COUNTRY CLUB HEIGHTS EROSION CONTROL PROJECT
Phase III
CIP No. 95191

Feasibility Report

EIP #01.01.01.0021

County of El Dorado
Community Development Services
Department of Transportation

June 2019

Country Club Heights Erosion Control Project
Phase III - Feasibility Report

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1.0 Existing Conditions

This Feasibility Report (Report) has been developed pursuant to the Storm Water Quality Improvement Committee (SWQIC) guidelines for environmental improvement projects[1] in the Lake Tahoe Basin (Basin) and has been prepared by the County of El Dorado Community Development Services, Department of Transportation (County). This Report includes analysis of the existing conditions and an analysis of potential alternatives for the Country Club Heights Erosion Control Project – Phase III (Project).

1.1 Introduction

The County is proposing to implement the Project funded by the California Tahoe Conservancy Proposition 1 funds, United States Forest Service (USFS) Southern Nevada Public Lands Management Act (SNPLMA) funds, and Tahoe Regional Planning Agency (TRPA) Water Quality Mitigation Funds. The Project's stakeholders include the general public and visitors of the Basin, County representatives, public agencies within the Basin, and other technical representatives which make up the Project Development Team (PDT).

1.1.1 Project Goals and Project Objectives

Project Goals

Phase 1 and 2 of the Project addressed existing Source Control issues, Hydrologic Design issues, and Treatment opportunities affecting water quality within the Project area. The Phase 3 project will focus on impacts to water quality at the northwestern end of the Project and opportunities to enhance recreation and access opportunities in the area. The area limits for this phase of the project includes Waverly Drive, Elks Club Drive between Waverly and Highway 50, and surrounding publicly owned parcels including the old "Elks Club Lodge" property and parking lot currently owned by the California Tahoe Conservancy (CTC).

There are two primary watershed outfalls within the project area and they include the drainage swale along the old Boca Raton stub road and a cross culvert on Elks Club Drive that drains into a meandering channel on a CTC owned parcel. The project will evaluate opportunities to remove existing coverage at or above these outfalls in order to reduce coverage, improve infiltration, and restore land to a previously identified land use.

The Elks Club property currently is a nexus for outdoor activity for the South Lake Tahoe community. The property has been used for a seasonal Flea Market during the summer months; river enthusiasts park their vehicles in the parking lot or on the north side of Elks Club Drive, between Highway 50 and the parking lot entrance, to launch kayaks, canoes, and tubes to float down the Upper Truckee River during the late spring and early summer; and people park their vehicles in the parking lot to access the existing unimproved trail network for hiking and biking throughout the area.

The CTC currently has plans in place for a continuous shared use path, commonly referred to as the Greenway, which will originate in the City of South Lake Tahoe and end in the community of Meyers[2]. Once complete, this path will connect to an existing trail network which includes the Pat Lowe Memorial Bike Trail (both sides of the highway through Meyers from State Route 89 to Pioneer Trail), the Sawmill Bike Trail (along the highway and Sawmill Rd from Santa Fe Rd to Lake Tahoe Blvd), and the bicycle trail contiguous with Lake Tahoe Blvd at Sawmill Pond towards Viking Rd/ D St. The current proposed alignment for the Greenway crosses through the Country Club Projects area east of the Elks Club property, continuing south across Elks Club Drive paralleling Boca Raton Drive, connecting to the existing Pat Lowe Trail at the intersection of Pioneer Trail and Highway 50.

The primary goals for this Project are to evaluate 1) opportunities to utilize the publicly owned parcels to improve the management of stormwater and dry weather runoff through capture, treatment, and reuse by using the natural functions of soils and plants; 2) the benefit of removing existing asphalt coverage to restore proper function of the floodplain, 3) opportunities to reduce flooding impacts to Elks Club Drive, 4) the effect that pavement condition has on water quality, and 5) opportunities to enhance recreational access at the "Elks Club Lodge" property.

The Project is identified in the El Dorado County Stormwater Resource Plan[3], the Environmental Improvement Program projects as a recreation project (EIP #612)[4], a watershed management project (EIP #948[5] and 01.02.01.0027[6]) and as a water quality project (EIP# 01.01.01.0021)[7]. Further the Project will be consistent with TRPA's *Linking Tahoe: Active Transportation Plan*[8] to provide access to local businesses, schools, and offices for bicyclists and pedestrians, to reduce vehicular transportation, and to enhance recreational opportunities within the basin.

Project Objective

The Project objectives represent physical conditions that can be measured to assess the success of the Project in achieving the Project goal. The Project will conform to the Preferred Design Approach as detailed in the SWQIC process. The objectives of the Project include:

- Reduce fine and coarse sediment, stormwater runoff volume, and peak flows by 33%, to the maximum extent practicable;
- Stabilize eroding cut slopes, roadside ditches, and capture road abrasives utilizing source control Best Management Practices (BMPs);
- Remove excess pavement and restore to the surrounding land capability;
- Increase opportunities for the infiltration of stormwater runoff.
- Provide a pathway link supporting TRPA's *Active Transportation Plan*;
- Enhance recreational opportunities within the Basin; and,
- Blend hardscape improvements into the scenic environment to the maximum extent practicable.

1.2 Project Area Information

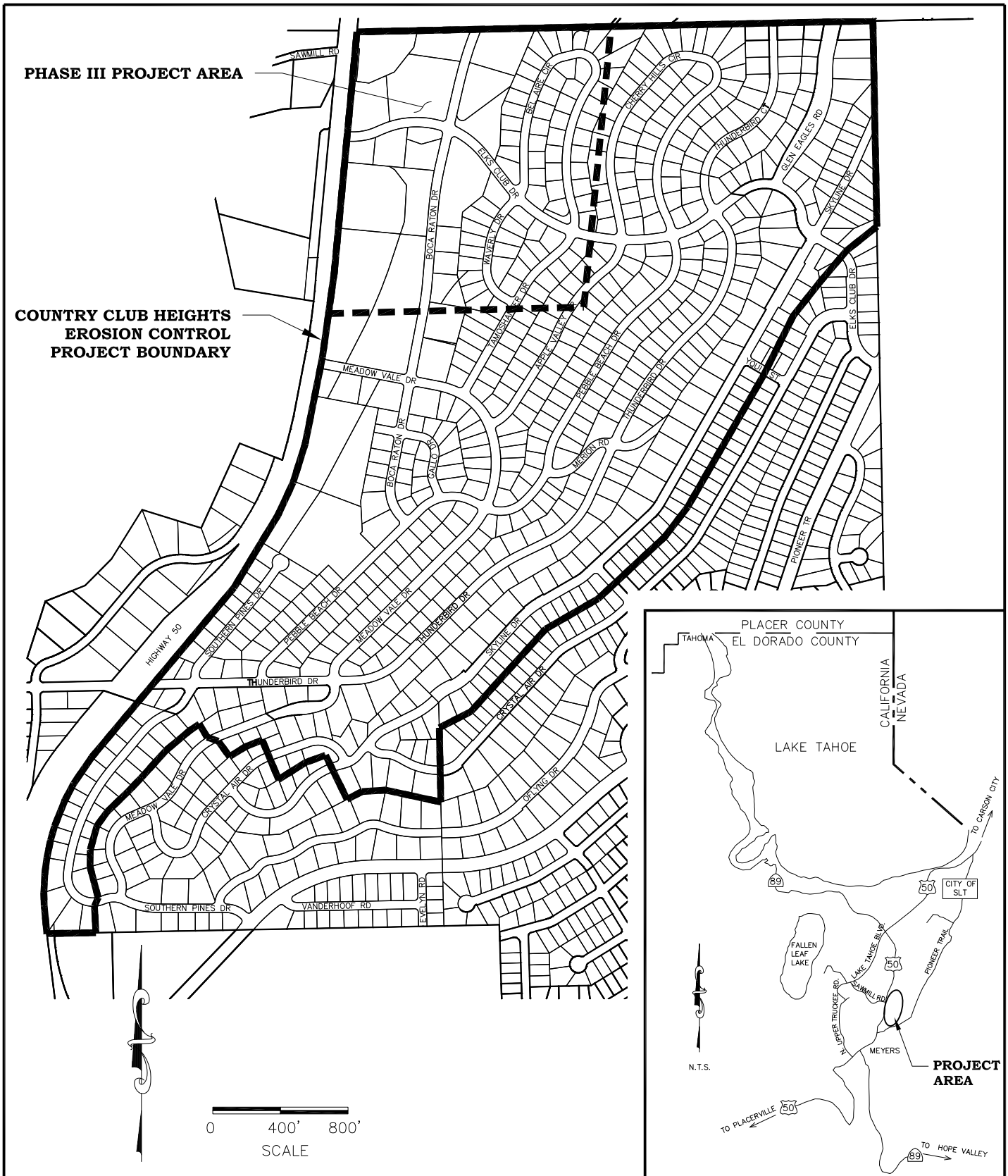
The Project is located in eastern El Dorado County, in the Tahoe Basin, near the community of Meyers (see Figure 1). The Project is located in the south section of the Lake Tahoe Basin within portions of Sections 20 and 21, Township 12 North, Range 18 East, Mount Diablo Meridian. This phase of the project area is approximately 57 acres within County Club Heights Unit 1 subdivision and encompasses County of El Dorado rights of way as well as County, CTC, USFS, and privately owned residential parcels. Improvements within the Project area include paved County roads ranging between approximate widths of 25-feet to 40-feet within ROW that varies in width between 50-feet to approximately 100-feet, unpaved access roads, the paved parking lot for the old "Elks Club Lodge" Property, storm drain systems (sediment basins, check dams, and channels), and overhead and underground utilities. Portions of the paved County roads may not be centered within the ROW.

