Burke Creek Highway 50 Crossing and Realignment Project Monitoring Plan

Nevada Tahoe Conservation District

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Introduction

Burke Creek is a small stream in the Lake Tahoe Basin which passes just north of the intersection of Highway (Hwy) 50 and Kahle Drive. It has an approximately 4.5 square mile drainage area to Lake Tahoe. The stream has been historically modified and relocated to accommodate development including the former Tahoe Nugget Casino, Hwy 50 and other commercial development. This includes parking lots that infringe on its floodplain. It flows through five property ownerships including the United State Forest Service (USFS), private (Sierra Colina & commercial area), Douglas County and the Nevada Department of Transportation (NDOT). The project consists of Phases I and 2 (Figure 1).

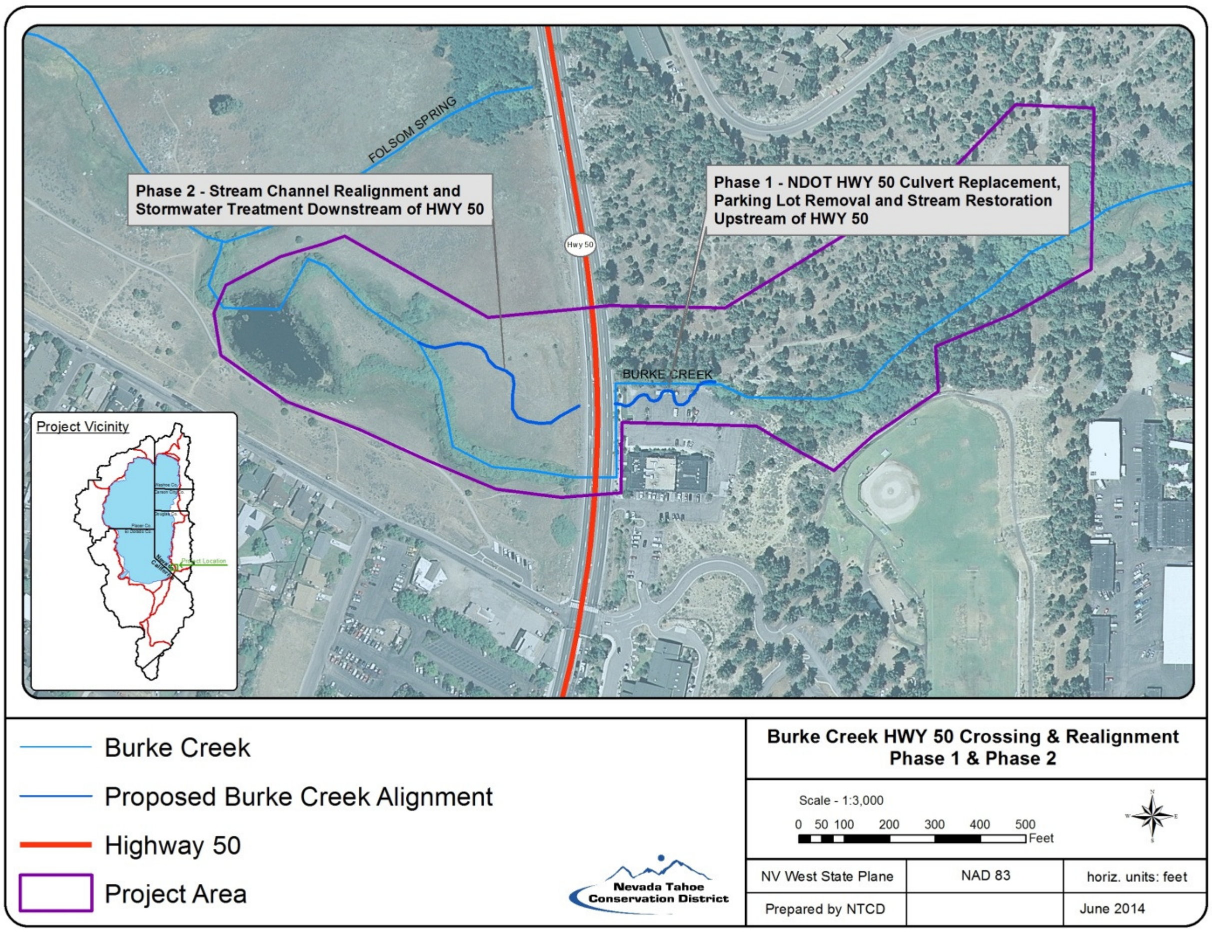

Figure 1. Project map showing the project location and phasing.

