2.7	7.5	
Z7	NEW - WELLS FARGO 7		NEW	6.9	2.7	18.7	
R1	STAGECOACH		EXISTING	12.4	4	49.6	E. Peak
R3	NEW - STAGECOACH 2		NO ACTION	7.1	5	35.6	
R4	NEW - STAGECOACH 3		NO ACTION	0.0	5	0.0	
R5							
S6	PONDEROSA (BONANZA BOWL)	Bonanza	RETAIN	4.0	4	15.9	
S7	EAST PEAK	Ponderosa	RETAIN	3.9	4	15.8	
U1	PERIMETER		RETAIN	13.5	2.7	36.4	
U2	GALAXY		RETAIN	10.1	2.7	27.3	
U3	NEW - GALAXY 1		NEW	8.7	2.7	23.4	
U4	NEW - GALAXY 2		NEW	2.7	2.7	7.3	
V5	LOWER BIG DIPPER	Connection to Galaxy	RETAIN	3.7	2.7	9.9	
V12	NEW - ORION'S II	Nova	NEW	3.4	2.7	9.3	
W1	ARIES		RETAIN	1.3	2.7	3.4	
W2	JACK'S		NEW	3.0	2.7	8.0	
*HH3	SILVER SPUR		NO ACTION	0.5	2.7	1.4	E. Peak
Nevada Out of Basin Non 'pod' transport trails							
7	LOWER WAY HOME		EXISTING	5.2	2.7	14.1	E. Peak
8	PEPI'S		EXISTING	4.0	2.7	10.8	E. Peak
10	VON SCHMIDT'S (1/2)		EXISTING - NOT EX 2017	2.4	2.7	6.5	E. Peak
14	NEW - GALAXY ACCESS		NEW	6.4	2.7	17.3	
15	NEW - SCORPION		NEW	6.3	2.7	17.1	
6	NEW - NEVADA TRAIL (WAY HOME)		NEW	5.9	2.7	16.0	
16	NEW - FARGO TO GALAXY	Fargo to Stagecoach	NEW	1.1	2.7	2.9	
NV-Out of Basin Total MP				229.1		690.8	
NV Out of Basin Existing Total (all E. Peak)				93.5		298.1	
				Acreege total by Quadrant % of Total Acreege			
Nevada Total--Master Plan				307.6		961.1	
Nevada Total--Existing				139.2		458.2	
% In Basin--Existing				33%		35%	
% Out of Basin				67%		65%	
Grand Total--2007 Master Plan				539.6		1,692.8	
				Cal Base Total	57.9	212.4	
				% in CA	100%	100%	
				% In Basin	100%	100%	
				Cal DamTotal	91.2	246.2	
				% in CA	100%	100%	
				% in Basin	100%	100%	
				E. Peak Total	172.9	549.2	
				% in CA	19.5%	16.6%	
				E. Peak in CA	33.7	91.0	
				% of E. Peak in CA-in Basin	12.5%	10.6%	
				E. Peak in NV	139.2	458.2	
				% of E. Peak in NV-in Basin	26%	29%	
				% E. Peak in Nevada	80.5%	83.4%	
				% of E. Peak in CA -out	7.0%	5.9%	
				% of E. Peak in NV -out	54.1%	54.3%	

Heavenly Mountain Resort
Mitigation and Monitoring Plan Annual Report
(October 2020 – September 2021)

APPENDIX
VI

DAGGETT CREEK MEMORANDUM



April 15, 2022

Via: Email

Mr. Frederick Newberry
Heavenly Mountain Resort
P.O. Box 2180
Stateline, Nevada 89449

Re: Water Year 2021 Daggett Creek Flow Monitoring

Dear Mr. Newberry:

Resource Concepts, Inc. (RCI) has assisted with monitoring flows on the South Fork of Daggett Creek, downstream of East Peak Lake since 2004. The Daggett Creek stream gauge has been used to support compliance monitoring for Heavenly's water rights since it was installed. Graphs generated from the data collected at the stream gauge help demonstrate that flows in Daggett Creek are maintained without impacting downstream water rights. This letter updates the preliminary report date March 31, 2021.

Field visits and maintenance activities during WY2021 included the recovery of information from the data logger in Daggett Creek, correspondence with the data logger manufacturer and troubleshooting the shuttle, installation of new probes at the stream gauge site, and periodic in-stream manual flow measurements.

Data from October 1, 2020, through May 19, 2021, was successfully recorded and retrieved. Data from May 19 through August 3 was corrupted due to failure of the "shuttle", which is the device used to transfer information from the in-situ probes to a computer. RCI attempted to retrieve the data in June, recognized the files were corrupt, worked with the manufacturer to troubleshoot the equipment and identify the problem, and then installed a replacement shuttle.

Also, the probes installed in 2017 were about four years old and would shortly need a battery replacement. To replace the battery, the probes need to be removed from the field and sent into the manufacturer, where it takes about six months to complete the process and have them returned. Therefore, a second set of probes was purchased, installed, and launched in the field on October 1. The original set will be sent in for battery replacement. Due to the shuttle malfunctioning, partial data is missing in WY2021 from May 19 to August 3. After replacing the new shuttle, we anticipate the issue has been resolved.

The attached figure illustrates flow estimated for the data gathered at Heavenly's Daggett Creek gauge for WY2021. However, The observed and measured flows in fall 2020 and summer/fall 2021 were typically low (0.05 to 0.2cfs). The attached graph shows an unlikely increase in flow in October 2020 and September 2021 when compared to prior data, precipitation records, and observed creek flows. We believe this is being caused by pine needles and thick vegetation that appear to catch in the channel and block the creek

CARSON CITY

340 North Minnesota St.
Carson City, NV 89703-4152
(775) 883-1600 • fax: (775) 883-1656

**Engineering • Surveying • Water Rights
Resources & Environmental Services**

www.rci-nv.com

LAKE TAHOE

276 Kingsbury Grade, Ste. 206, Stateline, NV
PO Box 11796, Zephyr Cove, NV 89448-3796
(775) 588-7500 • fax: (775) 589-6333

Mr. Frederick Newberry

April 15, 2022

Page 2

just below probe. This creates ponding and increases the depth measured by the probe, though the flow remains low.

RCI will continue to maintain the site and dataloggers to help improve flow measurement accuracy. We anticipate that the new shuttle and probes will allow the information to be more easily recorded and retrieved from the datalogger. In 2022, we will continue to investigate how physical site conditions may be seasonally skewing the data.

Please feel free to contact me with any comments or questions.

Sincerely,



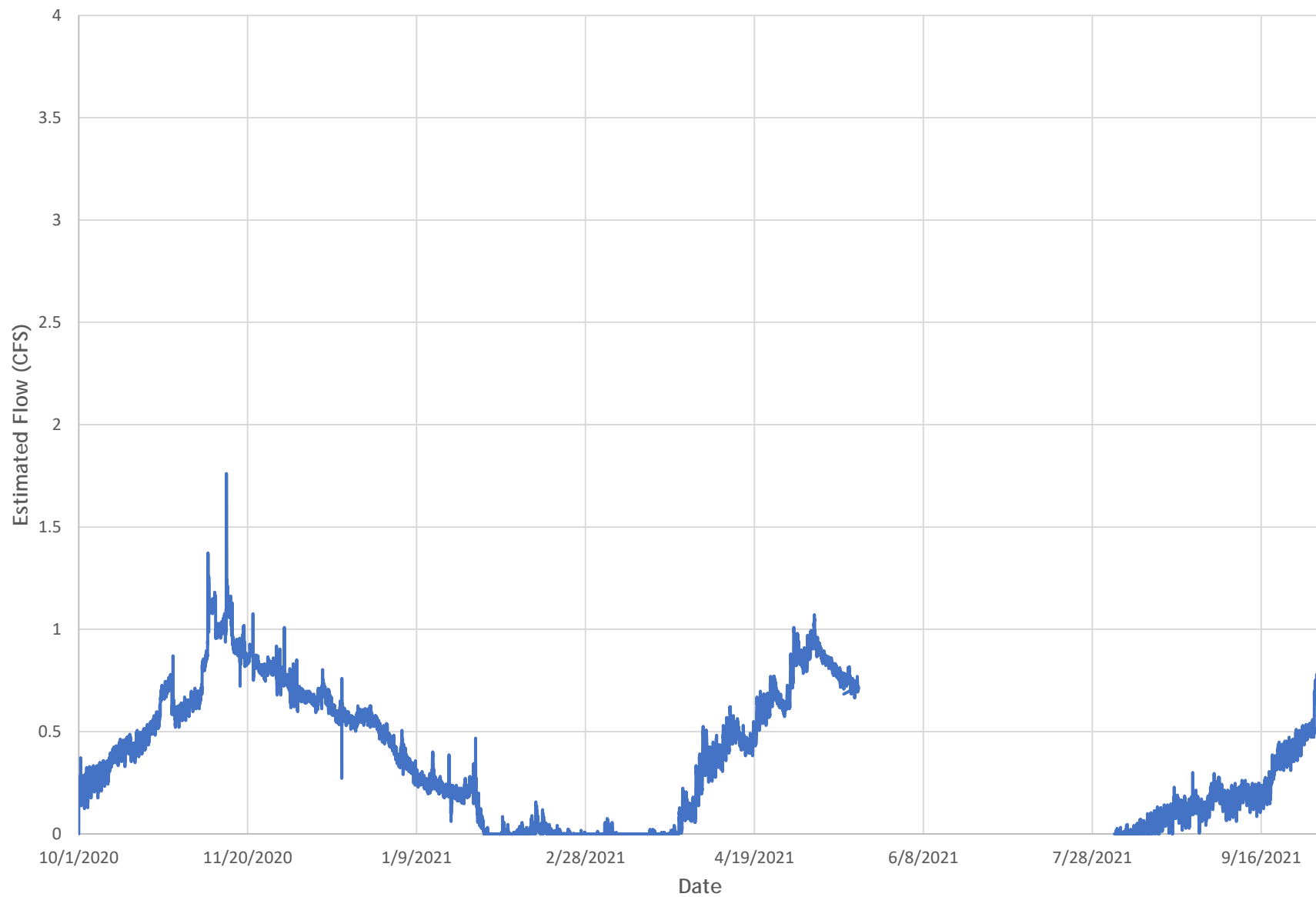
Jill Sutherland, P.E.
Project Manager

JLS/ca

Attachment

cc: Blair Davidson, Heavenly Mountain Resort

Daggett Creek Estimated Flow Water Year 2021



Heavenly Mountain Resort
Mitigation and Monitoring Plan Annual Report
(October 2020 – September 2021)

APPENDIX

VII

2022 WATERSHED MAINTENANCE
RESTORATION PROGRAM (WMRP)
PROPOSED ANNUAL WORK LIST

HEAVENLY MOUNTAIN RESORT –2022 ANNUAL SUMMER WORK LIST

#	Source**	Location	Treatment	Status
Watershed: CA-1 Heavenly Valley Creek				
1	M	Upper Shop	Maintain existing water bars, ditches, drop inlets and culverts.	Complete spring/summer and after storm events
2	M	Powderbowl/Groove Chair Base	Maintain rock-lined ditches at base of Groove Lift and sediment basin at base of Powderbowl Lift.	Complete spring/summer and after storm events
3	M	Maggie's Sediment Basins	Maintain and clean out sediment in Maggie's road shoulder sediment basins.	Complete spring/summer and after storm events
4	M	Hellwinkel's Sediment Basins	Maintain and clean out sediment in Hellwinkel's road shoulder sediment basins.	Complete spring/summer and after storm events
5	P	NV Energy	Third party project by NV Energy Project – Vault/power line installation and stabilization – NV Energy SWPPP	3rd Year, Multi Year Phased Project
6	RM	NV Energy	Hazard tree removal – CERP BMPs*	Multi Year Phased Project
7	RM	Top of Sky Lift	Remove wooden deck – CERP BMPs*	2022 Project
8	RM	Base of Tamarack Lift	Electronic sign installation – CERP BMPs*	2022 Project
Watershed: CA-6 Bijou Creek				
9	P	Lakeview Lodge / Top of Tram	Deck replacement / concrete platform – CERP BMPs*	2022 Project
10	P	Lower Shop California Base	Shop removal – TRPA and CERP BMPs*	2022/2023 Project
Watershed: CA-7 Unnamed Creek - Gondola				
		NONE		
Watershed: NV-1 Mott Canyon Creek				
11	M	Galaxy Road Sediment Basins	Maintain and clean out sediment in Galaxy road shoulder sediment basins.	Complete spring/summer and after storm events
12	RM	Liberty Energy	Powerline near top of Dipper Lift – CERP BMPs*	2022 Project

*Source Codes	
M	BMP Maintenance
P	Master Plan Implementation Project
RM	Resort Maintenance Project
EH-CA	Erosion Hotspot Inventory California
EH-NV	Erosion Hotspot Inventory Nevada

#	Source**	Location	Treatment	Status
13	EH-NV	Orion's at Skyline Trail	Access road drainage, water bar, and erosion control BMPs, pending coordination on Tahoe Draba location.	2022 Project
Watershed: NV-3 Edgewood Creek				
5 cont.	P	NV Energy	Third party project by NV Energy Project – Vault/power line installation and stabilization - SWPPP	3rd Year, Multi Year Phased Project
14	P	Northbowl Lift Replacement	Lift removal and replacement with temporary and permanent erosion control - SWPPP	2022/2023 Project
6 cont.	RM	NV Energy	Hazard tree removal – CERP BMPs*	Multi Year Phased Project
15	EH-NV	Upper Olympic 1	Ski trail / water bar stabilization and erosion reduction	2022 Project
16	EH-NV	Upper Olympic 2	Ski trail / water bar stabilization and erosion reduction	2022 Project
17	EH-NV	Summer Access below Boulder Parking Lot	Access road drainage, water bar, and sediment control BMPs, pending coordination with utilities.	2022 Project
Watershed: NV-2 + 5 Daggett Creek				
5 cont.	P	NV Energy	Third party project by NV Energy Project – Vault/power line installation and stabilization - SWPPP	3rd Year, Multi Year Phased Project
11 cont.	M	Galaxy Road Sediment Basins	Maintain and clean out sediment in Galaxy road shoulder sediment basins.	Complete spring/summer and after storm events
6 cont.	RM	NV Energy	Hazard tree removal - CERP BMPs*	Multi Year Phased Project

RESORT-WIDE ANNUAL MAINTENANCE

Installation of rope fencing along roadways and along sensitive areas.	Water quality inspections
Snowmaking systems maintenance: pipe, electrical and hydrant repairs.	Repair and replace signage damaged by storm events
Inspect and maintain roads, apply road base as needed after inspections.	Remove marked hazardous trees.
Building /structure maintenance (lodges, signs, water tanks, restrooms).	Ski lift maintenance at towers and terminals

****CERP BMPs - Heavenly Mountain Resort "Construction Erosion Reduction Program" Best Management Practices***

*Source Codes	
M	BMP Maintenance
P	Master Plan Implementation Project
RM	Resort Maintenance Project
EH-CA	Erosion Hotspot Inventory California
EH-NV	Erosion Hotspot Inventory Nevada

Heavenly Mountain Resort
Mitigation and Monitoring Plan Annual Report
(October 2020 – September 2021)

APPENDIX

VIII

2021 BIOLOGICAL SURVEY RESULTS



SIERRA ECOTONE SOLUTIONS

530.416.2440 • PO Box 1297 Zephyr Cove, NV 89448 • SierraEcotoneSolutions.com

9 December 2021

Mr. Fredrick Newberry
Heavenly Mountain Resort
P.O. Box 2180
Stateline, NV 89449

SUBJECT: HEAVENLY MOUNTAIN RESORT 2021 BIOLOGICAL SURVEY RESULTS SUMMARY

Dear Mr. Newberry,

In order to comply with US Forest Service LTBMU requirements and to allow for preparation of environmental documentation for future construction and implementation of projects, Sierra Ecotone Solutions LLC has performed wildlife surveys in suitable habitat within the Special Use Permit Boundary in 2021. Surveys for both northern goshawk and California spotted owl were completed to protocol. The fourth year of the migratory bird habitat utilization surveys were performed and will continue for one more year. Upon completion of the remaining one year of data collection, a summary report and analysis will be prepared. Additional surveys were performed for nesting bird species in the areas surrounding 2021 projects (Top of Gondola Activities). A summary of each species surveys is provided below:

Tahoe Draba

Surveys for Tahoe draba were performed in the vicinity of the J-lift alignment and Northbowl Lift replacement projects.

California Spotted Owl

Methods: Surveys were conducted and completed in potentially suitable habitat within and surrounding the project area. Surveys were conducted according to the United States Forest Service "Protocol for Surveying for Spotted Owls in Proposed Management Activity Areas and Habitat Conservation Areas" (March 12, 1991, Revised February 1993). The survey points used since the 2007 field season were utilized again in 2021 to provide continuity of data collected. Data sheets for 2021 surveys are attached to this letter.

Results: No auditory or visual detections of California spotted owls were documented within the survey area during 2021.

Northern Goshawk

Methods: Surveys were conducted and completed in suitable habitat within and adjacent to the project area for northern goshawk based on the updated habitat map generated by the US Forest Service for the environmental analysis of the Master Plan Amendment. In 2021, both dawn acoustical and broadcast survey methods were utilized and were completed to protocol. All surveys were conducted according to "Survey Methodology for Northern Goshawks in the Pacific Southwest

Region, U.S. Forest Service” (14 May 2002). Data sheets for 2021 dawn acoustical and broadcast surveys are submitted with this letter.

Results: No auditory or visual detections of northern goshawk were documented within the survey area in 2021.

The completion of the 2021 field surveys for northern goshawk and California spotted owl results in meeting the two-year protocol for these species. Based on Appendix A of the California spotted owl survey protocol, since no detections were documented, and the two-year protocol was met, “the negative results may be considered accurate for two additional years without conducting additional surveys.” The two-year timeline starts on the last day of the last survey, which would be 18 June 2021. Therefore, if implementation of projects would commence prior to 18 June 2023, no further surveys for California spotted owl would be necessary. However, if construction does not commence prior to this date, two-year protocol surveys must be conducted. The northern goshawk protocol does not include any discussion as to validity of surveys for any duration of time after protocol has been met. Since northern goshawks have been detected in previous years, it is recommended surveys for northern goshawks are continued to determine if goshawks are nesting within the special use permit boundary.

If you should have any questions regarding the surveys performed for the 2021 season, please do not hesitate to contact me at (530) 416-2440.

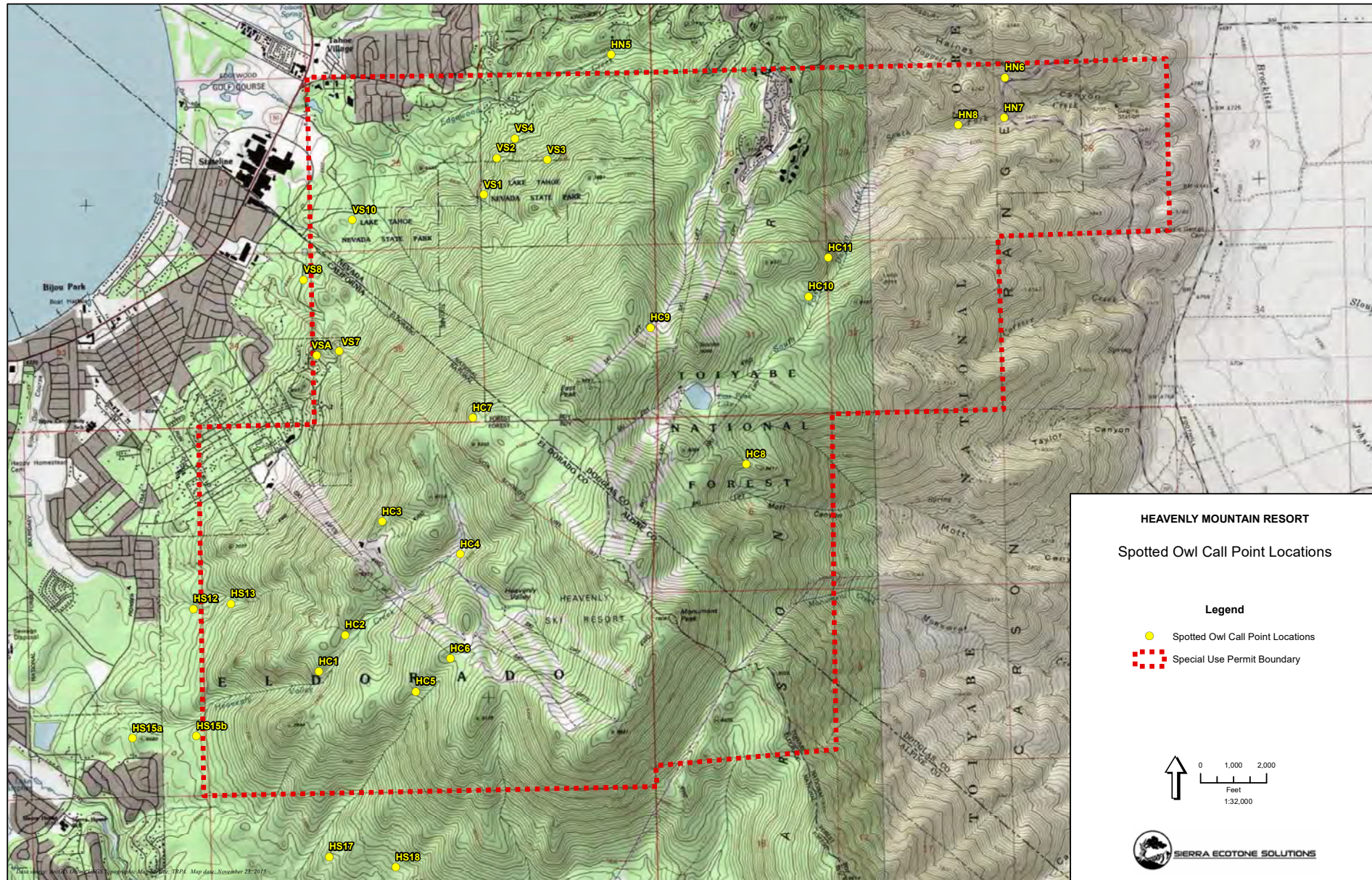
Regards,

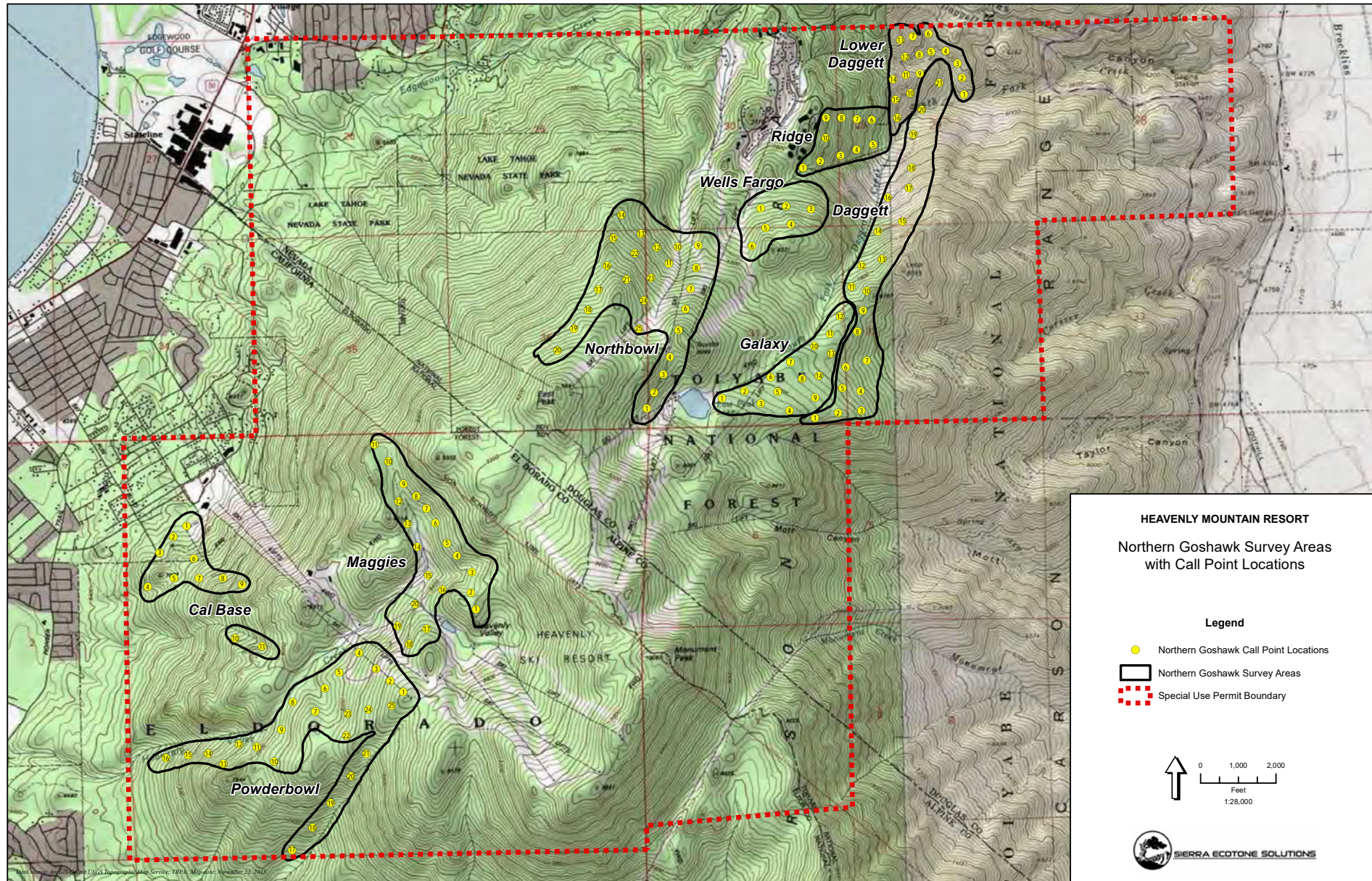
A handwritten signature in black ink, appearing to read 'Garth Alling', on a light-colored background.