The Upper Truckee River crosses through the northwestern corner of the project boundary and existing user trails cross through the project along the right of way for Boca Raton Drive. The old "Elks Club Lodge" parking lot is used by multiple users, but not limited to, recreational access to the Upper Truckee River, recreational access to the existing trail system, commercial access by campers and vehicles to a seasonal weekend flea market held during summer months, and by large turning radius commercial vehicles to check loads. South Tahoe Public Utility District (STPUD) has a force main, designed and installed in 1966, that is used as a back-up. The line is located between the river and the parking lot. During the winter of 1997[9] high flows exposed the force main along the southern banks of the river. STPUD supplied emergency placement of material and rock riprap protection along the south side of the Truckee in this location to protect the banks from further erosion and exposure of the line. The "Elks Club Lodge" parking lot is approximately 100 feet southeast of the river.

On the southeast side of the project area is Waverly Drive, a low volume connector road between Elks Club Drive and Tamoshanter Drive. Waverly Drive is bordered by CTC owned parcels on the northern end and privately owned parcels on the southern end. The road has two culvert crossings, one of which has been abandoned, with the overall road in very poor condition and adjacent to 1B classified land.

Urban development within the Project area resulted in concentrated storm water flows from the County ROW and developed parcels to be directed via dike, roadside ditch, and storm drain pipe toward conveyance systems that are connected to the Upper Truckee River. Infiltrating channels with rock check dams and vegetated detention basins were constructed as part of the 1987 Erosion Control Projects in the South Tahoe Basin, the 1994 Southern Pines Drive S.E.Z. Restoration Project, and the 2018 Country Club Heights Erosion Control Project to provide additional water quality treatment and peak flow / volume reduction.

The following sections provide further detail regarding the Project area's existing conditions with respect to topography, soils and geology, land use and land capabilities, land ownership, utilities, environmental resources, Federal Emergency Management Agency (FEMA) floodplain, and monitoring information.



COUNTY OF EL DORADO
COMMUNITY DEVELOPMENT AGENCY
TRANSPORTATION DIVISION

COUNTRY CLUB HEIGHTS EROSION CONTROL PROJECT
Phase III
LOCATION MAP

FIGURE 1

DATE:	PROJECT NO.:	BY:
12/2018	95191	DMG

Topography

The Basin straddles the border of California and Nevada with about one-third of the Basin in Nevada and two-thirds in California. The Basin is a north trending basin bounded by the Sierra Nevada to the west and the Carson Range to the east.

The Basin was formed by geologic block (normal) faulting about 5 to 10 million years ago. Resulting mountain peaks rise to more than 10,000 feet (3,048 m) above sea level. Volcanic activity about 2 million years ago blocked the northern end of the Basin and ultimately filled the lake. The original surface of the lake was over 600 feet higher than it is today. The Truckee River flowed through the lava dam, eventually lowering the surface of Lake Tahoe to an average elevation of about 6,225 feet (1,897 m) above mean sea level (US Geological Survey 1927 datum). Glaciers that formed in the last Ice Age (10,000 years ago) are responsible for much of the area's current topography

The Project is located on the Echo Lake USGS 7.5-minute quadrangle map. In general, the topography of the Project area is relatively flat/level with an average slope of approximately 5 percent, rising to east (Figures 2 and 3).

1.2.1 Soils and Geology

Soils

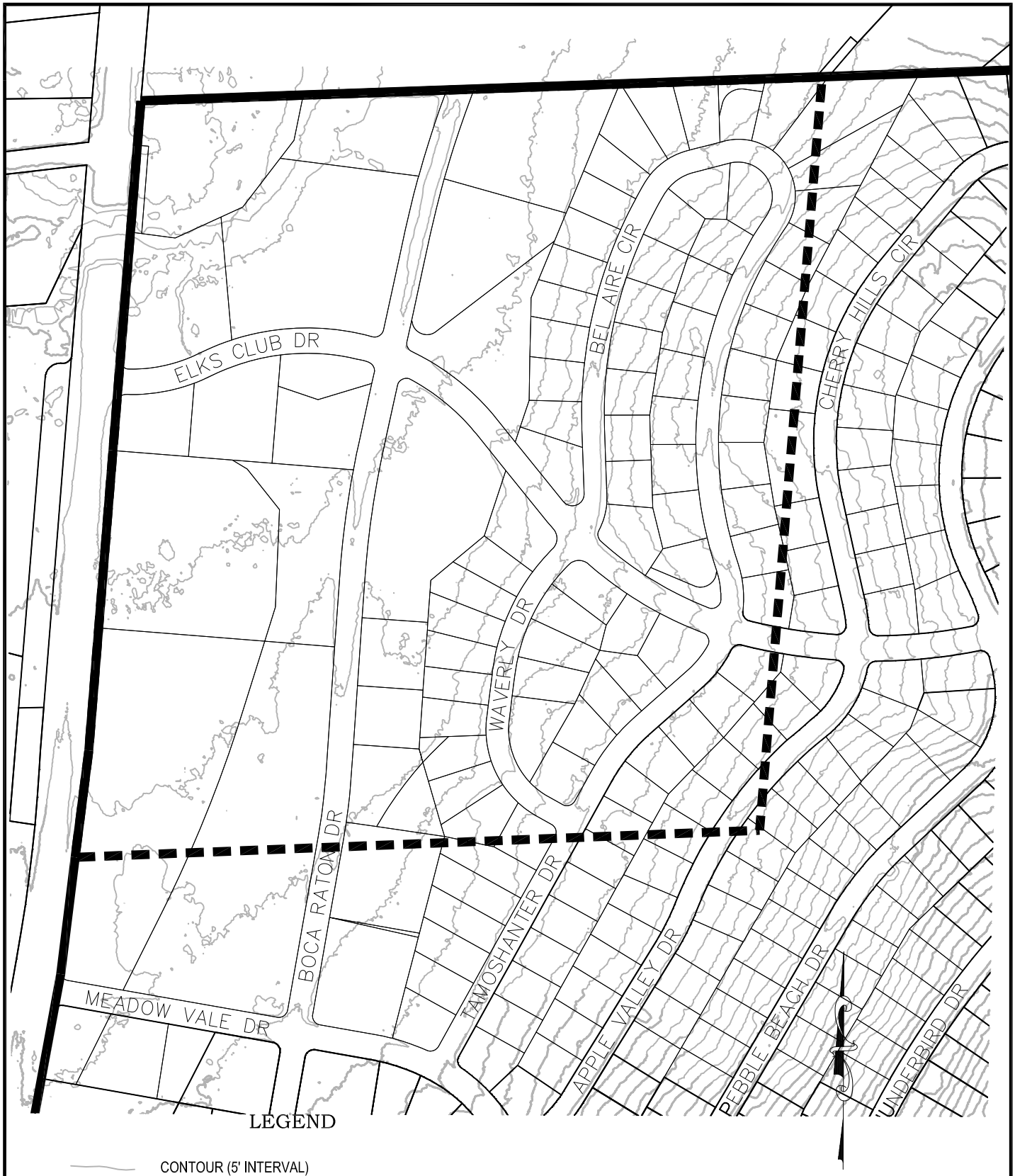
The 2007 National Resource Conservation Service (NRCS) soil survey data for the El Dorado County Tahoe Basin Area[10] indicates the primary soils units within the Project area as described below and shown in Figure 4:

- Celio series, 0 to 5 percent slopes (7431). This complex is typically found in the southern part of the Basin. The parental material consists of alluvium and/or outwash. The soil is somewhat poorly drained. Shrink-swell potential is low and the soil is rarely flooded. Surface runoff is high. The hydrologic soil group is A/D.

- Christopher series, 0 to 9 percent slopes (7441). This series consists of very deep, somewhat excessively drained soils that formed in glacial outwash derived from granodiorite. These soils are on glacial outwash terraces in the Lake Tahoe Basin.

- Gefo series, 2 to 9 percent slopes (7451). This series consists of very deep, somewhat excessively drained sols that formed in glacial outwash derived mainly from granitic rocks. These soils are on outwash terraces and alluvial fans.

- Jabu series, 0 to 9 percent slopes (7461). This series consists of very deep, well drained sols that formed in outwash and alluvium derived from granitic rocks. These soils are on glacial outwash terraces and moraines.