Background

In 2007, TRPA, USFS and NDOT hired a team of consultants: Winzler & Kelly, McBain & Trush and Michael Love & Associates to develop restoration alternatives for Burke Creek. In 2009, the above mentioned team produced the *BURKE CREEK RESTORATION PROJECT, ALTERNATIVE ANALYSIS REPORT, BURKE CREEK AT HIGHWAY 50, STATELINE, NEVADA* report. The report identifies four preliminary alternatives for the restoration of Burke Creek. The alternatives were shaped by the project objectives and the project constraints identified by the Technical Advisory Committee (TAC). The constraints were the gravity sewer line located beneath HWY 50 and the private property (APN 1318-23-401-39) upstream of HWY 50.

In 2011 the Burke Creek Rabe Meadow Complex Ecosystem Restoration (BRC Master Plan) Project received funding ($300K USFS; $200K NDOT; $100K TRPA DC SEZ MIT) to further the Winzler & Kelly work and to master plan stormwater and other improvements in the area. The TAC of the BRC Master Plan Project has reviewed the four alternatives created as part of the Winzler & Kelly work and has combined aspects of two alternatives for the preferred alternative. The preferred alternative has been advanced to 50% design for the Phase 2 portion (Figure 2). The upstream portion (Phase 1) has not been designed beyond the conceptual level of Winzler & Kelly because the land acquisition and easement issues surrounding the design, construction and maintenance were not resolved until recently (June 2014).

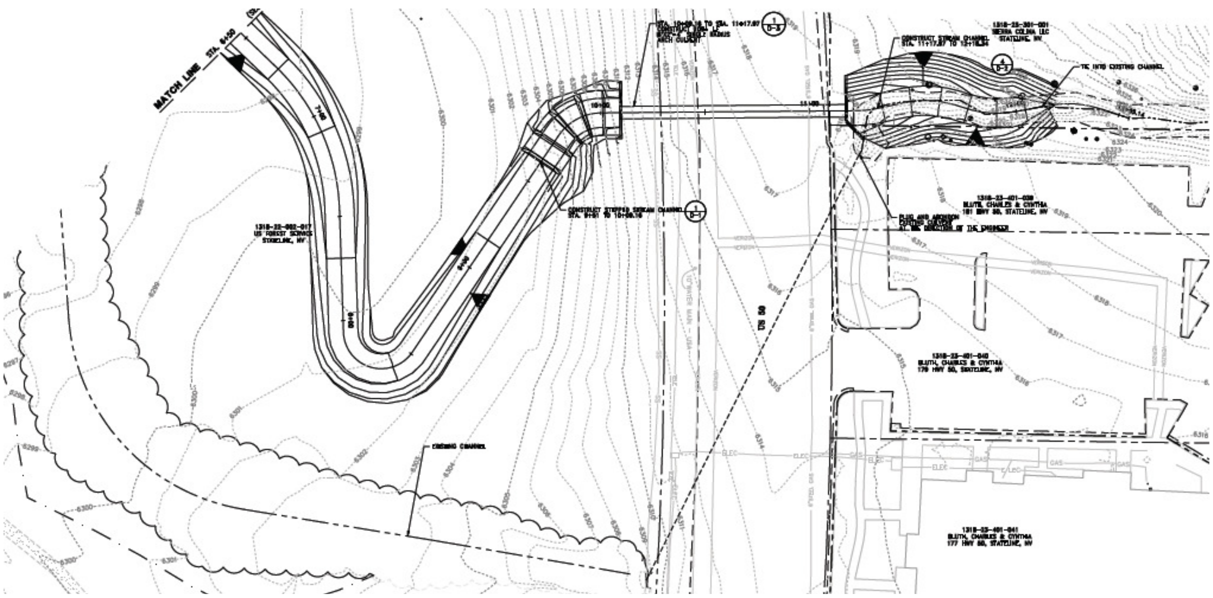

Figure 2. Preliminary 50% design plans for Phase 2 (downstream alignment).