Garth Alling
Principal Biologist

Enclosures

CC: Shay Zanetti, USFS LTBMU
Chris Donley, Cardno
Blair Davidson, Heavenly





California Spotted Owl Visit Form-USFS-Lake Tahoe Basin Management Unit

Route Name/Territory: HEAVENLY SOUTH Visit# 1 Outing# 1 Date: 8 APR 2021

Observers (and affiliation): G. ALLING

Survey Type (broadcast BC, nest check NC, incidental IN, follow up FO): SC Sunset/Sunrise: 1931 / 0629

Weather: Sky Cover: start 10% end 10% Temp: start 43 °F end 37 °F Beaufort Wind Speed: start 1 end 1

SURVEY INFORMATION: Start Time 1931 End Time 0031

Summary of Survey Results and Comments:

♂ GHO @ HS156

CS #	Start/Finish	Detection Type	Dir.	Dis.(m)	NAD 83 zone 10 UTM's		Comments
					Easting	Northing	
HS18	1931-1941						NO RESPONSE
HS17	1955-2005						↓
HS156	2041-2046						♂ GHO @ 35° ± 200m
HS15a	2057-2107						NR
HS13	2142-2152						↓
HS12	2204-2214						
VS7	2250-2300						
VS A	2317-2317						
VS8	2353-0003						
VS10	0021-0031						↓ COYOTE

Detection Type: A= aural (indicate type of call); V= visual (sex/age if possible); N= nest; PP= plucking post; F= feather; R= roost

Map: Attach map and denote all call points (use O) and detections (use Δ)

*do not survey in wind conditions >4 Beaufort

U.S. Weather Bureau Code	Indicator of sky cover
0	Clear or Few Clouds (0%-33%)
1	Partly Cloudy or Variable Sky (34%-66%)
2	Cloudy or Overcast (67%-100%)
3	Blowing Sand, Dust or Snow
4	Fog or Smoke
5	Drizzle
6	Showers
7	Rain
8	Thunderstorm
9	Snow or Sleet
Specify in comments	Other

Beaufort #	Wind Speed (mph)	WMO Classification	Indicator of wind speed
0	0	Calm	Smoke rises vertically
1	1-3	Light Air	Smoke drift indicates wind direction, still wind vane
2	4-7	Light Breeze	Wind felt on face, leaves rustle, vanes begin to move
3	8-12	Gentle Breeze	Leaves/small twigs constantly moving, light flags extended
4*	13-17	Moderate Breeze	Dust/leaves/loose paper lifted, small tree branches move
5	18-24	Fresh Breeze	Small trees in leaf begin to sway
6	25-30	Strong Breeze	Larger tree branches moving, whistling in wires
7	31-38	Near Gale	Whole trees moving, resistance felt walking against wind

California Spotted Owl Visit Form-USFS-Lake Tahoe Basin Management Unit

Route Name/Territory: HEAVENLY NORTH Visit# 1 Outing# 1 Date: 9 Apr 2021

Observers (and affiliation): G. ACCING

Survey Type (broadcast BC, nest check NC, incidental IN, follow up FO): SC Sunset/Sunrise: 1932 / 0628

Weather: Sky Cover: start 0 end 0 Temp: start 45 °F end 32 °F Beaufort Wind Speed: start 1 end 2

SURVEY INFORMATION: Start Time 1932 End Time 2324

Summary of Survey Results and Comments:

NO RESPONSE

CS #	Start/Finish	Detection Type	Dir.	Dis.(m)	NAD 83 zone 10 UTM's		Comments
					Easting	Northing	
VS 1	1932-1947						NR
VS 2	1959-2009						
VS 4	2022-2032						
VS 3	2051-2101						
HN 5	2134-2144						
HN 6	2211-2221						
HN 8	2250-2300						
HN 7	2314-2324						

Detection Type: A= aural (indicate type of call); V= visual (sex/age if possible); N= nest; PP= plucking post; F= feather; R= roost

Map: Attach map and denote all call points (use O) and detections (use Δ)

*do not survey in wind conditions >4 Beaufort

U.S. Weather Bureau Code	Indicator of sky cover
0	Clear or Few Clouds (0%-33%)
1	Partly Cloudy or Variable Sky (34%-66%)
2	Cloudy or Overcast (67%-100%)
3	Blowing Sand, Dust or Snow
4	Fog or Smoke
5	Drizzle
6	Showers
7	Rain
8	Thunderstorm
9	Snow or Sleet
Specify in comments	Other

Beaufort #	Wind Speed (mph)	WMO Classification	Indicator of wind speed
0	0	Calm	Smoke rises vertically
1	1-3	Light Air	Smoke drift indicates wind direction, still wind vane
2	4-7	Light Breeze	Wind felt on face, leaves rustle, vanes begin to move
3	8-12	Gentle Breeze	Leaves/small twigs constantly moving, light flags extended
4*	13-17	Moderate Breeze	Dust/leaves/loose paper lifted, small tree branches move
5	18-24	Fresh Breeze	Small trees in leaf begin to sway
6	25-30	Strong Breeze	Larger tree branches moving, whistling in wires
7	31-38	Near Gale	Whole trees moving, resistance felt walking against wind

California Spotted Owl Visit Form-USFS-Lake Tahoe Basin Management Unit

Route Name/Territory: (H) CORO Visit# 1 Outing# 1 Date: 29 APR 2021

Observers (and affiliation): G. ALLING

Survey Type (broadcast BC, nest check NC, incidental IN, follow up FO): SC Sunset/Sunrise: 1952 / 0600

Weather: Sky Cover: start 10% end 0% Temp: start 55 °F end 43 °F Beaufort Wind Speed: start 2 end 1

SURVEY INFORMATION: Start Time 1952 End Time 0137

Summary of Survey Results and Comments:

NO RESPONSE

CS #	Start/Finish	Detection Type	Dir.	Dis.(m)	NAD 83 zone 10 UTMs		Comments
					Easting	Northing	
Hc 1	1952-2002						NO STOC RESPONSE ↓
Hc 2	2020-2030						
Hc 3	2041-2051						
Hc 4	2059-2109						
Hc 6	2121-2131						
Hc 5	2149-2159						
Hc 7	2238-2248						
Hc 9	2330-2340						
Hc 8	0011-0021						
Hc 11	0101-0111						
Hc 10	0127-0137						

Detection Type: A= aural (indicate type of call); V= visual (sex/age if possible); N= nest; PP= plucking post; F= feather; R= roost

Map: Attach map and denote all call points (use O) and detections (use Δ)

*do not survey in wind conditions >4 Beaufort

U.S. Weather Bureau Code	Indicator of sky cover	Beaufort #	Wind Speed (mph)	WMO Classification	Indicator of wind speed
0	Clear or Few Clouds (0%-33%)	0	0	Calm	Smoke rises vertically
1	Partly Cloudy or Variable Sky (34%-66%)	1	1-3	Light Air	Smoke drift indicates wind direction, still wind vane
2	Cloudy or Overcast (67%-100%)	2	4-7	Light Breeze	Wind felt on face, leaves rustle, vanes begin to move
3	Blowing Sand, Dust or Snow	3	8-12	Gentle Breeze	Leaves/small twigs constantly moving, light flags extended
4	Fog or Smoke	4*	13-17	Moderate Breeze	Dust/leaves/loose paper lifted, small tree branches move
5	Drizzle	5	18-24	Fresh Breeze	Small trees in leaf begin to sway
6	Showers	6	25-30	Strong Breeze	Larger tree branches moving, whistling in wires
7	Rain	7	31-38	Near Gale	Whole trees moving, resistance felt walking against wind
Specify in comments	Other				

California Spotted Owl Visit Form-USFS-Lake Tahoe Basin Management Unit

Route Name/Territory: (H) SOUTH Visit# 2 Outing# 1 Date: 13 MAY 2002

Observers (and affiliation): G. ALLING (SOS)

Survey Type (broadcast BC, nest check NC, incidental IN, follow up FO): SC Sunset/Sunrise: 2005 10546

Weather: Sky Cover: start 0 end 0 Temp: start 61 °F end 43 °F Beaufort Wind Speed: start 2 end 2

SURVEY INFORMATION: Start Time 2005 End Time 0113

Summary of Survey Results and Comments:

NO RESPONSE

CS #	Start/Finish	Detection Type	Dir.	Dis.(m)	NAD 83 zone 10 UTM's		Comments
					Easting	Northing	
VS 98	2005-2015						NR
VS 10	2027-2037						
VS 7	2102-2112						
VS A	2117-2127						
HS 12	2206-2216						
HS 13	2231-2241						
HS 15a	2317-2327						
HS 15b	2336-2346						
HS 18	0040-0050						
HS 17	0103-0113						

Detection Type: A= aural (indicate type of call); V= visual (sex/age if possible); N= nest; PP= plucking post; F= feather; R= roost

Map: Attach map and denote all call points (use O) and detections (use Δ)

*do not survey in wind conditions >4 Beaufort

U.S. Weather Bureau Code	Indicator of sky cover
0	Clear or Few Clouds (0%-33%)
1	Partly Cloudy or Variable Sky (34%-66%)
2	Cloudy or Overcast (67%-100%)
3	Blowing Sand, Dust or Snow
4	Fog or Smoke
5	Drizzle
6	Showers
7	Rain
8	Thunderstorm
9	Snow or Sleet
Specify in comments	Other

Beaufort #	Wind Speed (mph)	WMO Classification	Indicator of wind speed
0	0	Calm	Smoke rises vertically
1	1-3	Light Air	Smoke drift indicates wind direction, still wind vane
2	4-7	Light Breeze	Wind felt on face, leaves rustle, vanes begin to move
3	8-12	Gentle Breeze	Leaves/small twigs constantly moving, light flags extended
4*	13-17	Moderate Breeze	Dust/leaves/loose paper lifted, small tree branches move
5	18-24	Fresh Breeze	Small trees in leaf begin to sway
6	25-30	Strong Breeze	Larger tree branches moving, whistling in wires
7	31-38	Near Gale	Whole trees moving, resistance felt walking against wind

California Spotted Owl Visit Form-USFS-Lake Tahoe Basin Management Unit

Route Name/Territory: (A) NORTH Visit# 2 Outing# 1 Date: 14 MAY 2021

Observers (and affiliation): G ALLEN (SOS)

Survey Type (broadcast BC, nest check NC, incidental IN, follow up FO): SC Sunset/Sunrise: 2006 / 0545

Weather: Sky Cover: start 0 end 0 Temp: start 62 °F end 43 °F Beaufort Wind Speed: start 2 end 3

SURVEY INFORMATION: Start Time 2006 End Time 2344

Summary of Survey Results and Comments:

NO SPOT RESPONSE

CS #	Start/Finish	Detection Type	Dir.	Dis.(m)	NAD 83 zone 10 UTM's		Comments
					Easting	Northing	
VS 3	2006-2016						NR
VS 4	2028-2038						
VS 2	2050-2100						
VS 1	2109-2119						
HN 5	2202-2212						
HN 8	2301-2311	SAW-WHIST ADD					SAW-WHIST @ 100m 290°
HN 7	2318-2328						NR
HN 6	2334-2344						

Detection Type: A= aural (indicate type of call); V= visual (sex/age if possible); N= nest; PP= plucking post; F= feather; R= roost

Map: Attach map and denote all call points (use O) and detections (use Δ)

*do not survey in wind conditions >4 Beaufort

U.S. Weather Bureau Code	Indicator of sky cover
0	Clear or Few Clouds (0%-33%)
1	Partly Cloudy or Variable Sky (34%-66%)
2	Cloudy or Overcast (67%-100%)
3	Blowing Sand, Dust or Snow
4	Fog or Smoke
5	Drizzle
6	Showers
7	Rain
8	Thunderstorm
9	Snow or Sleet
Specify in comments	Other

Beaufort #	Wind Speed (mph)	WMO Classification	Indicator of wind speed
0	0	Calm	Smoke rises vertically
1	1-3	Light Air	Smoke drift indicates wind direction, still wind vane
2	4-7	Light Breeze	Wind felt on face, leaves rustle, vanes begin to move
3	8-12	Gentle Breeze	Leaves/small twigs constantly moving, light flags extended
4*	13-17	Moderate Breeze	Dust/leaves/loose paper lifted, small tree branches move
5	18-24	Fresh Breeze	Small trees in leaf begin to sway
6	25-30	Strong Breeze	Larger tree branches moving, whistling in wires
7	31-38	Near Gale	Whole trees moving, resistance felt walking against wind

California Spotted Owl Visit Form-USFS-Lake Tahoe Basin Management Unit

Route Name/Territory: (A) CORO Visit# 2 Outing# 1 Date: 12 MAY 2009

Observers (and affiliation): G. ALLING

Survey Type (broadcast BC, nest check NC, incidental IN, follow up FO): SC Sunset/Sunrise: 2009 10542

Weather: Sky Cover: start 30% end 10% Temp: start 54 °F end 37 °F Beaufort Wind Speed: start 2 end 2

SURVEY INFORMATION: Start Time 2009 End Time 0130

Summary of Survey Results and Comments:

NO STOE RESPONSE

CS #	Start/Finish	Detection Type	Dir.	Dis.(m)	NAD 83 zone 10 UTM's		Comments
					Easting	Northing	
HC1	2009-2019						<u>NO RESPONSE</u>
HC2	2031-2041						
HC3	2058-2108						
HC4	2120-2130						
HC6	2143-2153						
HC5	2207-2217						
HC7	2256-2306						
HC9	2331-2341						
HC8	0004-0014						
HC10	0051-0101						
HC11	0120-0130						

Detection Type: A= aural (indicate type of call); V= visual (sex/age if possible); N= nest; PP= plucking post; F= feather; R= roost

Map: Attach map and denote all call points (use O) and detections (use Δ)

*do not survey in wind conditions >4 Beaufort

U.S. Weather Bureau Code	Indicator of sky cover
0	Clear or Few Clouds (0%-33%)
1	Partly Cloudy or Variable Sky (34%-66%)
2	Cloudy or Overcast (67%-100%)
3	Blowing Sand, Dust or Snow
4	Fog or Smoke
5	Drizzle
6	Showers
7	Rain
8	Thunderstorm
9	Snow or Sleet
Specify in comments	Other

Beaufort #	Wind Speed (mph)	WMO Classification	Indicator of wind speed
0	0	Calm	Smoke rises vertically
1	1-3	Light Air	Smoke drift indicates wind direction, still wind vane
2	4-7	Light Breeze	Wind felt on face, leaves rustle, vanes begin to move
3	8-12	Gentle Breeze	Leaves/small twigs constantly moving, light flags extended
4*	13-17	Moderate Breeze	Dust/leaves/loose paper lifted, small tree branches move
5	18-24	Fresh Breeze	Small trees in leaf begin to sway
6	25-30	Strong Breeze	Larger tree branches moving, whistling in wires
7	31-38	Near Gale	Whole trees moving, resistance felt walking against wind

California Spotted Owl Visit Form-USFS-Lake Tahoe Basin Management Unit

Route Name/Territory: (H) SAWMA Visit# 3 Outing# 1 Date: 23 MAY 2021

Observers (and affiliation): G ALLING

Survey Type (broadcast BC, nest check NC, incidental IN, follow up FO): SC Sunset/Sunrise: 2014 10538

Weather: Sky Cover: start 20% end 10% Temp: start 47 °F end 35 °F Beaufort Wind Speed: start 2 end 2

SURVEY INFORMATION: Start Time 2014 End Time 0134

Summary of Survey Results and Comments:

NO STOC RESPONSE

CS #	Start/Finish	Detection Type	Dir.	Dis.(m)	NAD 83 zone 10 UTM's		Comments
					Easting	Northing	
HS18	2014-2024						NO STOC
HS17	2035-2045						
HS16b	2131-2141						
HS16a	2152-2202						
HS13	2234-2344						
HS12	2358-0008						
USA	0021-0031						
VS7	0034-0044						
VS10	0106-0116						
VS8	0124-0134						

Detection Type: A= aural (indicate type of call); V= visual (sex/age if possible); N= nest; PP= plucking post; F= feather; R= roost

Map: Attach map and denote all call points (use O) and detections (use Δ)

*do not survey in wind conditions >4 Beaufort

U.S. Weather Bureau Code	Indicator of sky cover
0	Clear or Few Clouds (0%-33%)
1	Partly Cloudy or Variable Sky (34%-66%)
2	Cloudy or Overcast (67%-100%)
3	Blowing Sand, Dust or Snow
4	Fog or Smoke
5	Drizzle
6	Showers
7	Rain
8	Thunderstorm
9	Snow or Sleet
Specify in comments	Other

Beaufort #	Wind Speed (mph)	WMO Classification	Indicator of wind speed
0	0	Calm	Smoke rises vertically
1	1-3	Light Air	Smoke drift indicates wind direction, still wind vane
2	4-7	Light Breeze	Wind felt on face, leaves rustle, vanes begin to move
3	8-12	Gentle Breeze	Leaves/small twigs constantly moving, light flags extended
4*	13-17	Moderate Breeze	Dust/leaves/loose paper lifted, small tree branches move
5	18-24	Fresh Breeze	Small trees in leaf begin to sway
6	25-30	Strong Breeze	Larger tree branches moving, whistling in wires
7	31-38	Near Gale	Whole trees moving, resistance felt walking against wind

California Spotted Owl Visit Form-USFS-Lake Tahoe Basin Management Unit

Route Name/Territory: (H) CORO Visit# 3 Outing# 1 Date: 17 JUN 2024

Observers (and affiliation): G. Bunn

Survey Type (broadcast BC, nest check NC, incidental IN, follow up FO): SC Sunset/Sunrise: 2029 1 0532

Weather: Sky Cover: start ARE end 0 Temp: start 65 °F end 49 °F Beaufort Wind Speed: start 1 end 1

SURVEY INFORMATION: Start Time 2029 End Time 0208

Summary of Survey Results and Comments:

NO STOR RESPONSE

CS #	Start/Finish	Detection Type	Dir.	Dis.(m)	NAD 83 zone 10 UTM's		Comments
					Easting	Northing	
Hc1	2029-2039						NR
Hc2	2051-2101						
Hc3	2113-2123						
Hc4	2133-2143						
Hc5	2210-2220						
Hc6	2231-2241						
Hc7	2337-2347						
Hc9	0022-0032						
Hc8	0050-0100						
Hc11	0136-0146						
Hc10	0158-0208						

Detection Type: A= aural (indicate type of call); V= visual (sex/age if possible); N= nest; PP= plucking post; F= feather; R= roost

Map: Attach map and denote all call points (use O) and detections (use Δ)

*do not survey in wind conditions >4 Beaufort

U.S. Weather Bureau Code	Indicator of sky cover
0	Clear or Few Clouds (0%-33%)
1	Partly Cloudy or Variable Sky (34%-66%)
2	Cloudy or Overcast (67%-100%)
3	Blowing Sand, Dust or Snow
4	Fog or Smoke
5	Drizzle
6	Showers
7	Rain
8	Thunderstorm
9	Snow or Sleet
Specify in comments	Other

Beaufort #	Wind Speed (mph)	WMO Classification	Indicator of wind speed
0	0	Calm	Smoke rises vertically
1	1-3	Light Air	Smoke drift indicates wind direction, still wind vane
2	4-7	Light Breeze	Wind felt on face, leaves rustle, vanes begin to move
3	8-12	Gentle Breeze	Leaves/small twigs constantly moving, light flags extended
4*	13-17	Moderate Breeze	Dust/leaves/loose paper lifted, small tree branches move
5	18-24	Fresh Breeze	Small trees in leaf begin to sway
6	25-30	Strong Breeze	Larger tree branches moving, whistling in wires
7	31-38	Near Gale	Whole trees moving, resistance felt walking against wind