COUNTY OF EL DORADO
COMMUNITY DEVELOPMENT AGENCY
TRANSPORTATION DIVISION

COUNTRY CLUB HEIGHTS EROSION CONTROL PROJECT - PHASE III

TOPOGRAPHIC MAP

FIGURE 2

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SURFACE SLOPE DATA

MINIMUM SLOPE	MAXIMUM SLOPE	COLOR
0%	3%	
3%	6%	
6%	9%	
9%	14%	
14%	23%	
23%	≥60%	

0 150' 300'
SCALE

LEGEND

PROPERTY LINE OR COUNTY OR CALTRANS RIGHTS-OF-WAY
95191 PROJECT BOUNDARY
PHASE III PROJECT BOUNDARY

COUNTY OF EL DORADO
COMMUNITY DEVELOPMENT AGENCY
TRANSPORTATION DIVISION

COUNTRY CLUB HEIGHTS EROSION CONTROL PROJECT - PHASE III

SLOPE MAP

FIGURE 3

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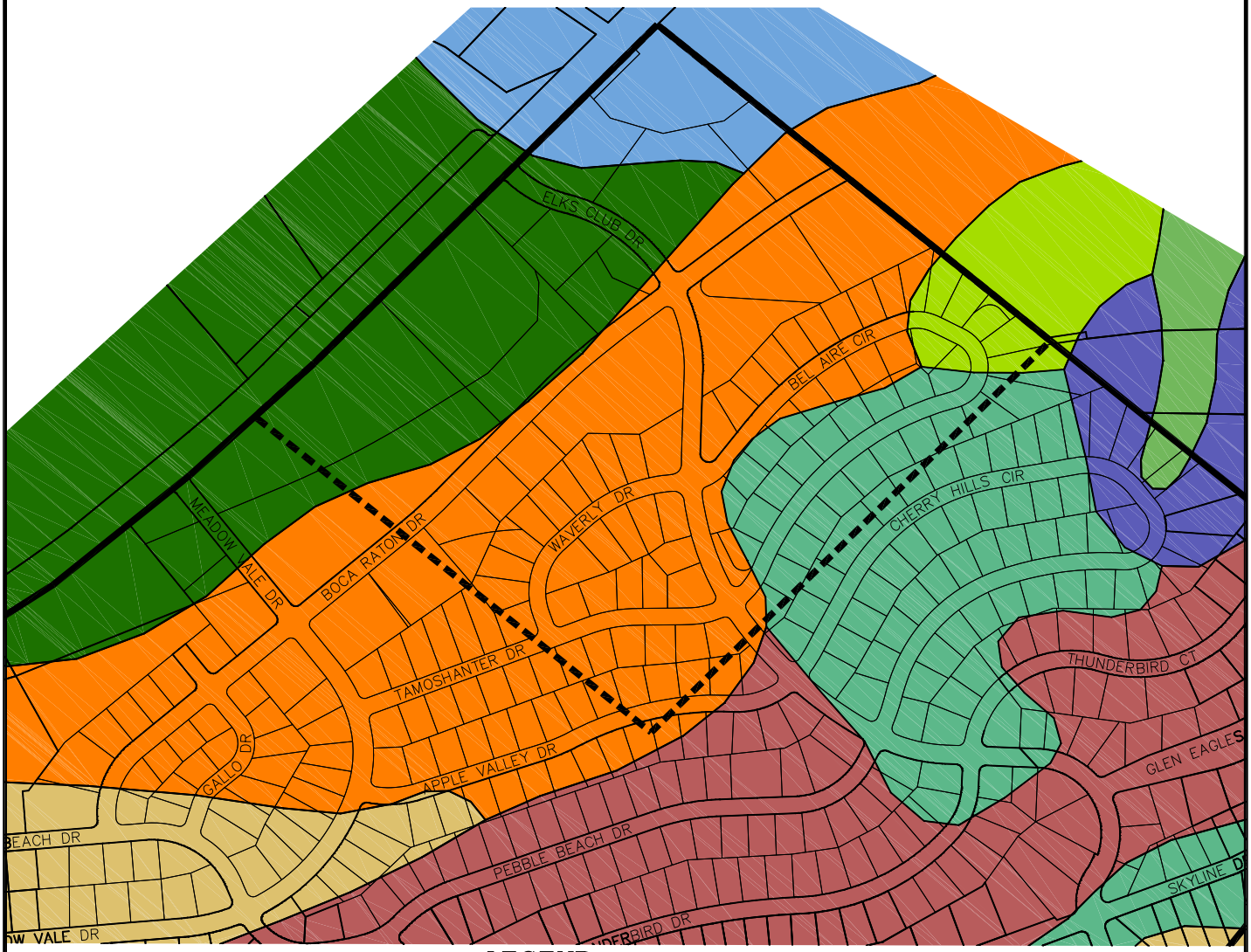

LEGEND

MAP UNIT COLOR/SYMBOL		MAP UNIT NAME
	7041	TAHOE COMPLEX, 0% TO 2% SLOPES
	7431	CELIO LOAMY COARSE SAND, 0% TO 5% SLOPES
	7441	CHRISTOPHER LOAMY COARSE SAND, 0% TO 9% SLOPES
	7442	CHRISTOPHER LOAMY COARSE SAND, 9% TO 30% SLOPES
	7451	GEFO GRAVELLY LOAMY COARSE SAND, 2% TO 9% SLOPES
	7461	JABU COARSE SANDY LOAM, 0% TO 9% SLOPES
	7462	JABU COARSE SANDY LOAM, 9% TO 30% SLOPES
	7471	MARLA LOAMY COARSE SAND, 0% TO 5% SLOPES
	7541	UBAJ SANDY LOAM, 0% TO 9% SLOPES

PARCEL, COUNTY OR CALTRANS RIGHT-OF-WAY

COUNTRY CLUB HEIGHTS PROJECT BOUNDARY

PHASE III PROJECT BOUNDARY

0 250' 500'

SCALE

COUNTY OF EL DORADO
COMMUNITY DEVELOPMENT AGENCY
TRANSPORTATION DIVISION

COUNTRY CLUB HEIGHTS EROSION CONTROL PROJECT - PHASE III

SOILS MAP

FIGURE 4

DATE:	PROJECT NO.:	BY:
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- Marla series, 0 to 5 percent slopes (7471). This series consists of very deep, poorly drained sols that formed in alluvium derived mostly from granitic rocks. These soils are on outwash terraces.

Table 1 - Distribution by Hydrologic Soil Group and Erosion Hazard

NRCS Series	Hydrologic Group	Erosion Hazard	% of Area
7431	A/D	slight	26.1
7441	A	slight	11.5
7451	A	slight	3.7
7461	A	slight	51.6
7471	A/D	slight	7.2

Geology

A preliminary review of regional geology within the Project area has shown that this geomorphic unit has flat to moderate slopes and moderate to steep slopes, weathered rock outcrops, and two main geologic map units as shown on Figure 5[11] and include *Flood Plain Deposits (Holocene) (Qfp) which consist of g*ravely to silty sand and sandy to clayey silt. Locally includes lacustrine and delta deposits. In part may be Pleistocene.

*The other primary unit is older Glacial Deposits (Pleistocene) - Pre-Tahoe Deposits; Till (Qog) which consist of d*eeply weathered bouldery deposits generally without morainal form; surface granitic boulders are weathered with stained, pitted and knobby surface; granitic boulders within the deposit are decomposed. Locally may include outwash deposits.

1.2.2 Land Use and Land Capability

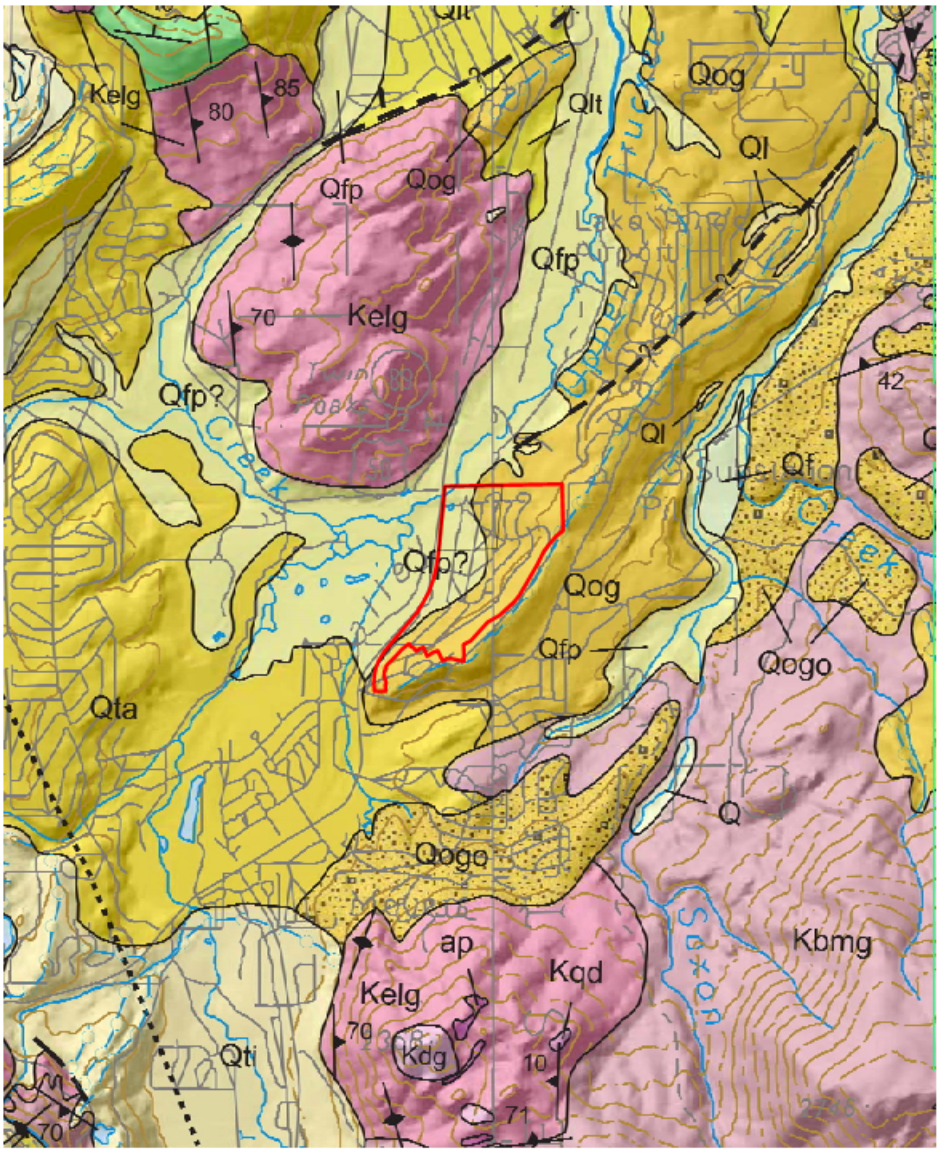
Land Use

The majority of the Project boundary lies within the TRPA Plan Area Statement (PAS) 119 – Country Club Meadow (Figure 6). The land use classification for PAS 119 is recreational, the management strategy is mitigation, and the special designation is scenic restoration area. The Planning Statement for this land use states that “this area should be managed for outdoor recreation and natural resource values to include opportunities for SEZ restoration”. Related special policies include, but are not limited to: 1. Areas of significant resource value or ecological importance within the Plan Area should be designated as natural areas, and should be buffered from intensive uses; 2. whenever possible, opportunities for restoration of disturbed stream environment zones and land coverage removal should be encouraged; 5. creation of waterfowl habitats in association with restoration efforts of disturbed areas should be encouraged; and 6. improved river access for fishing should be provided.