Burke Creek Issues

As Burke Creek approaches HWY 50 it is impacted by the close proximity of parking lots and directly connected stormwater runoff from HWY 50, Douglas County (Kahle ball fields) and adjacent commercial area. An undersized and circuitous culvert under Hwy 50 restricts proper stream function and has potential to backwater HWY 50 travel lanes according to HEC-RAS modeling and past observed incidents. The undersized culvert is nearly full of sediment at the downstream outlet, further limiting its conveyance abilities. The HEC-RAS modeling performed by Winzler & Kelly indicates that the culvert is capable of passing 25 cubic feet per second (cfs) flow, which is less than a 5 year flow event.

Downstream of HWY 50, the channel was reconstructed on USFS land in the early 1980’s as part of a restoration project. The channel runs along the top of a knoll before entering a pond in Rabe Meadow.

During high flows, water from the stream overtops the channel in numerous areas. The numerous avulsions along the channel signify channel instability as Burke Creek strives to find a natural channel. Once the channel escapes from the existing reinforced rock-lined channel onto man-placed or unstable fill, significant channel entrenchment and erosion are possible. Burke Creek may eventually create a new channel in an undesirable location due to these avulsions. Additionally the channel downstream of HWY 50 is choked with silt which is likely originating from the directly connected stormwater flows.

Upstream of HWY 50, Burke Creek was relocated from its floodplain onto a hillside to create room for development. This hillside location affords little floodplain access and limited sinuosity and stream complexity. Further upstream, head cuts exist and are causing channel entrenchment, bank undercutting and erosion. An area of floodplain pinching was caused by a 1997 rain on snow mudslide from an unstable slope of ball field fill. Untreated stormwater runoff from the Douglas County ball fields at the Kahle Community Center is conveyed into Burke Creek just above the Bluth parking lot. These stormwater flows have breached the conveyance swale and flowed down the slope and across the parking lot.

Monitoring Objectives and Goals

The goal of the project is to construct a proper geomorphic crossing for Burke Creek under HWY 50; provide safer floodplain access to the downstream reach between HWY 50 and Jennings pond; restore the reach just upstream of HWY 50; improve water quality and increase public safety. The combination of a proper geomorphic crossing with a properly restored channel will produce a stream with connectivity to the floodplain and continuity of in-stream function, both of which will improve water quality as well as riparian habitat. These channel improvements will also increase riverine processes. It has been shown through observation, research and monitoring that increase in riverine processes also increases nutrient assimilative capacity of a lotic waterbody. Thus the stream restoration and floodplain enhancement aspects of this project will reduce fine-grained sediment transport to the Lake and reduce nutrient discharge to the Lake.

The monitoring methods were chosen to document changes to the stream channel substrate, channel cross section profile and riparian habitat as a result of the stream restoration project. The project is expected to result in a reduction of fine sediment deposition downstream of HWY 50, improved bank stabilization both above and below HWY 50, and an improved riparian corridor. Thus, the monitoring methods were chosen to document changes in riverine processes by monitoring FSP deposition, bank stability and riparian habitat.

Monitoring Sites

Eleven monitoring sites will be located along Burke Creek: two upstream at headcuts, three downstream of HWY 50 below the project and six photo monitoring points only. The BRC1, BRC2, BRC3, BRC4, and BRC5 monitoring points will consist of Wolman pebble counts, channel cross sections and photo points; BRC5 monitoring point will also include a channel profile. The PP7, PP8, PP9, PP10, PP11 and PP12 will consist of photo points only. Monitoring sites will be located such that construction processes do not disturb the monitoring sites. Figure 3 shows the approximate Burke Creek monitoring locations.