California Spotted Owl Visit Form-USFS-Lake Tahoe Basin Management Unit

Route Name/Territory: (A) NORTH Visit# 3 Outing# 1 Date: 18 JUN 2021

Observers (and affiliation): E. Auning

Survey Type (broadcast BC, nest check NC, incidental IN, follow up FO): SC Sunset/Sunrise: 2029 / 0532

Weather: Sky Cover: start HAE end HAE Temp: start 72 °F end 57 °F Beaufort Wind Speed: start 2 end 2

SURVEY INFORMATION: Start Time 0829 End Time 2351

Summary of Survey Results and Comments:

NO STOC REUS PLANTS

CS #	Start/Finish	Detection Type	Dir.	Dis.(m)	NAD 83 zone 10 UTM's		Comments
					Easting	Northing	
VS1	2029-2039						NO RESPONSE
VS2	2050-2100						
VS4	2113-2123						
VS3	2140-2150						
HN5	2217-2227						
HN6	2301-2311						
HN7	2318-2328						
HN8	2341-2351						

Detection Type: A= aural (indicate type of call); V= visual (sex/age if possible); N= nest; PP= plucking post; F= feather; R= roost

Map: Attach map and denote all call points (use O) and detections (use Δ)

*do not survey in wind conditions >4 Beaufort

U.S. Weather Bureau Code	Indicator of sky cover
0	Clear or Few Clouds (0%-33%)
1	Partly Cloudy or Variable Sky (34%-66%)
2	Cloudy or Overcast (67%-100%)
3	Blowing Sand, Dust or Snow
4	Fog or Smoke
5	Drizzle
6	Showers
7	Rain
8	Thunderstorm
9	Snow or Sleet
Specify in comments	Other

Beaufort #	Wind Speed (mph)	WMO Classification	Indicator of wind speed
0	0	Calm	Smoke rises vertically
1	1-3	Light Air	Smoke drift indicates wind direction, still wind vane
2	4-7	Light Breeze	Wind felt on face, leaves rustle, vanes begin to move
3	8-12	Gentle Breeze	Leaves/small twigs constantly moving, light flags extended
4*	13-17	Moderate Breeze	Dust/leaves/loose paper lifted, small tree branches move
5	18-24	Fresh Breeze	Small trees in leaf begin to sway
6	25-30	Strong Breeze	Larger tree branches moving, whistling in wires
7	31-38	Near Gale	Whole trees moving, resistance felt walking against wind

Northern Goshawk Dawn Acoustical Survey- USFS-Lake Tahoe Basin Management Unit

Observer: Debra Scolnick Affiliation: Sierra Floating Solutions Date: 4/2/2021
Additional Observers and affiliation: (each surveyor must complete separate data form)

oute name: DA-4 Visit #: 1
escription of survey station location, and how accessed: Park on Alice Lake Rd + Quartz St. Hike uphill crossing over
Merline Trail. Continue uphill to DA-4 38.91510, -119.94630

Weather: Temp: start 37 °F end 48 °F Beaufort Wind Speed: start 1 end 1 Sky Cover: start 0 end 0

UNRISE: 6:43 START SURVEY: 6:00 END SURVEY: 8:13

Detections: (include time and duration of vocalizations, type of vocalization, direction and distance of vocal or visual detection, [TM coordinates]) No Detections

localization descriptions: Alarm Call- a harsh kak-kak-kak repeated many times; Wail Call- a loud, plaintive, drawn out call.

[illegible]

U.S. Weather Bureau Code	Indicator of sky cover
0	Clear or Few Clouds (0%-33%)
1	Partly Cloudy or Variable Sky (34%-66%)
2	Cloudy or Overcast (67%-100%)
3	Blowing Sand, Dust or Snow
4	Fog or Smoke
5	Drizzle
6	Showers
7	Rain
8	Thunderstorm
9	Snow or Sleet
Specify in comments	Other

Beaufort #	Wind Speed (mph)	WMO Classification	Indicator of wind speed
0	0	Calm	Smoke rises vertically
1	1-3	Light Air	Smoke drift indicates wind direction, still wind vane
2	4-7	Light Breeze	Wind felt on face, leaves rustle, vanes begin to move
3	8-12	Gentle Breeze	Leaves/small twigs constantly moving, light flags extended
4	13-17	Moderate Breeze	Dust/leaves/loose paper lifted, small tree branches move
5	18-24	Fresh Breeze	Small trees in leaf begin to sway
6	25-30	Strong Breeze	Larger tree branches moving, whistling in wires
7	31-38	Near Gale	Whole trees moving, resistance felt walking against wind

Observer: Debra Solonick Affiliation: Sierra Ecosystem Solutions Date: April 9 2021
Additional Observers and affiliation: (each surveyor must complete separate data form)

Description of survey station location, and how accessed:

XA-3 UTM 38,95550, -119,88280

Weather: Temp: start 29 °F end 37 °F Beaufort Wind Speed: start 1 end 0 Sky Cover: start 0 end 0

SUNRISE: 6:33 START SURVEY: 05:48 END SURVEY: 8:03

Detections: (include time and duration of vocalizations, type of vocalization, direction and distance of vocal or visual detection, JTM coordinates) *No Detections*

/ocalization descriptions: Alarm Call- a harsh kak-kak-kak repeated many times; Wail Call- a loud, plaintive, drawn out call.

[illegible]

U.S. Weather Bureau Code	Indicator of sky cover
0	Clear or Few Clouds (0%-33%)
1	Partly Cloudy or Variable Sky (34%-66%)
2	Cloudy or Overcast (67%-100%)
3	Blowing Sand, Dust or Snow
4	Fog or Smoke
5	Drizzle
6	Showers
7	Rain
8	Thunderstorm
9	Snow or Sleet
Specify in comments	Other

Beaufort #	Wind Speed (mph)	WMO Classification	Indicator of wind speed
0	0	Calm	Smoke rises vertically
1	1-3	Light Air	Smoke drift indicates wind direction, still wind vane
2	4-7	Light Breeze	Wind felt on face, leaves rustle, vane begin to move
3	8-12	Gentle Breeze	Leaves/small twigs constantly moving, light flags extended
4	13-17	Moderate Breeze	Dust/leaves/loose paper lifted, small tree branches move
5	18-24	Fresh Breeze	Small trees in leaf begin to sway
6	25-30	Strong Breeze	Larger tree branches moving, whistling in wires
7	31-38	Near Gale	Whole trees moving, resistance felt walking against wind

Observer: Debra Scolnick Affiliation: Sierra Ecotone Solutions Date: 24 March 2021
Additional Observers and affiliation: (each surveyor must complete separate data form)

UNRISE: 6:57 START SURVEY: 6:12 END SURVEY: 8:27

Detections: (include time and duration of vocalizations, type of vocalization, direction and distance of vocal or visual detection, ITM coordinates) NO Detections

ocalization descriptions: Alarm Call- a harsh kak-kak-kak repeated many times; Wail Call- a loud, plaintive, drawn out call.

[illegible]

U.S. Weather Bureau Code	Indicator of sky cover
0	Clear or Few Clouds (0%-33%)
1	Partly Cloudy or Variable Sky (34%-66%)
2	Cloudy or Overcast (67%-100%)
3	Blowing Sand, Dust or Snow
4	Fog or Smoke
5	Drizzle
6	Showers
7	Rain
8	Thunderstorm
9	Snow or Sleet
Specify in comments	Other

Beaufort #	Wind Speed (mph)	WMO Classification	Indicator of wind speed
0	0	Calm	Smoke rises vertically
1	1-3	Light Air	Smoke drift indicates wind direction, still wind vane
2	4-7	Light Breeze	Wind felt on face, leaves rustle, vanes begin to move
3	8-12	Gentle Breeze	Leaves/small twigs constantly moving, light flags extended
4	13-17	Moderate Breeze	Dust/leaves/loose paper lifted, small tree branches move
5	18-24	Fresh Breeze	Small trees in leaf begin to sway
6	25-30	Strong Breeze	Larger tree branches moving, whistling in wires
7	31-38	Near Gale	Whole trees moving, resistance felt walking against wind

server: Debra Solnick Affiliation: Specra Future Solutions Date: March 31 2021
Additional Observers and affiliation: (each surveyor must complete separate data form)

oute name: DA-1 Visit #: 1
 Description of survey station location, and how accessed: Skim up Stegecoach run to Stegecoach return (turn right),
kin over onto NV trail towards Boulder chute. Continue uphill on Boulder chute run until the junction of
J. Bowl + Bohemian Grove. Continue uphill to DA-1 38.953410, -114.846650

Weather: Temp: start 27 °F end 27 °F Beaufort Wind Speed: start 2 end 1 Sky Cover: start 0 end 0

UNRISE: 6:46 START SURVEY: 6:00 END SURVEY: 8:16

Detections: (include time and duration of vocalizations, type of vocalization, direction and distance of vocal or visual detection, ITM coordinates) NO Detections

localization descriptions: Alarm Call- a harsh kak-kak-kak repeated many times; Wail Call- a loud, plaintive, drawn out call.

[illegible]

U.S. Weather Bureau Code	Indicator of sky cover
0	Clear or Few Clouds (0%-33%)
1	Partly Cloudy or Variable Sky (34%-66%)
2	Cloudy or Overcast (67%-100%)
3	Blowing Sand, Dust or Snow
4	Fog or Smoke
5	Drizzle
6	Showers
7	Rain
8	Thunderstorm
9	Snow or Sleet
Specify in comments	Other

Beaufort #	Wind Speed (mph)	WMO Classification	Indicator of wind speed
0	0	Calm	Smoke rises vertically
1	1-3	Light Air	Smoke drift indicates wind direction, still wind vane
2	4-7	Light Breeze	Wind felt on face, leaves rustle, vanes begin to move
3	8-12	Gentle Breeze	Leaves/small twigs constantly moving, light flags extended
4	13-17	Moderate Breeze	Dust/leaves/loose paper lifted, small tree branches move
5	18-24	Fresh Breeze	Small trees in leaf begin to sway
6	25-30	Strong Breeze	Larger tree branches moving, whistling in wires
7	31-38	Near Gale	Whole trees moving, resistance felt walking against wind

Beaufort #	Wind Speed (mph)	WMO Classification	Indicator of wind speed
0	0	Calm	Smoke rises vertically
1	1-3	Light Air	Smoke drift indicates wind direction, still wind vane
2	4-7	Light Breeze	Wind felt on face, leaves rustle, vanes begin to move
3	8-12	Gentle Breeze	Leaves/small twigs constantly moving, light flags extended
4	13-17	Moderate Breeze	Dust/leaves/loose paper lifted, small tree branches move
5	18-24	Fresh Breeze	Small trees in leaf begin to sway
6	25-30	Strong Breeze	Larger tree branches moving, whistling in wires
7	31-38	Near Gale	Whole trees moving, resistance felt walking against wind

Site: (H) NORTHBOW Surveyors: G. J. W. G. Date: 14 JUN 2021

Weather: Temp: start 43 °F end 68 °F Beaufort Wind Speed: start 1 end 1 Sky Cover: start 10% end 0

RESULTS:

NO ACGO DETERMINATIONS

[illegible][illegible]

Map: Attach map and denote all call points (use O) and detections (use Δ)

U.S. Weather Bureau Code	Indicator of sky cover
0	Clear or Few Clouds (0%-33%)
1	Partly Cloudy or Variable Sky (34%-66%)
2	Cloudy or Overcast (67%-100%)
3	Blowing Sand, Dust or Snow
4	Fog or Smoke
5	Drizzle
6	Showers
7	Rain
8	Thunderstorm
9	Snow or Sleet
Specify in comments	Other

Beaufort #	Wind Speed (mph)	WMO Classification	Indicator of wind speed
0	0	Calm	Smoke rises vertically
1	1-3	Light Air	Smoke drift indicates wind direction, still wind vane
2	4-7	Light Breeze	Wind felt on face, leaves rustle, vanes begin to move
3	8-12	Gentle Breeze	Leaves/small twigs constantly moving, light flags extended
4	13-17	Moderate Breeze	Dust/leaves/loose paper lifted, small tree branches move
5	18-24	Fresh Breeze	Small trees in leaf begin to sway
6	25-30	Strong Breeze	Larger tree branches moving, whistling in wires
7	31-38	Near Gale	Whole trees moving, resistance felt walking against wind

Northern Goshawk Broadcast Survey Form- USFS-Lake Tahoe Basin Management Unit

Site: (H) WOLUS FARGO # RIDGE Surveyors: C. ALLEN Date: 15 JUN 2021

Visit #: 1 Outing #: 1 Survey Type (broadcast BC, nest check NC, incidental IN) BC MUST ATTACH A SURVEY MAP

Weather: Temp: start 52 °F end 70 °F Beaufort Wind Speed: start 3 end 2 Sky Cover: start HAR end HAR

SURVEY INFORMATION: Start Time 0507 End Time 1132 Call point and route information on back.
RESULTS: NO DETECTIONS

Detection Number	Time	Detection Type	Bearing	Distance (m)	NAD 83 ZONE 10 UTM's		GPS	Comments
					Easting	Northing		

Detection Number	Comments
	WOLUS FARGO STA 1-6 NR
	RIDGE STA 1-10
	NO DETECTIONS

Detection Type: A= aural (indicate type of call); V= visual (sex/age if possible); N= nest; PP= plucking post; F= feather; R= roost
Map: Attach map and denote all call points (use O) and detections (use Δ)

U.S. Weather Bureau Code	Indicator of sky cover	Beaufort #	Wind Speed (mph)	WMO Classification	Indicator of wind speed
0	Clear or Few Clouds (0%-33%)	0	0	Calm	Smoke rises vertically
1	Partly Cloudy or Variable Sky (34%-66%)	1	1-3	Light Air	Smoke drift indicates wind direction, still wind vane
2	Cloudy or Overcast (67%-100%)	2	4-7	Light Breeze	Wind felt on face, leaves rustle, vanes begin to move
3	Blowing Sand, Dust or Snow	3	8-12	Gentle Breeze	Leaves/small twigs constantly moving, light flags extended
4	Fog or Smoke	4	13-17	Moderate Breeze	Dust/leaves/loose paper lifted, small tree branches move
5	Drizzle	5	18-24	Fresh Breeze	Small trees in leaf begin to sway
6	Showers	6	25-30	Strong Breeze	Larger tree branches moving, whistling in wires
7	Rain	7	31-38	Near Gale	Whole trees moving, resistance felt walking against wind
8	Thunderstorm				
9	Snow or Sleet				
Specify in comments	Other				

Site: GALAXY f LOWR DAGGOTT Surveyors: G. Munn Date: 16 JUN 2021

Weather: Temp: start 38 °F end 83 °F Beaufort Wind Speed: start 2 end 2 Sky Cover: start 0 end HAZ

RESULTS:

NO DISTURBANCES

[illegible][illegible]

Map: Attach map and denote all call points (use O) and detections (use Δ)

U.S. Weather Bureau Code	Indicator of sky cover
0	Clear or Few Clouds (0%-33%)
1	Partly Cloudy or Variable Sky (34%-66%)
2	Cloudy or Overcast (67%-100%)
3	Blowing Sand, Dust or Snow
4	Fog or Smoke
5	Drizzle
6	Showers
7	Rain
8	Thunderstorm
9	Snow or Sleet
Specify in comments	Other

Beaufort #	Wind Speed (mph)	WMO Classification	Indicator of wind speed
0	0	Calm	Smoke rises vertically
1	1-3	Light Air	Smoke drift indicates wind direction, still wind vane
2	4-7	Light Breeze	Wind felt on face, leaves rustle, vanes begin to move
3	8-12	Gentle Breeze	Leaves/small twigs constantly moving, light flags extended
4	13-17	Moderate Breeze	Dust/leaves/loose paper lifted, small tree branches move
5	18-24	Fresh Breeze	Small trees in leaf begin to sway
6	25-30	Strong Breeze	Larger tree branches moving, whistling in wires
7	31-38	Near Gale	Whole trees moving, resistance felt walking against wind

Site: (H) DAGGOTT Surveyors: R. McNally Date: 17 Nov 2021
Visit #: 1 Outing #: 1 Survey Type (broadcast BC, nest check NC, incidental IN) _____ MUST ATTACH A SURVEY MAP
Weather: Temp: start 43 °F end 80 °F Beaufort Wind Speed: start 1 end 2 Sky Cover: start HAZ end HAZ

NO DETOURINGS

[illegible]

Map: Attach map and denote all call points (use O) and detections (use Δ)

Beaufort #	Wind Speed (mph)	WMO Classification	Indicator of wind speed
0	0	Calm	Smoke rises vertically
1	1-3	Light Air	Smoke drift indicates wind direction, still wind vane
2	4-7	Light Breeze	Wind felt on face, leaves rustle, vanes begin to move
3	8-12	Gentle Breeze	Leaves/small twigs constantly moving, light flags extended
4	13-17	Moderate Breeze	Dust/leaves/loose paper lifted, small tree branches move
5	18-24	Fresh Breeze	Small trees in leaf begin to sway
6	25-30	Strong Breeze	Larger tree branches moving, whistling in wires
7	31-38	Near Gale	Whole trees moving, resistance felt walking against wind

Northern Goshawk Broadcast Survey Form- USFS-Lake Tahoe Basin Management Unit

Site: CALIBASO Surveyors: G. AULING Date: 5 JUL 2021

Visit #: 1 Outing #: 1 Survey Type (broadcast BC, nest check NC, incidental IN) BC MUST ATTACH A SURVEY MAP

Weather: Temp: start 49 °F end 69 °F Beaufort Wind Speed: start 2 end 2 Sky Cover: start 0 end 0

SURVEY INFORMATION: Start Time 0535 End Time 0911 Call point and route information on back.

RESULTS:

NO DETECTIONS

Detection Number	Time	Detection Type	Bearing	Distance (m)	NAD 83 ZONE 10 UTM's		GPS	Comments
					Easting	Northing		

Detection Number	Comments
	NO DETECTIONS
	CALIBASO STA 1-11

Detection Type: A= aural (indicate type of call); V= visual (sex/age if possible); N= nest; PP= plucking post; F= feather; R= roost

Map: Attach map and denote all call points (use O) and detections (use Δ)

U.S. Weather Bureau Code	Indicator of sky cover
0	Clear or Few Clouds (0%-33%)
1	Partly Cloudy or Variable Sky (34%-66%)
2	Cloudy or Overcast (67%-100%)
3	Blowing Sand, Dust or Snow
4	Fog or Smoke
5	Drizzle
6	Showers
7	Rain
8	Thunderstorm
9	Snow or Sleet
Specify in comments	Other

Beaufort #	Wind Speed (mph)	WMO Classification	Indicator of wind speed
0	0	Calm	Smoke rises vertically
1	1-3	Light Air	Smoke drift indicates wind direction, still wind vane
2	4-7	Light Breeze	Wind felt on face, leaves rustle, vanes begin to move
3	8-12	Gentle Breeze	Leaves/small twigs constantly moving, light flags extended
4	13-17	Moderate Breeze	Dust/leaves/loose paper lifted, small tree branches move
5	18-24	Fresh Breeze	Small trees in leaf begin to sway
6	25-30	Strong Breeze	Larger tree branches moving, whistling in wires
7	31-38	Near Gale	Whole trees moving, resistance felt walking against wind

Site: A Powder Bowls Surveyors: G. ALING Date: 6 JUL 2021

Weather: Temp: start 45 °F end 77 °F Beaufort Wind Speed: start 2 end 2 Sky Cover: start 10% end 0

RESULTS:

NO ACGF DISTORTIONS

[illegible][illegible]

Map: Attach map and denote all call points (use O) and detections (use Δ)

U.S. Weather Bureau Code	Indicator of sky cover
0	Clear or Few Clouds (0%-33%)
1	Partly Cloudy or Variable Sky (34%-66%)
2	Cloudy or Overcast (67%-100%)
3	Blowing Sand, Dust or Snow
4	Fog or Smoke
5	Drizzle
6	Showers
7	Rain
8	Thunderstorm
9	Snow or Sleet
Specify in comments	Other

Beaufort #	Wind Speed (mph)	WMO Classification	Indicator of wind speed
0	0	Calm	Smoke rises vertically
1	1-3	Light Air	Smoke drift indicates wind direction, still wind vane
2	4-7	Light Breeze	Wind felt on face, leaves rustle, vanes begin to move
3	8-12	Gentle Breeze	Leaves/small twigs constantly moving, light flags extended
4	13-17	Moderate Breeze	Dust/leaves/loose paper lifted, small tree branches move
5	18-24	Fresh Breeze	Small trees in leaf begin to sway
6	25-30	Strong Breeze	Larger tree branches moving, whistling in wires
7	31-38	Near Gale	Whole trees moving, resistance felt walking against wind

Site: (H) TAGG/OS Surveyors: G. Adams Date: 7 JUL 2021

Weather: Temp: start 45 °F end 79 °F Beaufort Wind Speed: start 2 end 2 Sky Cover: start 20% end 10%

NO DETECTIONS

[illegible]

Map: Attach map and denote all call points (use O) and detections (use Δ)

Beaufort #	Wind Speed (mph)	WMO Classification	Indicator of wind speed
0	0	Calm	Smoke rises vertically
1	1-3	Light Air	Smoke drift indicates wind direction, still wind vane
2	4-7	Light Breeze	Wind felt on face, leaves rustle, vanes begin to move
3	8-12	Gentle Breeze	Leaves/small twigs constantly moving, light flags extended
4	13-17	Moderate Breeze	Dust/leaves/loose paper lifted, small tree branches move
5	18-24	Fresh Breeze	Small trees in leaf begin to sway
6	25-30	Strong Breeze	Larger tree branches moving, whistling in wires
7	31-38	Near Gale	Whole trees moving, resistance felt walking against wind

Site: 41 NORTH BOW Surveyors: A. ALLING Date: 8 JUL 2021
Visit #: 2 Outing #: 1 Survey Type (broadcast BC, nest check NC, incidental IN) BC MUST ATTACH A SURVEY MAP
Weather: Temp: start 48 °F end 78 °F Beaufort Wind Speed: start 0 end 2 Sky Cover: start 15% end 0

NO DISTORTIONS

[illegible]

U.S. Weather Bureau Code	Indicator of sky cover	Beaufort #	Wind Speed (mph)	WMO Classification	Indicator of wind speed
0	Clear or Few Clouds (0%-33%)	0	0	Calm	Smoke rises vertically
1	Partly Cloudy or Variable Sky (34%-66%)	1	1-3	Light Air	Smoke drift indicates wind direction, still wind vane
2	Cloudy or Overcast (67%-100%)	2	4-7	Light Breeze	Wind felt on face, leaves rustle, vanes begin to move
3	Blowing Sand, Dust or Snow	3	8-12	Gentle Breeze	Leaves/small twigs constantly moving, light flags extended
4	Fog or Smoke	4	13-17	Moderate Breeze	Dust/leaves/loose paper lifted, small tree branches move
5	Drizzle	5	18-24	Fresh Breeze	Small trees in leaf begin to sway
6	Showers	6	25-30	Strong Breeze	Larger tree branches moving, whistling in wires
7	Rain	7	31-38	Near Gale	Whole trees moving, resistance felt walking against wind
8	Thunderstorm				
9	Snow or Sleet				
Specify in comments	Other				

Site: WELLS FARGO / TRINGO Surveyors: G. ALLING Date: 9 JUL 2021

Visit #: 2 Outing #: 1 Survey Type (broadcast BC, nest check NC, incidental IN) BC MUST ATTACH A SURVEY MAP

Weather: Temp: start 50 °F end 72 °F Beaufort Wind Speed: start 1 end 3 Sky Cover: start 10% end 10%

SURVEY INFORMATION: Start Time 0505 End Time 1010 Call point and route information on back.