PAS 119 is primarily classified as 1B - SEZ with the dominate feature being the Upper Truckee River. Homes in this PAS are often located within SEZs.[12]

Land Capability

The USFS, in cooperation with TRPA, developed the land capability system currently used in the Basin. Lands within the Basin are divided into seven classes based on soil types, potential for erosion, and other related characteristics. Lands with a ranking of 1 have the highest potential for erosion and 7 have the lowest. Class 1 is also subdivided into 3 categories (1a, 1b, and 1c), all of which are high hazard. The land within this Project area fits into Classes 1b, 4, 5,



LEGEND

- Qfp — Flood-plain deposits (Holocene)
- Ql — Lake deposits (Holocene)
- Q — Alluvium (Holocene and Pleistocene)
- Qf — Alluvial fan deposits (Holocene and Pleistocene)
- Qlt — Lacustrine terrace deposits (Pleistocene)

Tahoe glacial deposits (Pleistocene)

- Qta — Till

Older glacial deposits - pre-Tahoe deposits (Pleistocene)

- Qog — Till
- Qogo — Outwash deposits
- Kelg — Echo Lake granodiorite (Cretaceous)
- Kbmg — Bryan Meadow granodiorite (Cretaceous)

95191 Project Boundary

Phase III Project Area

Fault - solid where well located; dashed where approximately located; short dash where inferred; dotted where concealed; queried where continuation or existence is uncertain. Ball and bar on downthrown side. *(The age and location of the faults in the lake bottom and cutting Quaternary deposits should be considered preliminary interpretations.)*

Glacial moraine crest.

Strike and dip of metamorphic and igneous foliation and cleavage.

49 — Foliation or cleavage

Vertical foliation or cleavage

0 2500' 5000'

SCALE

NOTE: ONLY THOSE GEOLOGIC REFERENCES CLOSEST TO THE PROJECT AREA ARE SHOWN IN THE LEGEND

COUNTY OF EL DORADO
COMMUNITY DEVELOPMENT AGENCY
TRANSPORTATION DIVISION

COUNTRY CLUB ESTATES EROSION CONTROL PROJECT
Phase III
GEOLOGY MAP

FIGURE 5

DATE:	PROJECT NO.:	BY:
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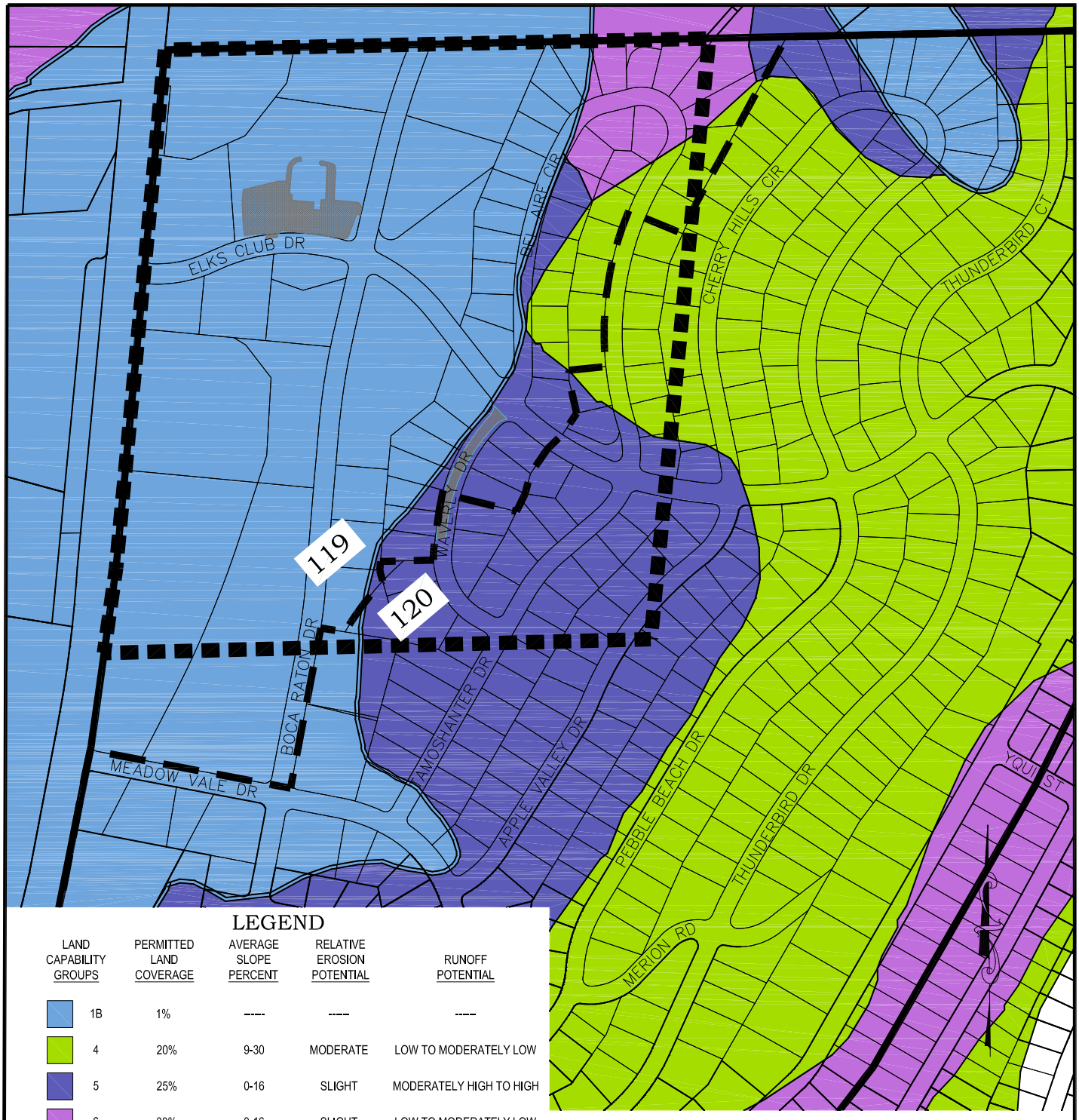

LEGEND

LAND CAPABILITY GROUPS	PERMITTED LAND COVERAGE	AVERAGE SLOPE PERCENT	RELATIVE EROSION POTENTIAL	RUNOFF POTENTIAL
1B	1%	----	----	----
4	20%	9-30	MODERATE	LOW TO MODERATELY LOW
5	25%	0-16	SLIGHT	MODERATELY HIGH TO HIGH
6	30%	0-16	SLIGHT	LOW TO MODERATELY LOW

119 — TRPA PLAN AREA STATEMENT DESIGNATION

TRPA PLAN AREA STATEMENT BOUNDARY

COUNTRY CLUB HEIGHTS PHASE III AREAS

PARCEL, COUNTY OR CALTRANS RIGHT-OF-WAY

COUNTRY CLUB HEIGHTS PROJECT BOUNDARY

0 200' 400'

SCALE

*note: Land Capabiltiy shown is based on an updated Bailey boundary for the SEZ. This is not to be used for individual parcel evaluations.

COUNTY OF EL DORADO
COMMUNITY DEVELOPMENT AGENCY
TRANSPORTATION DIVISION

COUNTRY CLUB HEIGHTS EROSION CONTROL PROJECT - PHASE III

LAND USE AND LAND CAPABILITY MAP

FIGURE 6

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and 6 (see Table 2). Classes 4, 5, and 6 have a lower potential for erosion than Class 1b. The land capability shown on Figure 6 is preliminary and still requires verification.

Table 2 - Area Distribution by Land Capability Class

Land Capability Class	NRCS Series			
	7431	7441	7451	7461
1b	☑		☑	☑
4		☑		☑
5				☑
6			☑	☑

The TRPA land capability verification (LCV) application was submitted in March 2019. The County anticipates having updated LCV results once the snow pack in the area has melted.