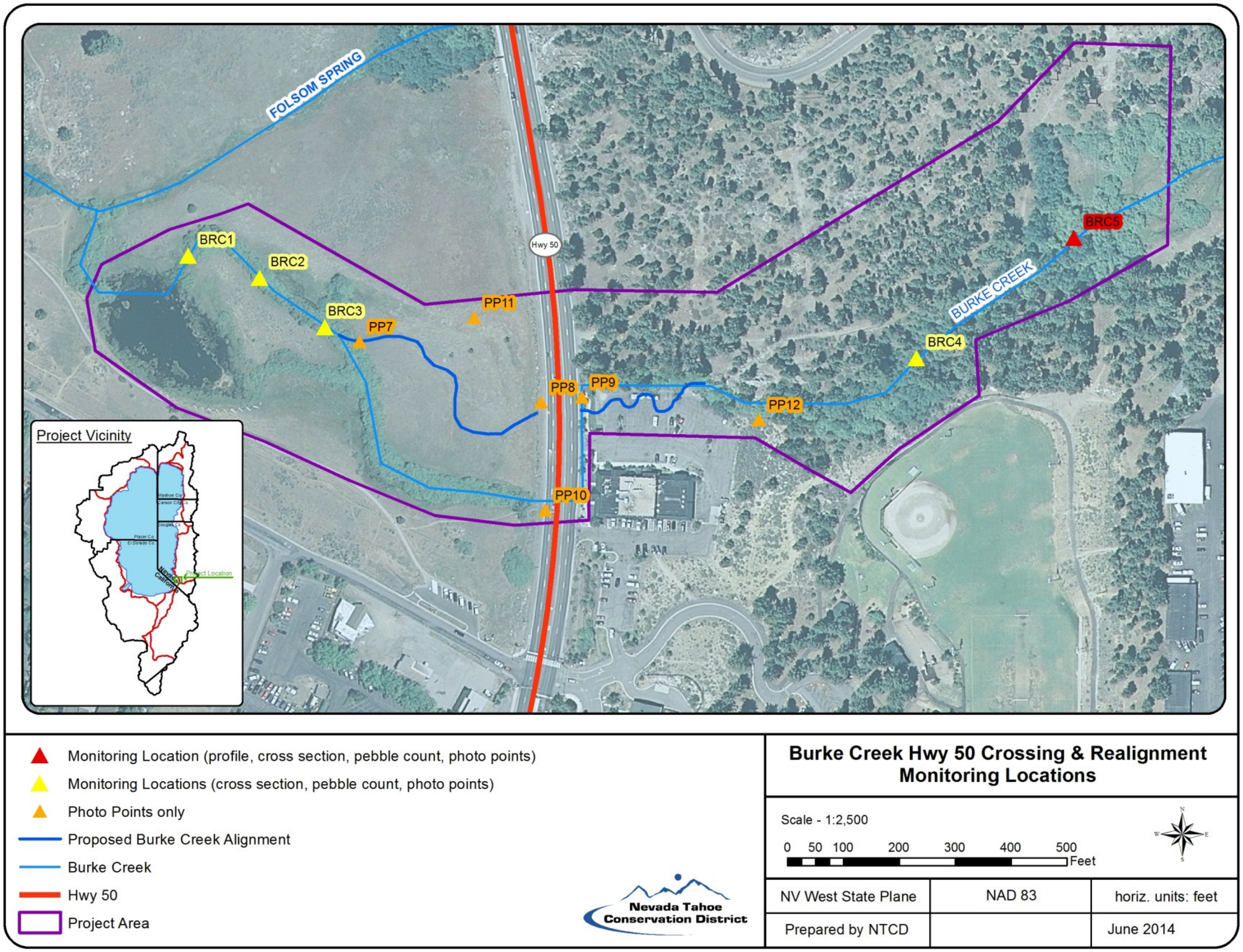

Figure 3. Burke Creek monitoring locations.

Data Collection Methods

Currently, Burke Creek receives untreated stormwater runoff from HWY 50. With the proposed Burke Creek realignment culvert crossing, the HWY 50 runoff will be disconnected from Burke Creek and treated elsewhere. The new culvert crossing, upstream stream channel realignment and headcut grade controls should improve the Burke Creek water quality and channel stability both upstream and downstream of HWY 50. The stream restoration is anticipated to result in increased riparian habitat as well. The following field methods will be used to collect both pre- and post-project data used to evaluate whether the project improved the Burke Creek riverine processes.