Ne DENTATIONS

[illegible]

Detection Number	Comments
	NO DETECTIONS
	WF STA 1-6
	RIDGE STA 1-10

Map: Attach map and denote all call points (use O) and detections (use Δ)

U.S. Weather Bureau Code	Indicator of sky cover
0	Clear or Few Clouds (0%-33%)
1	Partly Cloudy or Variable Sky (34%-66%)
2	Cloudy or Overcast (67%-100%)
3	Blowing Sand, Dust or Snow
4	Fog or Smoke
5	Drizzle
6	Showers
7	Rain
8	Thunderstorm
9	Snow or Sleet
Specify in comments	Other

Beaufort #	Wind Speed (mph)	WMO Classification	Indicator of wind speed
0	0	Calm	Smoke rises vertically
1	1-3	Light Air	Smoke drift indicates wind direction, still wind vane
2	4-7	Light Breeze	Wind felt on face, leaves rustle, vanes begin to move
3	8-12	Gentle Breeze	Leaves/small twigs constantly moving, light flags extended
4	13-17	Moderate Breeze	Dust/leaves/loose paper lifted, small tree branches move
5	18-24	Fresh Breeze	Small trees in leaf begin to sway
6	25-30	Strong Breeze	Larger tree branches moving, whistling in wires
7	31-38	Near Gale	Whole trees moving, resistance felt walking against wind

Site: GALAXY / CONNOR OAK GOTT Surveyors: G. ALLING Date: 12 JUL 2023

Visit #: 2 Outing #: 1 Survey Type (broadcast BC, nest check NC, incidental IN) BC MUST ATTACH A SURVEY MAP

Weather: Temp: start 52 °F end 45 °F Beaufort Wind Speed: start 1 end 2 Sky Cover: start 0% end 0%

SURVEY INFORMATION: Start Time 0457 End Time 1402 Call point and route information on back.

RESULTS:

NO DETECTIONS

[illegible]

Detection Number	Comments
	NO DOTATIONS
	GALAXY 1-14
	LOWON DAGGOTT 1-16

Map: Attach map and denote all call points (use \bigcirc) and detections (use Δ)

U.S. Weather Bureau Code	Indicator of sky cover
0	Clear or Few Clouds (0%-33%)
1	Partly Cloudy or Variable Sky (34%-66%)
2	Cloudy or Overcast (67%-100%)
3	Blowing Sand, Dust or Snow
4	Fog or Smoke
5	Drizzle
6	Showers
7	Rain
8	Thunderstorm
9	Snow or Sleet
Specify in comments	Other

Beaufort #	Wind Speed (mph)	WMO Classification	Indicator of wind speed
0	0	Calm	Smoke rises vertically
1	1-3	Light Air	Smoke drift indicates wind direction, still wind vane
2	4-7	Light Breeze	Wind felt on face, leaves rustle, vanes begin to move
3	8-12	Gentle Breeze	Leaves/small twigs constantly moving, light flags extended
4	13-17	Moderate Breeze	Dust/leaves/loose paper lifted, small tree branches move
5	18-24	Fresh Breeze	Small trees in leaf begin to sway
6	25-30	Strong Breeze	Larger tree branches moving, whistling in wires
7	31-38	Near Gale	Whole trees moving, resistance felt walking against wind

Site: DAGGOTT Surveyors: G. ALLING Date: 13 JUL 2021

Visit #: 2 Outing #: 1 Survey Type (broadcast BC, nest check NC, incidental IN) BC MUST ATTACH A SURVEY MAP

Weather: Temp: start 55 °F end 88 °F Beaufort Wind Speed: start _____ end _____ Sky Cover: start Hazy end Hazy

SURVEY INFORMATION: Start Time 0515 End Time 1351 Call point and route information on back.

NO DOUBTS

[illegible][illegible]

Detection Type: A= aural (indicate type of call); V= visual (sex/age if possible); N= nest; PP= plucking post; F= feather; R= roost

Map: Attach map and denote all call points (use O) and detections (use Δ)

U.S. Weather Bureau Code	Indicator of sky cover
0	Clear or Few Clouds (0%-33%)
1	Partly Cloudy or Variable Sky (34%-66%)
2	Cloudy or Overcast (67%-100%)
3	Blowing Sand, Dust or Snow
4	Fog or Smoke
5	Drizzle
6	Showers
7	Rain
8	Thunderstorm
9	Snow or Sleet
Specify in comments	Other

Beaufort #	Wind Speed (mph)	WMO Classification	Indicator of wind speed
0	0	Calm	Smoke rises vertically
1	1-3	Light Air	Smoke drift indicates wind direction, still wind vane
2	4-7	Light Breeze	Wind felt on face, leaves rustle, vanes begin to move
3	8-12	Gentle Breeze	Leaves/small twigs constantly moving, light flags extended
4	13-17	Moderate Breeze	Dust/leaves/loose paper lifted, small tree branches move
5	18-24	Fresh Breeze	Small trees in leaf begin to sway
6	25-30	Strong Breeze	Larger tree branches moving, whistling in wires
7	31-38	Near Gale	Whole trees moving, resistance felt walking against wind

Site: CA BASS/MAGGIOS Surveyors: G. ALLING Date: 14 JUL 2024

Weather: Temp: start _____ °F end _____ °F Beaufort Wind Speed: start _____ end _____ Sky Cover: start _____ end _____

RESULTS:

NO DONATIONS

Detection Number	Comments
	NO DETECTIONS
	car B/TS 1-11
	MHG/OS 1-20

Map: Attach map and denote all call points (use O) and detections (use Δ)

Beaufort #	Wind Speed (mph)	WMO Classification	Indicator of wind speed
0	0	Calm	Smoke rises vertically
1	1-3	Light Air	Smoke drift indicates wind direction, still wind vane
2	4-7	Light Breeze	Wind felt on face, leaves rustle, vanes begin to move
3	8-12	Gentle Breeze	Leaves/small twigs constantly moving, light flags extended
4	13-17	Moderate Breeze	Dust/leaves/loose paper lifted, small tree branches move
5	18-24	Fresh Breeze	Small trees in leaf begin to sway
6	25-30	Strong Breeze	Larger tree branches moving, whistling in wires
7	31-38	Near Gale	Whole trees moving, resistance felt walking against wind

Northern Goshawk Broadcast Survey Form- USFS-Lake Tahoe Basin Management Unit

Site: POWDER BOWL Surveyors: A. ALLING Date: 15 JUL 2021

Visit #: 2 Outing #: 1 Survey Type (broadcast BC, nest check NC, incidental IN) BC MUST ATTACH A SURVEY MAP

Weather: Temp: start 52 °F end 70 °F Beaufort Wind Speed: start 2 end 2 Sky Cover: start 0 end 0

SURVEY INFORMATION: Start Time 0614 End Time 1411 Call point and route information on back.

RESULTS:

NO DETECTIONS

Detection Number	Time	Detection Type	Bearing	Distance (m)	NAD 83 ZONE 10 UTM's		GPS	Comments
					Easting	Northing		

Detection Number	Comments

NO DETECTIONS
CALL STATION-25

Detection Type: A= aural (indicate type of call); V= visual (sex/age if possible); N= nest; PP= plucking post; F= feather; R= roost

Map: Attach map and denote all call points (use O) and detections (use Δ)

U.S. Weather Bureau Code	Indicator of sky cover	Beaufort #	Wind Speed (mph)	WMO Classification	Indicator of wind speed
0	Clear or Few Clouds (0%-33%)	0	0	Calm	Smoke rises vertically
1	Partly Cloudy or Variable Sky (34%-66%)	1	1-3	Light Air	Smoke drift indicates wind direction, still wind vane
2	Cloudy or Overcast (67%-100%)	2	4-7	Light Breeze	Wind felt on face, leaves rustle, vanes begin to move
3	Blowing Sand, Dust or Snow	3	8-12	Gentle Breeze	Leaves/small twigs constantly moving, light flags extended
4	Fog or Smoke	4	13-17	Moderate Breeze	Dust/leaves/loose paper lifted, small tree branches move
5	Drizzle	5	18-24	Fresh Breeze	Small trees in leaf begin to sway
6	Showers	6	25-30	Strong Breeze	Larger tree branches moving, whistling in wires
7	Rain	7	31-38	Near Gale	Whole trees moving, resistance felt walking against wind
8	Thunderstorm				
9	Snow or Sleet				
Specify in comments	Other				



SIERRA ECOTONE SOLUTIONS

530.416.2440 • PO Box 1297 Zephyr Cove, NV 89448 • SierraEcotoneSolutions.com

18 June 2021

Mr. Fredrick Newberry
Heavenly Mountain Resort
PO Box 2180
Stateline, NV 89449
-via e-mail-

SUBJECT: 2021 SUMMER ACTIVITIES NESTING BIRD SURVEY RESULTS

Mr. Newberry:

A nesting bird survey was performed on 12, 13, 14 and 15 June 2021 for summer activities located at the top of the Gondola and surrounding areas. The project areas were surveyed for nesting birds in accordance with the design features identified in the Biological Evaluation and the Epic Discovery EIR/EIS/EIS. The following project areas were surveyed for nesting birds: Mountain Coaster, Gem Panning, Rock Wall, Tubing and surrounding areas at the top of the Gondola.

Nesting Bird Survey: The project areas were surveyed for nesting birds on the above dates and project areas. No active nests were observed on the project facilities or within the immediate vicinity that would result in impacts. One active mountain chickadee nest was located in a cavity approximately 120m to the north of the mountain coaster. This nest will not be impacted as a result of project activities due to the distance away from the coaster and no trails/activity in the area.

Species observed:

Common Name	Scientific Name
Avian Species	
Red-tailed hawk	<i>Buteo jamaicensis</i>
Downy woodpecker	<i>Picoides pubescens</i>
Williamson's sapsucker	<i>Sphyrapicus thyroideus</i>
Northern flicker	<i>Colaptes auratus</i>
Pacific slope flycatcher	<i>Empidonax difficilis</i>
Olive-sided flycatcher	<i>Contopus cooperi</i>
Western wood-pewee	<i>Contopus sordidulus</i>
Dusky flycatcher	<i>Empidonax oberholseri</i>

Clark's nutcracker	<i>Nucifraga columbiana</i>
Steller's jay	<i>Cyanocitta stelleri</i>
Common raven	<i>Corvus Corax</i>
Mountain chickadee	<i>Poecile gambeli</i>
Red-breasted nuthatch	<i>Sitta canadensis</i>
White-breasted nuthatch	<i>Sitta carolinensis</i>
Brown creeper	<i>Certhia americana</i>
Mountain bluebird	<i>Sialia currucoides</i>
Townsend's solitaire	<i>Myadestes townsendi</i>
American robin	<i>Turdus migratorius</i>
Pine siskin	<i>Spinus pinus</i>
Fox sparrow	<i>Passerella iliaca</i>
White-crowned sparrow	<i>Zonotrichia leucophrys</i>
Cassin's finch	<i>Haemorhous cassinii</i>
Dark-eyed junco	<i>Junco hyemalis</i>
Brewer's blackbird	<i>Euphagus cyanocephalus</i>
Townsend's warbler	<i>Setophaga townsendi</i>
Hermit warbler	<i>Setophaga occidentalis</i>
Yellow-rumped warbler	<i>Setophaga coronata</i>
Western Tanager	<i>Piranga ludoviciana</i>
Red crossbill	<i>Loxia curvirostra</i>
Mammal Species	
Douglas' squirrel	<i>Tamiasciurus douglasii</i>
Mule deer	<i>Odocoileus hemionus</i>
Chipmunk sp.	<i>Tamias sp.</i>
American black bear	<i>Ursus americanus</i>

Regards,



Garth Alling
Principal Biologist

CC: Shay Zanetti, LTBMU
Chris Donley, Cardno



SIERRA ECOTONE SOLUTIONS

530.416.2440 • PO Box 1297 Zephyr Cove, NV 89448 • SierraEcotoneSolutions.com

3 June 2021

Ms. Alison Pruett
Power Engineers, Inc.
9097 Spoonbill Ridge Pl.
Las Vegas, NV 89143
-via e-mail-

**SUBJECT: 2021 NV ENERGY HEAVNELY DISTRIBUTION PROJECT PRE-
CONSTRUCTION BIOLOGICAL SURVEY RESULTS**

Ms. Pruett:

This memorandum is to inform you of the completion of preconstruction surveys for nesting bird species, marten den sites and bat roost surveys. The NV Energy Distribution Project area was surveyed for the presence of the above wildlife species/types. These areas were surveyed for the presence of bat roost sites and for nesting birds in accordance with the Wildlife Design Features outlined in Section 2.3.5 of the Epic Discovery EIS and incorporated through the issuance of the Decision Notice, Finding of No Significant Effect dated 29 April 2015. The subject area was surveyed on 24, 25 and 26 May 2021. A map of the project area (same as 2020 survey) is located as an attachment to this memorandum.

Bat Roost Survey: The project area was surveyed for the presence of bat roosts in rock crevices, snags and within dense trees. No evidence of bat roosts was observed during the surveys.

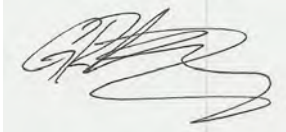
Nesting Bird Survey: The project area was surveyed for nesting birds on all of the above dates. No active nests were observed within the immediate vicinity of the proposed project. Two dark-eyed junco nests were located within the project area but sufficient distance from the work corridor (75m and 130m) that they will not be subject to impacts. A red-breasted nuthatch nest was also located in a snag approximately 90m from the project corridor. Due to the distance from the work corridor and sufficient cover/screening this nest will not be impacted.

Table 1 - Species Observed

Table 1 - Species Observed	
Common Name	Scientific Name
Avian Species	
California quail	<i>Callipepla californica</i>

Table 1 - Species Observed	
Common Name	Scientific Name
Mourning dove	<i>Zenaida macroura</i>
Red-tailed hawk	<i>Buteo jamaicensis</i>
Downy woodpecker	<i>Picoides pubescens</i>
Hairy woodpecker	<i>Leuconotopicus villosus</i>
Williamson's sapsucker	<i>Sphyrapicus thyroideus</i>
Pacific slope flycatcher	<i>Empidonax difficilis</i>
Dusky flycatcher	<i>Empidonax oberholseri</i>
Clark's nutcracker	<i>Nucifraga columbiana</i>
Steller's jay	<i>Cyanocitta stelleri</i>
Common raven	<i>Corvus Corax</i>
Mountain chickadee	<i>Poecile gambeli</i>
Red-breasted nuthatch	<i>Sitta canadensis</i>
White-breasted nuthatch	<i>Sitta carolinensis</i>
Brown creeper	<i>Certhia americana</i>
Mountain bluebird	<i>Sialia currucoides</i>
American robin	<i>Turdus migratorius</i>
Cassin's finch	<i>Haemorhous cassinii</i>
Dark-eyed junco	<i>Junco hyemalis</i>
Brewer's blackbird	<i>Euphagus cyanocephalus</i>
Yellow-rumped warbler	<i>Setophaga coronata</i>
Red crossbill	<i>Loxia curvirostra</i>
Mammal Species	
Douglas squirrel	<i>Tamiasciurus douglasii</i>
American black bear	<i>Ursus americanus</i>
Chipmunk sp.	<i>Tamias sp.</i>

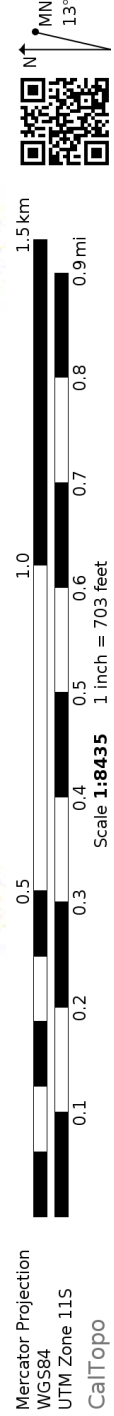
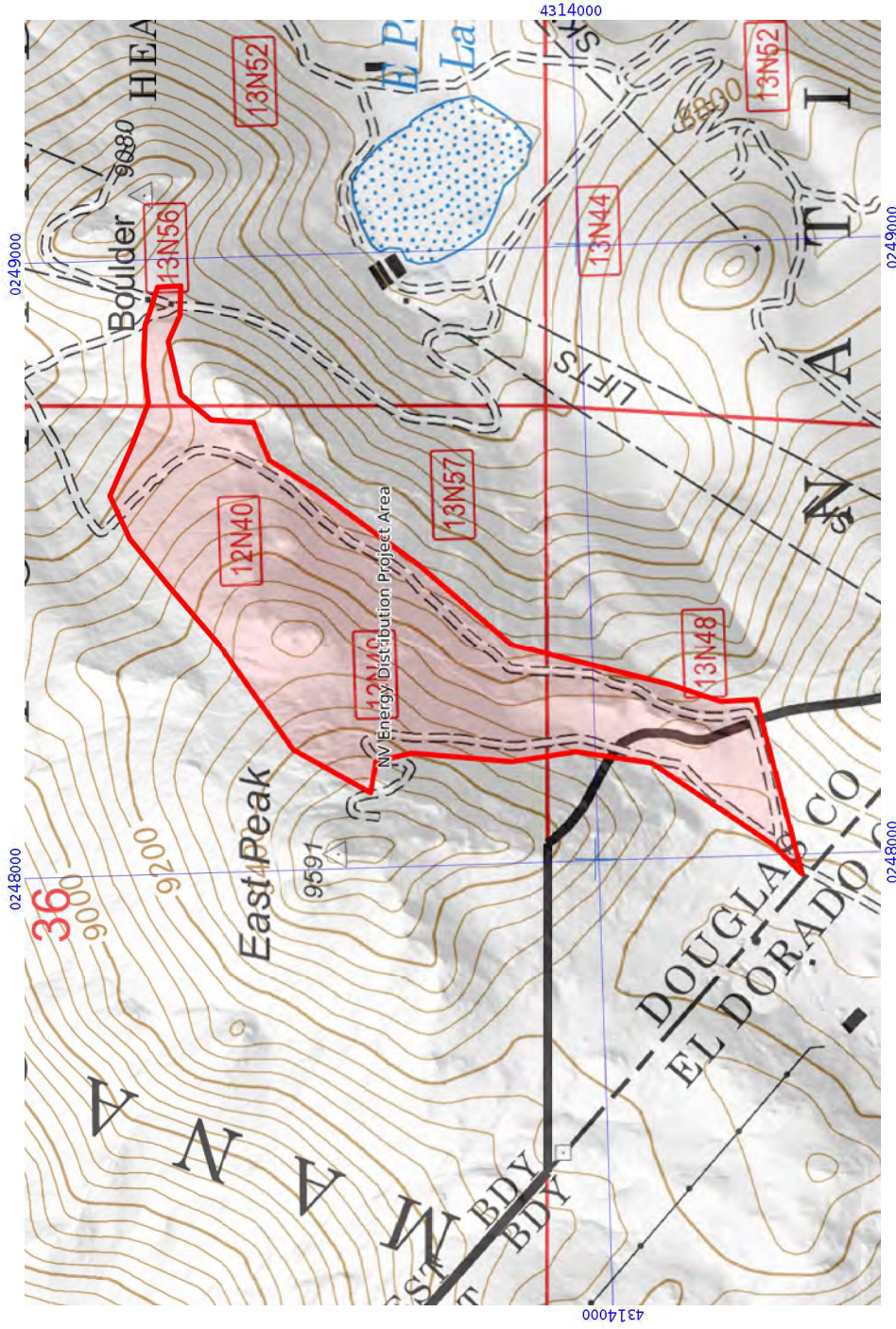
Regards,



Garth Alling
Principal Biologist

CC: Shay Zanetti, LTBMU
Fredrick Newberry, Heavenly Mountain Resort
Chris Donley, Cardno

Attachment





SIERRA ECOTONE SOLUTIONS

530.416.2440 • PO Box 1297 Zephyr Cove, NV 89448 • SierraEcotoneSolutions.com

15 February 2022

Mr. Fredrick Newberry
Heavenly Mountain Resort
PO Box 2180
Stateline, NV 89449
-via e-mail-

SUBJECT: 2021 NV ENERGY HEAVNELY DISTRIBUTION PROJECT PRE-
CONSTRUCTION BIOLOGICAL SURVEY RESULTS – ADDENDUM-

Mr. Newberry:

This memorandum is an addendum to the original (dated 3 June 2021) that failed to include the marten/nursery site survey results. This memo is to inform you of the completion of preconstruction den site and nursery site surveys in the NV Energy Distribution Project area. The subject area were marten den locations and other wildlife nursery sites in accordance with the Wildlife Design Features outlined in Section 2.3.5 of the Epic Discovery EIS and incorporated through the issuance of the Decision Notice, Finding of No Significant Effect dated 29 April 2015. The subject area was surveyed on 24, 25 and 26 May 2021. A map of the project area (same at 2020 survey) is located as an attachment to this memorandum.

Marten Den Site and Wildlife Nursery Site Survey: The project area was surveyed for the presence of marten dens and wildlife nursery sites during the above dates. No evidence of marten or nursery sites were observed in the project area. It should be noted this project area lies within a known home range of a reproductive female marten (HMR Epic Discovery Project FEIS/EIS/EIR, February 2015). Any visual evidence of marten activity while implementing the project shall be reported to USFS biologists.