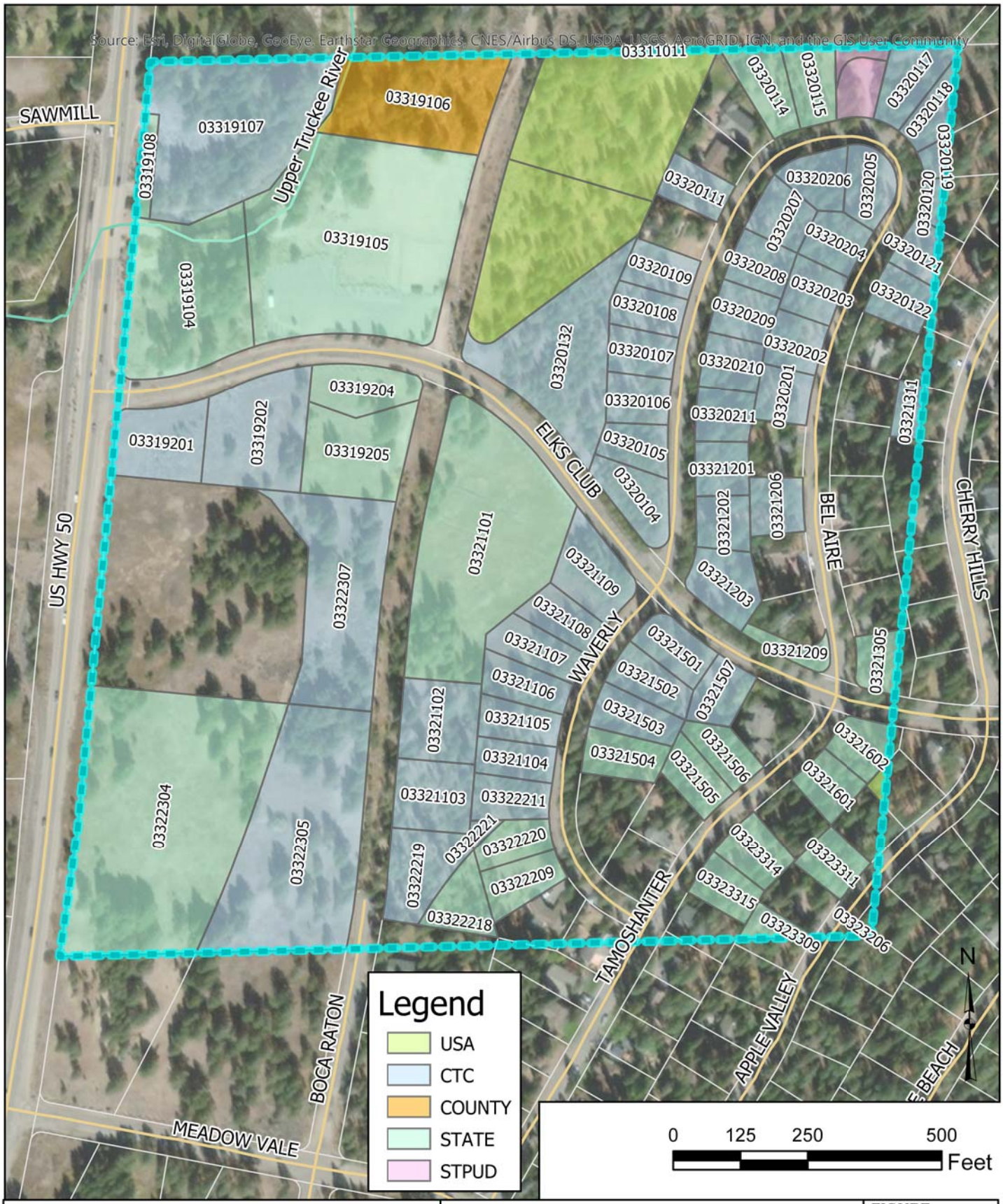
1.2.3 Land Ownership

The public land ownership, summarized in Table 3 and depicted in Figure 7, was developed from record parcel maps, subdivision maps, deed information, and assessors documents and shows County right-of-way, property lines, and publicly owned properties. The Project is comprised of County road right-of-way and private and public parcels, with the public parcels surrounding lower Elks Club and Waverly Drive owned by the County (1), State of California (25), California Tahoe Conservancy (44), and the USFS (3). The County will pursue the necessary easements, special use permits, and/or license agreements for any affected parcels during the development of the preferred project.

Table 3 – Public Land Ownership

United States Forest Service				
033-20-101	033-20-131	033-21-603	-	-
California Tahoe Conservancy				
033-21-103	033-22-211	033-22-219	033-22-221	033-19-107
033-21-102	033-22-305	033-21-105	033-21-503	033-21-104
033-21-107	033-21-501	033-21-106	033-21-502	033-21-507
033-21-206	033-21-202	033-21-109	033-21-203	033-21-108
033-20-211	033-20-105	033-21-201	033-20-104	033-22-307
033-19-202	033-20-201	033-19-201	033-20-106	033-21-311
033-20-209	033-20-108	033-20-202	033-20-107	033-20-210
033-20-208	033-20-132	033-20-109	033-20-203	033-20-122
033-20-117	033-20-118	033-20-119	033-20-205	033-20-206
033-11-011	033-20-115	033-20-114	033-19-108	033-19-105
033-19-104	033-19-204	033-21-101	033-21-305	033-21-209
033-22-304	033-21-602	033-21-504	033-21-506	033-21-601
033-21-505	033-22-220	033-23-314	033-22-218	033-22-209
033-23-311	033-23-315	033-23-309	033-23-206	033-19-205
El Dorado County				
033-19-106				

- As of February 2019.



COUNTY OF EL DORADO
COMMUNITY DEVELOPMENT SERVICES
DEPARTMENT OF TRANSPORTATION

COUNTRY CLUB HEIGHTS
WATER QUALITY PROJECT
PHASE 3
PUBLIC PROPERTY MAP

FIGURE
7

DATE: 03/2019 | PROJECT NO: 95191 | BY: DWK

1.2.4 Utilities

Numerous utilities are situated underground and overhead within the Project. In order to better define these utilities, a utilities base map was developed by coordinating with each company (see Figure 8). Utility owners are listed below in Table 4. Potential areas of impact include the existing STPUD force main that parallels the southern bank of the Upper Truckee River. Based on 1966 record drawings, the line is estimated to be as close as 15' to the existing top of bank and as shallow as 5' below ground surface. Any conflicts will be addressed with the corresponding utility owners.

Table 4 - Utilities Representative List

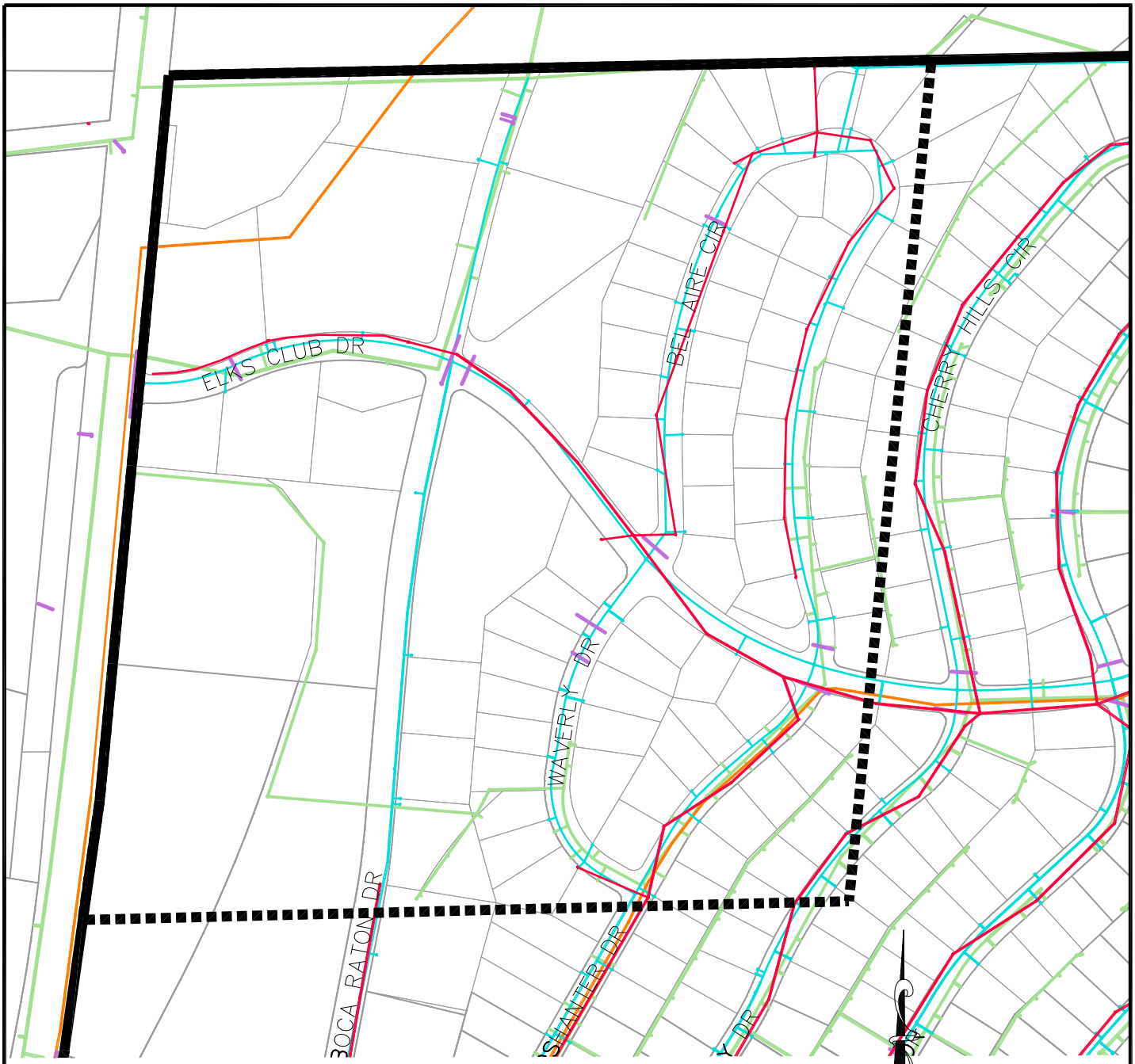
Utility	Owner	Owner Address	Contact
Natural Gas	Southwest Gas	1740 D St, Unit No. 4 S Lake Tahoe, CA 96150	Chris Foster
Telephone	AT&T	12824 Earhart Ave Auburn, CA 95602	Astrid Willard
Electricity	Liberty Utilities	933 Eloise Avenue S Lake Tahoe, CA 96150	Andrew Gregorich
Water & Sewer	South Tahoe PUD	1275 Meadow Crest Drive S Lake Tahoe, CA 96150	Steve Caswell
Cable Television	Charter Communications	9335 Prototype Dr Reno, NV 89521	Anthony Lefanto

1.2.5 Recreation and Access to Area

The lower area of Elks Club drive is a nexus for multiple recreation activities near the area (Figure 9). The proximity of the Upper Truckee River to the existing old "Elks Club Lodge" parking lot makes this location attractive for parking of vehicles and launching of small boats and tubes to float the river. A seasonal flea market is held on the improved and unimproved area of the CTC owned old Elks Club property. Portable toilets are stored seasonally on the parcel for use during the Flea Market. Customers park in the existing paved parking lot and on the sides of Elks Club Drive. An existing network of unimproved trails and existing improved trails are also accessed from this location, with users parking in the parking lot. The proposed alignment for the Greenway shared use trail goes through the project area within the Boca Raton Drive right-of-way along existing unimproved trails, including on the existing STPUD access road.