Wolman pebble counts

Establish monitoring sites at the upstream headcuts and downstream of the proposed realignment to document changes in channel substrate composition. Currently the channel downstream of HWY 50 is choked with fine sediment. The project is expected to remove the fine sediment inputs to the stream (stormwater runoff) and thereby return the channel substrate composition to more natural conditions. The Wolman pebble count sampling method will be used.

Channel cross sections

Using established Wolman pebble count monitoring sites, a stadia rod and level will be utilized to measure channel cross sections. Both pre- and post-cross section measurements will be compared to document changes in the channel cross section. The cross section measurements will show how the stream channel is changing: widening, deepening, undercutting, etc.

Channel profile

Using the most upstream established monitoring site, a stadia rod and level will be utilized to measure the profile. Both pre- and post-profile measurements will be compared to document changes in the channel streambed. The profile measurements will show how the stream channel is changing: aggradation, degradation, thalwag movement, etc.

Photo Points

Establish twelve permanent photo points for purposes of documenting pre- and post-project changes to the stream. Photo documentation provides a visual assessment to compare against the changes noted from the Wolman pebble count and bank stabilization data. Photo points also document the riparian health and extent along the stream channel.

Field Equipment Installation and Maintenance

To ensure the exact sampling location is visited each time, rebar and flagging tape will be installed at each monitoring site. The rebar and flagging tape will mark the Wolman pebble count reaches and photo points. Separate rebar will be installed, near the rebar and flagging tape, at bankfull locations on each side of the creek to mark the channel cross sections and channel profile. The rebar will ensure the exact cross section and profile locations are repeatedly measured along with providing stability for holding the measuring tape. Photos will be collected from a height of 5 feet off the ground.

Event Preparation and Logistics

All field personnel will undergo training to become familiar with and ensure their competence with the techniques and protocols specified in this sampling and analysis plan. Field personnel must prepare in advance by checking the weather to ensure no precipitation has occurred or is anticipated within 48 hours of performing field measurements. Field personnel must also prepare all necessary monitoring equipment. The following is a suggested field equipment list:

- Field book or Data Input sheet
- Pencil
- Camera
- Ruler or Gravelometer
- Stadia rod
- Level
- 2 measuring tapes (small pocket 25 foot & larger 100 foot roll)
- Water and personal protective gear

Collection Events

Data collection will be conducted three times a year on May 15, July 1 and October 15. Data collection will not occur within 48 hours of a precipitation event. Prior to site departure, inspect the condition of all equipment and ensure all pertinent data was collected and recorded.

Quality Assurance and Quality Control Procedures

All data recorded must be carefully reviewed to determine if there are any anomalies and if the project's data collection objectives have been satisfied. All data must be reviewed immediately after collection for completeness and accuracy. All errors will be documented and corrected (where feasible) and the team shall institute the appropriated corrective action necessary to improve data quality.

Data managements and Storage

All field observations will be collected in a field notebook. Data will be input into an Excel spreadsheet for storing continuous parameters, collection dates and times, and other pertinent field data information.

Data Reporting

Data collected in the Excel spreadsheets will be used to evaluate the Burke Creek riverine processes. In particular, the data will be analyzed to serve the following purposes:

1. Wolman Pebble count data pre- and post-project can be compared to determine if the stream bed substrate is increasing in size, indicating a healthier stream due to less fine sediment deposition.
2. Channel cross section measurements collected pre- and post-project can be compared to determine if the banks are stable, indicating a healthier stream due to less entrenchment and/or bank undercutting.

3. Channel profile measurements collected pre- and post-project can be compared to determine if the creek streambed is aggrading or degrading based on stabilizing the headcuts, which would improve stream health.
4. Photo Point documentation can be compared pre- and post-project to determine if Burke Creek is healthy, specifically looking for channel sinuosity, bank stability, riparian vegetation, and channel avulsions.

Annual reports will be provided showing the data collected, but the Final Annual Report submitted will synthesize all data collected and determine if the project met the restoration project goals and objectives.

Monitoring Budget and Schedule

The monitoring budget for this project is $15,000 for a four year monitoring period, one pre-project monitoring year and three post-project. The budget will be spent on field data collection, data management, minimal equipment purchases and annual reports. Monitoring will commence fall 2014 and continue through spring 2018.

References

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