Regards,

Garth Alling
Principal Biologist

CC: Shay Zanetti, LTBMU
Fredrick Newberry, Heavenly Mountain Resort
Chris Donley, Cardno

Attachment

North Bowl Plant Species List Aug 2021

Scientific name	Common name	Family
Trees		
<i>Abies magnifica</i>	red fir	Pinaceae
<i>Abies concolor</i>	white fir	Pinaceae
<i>Pinus albicaulis</i>	whitebark pine	Pinaceae
<i>Pinus contorta</i>	lodgepole pine	Pinaceae
<i>Pinus monticola</i>	western white pine	Pinaceae
Shrubs		
<i>Alnus incana</i> ssp. <i>tenuifolia</i>	thinleaf alder	Betulaceae
<i>Arctostaphylos nevadensis</i>	pinemat manzanita	Ericaceae
<i>Ceanothus velutinus</i>	tobacco bush	Rhamnaceae
<i>Cercocarpus ledifolius</i>	mountain mahogany	Rosaceae
<i>Chrysolepis sempervirens</i>	Sierra chinquapin	Fagaceae
<i>Ericameria nauseosus</i>	rabbitbrush	Asteraceae
<i>Ribes viscosissimum</i>	sticky currant	Grossulariaceae
<i>Salix scouleriana</i>	Scouler's willow	Salicaceae
<i>Salix lucida</i>	shining willow	Salicaceae
Scientific name	Common name	Family
Forbs		
<i>Achillea millefolium</i>	yarrow	Asteraceae
<i>Antennaria rosea</i>	roseay everlasting	Asteraceae
<i>Boechera stricta</i>	Drummond's rockcress	Brassicaceae
<i>Boechera lemmonii</i>	Lemon's rockcress	Brassicaceae
<i>Boechera platysperma</i>	pioneer rockcress	Brassicaceae
<i>Calyptridium umbellatum</i>	pussypaws	Portulacaceae
<i>Castilleja nana</i>	dwarf Indian paintbrush	Orobanchaceae
<i>Drymocallis glandulosa</i>	sticky cinquefoil	Rosaceae
<i>Eriogonum marifolium</i>	marum-leaved buckwheat	Polygonaceae
<i>Eriogonum nudum</i>	nude buckwheat	Polygonaceae
<i>Gayophytum diffusum</i>	spreading groundsmoke	Onagraceae
<i>Gayophytum humile</i>	dwarf groundsmoke	Onagraceae
<i>Leptosiphon nuttallii</i>	Nuttall's linanthus	Polemoniaceae
<i>Linanthus pungens</i>	granite gilia	Polemoniaceae
<i>Lupinus arbustus</i>	crest lupine	Fabaceae
<i>Lupinus latifolius</i>	broad-leaved lupine	Fabaceae
<i>Penstemon gracilentus</i>	slender penstemon	Plantaginaceae
<i>Penstemon heterodoxus</i>	Sierra penstemon	Plantaginaceae
<i>Penstemon newberryi</i>	mountain pride	Plantaginaceae
<i>Penstemon speciosus</i>	showy penstemon	Plantaginaceae
<i>Phacelia hastata</i> ssp. <i>compacta</i>	timberline phacelia	Hydrophyllaceae
<i>Phlox diffusa</i>	spreading phlox	Polemoniaceae
<i>Polygonum aviculare</i>	prostrate knotweed	Polygonaceae
<i>Senecio triangularis</i>	arrowleaf groundsel	Asteraceae
<i>Solidago canadensis</i>	Canada goldenrod	Asteraceae
<i>Pterospora andromedea</i>	woodland pinedrops	Monotropaceae
<i>Pyrola picta</i>	whiteveined wintergreen	Pyrolaceae
<i>Rumex salicifolia</i>	willow leaved dock	Polygonaceae

Rorippa curvisiliqua	western cress	Brassicaceae
Bistorta bistortoides	American bistort	Polygonaceae
Epilobium ciliatum	slender willowherb	Onagraceae
Epilobium oregonense	slimstem willowherb	Onagraceae

Grasses and grass-like plants

Agrostis idahoensis	Idaho bentgrass	Poaceae
Bromus carinatus	mountain brome	Poaceae
Carex subfusca	brown sedge	Cyperaceae
Carex douglasii	Douglas' sedge	Cyperaceae
Carex rossii	Ross' sedge	Cyperaceae
Deschampsia cespitosa	salt and pepper grass	Poaceae
Deschampsia elongata	slender hairgrass	Poaceae
Elymus cinereus	Great Basin wildrye	Poaceae
Elymus elymoides	squirreltail	Poaceae
Elymus glaucus	blue wildrye	Poaceae
Elymus hispidus	intermediate wheatgrass	Poaceae
Elymus trachycaulus	slender wheatgrass	Poaceae
Juncus bufonius	toad rush	Juncaceae
Juncus balticus	wire rush	Juncaceae
Juncus bryoides	moss rush	Juncaceae
Juncus nevadensis	Sierra rush	Juncaceae
Juncus occidentalis	western rush	Juncaceae
Juncus orthophyllus	straight-leaved rush	Juncaceae
Poa pratensis	kentucky bluegrass	Poaceae
Poa secunda	Nevada bluegrass	Poaceae
Poa wheeleri	Wheeler's poa	Poaceae

Heavenly Mountain Resort
Mitigation and Monitoring Plan Annual Report
(October 2020 – September 2021)

APPENDIX
IX

2021 BOUNDARY MANAGEMENT
PLAN

BOUNDARY MANAGEMENT

- A. In perimeter areas, where it is likely for the skiing public to ski out of the patrolled area, Heavenly may utilize a gated boundary system consisting of the following elements:
1. Gates located in areas that people have traditionally gone through in order to reach an area out-of-bounds.
 2. Appropriate signage will be placed at the gates informing users this is true backcountry access. Heavenly will place signs indicating that terrain is not patrolled or maintained beyond the point of the boundary gate, avalanche danger exists, and that you are responsible for your own safety and survival. Searches may or may not be conducted due to hazardous conditions. Skiers who enter the backcountry areas will do so knowingly and will accept full responsibility for property loss, injury and/or death. Gate postings will include the Back Country Checklist, the North American Public Avalanche Danger Scale, USDAFS Access Point Notice and other signage. They may also be cited by local authorities and charged for the cost of their rescue.
 3. Gated entrances/exits will be well-identified vertical structures through which a skier/rider must pass. A horizontal steel gate will be held in place and hang from one post by a self-closing mechanism. For someone to enter the area they must pull the gate in front of them as they pass through. The gate will auto-mechanically close behind them. The gate height will be adjustable to allow it to remain at a general waist-height elevation for an average adult. The intent in doing this is to require a physical action beyond merely going through the posts to enter the area.
 4. Due to the fact that the experience in this accessed terrain is deemed to be the same as any other backcountry experience, Heavenly will rarely close or restrict access into the terrain.
 - i. However, the Fulstone and Beach Gates (See #7 below for locations) do periodically close due to:
 1. Active avalanche control with explosives. The gates and terrain open once active avalanche work is completed.
 2. Early season conditions when Killebrew Canyon has not yet opened due to lack of snow or inability to secure boundary parameter. A secure boundary rope is needed and in place around Killebrew Canyon before allowing access through those two gates. A secured boundary prevents access into our uncontrolled in bounds terrain.

5. “Closed Ski Area Boundary, Exit Through Gates Only” signage will be placed along perimeter ropes. These signs are placed at appropriate intervals so that individuals have the opportunity to read the warning from inside the area perimeter ropes. The signage may indicate that some routes may access private property.
6. Heavenly will provide and maintain counters at each of the gates for the entire ski season. Gate use will be monitored and reported to Forest Service
7. Heavenly will intend to assist county search and rescue efforts when possible. Back Country Access Gates will be monitored throughout the winter season to ensure signage is in place, the gates are functioning properly, and that they are at the appropriate height. The gates are installed at the following locations:
 - i. Fire Break: This gate is located to the north of the top of Olympic Chair. It accesses north/northwest terrain locally termed “The Palisades” continuing down towards lower 207 Kingsbury grade (lake side).
 - ii. Raley’s Gulch: This gate is located off the California Trail at the perimeter rope of Maggie’s Canyon. It accesses north/northwest terrain that continues down the front side of the mountain towards Lake Tahoe.
 - iii. Fulstone Canyon: This gate is located above the existing Gate ‘A’ of Killebrew Canyon. It accesses east/northeast terrain to the southeast of Killebrew Canyon and continues down to the Foothill side of 207 Kingsbury grade.
 - iv. Stateline Gate: This gate is located at the summer/winter road out to the mid-station of the gondola behind Tamarack Lodge. This gate accesses north/northwest terrain that continues down the front side of the mountain and areas under the gondola.
 - v. The Beach: This gate is located off of the upper area of the Skyline Trail. It accesses east facing terrain that continues down to Monument Pass and the lower Fulstone terrain.
 - vi. Broad Daylight: This gate is located at the end of “The Cut” on upper Roundabout trail in CA. It accesses north/northwest terrain that continues down toward the “Powerline Trail”, Pioneer Trail, and upper Ski Run areas.

Heavenly Mountain Resort
Mitigation and Monitoring Plan Annual Report
(October 2020 – September 2021)

APPENDIX

X

2021-2021 ANNUAL NOISE
MONITORING REPORT



Heavenly Ski Resort Master Plan Noise Monitoring Survey

2020 – 2021 Ski Season



j.c. brennan & associates
consultants in acoustics



June 9, 2021

Mr. Chris Donley
Senior Project Engineer
Cardno
250 Bobwhite Court, Suite 250
Boise, Idaho 83706

Subject: Submittal of the Heavenly Ski Area Mitigation Monitoring Report for Noise - 2020/2021 Ski Season

Dear Mr. Donley:

The acoustical consulting firm of j.c. brennan & associates, Inc. is pleased to submit the results of the 2020/2021 Heavenly Ski Area Mitigation Monitoring Noise Report. The results of the report are very similar to previous years. Snowmaking noise levels at the California and Nevada base areas continue to either show similar results to previous years, and in some cases, reductions in overall noise levels. Continued implementation of newer technology quiet snowmaking equipment on the mountain is expected to continue this trend. We have included recommendations for continued noise monitoring to this report.

Please feel free to call if you have questions.

Respectfully submitted,

j.c. brennan & associates, Inc.

Jim Brennan
President
Member: Institute of Noise Control Engineering

I INTRODUCTION

j.c. brennan & associates, Inc. is providing a final report for the Heavenly Master Plan Noise Mitigation Monitoring Plan, and analysis of noise measurement data collected during the 2020/2021 snowmaking operations at Heavenly Ski Resort. The noise measurements and analysis of data are required as a condition of approval for the Heavenly Master Plan EIS/EIR. This is the 25th annual analysis of snowmaking operations noise levels.

j.c. brennan & associates, Inc. staff have been involved in conducting the annual snowmaking operations noise analyses since the 1996/1997 ski seasons. The previous 15 noise analyses for the 2004/2005 through the 2019/2020 ski seasons were prepared by j.c. brennan & associates, Inc.

The conditions of approval for the Heavenly Master Plan EIS/EIR include instituting a comprehensive noise monitoring program, the replacement of older and louder air/ water nozzles with quiet model snowmaking equipment, sound control devices for snowmaking equipment, and participation with the snowmaking industry in the research and development of quiet snowmaking equipment and sound control devices for snowmaking equipment. The current technology considers quiet snowmaking equipment to include both fan guns and more efficient air/water nozzles (sometimes referred to as "stick guns"). Based upon noise measurement data collected for the various types of snowmaking equipment, fan guns are generally 10 dBA or more, quieter than older model air/water nozzles. In recent years, significant reductions in noise have been realized from newer designs of some air/water nozzles. Generally, lower air pressure during the mixing process at the nozzle results in lower noise emissions.

Since the 1996/1997 ski season, Heavenly Ski Resort has committed to the installation of a permanent noise monitoring site at the base of the ski area near the California lodge, and to establishing the existing snowmaking noise levels at the Boulder Base and Stagecoach Base. Refer to Figure 1 for locations of noise monitoring sites.

According to the previous snowmaking noise reports, during the 1996/1997 ski season some quiet snowmaking equipment was installed and used at the California Base facilities. However, the use of quiet equipment was limited. During the 1997/1998 ski season, additional quiet snowmaking equipment was introduced into the fleet of snowmaking operations. During the 1998/1999 snowmaking operations, no additional quiet snowmaking equipment was implemented. Based upon review of the log of snowmaking activities provided by Heavenly, fan guns have been used in both the lower and upper locations of the California Base since the 1999/2000 ski season. Beginning with the 2008/2009 ski season, fan guns have been used extensively on the lower portion of the California Base area. Based upon the snowmaking logs, there has been limited use of air/water nozzles on the lower portion of the California side as an effort to reduce overall snowmaking noise levels.

RECOMMENDATIONS

1. In the late 1990's and early 2000 the snowmaking industry had made considerable strides in developing technology to reduce overall noise levels associated with snowmaking equipment. This was apparent from the overall measured noise levels that have been collected for these reports. Specifically, the introduction of fan guns and some of the tower air/water (stick guns) have proven to produce lower noise levels. However, in some instances the equipment which produces lower noise levels are not as efficient at making snow, especially at higher wet-bulb temperatures.

These improvements to snowmaking equipment, which have resulted in lower noise levels appear to have slowed. This has also been evident from the overall measured and reported noise levels associated with these annual reports. It is the recommendation from j.c. brennan & associates, Inc., that the TRPA consider eliminating these reports from an annual basis to every two to three years.

2. Based upon the insurance requirements for consultants to ride on snowmobiles at Heavenly, it has been prohibitive to access the upper mountain remote plan areas. In addition, the noise measurements conducted over previous years at the remote plan area known as "Party Rock", have resulted in considerably low overall measured noise levels during snowmaking operations. Most times the noise levels were inaudible, or were influenced by wind or other ambient noise, and the actual noise levels due to snowmaking operations could not be verified. For this reason, it is recommended that the task of measuring snowmaking noise levels at the remote Plan Areas should be eliminated.



II PURPOSE AND NEED

The purpose and need for the Annual Noise Monitoring Report is to address the attainment of performance standards contained within the Heavenly Master Plan and to address progress toward attainment of the TRPA noise level criteria.

TRPA Criteria

The Tahoe Regional Planning Agency (TRPA) has adopted Environmental Thresholds for the Lake Tahoe Region. The noise standards, or Thresholds as they are commonly referred to, are numerical Community Noise Equivalent Level (CNEL)¹ values for various land use categories and transportation corridors.

As a form of zoning, the TRPA has divided the Lake Tahoe Region into more than 175 separate Plan Areas. Boundaries for each of the Plan Areas have been established based upon similar land uses and the unique character of each geographic area. For each Plan Area, a Statement is made as to how that particular area should be regulated to achieve regional environmental and land use objectives. An outdoor CNEL standard is established based upon the Thresholds as a part of each Statement. Table 1 shows the existing CNEL standards for the Heavenly Plan Areas and adjacent Plan Areas.

Table 1 Plan Area Statement (PAS) CNEL Criteria		
PAS	Description	CNEL Criterion
087	Heavenly Valley California	55 dBA
085	Lakeview Heights (Location of California Base noise monitoring location)	55 dBA
094	Glenwood	50 dBA
095	Trout/Cold Creek	50 dBA
086	Heavenly Valley Nevada	55 dBA
082	Upper Kingsbury	55 dBA
080	Kingsbury Drainage	50 dBA
088	Tahoe Village	55 dBA

¹ For an explanation of these terms, see Appendix A: "Acoustical Terminology"

III COMPLIANCE REPORTING

III.1 Snow Grooming Noise

III.1a Master Plan Mitigation Methods

The Master Plan mitigation methods for snow grooming operations are to maintain an 85 foot setback from Plan Area boundaries that are adjacent to Heavenly. Operations of snow grooming equipment would not exceed Plan Area noise standards with a minimum of 85 feet of separation.

III.1.b Master Plan Milestone/Product

Snow grooming machines are not operated within 85 feet of PAS boundaries. Portions of the fleet are replaced continually with newer technology equipment

III.1c Responsible Party

Heavenly is responsible for educating snow groomers to maintain the 85-foot setback.

III.1d PAS Criteria

PAS 080 – 50 dB CNEL

PAS 082, 085, 086, 087, 088 – 55 dB CNEL

PAS 095, PAS 121 – 45 dB CNEL

III.1.e Results of Reporting and Determination of Compliance

In previous years this measure was included in the Cardno compliance report.

III.2 Snowmobile Noise

III.2.a Master Plan Mitigation Methods

Replace all snowmobiles with 4-stroke technology. This would ensure that snowmobiles would comply with the 82 dBA single event noise level standard. Currently, Heavenly only uses 4-stroke engine snowmobiles.

III.2.b Master Plan Milestone/Product

Snowmobile equipment is maintained and operated within 85 feet of PAS boundaries. Portions of the fleet are replaced with newer technology equipment on an annual basis.

III.2.c Responsible Party

Heavenly is responsible for replacing the fleet of snowmobiles with 4-stroke technology machines.

III.2.d Criteria

The TRPA single event noise level standard for snowmobiles is 82 dBA Lmax, at a distance of 50 feet.

III.2.e Results of Reporting and Determination of Compliance

Heavenly staff reported in 2008 that all snowmobiles in the fleet are 4-stroke engine technology. Noise measurement data collected by j.c. brennan & associates, Inc. staff for the snowmobiles indicate that they comply with the noise level criterion of 82 dBA Lmax. Therefore, this is in compliance with the TRPA thresholds.

Since the Heavenly snowmobile fleet has been converted to 4-stroke technology and the technology continues to focus attention on quiet operations, the Heavenly snowmobile fleet is expected to continue to become quieter over time. It is acknowledged within this report that this mitigation measure has attained compliance and can be removed from the master plan mitigation measures.

III.3 Snow Removal Noise

III.3.a Master Plan Mitigation Methods

Mitigation methods for snow removal noise impacts are to minimize nighttime snow removal operations, and by constructing noise barriers along the perimeters of the parking lots. At the California Base area, the upper parking lot should be cleared first, and clearing of the lower parking lot should be conducted during the daytime and evening hours.

III.3.b Master Plan Milestone/Product

Snow removal equipment is operated consistent with the measures listed above.

III.3.c Responsible Party

Heavenly is responsible for operating snow removal equipment consistent with the measures listed above.

III.3.d Criteria

PAS 080 – 50 dB CNEL

PAS 082, 085, 086, 087, 088 – 55 dB CNEL

PAS 095, PAS 121 – 45 dB CNEL

Results of Reporting and Determination of Compliance

To be provided in Cardno compliance report.

III.4 Snowmaking California Base Area Noise

III.4.a Master Plan Mitigation Methods

1. Use of fans in place of air/water nozzles or air/water guns which are low noise;
2. Re-direction of nozzles and fans to minimize noise exposures at PAS boundaries;
3. Reduction in the numbers of nozzles and/or fans;
4. Use of setbacks to reduce noise exposures at PAS boundaries;
5. Use of noise reduction housings for air/water nozzles;
6. Use of barriers at low-mounted air/water nozzles;
7. Reduction in snowmaking activities at nighttime;
8. Sponsor research into reducing noise produced by snowmaking. This may include support of industry-wide research activities, specific studies concerning nozzle design sponsored directly by Heavenly, and the study of alternatives in placement of guns and fans at Heavenly.

III.4.b Master Plan Milestone/Product

Heavenly has installed the long-term noise monitoring station at the California Base area. The annual noise monitoring occurs from approximately November 1st, and generally through March 31st, depending on the snowmaking activities. Heavenly has completely replaced the air-water snowmaking nozzles at the base of California with fan guns. Heavenly has not implemented items 4 through 6 listed above. However, Heavenly staff has closely monitored the snowpack produced through winter storms and snowmaking operations to determine the appropriate time for discontinuing snowmaking operations and reduce nighttime snowmaking noise levels. In addition, Heavenly continues to invest in conducting noise measurements of varying types of snowmaking equipment to determine the feasibility of introducing more quiet technology snowmaking equipment.

III.4.c Responsible Party

Heavenly is responsible for implementing the mitigation measures.

III.4.d PAS Criteria

PAS 080 – 50 dB CNEL

PAS 082, 085, 086, 087, 088 – 55 dB CNEL

PAS 095, PAS 121 – 45 dB CNEL

III.4.e Results of Reporting and Determination of Compliance

1996/1997 - 2020/2021 Snowmaking Noise Levels Summary:

Previous reports provide details on the analysis of past and present snowmaking seasons. Results of all noise monitoring surveys are provided in Tables 2 and 3.

2020/2021 Snowmaking Noise Levels Summary:

The ski season during the 2020/2021 spanned a total of approximately 147 days, between November 20th, 2020 through April 17th, 2021. Snowmaking generally occurred between November 7th, 2020 and January 26th, 2021. Continuous noise level measurements were conducted between November 1st, 2020 and March 16th, 2021 at the permanent noise monitoring site, located on the USFS property located directly east of Heavenly Ski Area, and across Keller Road (PAS 085). The monitoring site is located on the southeast corner of the intersection of Keller Road and Saddle Road, with a direct line of sight to the California Base snowmaking operations.

As mentioned in previous reports, the location of the noise monitor was at the northeast corner of Keller Road and Saddle Road, and adjacent to the Tahoe Seasons Resort. That monitoring location was reaching the limitations of its usefulness. Traffic noise from the intersection of Keller Road and Saddle Road was influencing the overall measured noise levels. The current location has sufficient setback to reduce the amount of noise associated with the traffic as it affected the overall measured noise levels and the noise levels associated with the snowmaking operations.

The equipment used for the noise level measurements was a Larson Davis Laboratories (LDL) Model 820 precision integrating sound level meter which was calibrated with an LDL Model CAL 200 acoustical calibrator. The sound level meter is powered by a solar panel with a deep cell battery back-up. The sound level meter was downloaded once per month, and was checked for calibration.

During the 2020/2021 ski season the Heavenly snowmaking staff continued the log of snowmaking operations, also noting the use and location of snowmaking equipment, during the hours of operation when snowmaking activity occurred. Upon review of the snowmaking activities log provided by Heavenly snowmaking personnel, the measured CNEL values during snowmaking activities was determined at the noise monitoring location. Noise associated with snowmaking activities was a function of the number and location of snowmaking nozzles and/or fans guns in operation. Table 2 summarizes the previous 24 years of snowmaking levels at the Tahoe Seasons Resort (PAS 085), as well as the 2020/2021 season.