1.2.6 Environmental Resources

The environmental resources investigated as part of the Country Club Erosion Control Project include cultural/archaeological, biological, vegetation, and wetlands. The initial environmental evaluation included all County rights-of-way within this phase of the project and select parcels, but did not include 1) the parcels on either side of lower Elks Club Drive between Boca Raton and Highway 50 and 2) the parcels on either side of Waverly Drive. The County will be returning with NCE to complete an updated evaluation of affected parcels as a future amendment to the environmental documents. A summary of key findings relative to this phase are show below.



LEGEND

- STORM DRAIN
- ELECTRICAL
- WATER MAIN
- SEWER MAIN
- SEWER FORCE MAIN
- GAS **PENDING**
- PARCEL, COUNTY OR CALTRANS RIGHT-OF-WAY
- COUNTRY CLUB HEIGHTS PROJECT BOUNDARY
- PHASE III PROJECT AREA

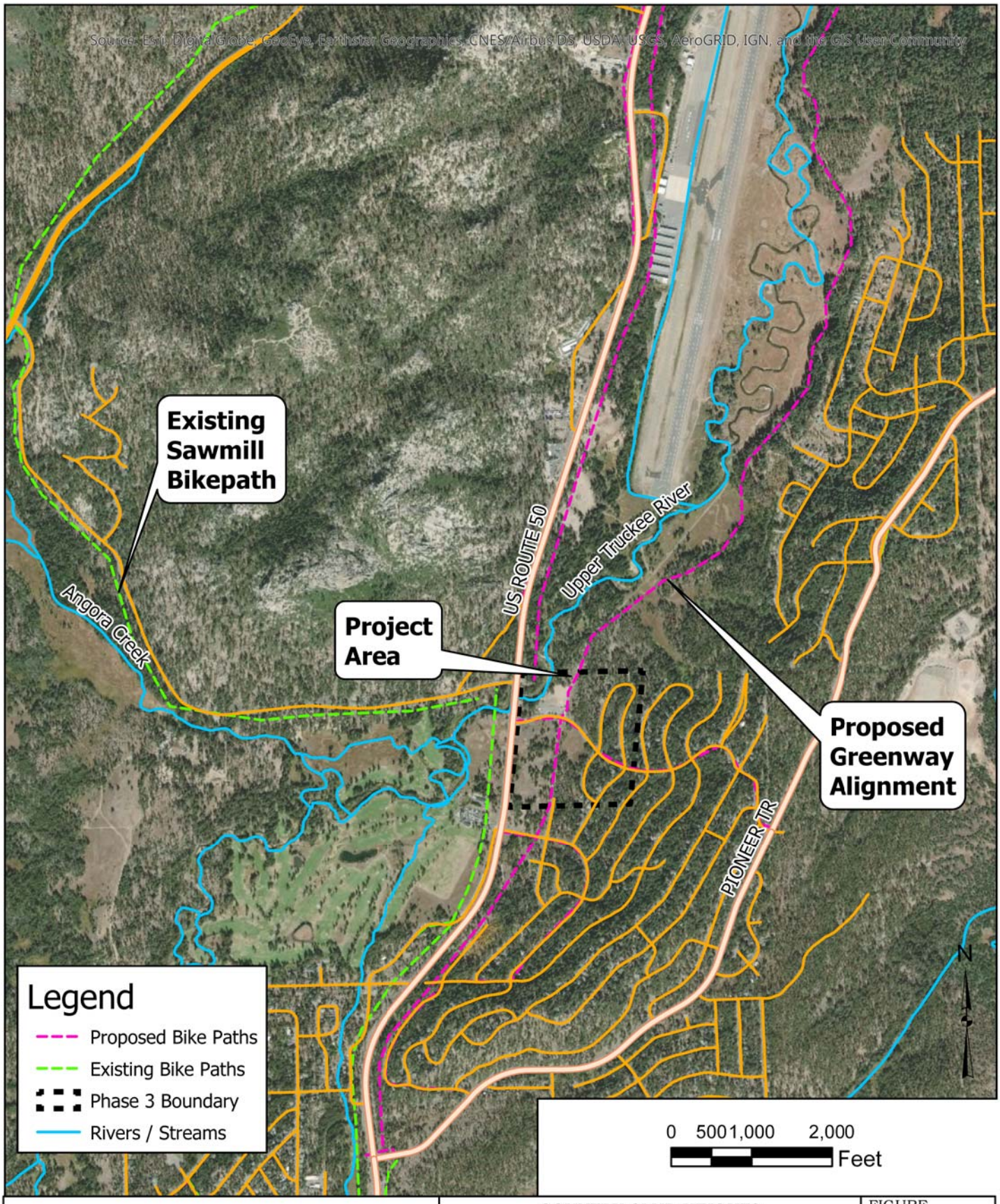
0 150' 300'
SCALE

COUNTY OF EL DORADO
COMMUNITY DEVELOPMENT AGENCY
TRANSPORTATION DIVISION

COUNTRY CLUB HEIGHTS EROSION CONTROL PROJECT
Phase III
EXISTING UTILITIES MAP

FIGURE 8

DATE:	PROJECT NO.:	BY:
12/2018	95191	DMG



COUNTY OF EL DORADO
COMMUNITY DEVELOPMENT SERVICES
DEPARTMENT OF TRANSPORTATION

COUNTRY CLUB HEIGHTS
WATER QUALITY PROJECT
PHASE 3
BIKE TRAILS MAP

FIGURE 9

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Cultural/Archaeological Resources

A Cultural Resources Inventory Report was completed by NCE to document and evaluate the cultural resources present in the Project area (report available upon request). No resources were identified within this phase of the surrounding project area.

Biological Resources

The Lake Tahoe area provides suitable habitat for over 250 species of animals. In order to characterize the existing biological conditions present within the Project area, an inventory and evaluation of the Project area's vegetation and wildlife communities was conducted and a Biological Resources Inventory Report was completed in 2016 by NCE (report available upon request). This report also identifies the potential occurrence of special status plant and animal species within the Project area, which includes potential Willow Flycatcher habitat on CTC parcel to the west of the Elks Club parking lot (APN 033-191-040).

Vegetation

Several vegetation types were identified within the Project area during a 2016 field survey for the Biological Resources Inventory Report (report available upon request). These vegetation types were identified in both the lower Elks Club area and Waverly Drive area and include: Jeffrey pine, perennial grasses and forbs as reported by NCE. An invasive plant survey of surrounding parcels was completed in 2016 by NCE. The County will have NCE complete additional surveys this year in the area of interest. The County will develop a mitigation plan to eradicate any invasive species identified within the area.

Wetlands

A Wetlands Delineation and Waters of the US Inventory was completed by NCE in 2016 to identify the potential presence of wetlands and other jurisdictional waters. The areas analyzed included all County rights-of-ways (including Waverly Drive and the Boca Raton sub), but not the CTC owned parcels bounded by Boca Raton, Elks Club, and the Upper Truckee River. Based on the required wetland parameters, no potential wetland areas were identified within the County rights-of-way within the Project area. The existing swale that borders Elks Club Drive was determined to be man-made and is identified as potentially non-jurisdictional.

The delineation and mapping identified the existence of approximately 0.818 acres of non-jurisdictional features (pre-US Corps of Engineers verification) within the Project area. A final determination has not been issued by the Corps of Engineers. The County will utilize NCE to complete additional studies as needed in the project area.

Federal Emergency Management Agency Floodplain

The Federal Emergency Management Agency (FEMA) has designated a floodplain associated with the Upper Truckee River. The floodplain designation is identified on FEMA Flood Insurance Rate Maps:

- 06017C0369E effective September 26, 2008.
- 06017C0632E effective September 26, 2008.

The floodplains designated include:

- Zone AE: Areas of 100-year flood, including base flood elevations
- Zone X: Areas between limits of the 100-year and 500-year flood

Preliminary review of the flood plain maps indicate that the area west of Boca Raton and north of Elks Club Drive is within Zones AE and X. The County completed a hydrologic/hydraulic analysis of existing culverts in this area as part of the report.

1.2.7 Monitoring Information

A pre-construction photo inventory was completed and is included as Appendix B to this Report. The photographs were utilized to identify potential physical and environmental constraints and evaluate Project alternatives as discussed in Section 2 of this Report.

1.3 Hydrologic Conditions

The Basin has been divided into 63 Watersheds, all of which drain into Lake Tahoe. The Project area falls within the largest watershed (57 square miles) in the Basin, the Upper Truckee River (USGS Basin #73) (Figure 10).