Table 2 Summary of Measured Noise Levels at the Heavenly Base Area (Average Measured CNEL Values) Noise Monitoring Site GPS Coordinates (38° 56' 17.43" N - 119° 56' 18.43" W)					
Year	CNEL on Days with Snowmaking	CNEL on Days without Snowmaking	CNEL During Measurement Period	Total # of Monitoring Days	Total # of Snowmaking Days
1996/1997	74.1 dBA	61.7 dBA	71.6 dBA	--	--
1997/1998	73.5 dBA	61.8 dBA	70.2 dBA	--	--
1998/1999	73.0 dBA	62.0 dBA	69.5 dBA	--	--
1999/2000	74.3 dBA	62.0 dBA	73.0 dBA	141	101
*2000/2001	74.1 dBA	60.0 dBA	72.2 dBA	140	89
*2001/2002	73.9 dBA	60.3 dBA	72.1 dBA	145	93
*2002/2003	72.0 dBA	63.1 dBA	68.3 dBA	150	61
*2003/2004	67.4 dBA	62.3 dBA	65.7 dBA	104	56
*2004/2005	65.3 dBA	61.5 dBA	63.1 dBA	149	51
*2005/2006	61.0 dBA	60.9 dBA	61.4 dBA	151	41
*2006/2007	63.7 dBA	58.1 dBA	62.6 dBA	149	75
*2007/2008	62.4 dBA	58.2 dBA	61.6 dBA	140	62
*2008/2009	62.4 dBA	59.7 dBA	61.2 dBA	119	75
**2009/2010	59.8 dBA	55.5 dBA	58.1 dBA	150	72
**2010/2011	57.9 dBA	55.6 dBA	56.5 dBA	150	52
**2011/2012	59.3 dBA	55.5 dBA	58.1 dBA	148	86
**2012/2013	60.1 dBA	55.9 dBA	58.6 dBA	143	77
**2013/2014	57.9 dBA	55.2 dBA	56.7 dBA	136	62
**2014/2015	58.7 dBA	52.5 dBA	57.0 dBA	148	86
**2015/2016	57.8 dBA	53.6 dBA	57.1 dBA	152	61
**2016/2017	59.5 dBA	58.3 dBA	56.1 dBA	151	43
**2017/2018	58.9 dBA	55.7 dBA	57.9 dBA	150	90
2018/2019	59.9 dBA	57.8 dBA	58.7 dBA	120*	64
**2019/2020	59.7 dBA	55.0 dBA	58.0 dBA	119	61
**2020/2021	59.9 dBA	56.8 dBA	58.2 dBA	136	70
<p>*The 2000/2001 - 2008/2009 measurement site was moved to the ground level of the Tahoe Seasons Resort. Previously this site was located at the roof-top of the Tahoe Seasons Resort.</p> <p>** Noise measurement site located on USFS property @ northeast corner of Keller and Saddle.</p> <p>***Noise measurements were not conducted for the month of March 2019 due to equipment failure</p> <p>Year 2003-2004 Heavenly began Fan Gun Technology</p>					

The average measured CNEL value at the monitoring site for the 2020/2021 season was 59.9 dBA when snowmaking operations occurred. This is consistently within 1 dBA to 2 dBA with the lowest measured CNEL values since the reporting began. Currently, the measured snowmaking noise

levels have leveled off, and are generally range between 59 dBA and 60 dBA CNEL. The progress in reducing snowmaking noise occurred with the introduction of the Fan Technology and improved noise reduction associated with air/water guns. In addition, the measured CNEL values on days without snowmaking operations was 56.8 dBA, and was not in compliance with the 085 and 087 Plan Area CNEL standards. It is noted that when snowmaking did not occur there was influence from roadway traffic, wind and individuals recreating on the USFS property where the sound level meter is located. The snowfall for 2020/2021 resulted in significant noise levels in the area associated with snow removal on the local street system and in the Heavenly parking lot. Figures 2 through 5 graphically show the results of the noise monitoring, as they compare to the TRPA CNEL criterion of 55 dBA for PAS 085 and 087.

Snowmaking can occur over a significant portion of the California side of the mountain. In addition, the array of snowmaking at the California Base can include air/water nozzle and fan-gun type snowmaking equipment. The fan-guns have been found to produce noise levels which are a minimum of 10 dBA less than the traditional air-water nozzle guns. Table 3 summarizes the last 18 years of CNEL values for varying types of snowmaking operations.

Table 3
Summary of Measured Noise Levels at the Heavenly Base Area
Based upon Varying Arrays of Snowmaking Operations on the California Side

Year	Days with Lower Snowmaking Only	Days with Upper Snowmaking Only	Days with Lower Air/Water Nozzles Only	Days with Upper Air/Water Nozzles Only	Days with Lower Fan-Guns Only
	Logarithmic CNEL				
2001-2002	74.7 dBA	63.7 dBA	72.2 dBA	63.7 dBA	NA ²
2002-2003	73.0 dBA	63.0 dBA	NA ³	62.8 dBA	NA ²
2003-2004	61.7 dBA	60.9 dBA	NA ³	60.3 dBA	61.1 dBA
2004-2005	64.1 dBA	60.3 dBA	66.1 dBA	NA ¹	NA ²
2005-2006	63.4 dBA	57.6 dBA	NA ³	NA ¹	63.4 dBA
2006-2007	65.4 dBA	60.2 dBA	NA ³	59.3 dBA	65.2 dBA
2007-2008	60.6 dBA	61.2 dBA	NA ³	62.0 dBA	60.1 dBA
2008-2009	64.3 dBA	58.1 dBA	NA ³	63.3 dBA	63.4 dBA
2009-2010	57.9 dBA	55.7 dBA	NA ³	58.4 dBA	57.9 dBA
2010-2011	58.8 dBA	52.7 dBA	NA ³	51.9 dBA	58.8 dBA
2011-2012	59.8 dBA	56.1 dBA	NA ³	53.4 dBA	58.5 dBA
2012-2013	60.2 dBA	55.5 dBA	NA ³	55.5 dBA	60.3 dBA
2013-2014	62.7 dBA	56.5 dBA	NA ³	55.3 dBA	62.7 dBA
2014-2015	62.1 dBA	54.2 dBA	NA ³	51.8 dBA	62.1 dBA
2015-2016	61.8 dBA	55.7 dBA	NA ³	56.3 dBA	61.8 dBA
2016-2017	NA ⁴	56.5 dBA	NA ³	60.1 dBA	NA ²
2017-2018	NA ⁴	55.3 dBA	NA ³	54.0 dBA	NA ²
2018-2019	61.1 dBA	54.8 dBA	NA ³	55.6 dBA	61.0 dBA
2019-2020	NA ⁴	56.5 dBA	NA ³	54.4 dBA	NA ²
2020-2021	NA ⁴	56.4 dBA	NA ³	56.9 dBA	NA ²

¹NA - No snowmaking occurred with strictly Upper Air-Water Nozzles operating.

²NA - No snowmaking occurred with strictly Fan Guns operating.

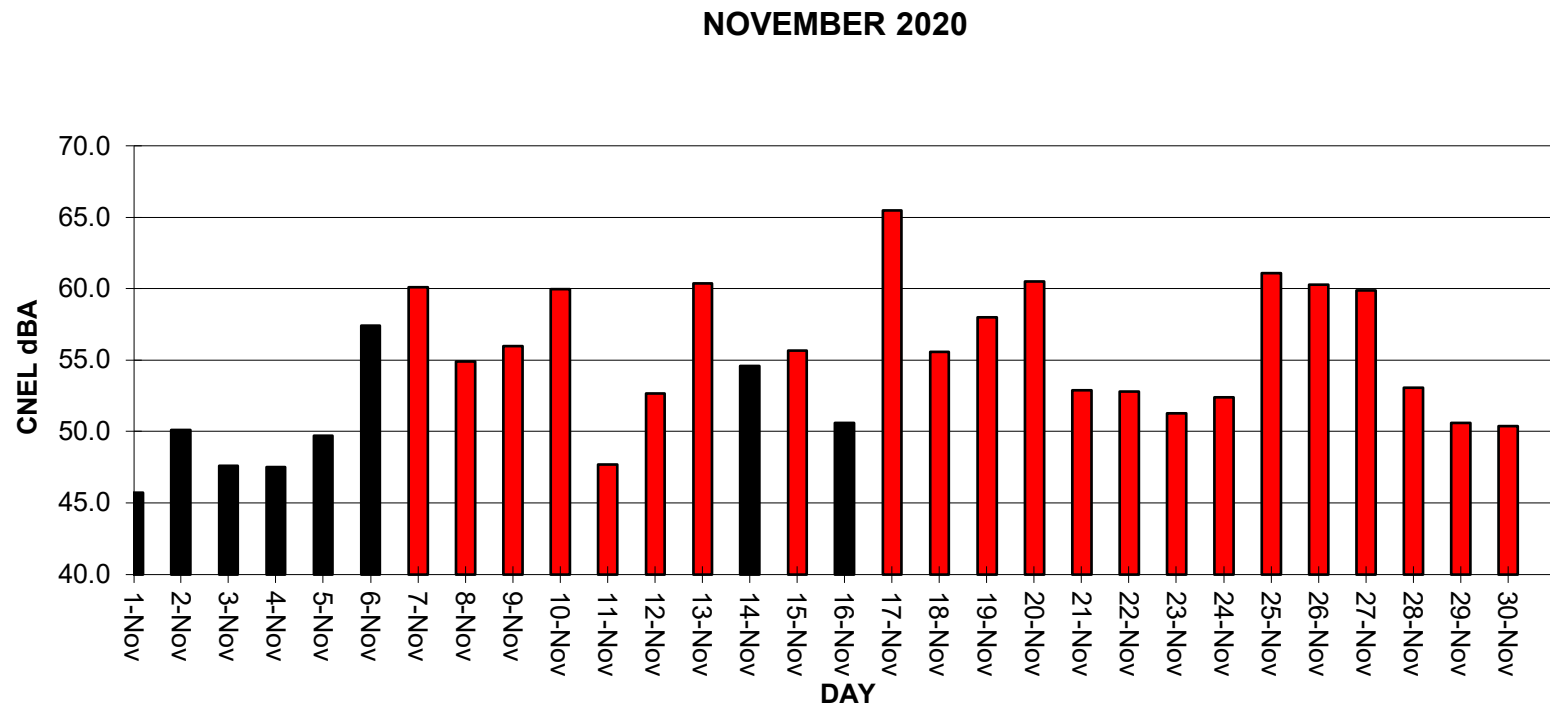
³NA - No snowmaking occurred with strictly Lower Air-Water Nozzles Only

⁴NA- No snowmaking occurred with only lower snowmaking occurred

Figure 2

Heavenly California Base Area Snowmaking Monitoring

Annual Snowmaking Report
Summary of CNEL
November-19



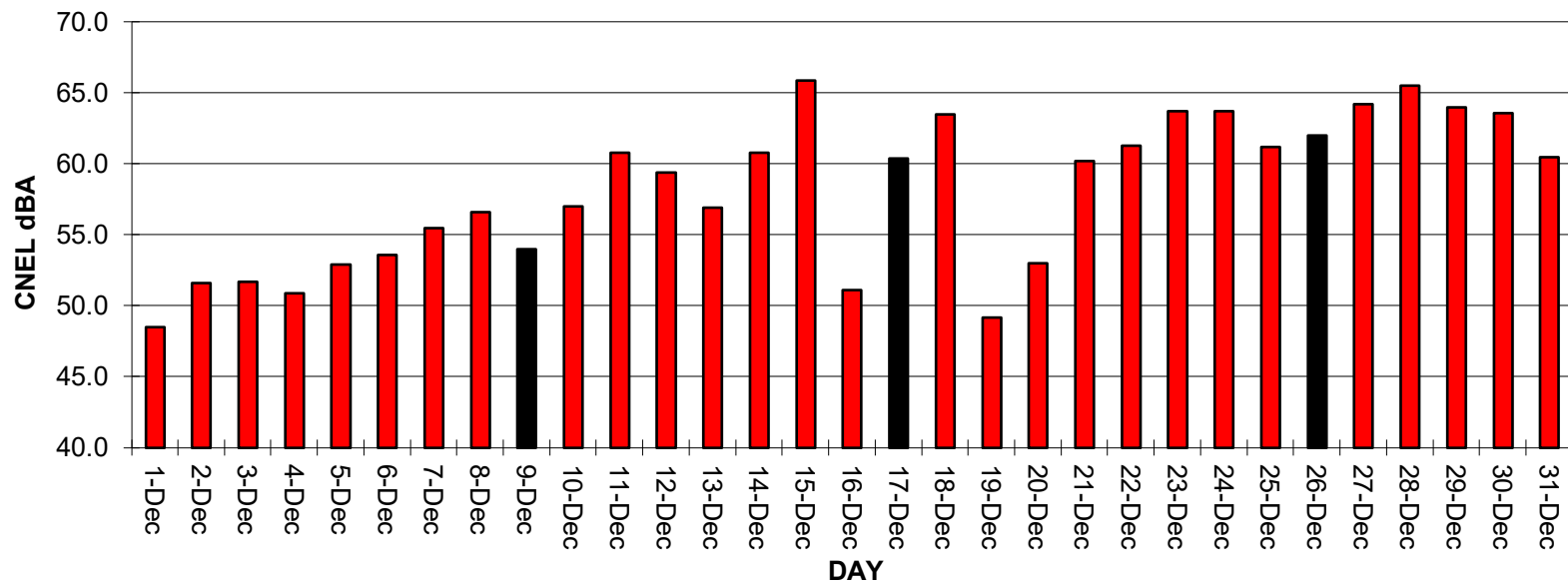
NO SNOWMAKING 
SNOWMAKING 
CNEL Criterion 55 dBA

Figure 3

California Base Area Heavenly Snowmaking Monitoring

Annual Snowmaking Report
Summary of CNEL
December-19

DECEMBER 2020



NO SNOWMAKING



SNOWMAKING



CNEL Criterion

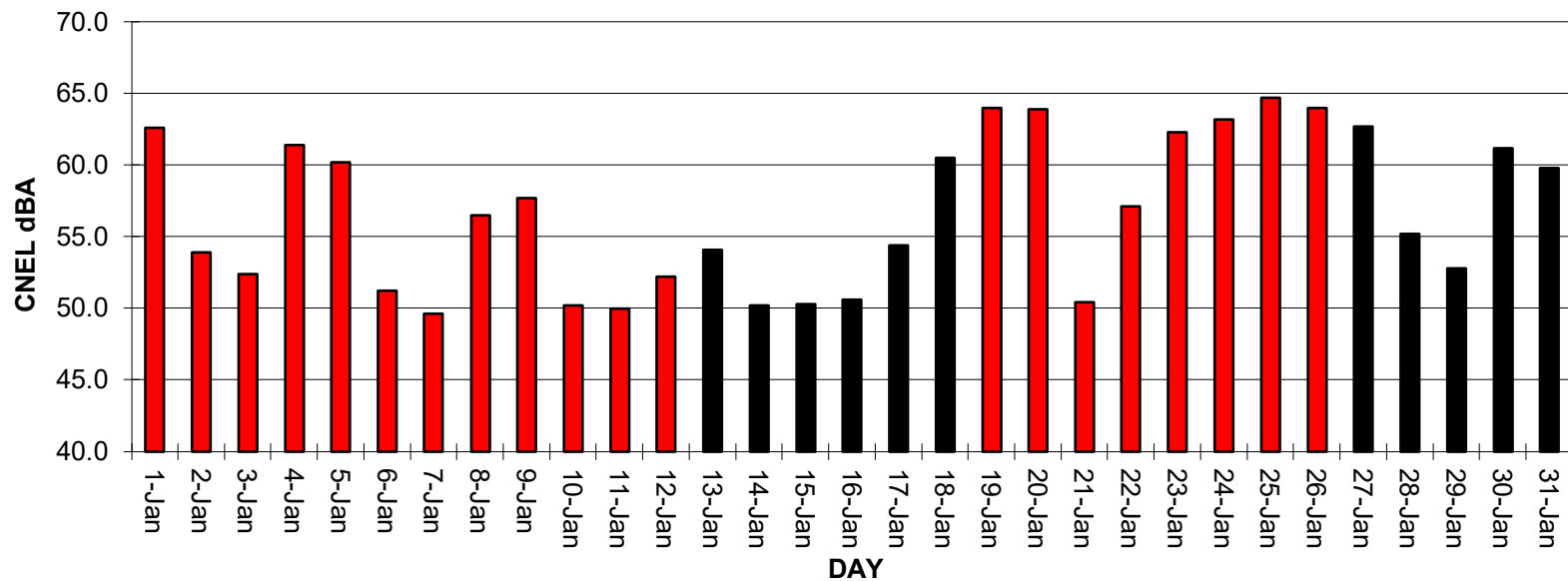
55 dBA

Figure 4

California Base Area Heavenly Snowmaking Monitoring

Annual Snowmaking Report
Summary of CNEL
January-20

JANUARY 2021



NO SNOWMAKING



SNOWMAKING



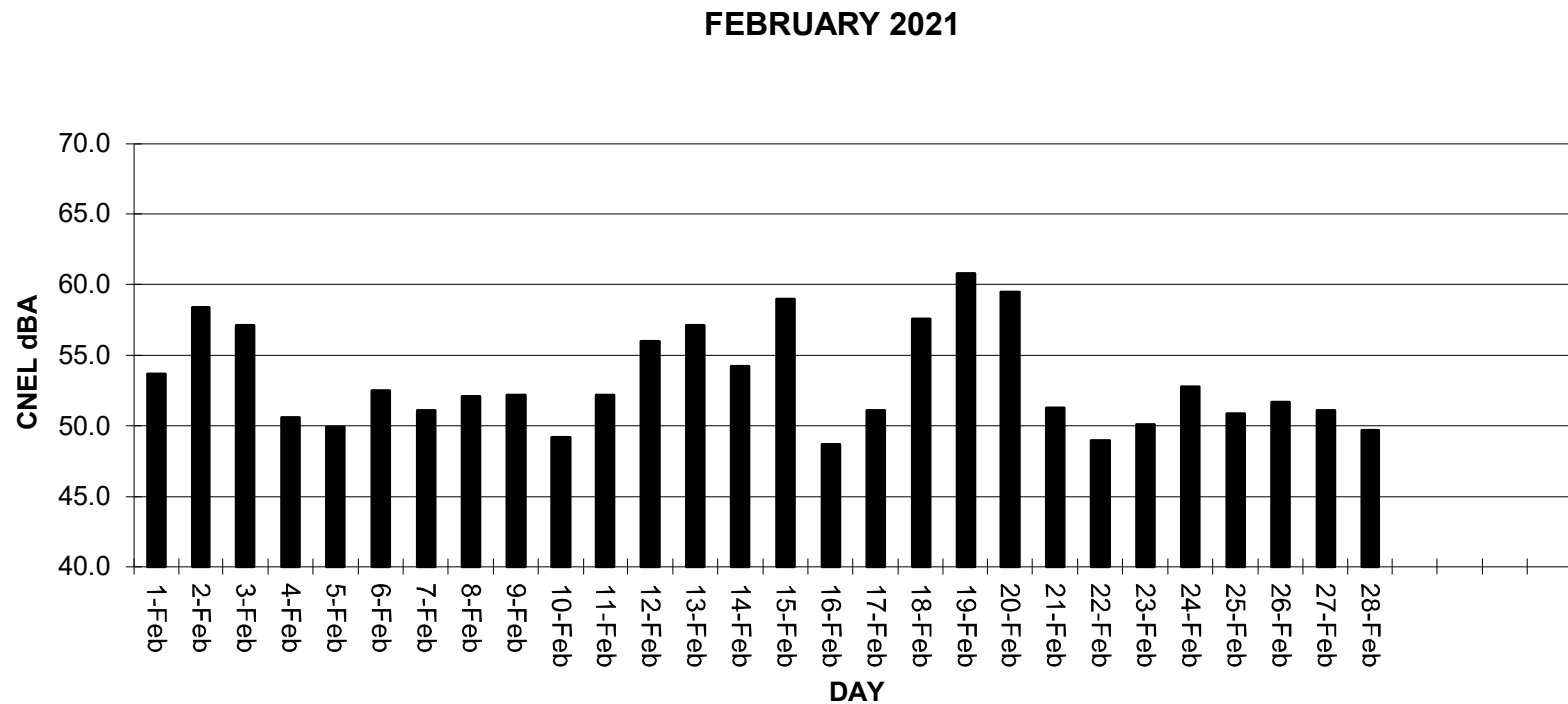
CNEL Criterion

55 dBA

Figure 5

California Base Area Heavenly Snowmaking Monitoring

Annual Snowmaking Report
Summary of CNEL
February-20

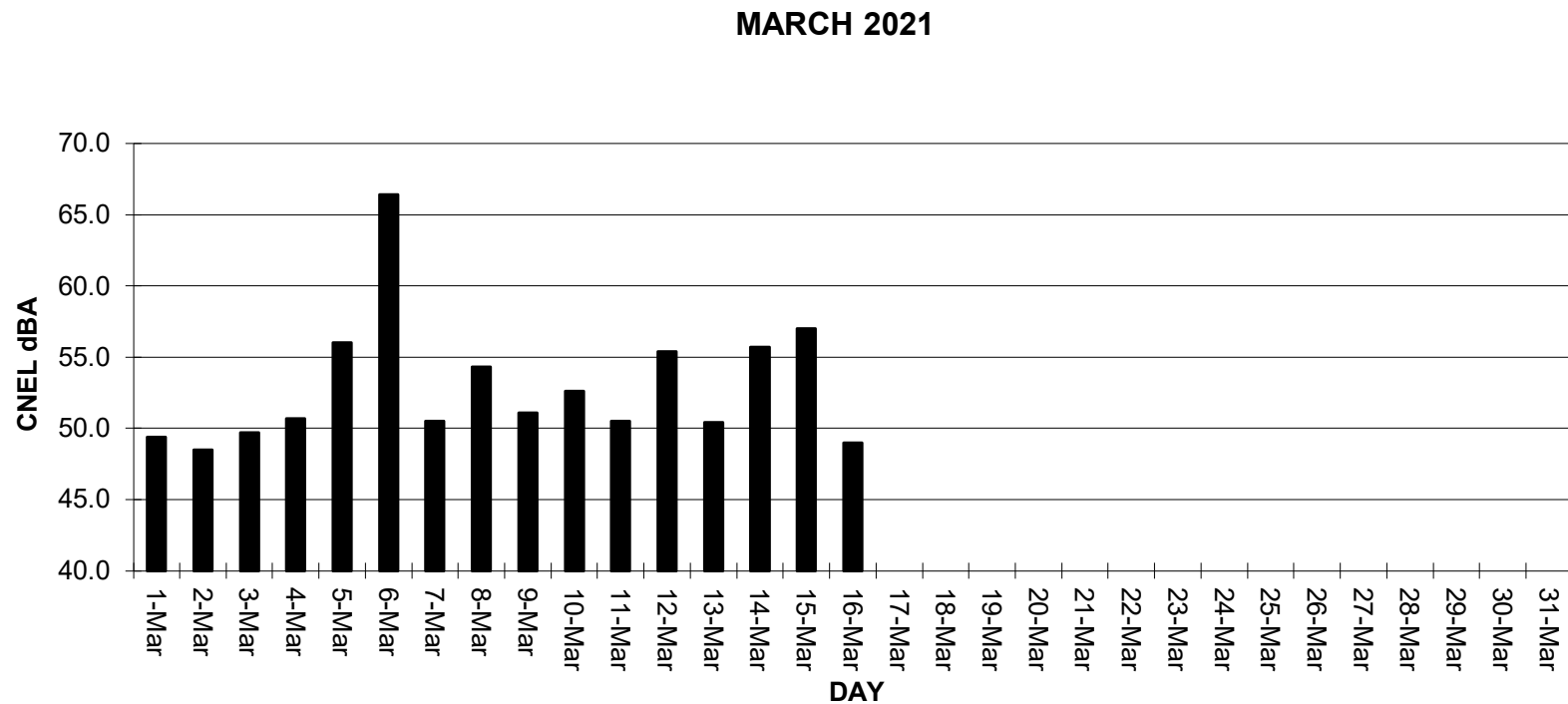


NO SNOWMAKING 
SNOWMAKING 
CNEL Criterion 55 dBA

Figure 6

California Base Area Heavenly Snowmaking Monitoring

Annual Snowmaking Report
Summary of CNEL
March-20



NO SNOWMAKING

SNOWMAKING

CNEL Criterion 55 dBA

Fan Gun Noise Levels

Heavenly has completed the process of converting the California Base snowmaking operations to the use of fan-guns. The lower mountain which includes the ski runs named Round About and Lower Gun Barrel. The types of fan guns which Heavenly is currently using include SMI Super Polecat and SMI Puma's. The air/water nozzle snowmaking guns are currently newer technology and produce lower noise levels than the older technology air/water nozzle snowmaking guns.