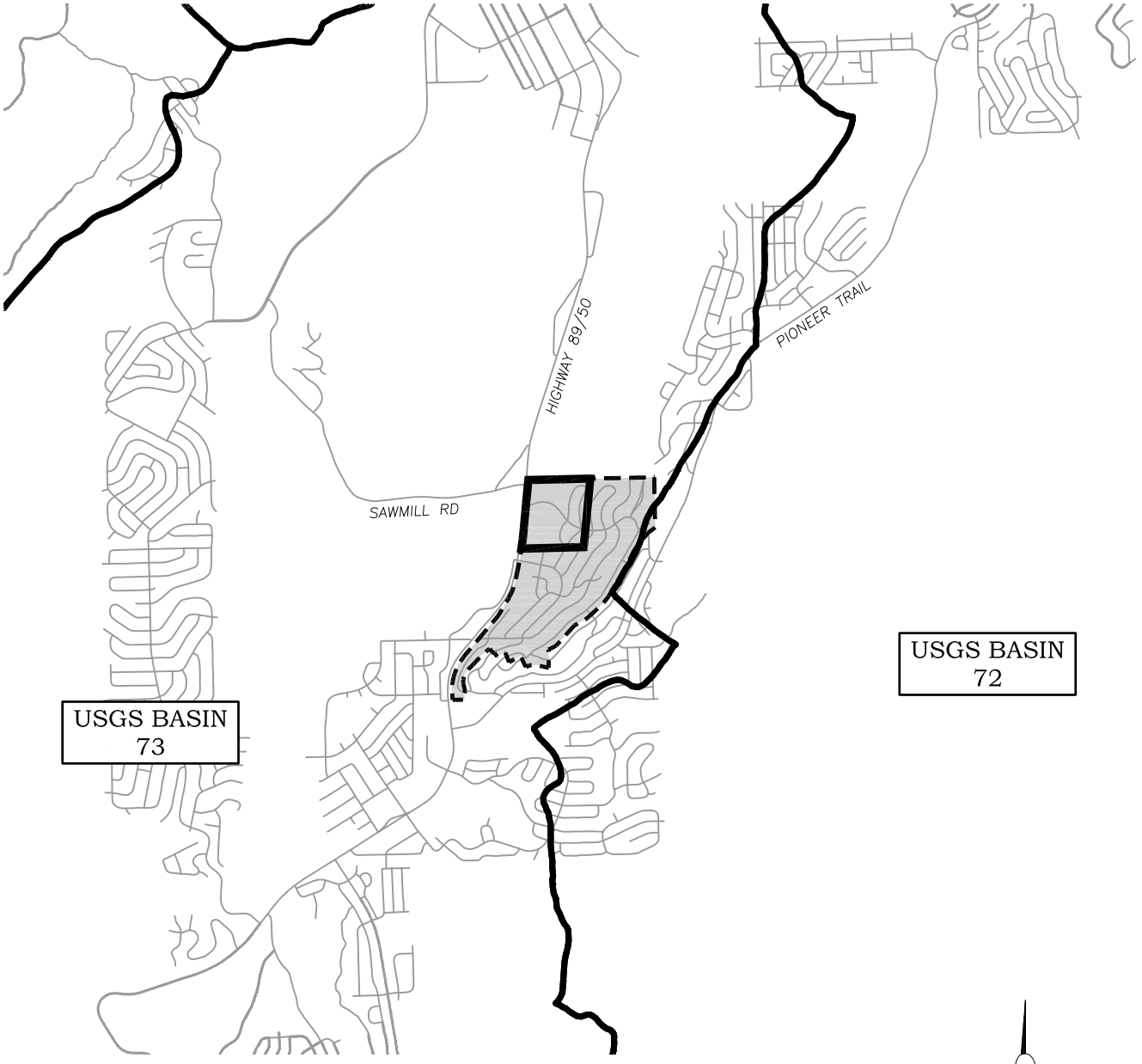
1.3.1 Watershed, Drainage Area and Sub-area Boundaries

The County completed construction of two phases of the Country Club Heights Erosion Control Project. The drainage study completed for this project was used as the basis for the analysis completed for this project (Figure 11).

The drainage outfalls that cross lower Elks Club Drive, between Waverly Drive and Highway 50, were looked at for this project. The Project will be analyzed for additional treatment opportunities through the removal of pavement on Waverly Drive, and restoration of impacts from the old “Elks Club Lodge” on the CTC owned parcel.

1.3.2 Storm Frequency

The County utilizes the 1995 County of El Dorado Drainage Manual[13] (Drainage Manual) as a guidance document for hydrologic design within the Basin. The Drainage Manual requires utilizing the 100-year storm event, which has the probability of occurrence of 0.01 in any given year, for drainage areas greater than 100 acres, to design drainage facility conveyance structures. All drainage facilities for areas less than 100 acres need to be designed to safely convey the 10-year event, probability of 0.10 in any given year, without the headwater depth exceeding the culvert barrel height.



LEGEND

- USGS WATERSHED BOUNDARY
- PARCEL BOUNDARY, COUNTY, OR CALTRANS RIGHT-OF-WAY
- COUNTRY CLUB HEIGHTS PROJECT BOUNDARY
- PHASE III PROJECT AREA

0 2000' 4000'
SCALE

COUNTY OF EL DORADO
COMMUNITY DEVELOPMENT AGENCY
TRANSPORTATION DIVISION

COUNTRY CLUB HEIGHTS EROSION CONTROL PROJECT - PHASE III

USGS WATERSHED MAP

DATE:	PROJECT NO.:	BY:
12/2018	95191	DMG

FIGURE 10

150' 300'
SCALE

HWY 50
UPPER TRUCKEE RIVER
Elks Parking Lot
Ex. Weir
CHANNEL AND BASIN
BOCA RATON DR
CALLO DR
PEBBLE BEACH DR
MEADOW VALE DR
TAMOSHANTER DR
WAVERLY DR
ELKS CLUB DR
BEL AIRE CIR
APPLE VALLEY DR
SKYLINE DR
CRYSTAL AIR DR
PEBBLE BEACH DR
MERION RD
THUNDERBIRD DR
CHERRY HILLS CIR
THUNDERBIRD CT
GLEN EAGLES RD
ELKS CLUB DR
CALLO ST
YOUT ST

C9 7.8
C10 16.1
C8 1.9
C4 5.2
C3 3.1
D15 0.3
D1 2.6
D14 0.6
D23 16.3
C7 1.2
C6 0.2
D2 3.8
D12 1.5
C2 4.4
C1 4.2
D6 0.9
E7 0.8
D22 4.0
C 48.4
D5 7.0
D8 2.7
D 92.9
D13 7.8
E6 2.2
C5 4.5
D11 7.8
D21 0.3
E5 3.0
D7 0.5
D10 6.7
D20 2.4
E 14.4
E4 4.6
D4 7.1
D9 3.0
D17 3.9
E2 0.6
E3 2.2
D3 1.7
D19 0.6
E1 1.0
D16 6.3
D18 4.9

LEGEND

- PROJECT AREA
- D 30.4 — WATERSHED ID, AREA IN ACRES
- WATERSHED BOUNDARY
- D13 2.9 — SUB-WATERSHED, AREA IN ACRES
- SUB-WATERSHED BOUNDARY
- FLOWPATH
- 28 — NODE DESIGNATION
- EXISTING PIPE AND CMP INLET
- COUNTY ROW AND/OR PROPERTY LINES

COUNTY OF EL DORADO
COMMUNITY DEVELOPMENT AGENCY
TRANSPORTATION DIVISION

COUNTRY CLUB HEIGHTS EROSION CONTROL PROJECT Phase III

WATERSHED MAP

FIGURE 11

DATE: 12/2018 | PROJECT NO.: 95191 | BY: DMG

The TRPA 208 Plan[14] requires that the 10-yr, 24-hr storm event be used to design stormwater conveyance facilities and the 50-year storm event be used when designing the conveyance facility through a Stream Environment Zone (SEZ).

The Lahontan Regional Water Quality Control Board (Lahontan) Basin Plan requires that the minimum "design storm" for storm water treatment facilities in the Basin is the 20-year, 1-hour storm event. Based on several reports completed by Lahontan, this event equates to approximately 1 inch of rainfall within 1 hour.

Based on various spatial historical precipitation data within the Basin, the Drainage Manual requirements, the regulatory requirements mentioned, and the observed events, the hydrologic storm frequencies utilized for this Project design are as follows:

10-year, 6 hour

Conveyance facilities for areas less than 100 acres and not in an SEZ. The 10-year, 6-hour storms tend to be associated with Fall/Spring frontal systems with resultant peak Spring snow melt.

20-year, 1 hour

Conveyance facilities discharging to storm water treatment facilities for County right-of-way drainage tributary areas; storm water treatment capacity for County right-of-way drainage tributary areas for all impound/detention facilities. Typically, this event occurs in summer as localized thundershowers, or convective storm systems.