As Heavenly continues to introduce lower noise emission technology snowmaking equipment to the lower California snowmaking fleet, it is expected that a minimum noise level reduction of 3 dBA to 5 dBA can be achieved for all snowmaking operations. Since the 2017/2018 ski season, Heavenly reported consistent use of fan guns for snowmaking at the lower portion of the California side. As the lower mountain converts to fan guns, it is expected that a reduction in snowmaking noise levels can be realized at the base areas.

The determining factors on overall noise from the snowmaking system include the types of snowmaking equipment, the number of air/water nozzles or fans operating at any time, and the total hours of operations. If fan gun technology is not capable of producing the amount of snow that the air/water nozzles produce, then snowmaking operations may require an increase in the number of fan guns operating at any one time and/or an increase in hours of operation.

III.5 Snowmaking at Boulder Base Area Noise

III.5.a Master Plan Mitigation Methods

1. Use of fans in place of air/water nozzles or using air/water nozzles which are low noise;
2. Re-direction of nozzles and fans to minimize noise exposures at PAS boundaries;
3. Reduction in the numbers of nozzles and/or fans;
4. Use of setbacks to reduce noise exposures at PAS boundaries;
5. Use of noise reduction housings for air/water nozzles;
6. Use of barriers at low-mounted air/water nozzles;
7. Reduction in snowmaking activities at nighttime;
8. Sponsor research into reducing noise produced by snowmaking. This may include support of industry-wide research activities, specific studies concerning nozzle design sponsored directly by Heavenly, and the study of alternatives in placement of guns and fans at Heavenly.
9. At the Stagecoach and Boulder Bases, Heavenly has replaced the older style air/water nozzles with newer generation Low-E "stick guns" and depending upon technological changes, may include fans.

III.5.b Master Plan Milestone/Product

During the 2020/2021 ski season, j.c. brennan & associates, Inc. has conducted short-term noise monitoring at the Boulder Base area. The noise monitoring occurs for short periods of time since the snowmaking only occurs for between 2 and 4 days per year. Heavenly anticipates replacing the air/water nozzles after complete replacement of nozzles with fan guns on the entire California face. Heavenly is investing in low noise technology fan gun and air/water nozzles and anticipates this is the next area for replacement of noisy air/water nozzles. Heavenly has not implemented any of the other mitigation measures listed above.

III.5.c Responsible Party

Heavenly is responsible for implementing the mitigation measures.

III.5.d PAS Criteria

PAS 080 – 50 dB CNEL

PAS 082, 085, 086, 087, 088 – 55 dB CNEL

PAS 095, PAS 121 – 45 dB CNEL

III.5.e Results of Reporting and Determination of Compliance

Short-term noise level measurements of snowmaking operations were conducted during the 2020/2021 ski season at the Boulder Base on December 27, 2020. Measured noise levels at this location were approximately 64 dBA Leq during snowmaking operations. Measurements were also conducted at the corner of Jack Circle and Bonnie Court. The measured noise levels were approximately 61 dBA Leq. The results of the ambient noise measurements for the 2020/2021 ski season and previous ski seasons are shown in Table 4. The predicted CNEL value at the Boulder Base is 70.6 dBA. The predicted CNEL value at the Jacks Circle location is 67.6 dBA.

The CNEL calculations assume snowmaking operations occur continually for a 24-hour period.

Table 4 Ambient Noise Level Measurements for the Boulder Base Area				
Year	Date	Measured Sound Level, Leq		
		Boulder Base Site 1	Corner of Jack Cir. & Bonnie Ct. - Site 2	
			Measured	Measured for Master Plan
1999-2000	December 14, 1999	70 dBA	63 dBA	65 dBA
2000-2001	December 14, 2000	73 dBA	65 dBA	
2001-2002	NA ¹	NA ¹	NA	
2002-2003	February 4, 2003	71 dBA	53 dBA	
2003-2004	December 8, 2003	60 dBA	NA ¹	
2004-2005	December 3, 2004	66 dBA	58 dBA	
2005-2006	December 13, 2005	71 dBA	64 dBA	
2006-2007	December 28, 2006	68 dBA	63 dBA	
2007-2008	December 31, 2007	67 dBA	65 dBA	
2008-2009	December 24, 2008	67 dBA	65 dBA	
2009-2010	December 15, 2009	68 dBA	62 dBA	
2010-2011	December 15, 2010	67 dBA	64 dBA	
2011-2012	December 22, 2011	68 dBA	65 dBA	
2012-2013	December 17, 2012	67 dBA	63 dBA	
2013-2014	January 15, 2014	69 dBA	64 dBA	
2014-2015	December 18, 2014	68 dBA	62 dBA	
2015-2016	December 14, 2015	69 dBA	63 dBA	
2016-2017	December 18, 2016	67 dBA	62 dBA	
2017-2018	January 22, 2018	66 dBA	63 dBA	
2018-2019	December 26, 2018	62 dBA	58 dBA	
2019-2020	December 18, 2019	64 dBA	60 dBA	
2020-2021	December 27,2020	64 dBA	61 dBA	
¹ Snowmaking operations did not occur at this location during this season. Boulder Base GPS Coordinates (38° 58.3' 3.98" N - 119° 53' 25.81" W) Jack Circle/Bonnie Ct. GPS Coordinates (38° 58' 5.14" N – 119° 53' 34.76" W)				

Currently, the snowmaking operations are out of compliance with the TRPA criteria.

III.6 Snowmaking at Stagecoach Base Area Noise

III.6.a Master Plan Mitigation Methods

1. Use of fans in place of air/water nozzles or air/water guns which are low noise;
2. Re-direction of nozzles and fans to minimize noise exposures at PAS boundaries;
3. Reduction in the numbers of nozzles and/or fans;

4. Use of setbacks to reduce noise exposures at PAS boundaries;
5. Use of noise reduction housings for air/water nozzles;
6. Use of barriers at low-mounted air/water nozzles;
7. Reduction in snowmaking activities at nighttime;
8. Sponsor research into reducing noise produced by snowmaking. This may include support of industry-wide research activities, specific studies concerning nozzle design sponsored directly by Heavenly, and the study of alternatives in placement of guns and fans at Heavenly.
9. At the Stagecoach and Boulder Bases, Heavenly will strive to replace all air/water nozzles with fans.

III.6.b Master Plan Milestone/Product

During the 2020/2021 ski season, Heavenly has conducted short-term noise monitoring at the Stagecoach Base area. The noise monitoring occurs for short periods of time since the snowmaking only occurs for between 2 and 4 days per year. Heavenly anticipates replacing the air/water nozzles after complete replacement of nozzles with fan guns on the entire California face. Heavenly has not implemented any of the mitigation measures listed above.

III.6.c Responsible Party

Heavenly is responsible for implementing the mitigation measures.

III.6.d PAS Criteria

This area is located outside of the TRPA area of influence.

III.6.e Results of Reporting and Determination of Compliance

During the 2020/2021 ski season, noise measurements were conducted at the Stagecoach Base area on December 14, 2020. The noise measurements were collected at three different locations as shown in Table 5. It is noted that the predicted CNEL values at each site would be 6.6 dBA higher than the measured hourly Leq, while assuming that the equipment operates 24-hours.

Please see the 2017-2018 noise monitoring report to explain the lower noise levels at the Entrance to the Ridge in 2017.

Table 5 Ambient Noise Level Measurements Stage Coach Base Area					
Year	Date	Measured Sound Level, Leq			
		460 Quaking Aspen Rd. Site 3		Entrance to The Ridge Site 4	Eagles Nest Site 5
		Measured	Measured for Master Plan		
1999-2000	December 4, 1999	87 dBA	82-92 dBA	62 dBA	78 dBA
2000-2001	December 11, 2000	86 dBA		56 dBA	72 dBA
2001-2002	November 30, 2001	57 dBA		55 dBA	59 dBA
2002-2003	February 2, 2003	83 dBA		--	70 dBA
2003-2004	December 8, 2003	87 dBA		58 dBA	74 dBA
2004-2005	November 30, 2004	81 dBA		58 dBA	68 dBA
2005-2006	December 5, 2005	81 dBA		63 dBA	73 dBA
2006-2007	December 18, 2006	88 dBA		62 dBA	72 dBA
2007-2008	December 20, 2007	82 dBA		60 dBA	68 dBA
2008-2009	December 17, 2008	78 dBA		55 dBA	65 dBA
2009-2010	December 8, 2009	78 dBA		56 dBA	62 dBA
2010-2011	November 29, 2010	78 dBA		58 dBA	65 dBA
2011-2012	December 9, 2011	75 dBA		57 dBA	62 dBA
2012-2013	December 14, 2012	78 dBA		57 dBA	60 dBA
2013-2014	December 9, 2013	77 dBA		56 dBA	60 dBA
2014-2015	December 14, 2014	77 dBA		55 dBA	61 dBA
2015-2016	November 25, 2015	76 dBA		58 dBA	61 dBA
2016-2017	--	--		--	--
2017-2018	November 28, 2017	77 dBA		45.2 dBA	61 dBA
2018-2019	December 1, 2018	74 dBA		52 dBA	58 dBA
2019-2020	November 30, 2019	81 dBA		54 dBA	59 dBA
2020-2021	December 14, 2020	79 dBA	55 dBA	61 dBA	
Quaking Aspen GPS Coordinates (38° 57' 37.52" - 119° 53' 16.57" W) Entrance to Ridge GPS Coordinates (38°57' 46.68" N - 119° 56' 3.68" W) Eagles Nest GPS Coordinates (38° 57' 35.04" N - 119° 53' 23.63" W)					

III.7 Snowmaking Upper Mountain Noise

III.7.a Master Plan Mitigation Methods

In order to reduce overall snowmaking noise levels, Heavenly shall use fan guns or other similar noise reduction measures for all new snowmaking areas. In addition, where new snowmaking is placed adjacent to existing ski trails with snowmaking, Heavenly shall convert the existing air/water snowmaking nozzles with fan guns or use other similar noise reduction measures to maintain or reduce existing noise levels in that area.

III.7.b Master Plan Milestone/Product

Snowmaking noise from the upper mountain areas is monitored and evaluated from the California Base Area permanent noise monitor, and through Remote Plan Area monitoring. The analysis to date indicates that upper mountain snowmaking does not exceed the ambient noise when snowmaking is not occurring. New snowmaking installations are fan guns.

III.7.c Responsible Party

Heavenly is the responsible party.

III.7.d PAS Criteria

PAS 080 – 50 dB CNEL

PAS 082, 085, 086, 087, 088 – 55 dB CNEL

PAS 095, PAS 121 – 45 dB CNEL

III.7.e Results of Reporting and Determination of Compliance

See the reporting for the California Base Area. The following provides results of the Remote Plan Area Noise Measurements

j.c. brennan & associates, Inc., did not conduct noise level measurements of snowmaking operations at the remote Plan Area locations. The noise measurement location, which is known as the area identified as “Party Rock” (Noise Measurement Site 7) is located within Plan Area 080. Noise measurements were not conducted at that location due to previous years measurements which indicated that snowmaking operations were either inaudible or could not be determined due to other background noise measurements.

During this year, noise measurements were not conducted at the upper mountain remote area in Plan Area 095, which is generally located adjacent to the ski area boundary, and southeast of Liz’s and Canyon Runs (Noise Measurement Site 6). They were not conducted at this location due to inaccessibility.

GPS coordinates for the Remote Plan Area measurements sites are as follows:

Party Rock (38° 56’ 27.63” N - 119° 56’ 1.35” W);
Liz’s / Canyon Run (38° 54’ 47.5” N - 119° 54’ 43” W).

III.8 Rock Busting Noise

III.8.a Master Plan Mitigation Methods

Rock busting generally occurs through the use of explosives and blasting. Control the number, size and location of Rock Busting blasts.

III.8.b Master Plan Milestone/Product

None

III.8.c Responsible Party

Heavenly is the responsible party.

III.8.d PAS Criteria

PAS 080 – 50 dB CNEL

PAS 082, 085, 086, 087, 088 – 55 dB CNEL

PAS 095, PAS 121 – 45 dB CNEL

III.8.e Results of Reporting and Determination of Compliance

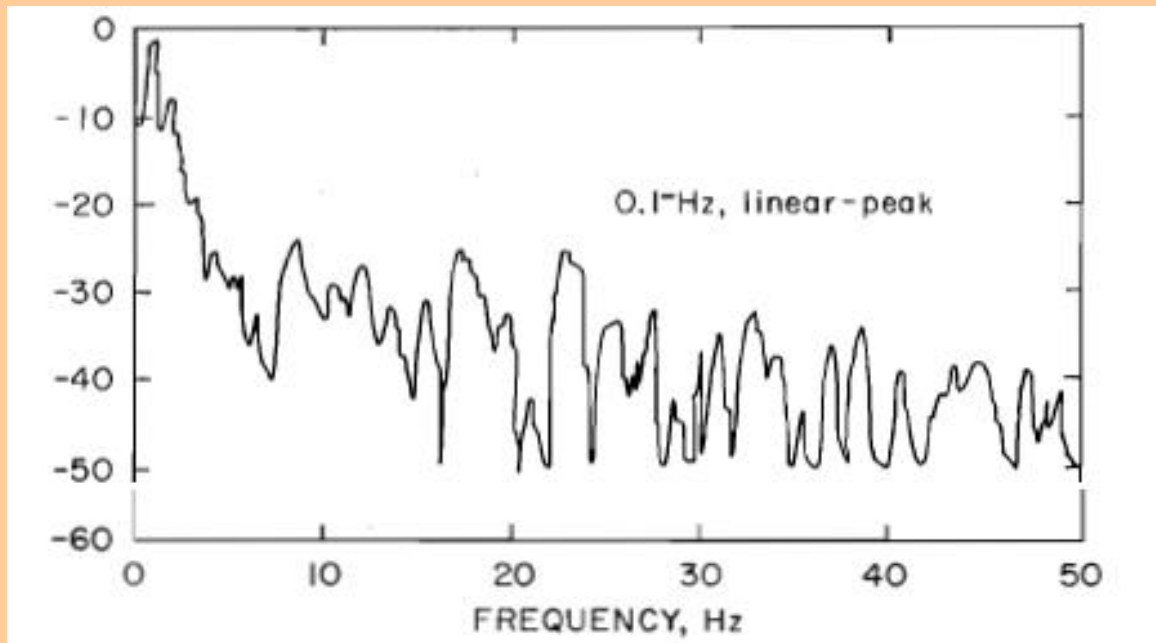
Heavenly has not contacted j.c. brennan & associates, Inc. to conduct noise measurements of blasting or rock busting. It is assumed that this activity has not occurred.

The process associated with rock busting includes setting explosive charges. The process includes drilling holes in the rock to set the charges. In general, blasting is controlled using micro delays between charges and by limiting charge size to minimize dispersal of the rock fragments, and to ensure the safety of the workers. Blasting is also controlled to prevent damage to nearby structures.

Airborne overpressures produced by blasting are typically measured in terms of the overall peak sound pressure level, without applying the A-weighting filter. The dominant frequencies of sound pressures associated with blasting lie in the very low frequency ranges of 2 Hz to 25 Hz, and the acoustical energy is concentrated below about 5 Hz. The figure below depicts a typical blast acoustical spectrum, which shows that the acoustical energy is concentrated well below 5 Hz.

Typical Blast Acoustical Spectrum

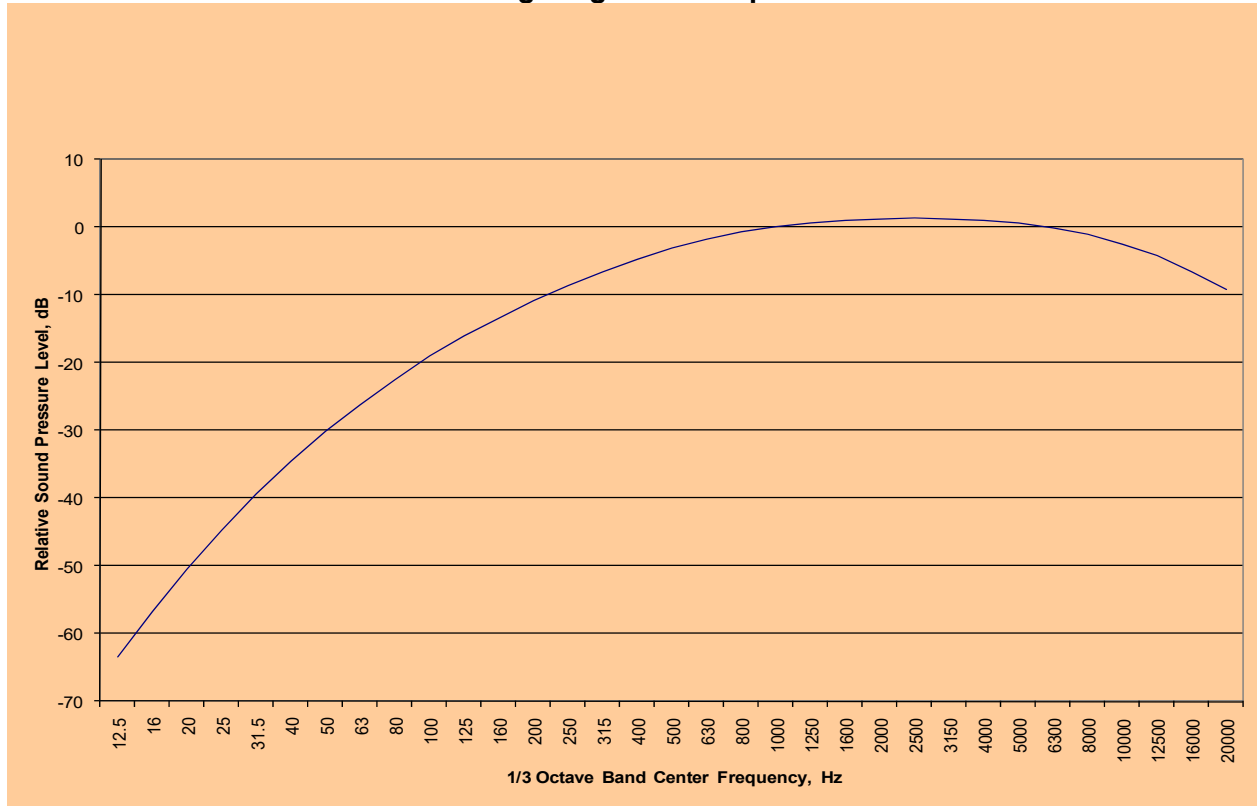
Relative Amplitude, dB



Source: "Airblast Instrumentation and Measurement Techniques for Surface Mine Blasting"
U.S. Dept. of the Interior Report of Investigations 8508.

Audible sound, in contrast, is usually assumed to begin at 20 Hz, ranging up to 20,000 Hz. People hear best at frequencies in the range of 1,000 Hz to 4,000 Hz, and people hear poorly at the low frequencies associated with blast overpressures. As a result, the A-weighting curve is usually applied to other environmental noise measurements. The A-weighting curve is shown by Figure 6 below.

Figure 6
A-Weighting Filter Response



The A-weighting adjustment factor for sound at 25 Hz (the upper limit of the dominant blast frequencies) is -44.7 dB. There are no published A-weighting correction factors below 12.5 Hz (where the A-weighting correction factor is -63.4 dB). These factors indicate that very high blast overpressures would be required to generate sound pressure levels that would be audible in an outdoor environment.

The audible sound associated with blasting is the result of escaping gases and falling (slumping) rock. Subjectively, audible blasting sound has been described as similar to the closing of a car trunk, or to rolling thunder. While these terms are subjective rather than quantitative, the described sounds are relatively benign. Audible noise due to blasting is not commonly considered to be a significant source of annoyance if blasting is controlled to meet safety standards on the project site.

Since rock busting is such an infrequent event, and is not considered to be a significant noise source, it is recommended that this mitigation monitoring measure is removed.

III.9 Amphitheater Operations Noise

III.9.a Master Plan Mitigation Methods

Restrict hours of concert noise to the daytime and early evening hours. This is consistent with the hours of operations assumed for the amphitheater noise study. In addition, concerts should not extend more than 6 hours in duration.

III.9.b Master Plan Milestone/Product

Heavenly has conducted a concert simulation and amphitheater noise study.

III.9.c Responsible Party

Heavenly is the responsible party

III.9.d PAS Criteria.

PAS 080 – 50 dB CNEL

PAS 082, 085, 086, 087, 088 – 55 dB CNEL

PAS 095, PAS 121 – 45 dB CNEL

III.9.e Results of Reporting and Determination of Compliance

No concerts were monitored.

Appendix A

Acoustical Terminology

Acoustics	The science of sound.
Ambient Noise	The distinctive acoustical characteristics of a given space consisting of all noise sources audible at that location. In many cases, the term ambient is used to describe an existing or pre-project condition such as the setting in an environmental noise study.
Attenuation	The reduction of an acoustic signal.
A-Weighting	A frequency-response adjustment of a sound level meter that conditions the output signal to approximate human response.
Decibel or dB	Fundamental unit of sound, A Bell is defined as the logarithm of the ratio of the sound pressure squared over the reference pressure squared. A Decibel is one-tenth of a Bell.
CNEL	Community Noise Equivalent Level. Defined as the 24-hour average noise level with noise occurring during evening hours (7 - 10 p.m.) weighted by a factor of three (+5 dB for TRPA calculations) and nighttime hours weighted by a factor of 10 (or +10 dB) prior to averaging.
Frequency	The measure of the rapidity of alterations of a periodic signal, expressed in cycles per second or hertz.
Ldn	Day/Night Average Sound Level. Similar to CNEL but with no evening weighting.
Leq	Equivalent or energy-averaged sound level.
Lmax	The highest root-mean-square (RMS) sound level measured over a given period of time.
L(n)	The sound level exceeded a described percentile over a measurement period. For instance, an hourly L50 is the sound level exceeded 50% of the time during the one hour period.
Loudness	A subjective term for the sensation of the magnitude of sound.
Noise	Unwanted sound.
Peak Noise	The level corresponding to the highest (not RMS) sound pressure measured over a given period of time. This term is often confused with the "Maximum" level, which is the highest RMS level.
RT₆₀	The time it takes reverberant sound to decay by 60 dB once the source has been removed.
Sabin	The unit of sound absorption. One square foot of material absorbing 100% of incident sound has an absorption of 1 sabin.
Threshold of Hearing	The lowest sound that can be perceived by the human auditory system, generally considered to be 0 dB for persons with perfect hearing.
Threshold of Pain	Approximately 120 dB above the threshold of hearing.
Impulsive	Sound of short duration, usually less than one second, with an abrupt onset and rapid decay.
Simple Tone	Any sound which can be judged as audible as a single pitch or set of single pitches.

Heavenly Mountain Resort
Mitigation and Monitoring Plan Annual Report
(October 2020 – September 2021)

APPENDIX
XI

2020-2021 HEAVENLY SHUTTLE &
ROUTE SCHEDULE



GETTING TO HEAVENLY FROM SOUTH LAKE TAHOE



THE Y & MID-TOWN TO HEAVENLY VILLAGE

- To access the Heavenly Village please use Tahoe Transportation District bus route 50 to the Stateline Transit Center/Heavenly Village.
- The Transit Center is located in the Heavenly Village with access to the Heavenly Gondola.
- This route has a cost of \$4 per trip. Please see reverse side for a full schedule and more information.

To access the California Lodge, Stagecoach Lodge or Boulder Lodge please see information in those sections below.

STATELINE TO HEAVENLY VILLAGE

- Access to the Gondola from the Casino Corridor and Stateline is a short walk away.
- No buses run from Casino/Stateline lodging to Heavenly Village.

To access the California Lodge, Stagecoach Lodge or Boulder Lodge please see information in those sections below.

CALIFORNIA LODGE TO & FROM HEAVENLY VILLAGE

- For transportation between California Lodge and Heavenly Village or from Heavenly Village to California Lodge please ride the Heavenly Shuttle Orange Loop.
- Heavenly Shuttle Orange Loop runs 7 days a week from 8AM to 6PM.
- Pickup locations are as follows: At Heavenly Village pickup is at the Transit Center and at California Lodge pickup is in the parking lot directly in front of ticket windows.

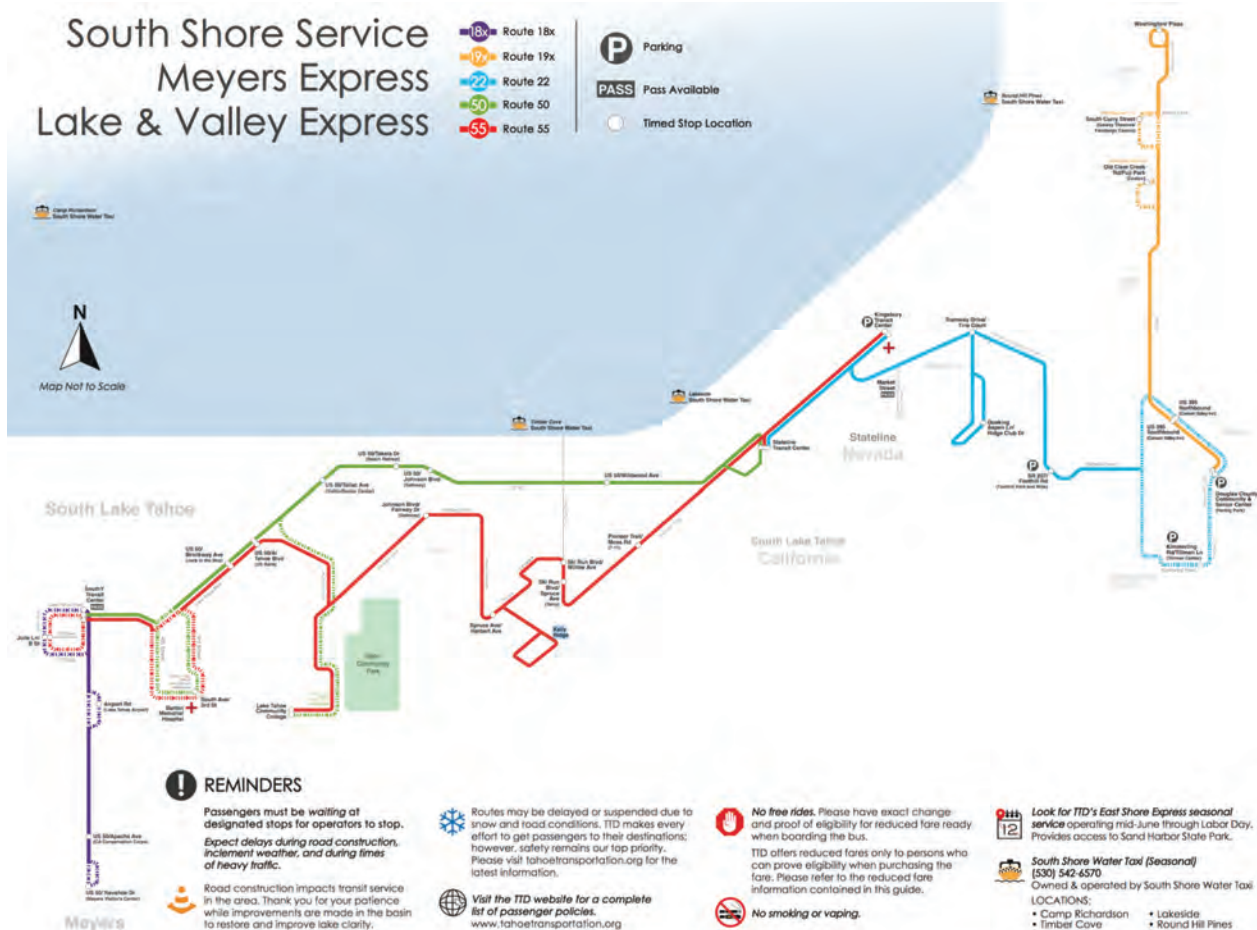
STAGECOACH LODGE & BOULDER LODGE

- Heavenly Blue Route shuttles run between Stagecoach Lodge and Boulder Lodge only.
- Heavenly shuttles will pick up guest along the Tram Way loop between Boulder and Stagecoach.
- For access between Stagecoach/Boulder and the Transit Center/Heavenly Village please use Tahoe Transportation District Bus Route 22. This route does have limited service and has a cost of \$4 per trip. Please see the reverse side for a full schedule and more information.

South Shore Service Meyers Express Lake & Valley Express

18x Route 18x
19x Route 19x
22 Route 22
50 Route 50
55 Route 55

P Parking
PASS Pass Available
Timed Stop Location



REMINDERS

Passengers must be waiting at designated stops for operators to stop. Expect delays during road construction, inclement weather, and during times of heavy traffic.

Road construction impacts transit service in the area. Thank you for your patience while improvements are made in the basin to restore and improve lake clarity.

Routes may be delayed or suspended due to snow and road conditions. TTD makes every effort to get passengers to their destinations; however, safety remains our top priority. Please visit tahoe transportation.org for the latest information.

Visit the TTD website for a complete list of passenger policies. www.tahoe transportation.org

No free rides. Please have exact change and proof of eligibility for reduced fare ready when boarding the bus.

TTD offers reduced fares only to persons who can prove eligibility when purchasing the fare. Please refer to the reduced fare information contained in this guide.

No smoking or vaping.

Look for TTD's East Shore Express seasonal service operating mid-June through Labor Day. Provides access to Sand Harbor State Park.

South Shore Water Taxi (Seasonal) (530) 542-4570
Owned & operated by South Shore Water Taxi
LOCATIONS:
• Camp Richardson • Lakeside
• Timber Cove • Round Hill Pines

18x 19x 22 50 55

Route Schedules

Note: AM times are shown in lightface type, PM times are shown in boldface type.

18x Meyers Express Daily

South		North	
South Y Transit Center	US 50/ Meadows Dr (Meadows Valley Center)	US 50/ Meadows Dr (Meadows Valley Center)	US 50/ Meadows Dr (Meadows Valley Center)
6:30	6:46	6:50	6:52
7:15	7:31	7:35	7:37
6:00	6:16	6:20	6:22
6:30	6:46	6:50	6:52
		7:00	7:05
		7:35	7:40
		7:50	7:51

19x Valley Express Daily

Northbound		Southbound	
Staterline Transit Center	SR 207/Foothill Rd (Foothill Park and Ride)	Washington Plaza	Off Chap Creek Rd (Foothill Park and Ride)
2:40	3:01	6:15	6:26
		7:45	7:56
		9:45	9:56
		10:11	10:30
		10:31	10:45
		11:15	
		4:15	4:26
		6:15	6:26
		6:41	6:41
		7:00	7:00

50 South Shore Daily

Eastbound		Westbound	
South Y Transit Center	South Ave/350 St (Rincon Hospital)	Staterline Transit Center	US 50/ Meadows Dr (Meadows Valley Center)
6:30	6:33	7:00	7:03
7:30	7:33	8:00	8:03
8:20	8:23	8:45	8:48
8:40	8:43	9:05	9:08
9:20	9:23	9:45	9:48
9:40	9:43	10:05	10:08
10:20	10:23	10:45	10:48
10:40	10:43	11:05	11:08
11:20	11:23	11:45	11:48
11:40	11:43	12:05	12:08
12:20	12:23	12:45	12:48
12:40	12:43	1:05	1:08
1:20	1:23	1:45	1:48
1:40	1:43	2:05	2:08
2:20	2:23	2:45	2:48
2:40	2:43	3:05	3:08
3:20	3:23	3:45	3:48
3:40	3:43	4:05	4:08
4:20	4:23	4:45	4:48
4:40	4:43	5:05	5:08
5:20	5:23	5:45	5:48
5:40	5:43	6:05	6:08
6:20	6:23	7:05	7:08
7:40	7:43	8:05	8:08

22 South Shore Service & Lake Express Daily

Eastbound		Westbound	
Staterline Transit Center	Knappa Transit Center	Knappa Transit Center	Staterline Transit Center
5:50	5:53	7:00	7:03
7:00	7:03	8:00	8:03
8:00	8:03	9:00	9:03
9:30	9:35	10:05	10:10
10:30	10:35	11:05	11:10
11:30	11:35	12:05	12:10
12:30	12:35	1:05	1:10
1:30	1:35	2:05	2:10
2:30	2:35	3:05	3:10
3:30	3:35	4:05	4:10
4:20	4:23	5:05	5:10
4:30	4:35	6:05	6:10
5:30	5:33	7:05	7:10
6:30	6:33	8:05	8:10

55 South Shore Daily

Eastbound		Westbound	
South Y Transit Center	South Ave/350 St (Rincon Hospital)	Knappa Transit Center	South Y Transit Center
6:00	6:03	7:00	7:03
7:00	7:03	8:00	8:03
8:00	8:03	9:00	9:03
9:30	9:33	10:05	10:10
10:30	10:33	11:05	11:10
11:30	11:33	12:05	12:10
12:30	12:33	1:05	1:10
1:30	1:33	2:05	2:10
2:30	2:33	3:05	3:10
3:30	3:33	4:05	4:10
4:20	4:23	5:05	5:10
4:30	4:33	6:05	6:10
5:30	5:33	7:05	7:10
6:30	6:33	8:05	8:10

REDUCED FARE ELIGIBILITY

TTD only offers reduced fares to persons who can prove eligibility when purchasing the fare.

- Persons with TTD's ADA Paratransit ID card
- Persons 65 years of age and older (seniors) with a valid government-issued photo ID
- Persons with a valid Medicare card and a valid government issued photo ID
- Veteran's Health Identification Card with a "service-connected disability" designation

REQUISITOS PARA TARIFA REDUCIDA

TTD sólo ofrece tarifas reducidas a las personas que pueden comprobar que reúnen los requisitos al comprar la tarifa.

- Personas con la Tarjeta de Identificación de Paratransito ADA de TTD
- Personas de 65 años de edad y mayores (tercera edad) con una identificación válida con foto emitida por el gobierno
- Personas con una tarjeta de Medicare válida y una identificación válida con foto emitida por el gobierno
- Tarjeta de Identificación Sanitaria de Veterano con una discapacidad conectada al servicio

For more information, please email info@tahoe transportation.org or call 775-589-5500.

GENERAL INFORMATION

Bicycles / Bicicletas

Bike racks are available on a first come, first served basis. Folding bicycles may be brought on buses if space is available and the bicycle does not obstruct or pose a risk to other passengers.

Heavenly Mountain Resort
Mitigation and Monitoring Plan Annual Report
(October 2018 – September 2019)

APPENDIX

XII

FOREST SERVICE OLD GROWTH
COMPLETION LETTER



United States
Department of
Agriculture

Forest
Service

Lake Tahoe Basin
Management Unit

35 College Drive
South Lake Tahoe, CA 96150
530 543-2600

File Code:

Date: March 19, 2009

Andrew Strain
Heavenly Mountain Resort
PO Box 2180
Stateline, NV 89449

Dear Andrew,

The High Meadows stand identified for hand thinning to improve long-term habitat conditions for northern Goshawk per the Heavenly Master Plan Amendment was treated in the fall of 2007. All contract work was completed and accepted per the contract requirements on December 6 2007. I will fax you the signed copies of the Certificate of Final Inspection and the Contract Release for this project for your records. If you have questions, please give me a call at (530) 543-2687.

Sincerely,

SCOTT PARSONS
Contracting Officer's Representative



U.S. DEPARTMENT OF AGRICULTURE FOREST SERVICE CERTIFICATE OF FINAL INSPECTION <i>(Reference FSH 6309.31)</i>	CONTRACT NUMBER AG-9A63-C-08-0015	
	UNIT LTBMU	
	PROJECT South Shore hand Thin 2007	
TO: Matthew Gagnon CONTRACTING OFFICER	NAME AND ADDRESS OF CONTRACTOR Central Valley Forestry 18985C Road 256 Exeter, CA 93221	
<p>I hereby certify that the final inspection of the work under the above contract was made on <u>12-6-07</u>.</p> <p>The last day on which work was performed was <u>12-6-07</u> after which no calendar days should be charged against time. All materials have been furnished, all the work has been performed, and all the construction required by the contract in accordance with its terms has been completed.</p> <p>A copy of the inspection report is enclosed.</p>		
Enclosure(s) SIGNATURE Robert Guebard	TITLE Contracting Officer's Representative	DATE 12-6-07

Matthew 12-10-07

12/10/2007 14:37 FAX 530 543 2893

USDA FOREST SERVICE

005

FS-6300-18 (11/10)

USDA - Forest Service CONTRACT RELEASE (Reference FSH 6309.11)	CONTRACT NUMBER AG-9A63-C-08-0015 UNIT LTEMU PROJECT South Shore Hand Thin 2007
TO: Matthew Gagnon CONTRACTING OFFICER	NAME AND ADDRESS OF CONTRACTOR Central Valley Forestry 18985C Road 258 Exeter, CA 93221
<p>In consideration of the receipt of final payment in the amount of \$ <u>84,385.00</u> the undersigned hereby releases the United States of America from any and all obligations arising under this contract and any modifications thereof except as reserved below.</p> <p>Reservations: none</p>	
<p><u>12/10/07</u> Date (mm/dd/yyyy)</p> <p><u>Central Valley Forestry</u> Contractor</p> <p>By <u>[Signature]</u> Title <u>Owner</u></p>	

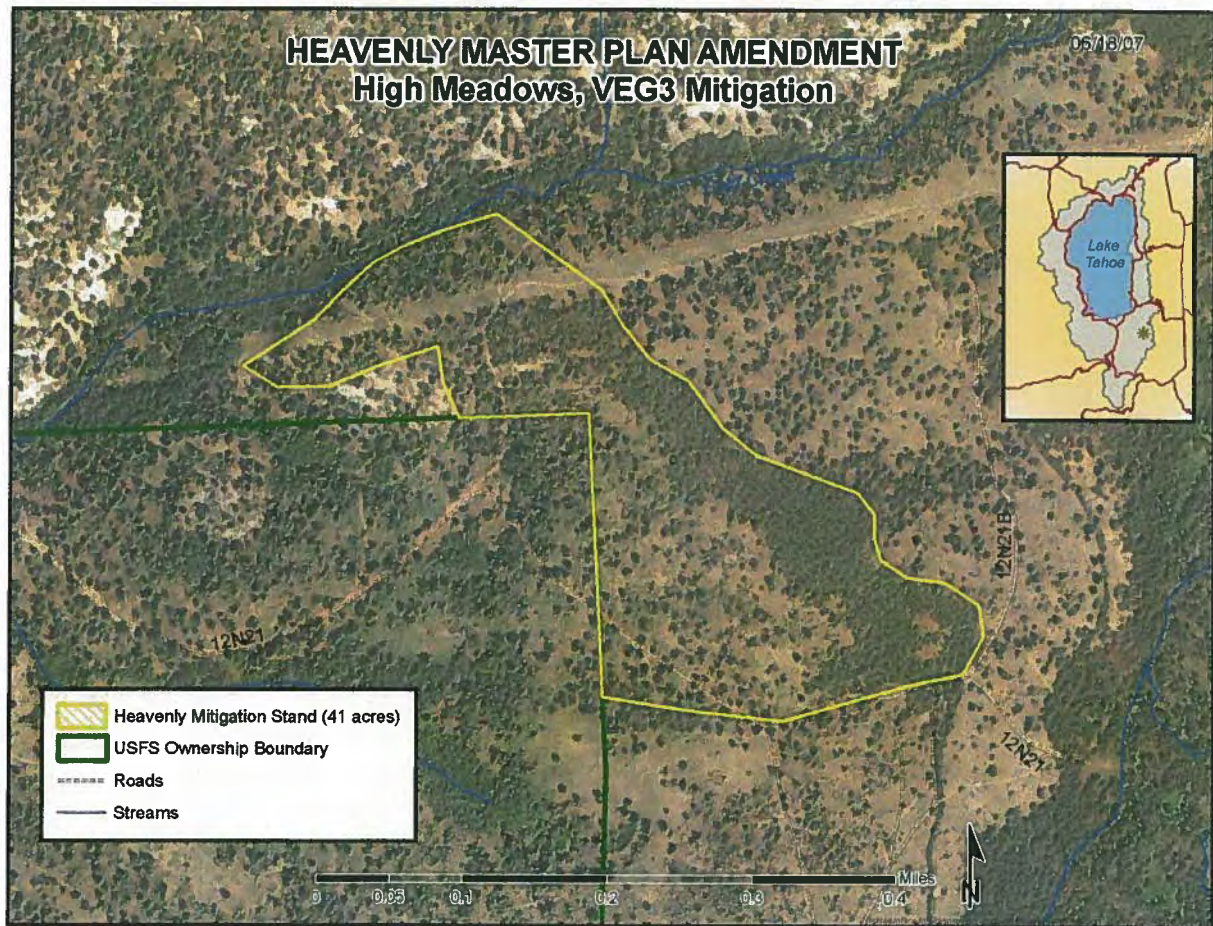
Microsoft Word 2003

7.5-25 Late Seral/Old Growth Forest Enhancement

To mitigate for any projects that involve the removal of late seral/old growth suitable habitat, Heavenly must enhance or restore twice the area to late seral/old growth characteristics.

Heavenly enhanced/restored a stand of forest equal to twice the area proposed for removal in the Master Plan Amendment. The enhanced forest was restored during the fall of 2007 and is located in the High Meadows area and is undergoing monitoring by the Forest Service every five years for success. The next monitoring report will be conducted in 2012. The Forest Service documentation certifying of completion of this task is located in Appendix XIII. (Text copied from the 2011 report.)

On May 1st 2013, Forest Silviculturist Rita Mustatia and Assistant VUFF Staff Officer David Fournier visited the Heavenly Mitigation Stand (see map below).



Portions of the mitigation stand included high levels of tree mortality that posed a high risk of stand replacing fire and relatively large older trees that were susceptible to bark beetle mortality.

The objectives of the mitigation were three-fold: 1) To reduce the fire hazard to the older forest portion of the stand, and 2) to improve the resiliency of the old forest stand to fire and insects, and 3) to monitor natural regeneration of early seral portions of the stand.

The result of the site visit to monitor the completion of these objectives proved satisfactory. The high levels of lodgepole mortality (from Mountain Pine Beetle) were cut, piled and burned, reducing the risk of stand replacing fire. The understory in the older portions of the stand was thinned to levels that would effectively improve resiliency for the long-term. There was evidence of adequate stocking of naturally regenerating seedlings throughout the treated area of the stand.

The photos below highlight the result of these treatments:

Photo 1: Reduction of fuel hazard and follow-up prescribed burning



Photo 2: Natural regeneration occurring within the stand.



Photo 3: Enhancement of older forest portion of the stand.



Photo 4: Enhancement of older portion of the stand.



This report certifies that the treatment goals for the mitigation stand have been met. As a result of the monitoring conducted, there is no further need for monitoring.

David P. Fournier

David Fournier, Assistant Staff Officer

4/10/2014

Rita Mustatia

Rita Mustatia, Silviculturist

4/10/2014

TOGETHER we can do great things

Community

When we say community, we don't just mean the neighborhoods that people call home. We mean everyone and everything with a stake in the work that we do—from our Stantec and industry colleagues to the clients we collaborate with and the people and places we impact. Whether creating, sustaining, or revitalizing a community, we help diverse cultures and perspectives work together toward shared successes.

Although our work helps to create physical communities, our ultimate goal is to create something far more meaningful—a sense of community.

Creativity

For us, creativity is driven by purpose. Knowing that transformation is truly possible inspires us to approach every situation with a fresh perspective.

Our inventive and collaborative approach to problem-solving helps bring big ideas to life through creative solutions.

Whether our contribution is a design that strikes the perfect balance between function and aesthetics, a feat of engineering that redefines what's possible, or a project management approach that delivers results, we strive for outcomes that transcend the challenges they solve and shape the communities we serve for the better.

Client Relationships

We're better together. This belief shapes how we collaborate with our clients, our partners, and our communities.

We listen so we can deeply understand our clients' needs, communicate with purpose so we maintain alignment, and remain open and flexible so we never miss an opportunity to strengthen a project and positively transform a community.