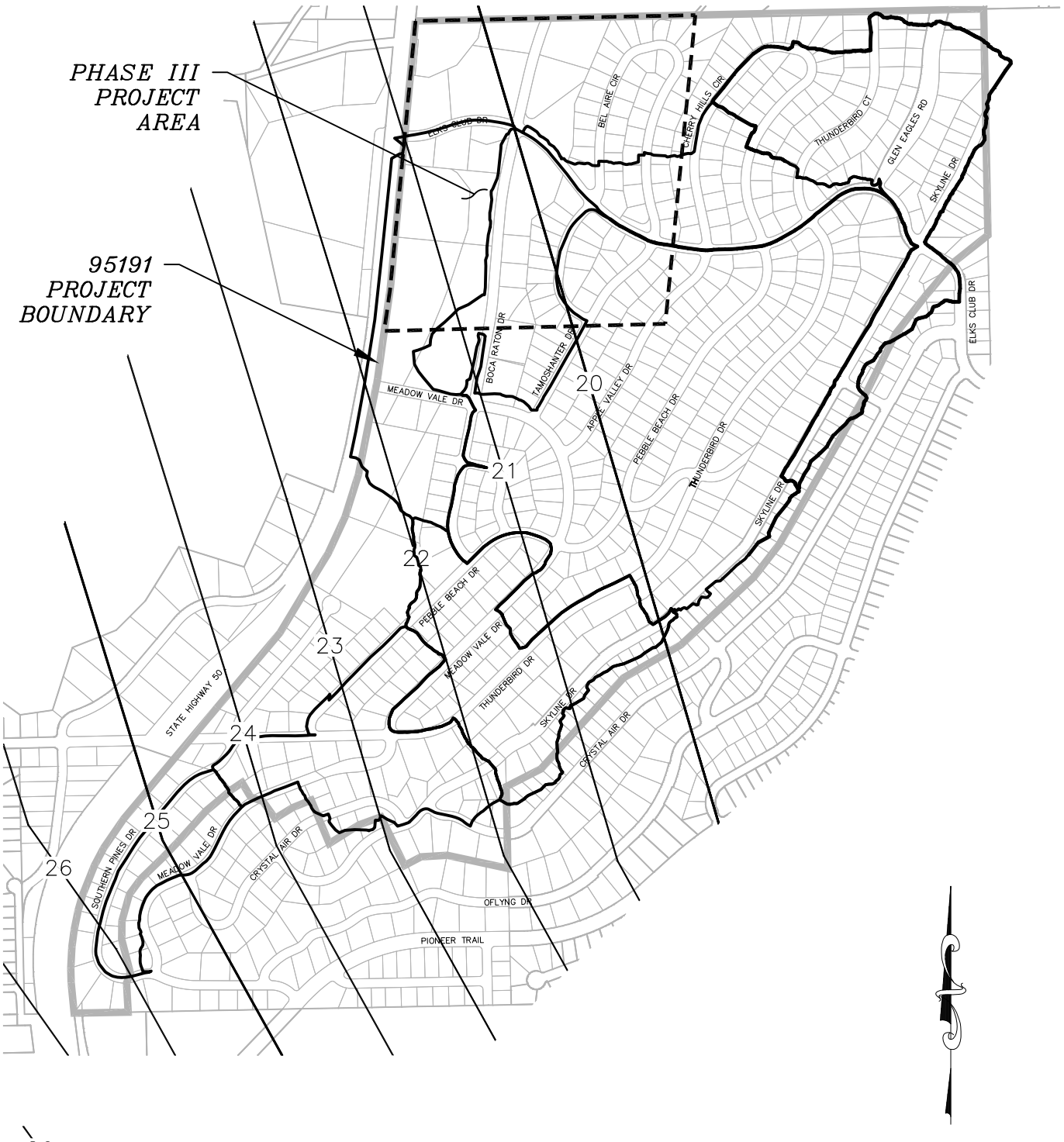
100 –year, 24 hour

Conveyance within the County right-of-way; all outfall structures from impound/detention facilities which discharge through an SEZ, or directly to a tributary of Lake Tahoe, or Lake Tahoe; conveyance facilities for drainage areas greater than 100 acres within the County right-of-way; conveyance facilities downstream of the impound facilities for hydrologic wave control. Events in this category may be characterized as warm frontal systems producing a rain-on-snow event.

1.3.3 Precipitation

The precipitation depth for the design storm frequency was obtained from the Drainage Manual. The mean annual precipitation depth isohyetal maps (Figure 12)was used to select the value of 21 inches per year for the Project area which was then used to determine the following Rainfall Depth table.

Design Storm	Rainfall Depth (inches)
10-year, 6-hour	1.3
20-year, 1-hour	0.6
100-year, 24-hour	3.8



26 MEAN ANNUAL PRECIPITATION, INCHES PER YEAR

PROJECT WATERSHED BOUNDARIES

0 400' 800'

SCALE

REFERENCE: REPORT ON EL DORADO COUNTY DESIGN RAINFALL BY JIM GOODRIDGE, 2008

COUNTY OF EL DORADO
COMMUNITY DEVELOPMENT AGENCY
TRANSPORTATION DIVISION

COUNTRY CLUB HEIGHTS EROSION CONTROL PROJECT- PHASE III

MEAN ANNUAL RAINFALL MAP

FIGURE 12

DATE:	PROJECT NO.:	BY:
12/2018	95191	DMG

1.3.4 Hydrologic Method

The Rational Method was used to calculate estimated peak flows within the Project area. The Rational Method was selected because the sub-basins within the Project area are less than one acre. This method is commonly used to determine peak flow when the watershed is small (less than 100 acres).

This method relies on four input variables and was calculated using equation 1:[15]

$$Q = C \cdot C_f \cdot I \cdot A \quad (1)$$

Where *Q* is peak discharge in cubic feet per second (cfs), *C* is the runoff coefficient, *Cf* is the runoff coefficient frequency adjustment factor, *I* is the rainfall intensity in inches per hour, and *A* is the area of the watershed in acres. For the Project area, an unadjusted runoff coefficient *C* of 0.1 was selected based on the drainage area being unimproved. For the Project design rainfall return periods of 10 and 25 years, a runoff coefficient frequency adjustment factor *Cf* of 1.0 was applied to the runoff coefficient and for the 100 year design rainfall return period, an adjustment factor *Cf* of 1.0 x 1.25 was applied.[16] The rain intensity *I* of the design storm was calculated using the estimated time of concentration *Tc* and the area *A* of the sub-watershed.

The flow paths for the Project watersheds were segregated into overland sheet flow, shallow concentrated flow, and, where applicable, channel flow and curb and gutter. The times of concentration were calculated for each watershed to determine the time required for runoff to travel from the hydraulically most distant part of the watershed to the outfall. For this Project area, the overland-flow roughness coefficient was estimated to be 0.40 based on Woods with light underbrush.

The travel times were calculated using methods established in the County Drainage Manual[17]. The travel time for sheetflow was calculated using the kinematic-wave equation and is presented as equation 2:

$$T_t = 0.007 \frac{(n \cdot L)^{0.8}}{P^{0.5} \cdot S^{0.4}} \quad (2)$$

Where T_t is sheetflow time of travel in hours, *n* is overland-flow roughness coefficient, *L* is length of overland flow in feet (300 foot maximum), *P* is rainfall depth in inches, and *S* is land slope in feet per feet.

The velocity of shallow flow over unpaved surfaces was estimated based on equation 3:

$$V_U = 16.1345 \cdot S_O^{0.5} \quad (3)$$

Where V_U is flow velocity in feet per second and S_0 is land slope in feet per foot.

The velocity of shallow flow over paved surfaces was estimated based on equation 4:

$$V_P = 20.3283 \cdot S_O^{0.5} \quad (4)$$

Where V_P is flow velocity in feet per second and S_0 is land slope in feet per foot.

The times of concentration for shallow flow over unpaved and paved surfaces were calculated by dividing the flow path length by the velocity. The watershed time of concentration for each of these flow path segments was summed to determine the total time. In all cases, a 6 minute initial time of concentration was used.

Input parameters and output results for the Rational Method are contained in Appendix A.

1.3.4.1 Unit Hydrograph Method (HEC-HMS)

The Unit Hydrograph Method is commonly used for determining the peak flow (Q) and the hydrograph from relatively large watersheds (up to 10 sq. mi.). Transportation used the unit hydrograph for an entire watershed tributary to its outflow as well as at specific drainage structures and treatment locations. This method was used to determine the peak runoff rates for the Project watersheds.

The program requires input parameters and variables such as a Basin Model, Meteorological Model, and a Control Storm. The Basin Model parameters include: input of the drainage area, lag time, percent impervious, initial abstraction I_a, and any base flow information. The lag time is the product of 0.6 multiplied by the time of concentration derived from the Rational Method. The impervious coverage was estimated using field survey data and existing aerial topographic maps for each watershed. The initial abstraction was calculated using equation 5:[18]

$$I_a = 0.2\left(\frac{1000}{RI} - 10\right) \quad (5)$$

With the runoff index (*RI*) being equivalent to a weighted curve number (CN). For the Meteorological Model, the Soil Conservation Services (SCS) method was chosen with a Type 1A storm, per the Drainage Manual.[19]

1.3.4.2 Hydrologic Results

Based on the results of the Rational Method, the peak discharge for the watersheds in this phase are presented in Table 5 and Appendix A.

Table 5 – Watershed Peak Flow Summary [25-yr, 1-hr] (Rational)

Main WS	Area (ac)	Parameters			Q Peak (cfs)			% Impervious
		C[1]	Tc (min)	I[2] (in/hr)	10-Yr, 6-Hr	25-Yr, 1-Hr	100-Yr, 24-Hr	
C (C1-C10)	48.4	0.22	83	0.56	5.1	6.0	9.2	15
D (D16-D22)	22.4	0.21	44	0.74	3.0	3.5	5.3	14
D (D1-D23)	92.9	0.23	63	0.61	11.3	13.2	19.9	17
E	14.4	0.3	49	0.7	2.5	3.0	4.5	25

1. For 100-year events, value increased by 25%.
2. Only 25-year event is listed here.

Based on the results of the HEC-HMS model, the peak discharge and volumes for the 25-year, 1-hour storm for the main watersheds in this phase are presented in Table 6 and Appendix A.

Table 6 – Main Watershed Peak Flow Summary [25-yr, 1-hr] (Unit Hydrograph)

WS	Area (acres)	Area (sq mi)	Q Peak (cfs)	Volume (ac-ft)	Volume (ft^3)
C	24.5	0.0382646361	4.5	0.2706	11,787
D	92.87	0.1451563	9.2	0.77530	33,772
E	14.4	0.0225000	2.9	0.21158	9,216

1.4 Hydraulics Summary

There are a number of existing pipes, inlets, and channels within this phase of the Project area. These facilities were installed as subdivision infrastructure, maintenance upgrades, or as part of previous erosion control projects. The existing conveyance facilities direct runoff toward the infiltrating channels/basin in the Boca Raton Drive ROW. The hydraulic analysis consisted primarily of two areas: the cross drainage culverts on lower Elks Club Drive and corresponding proposed infiltration basin on the CTC Elks Club Lodge parcel; and the existing Waverly Drive culvert and corresponding treatment opportunities for tributary flows.

1.4.1 Hydraulic Methods

For circular pipes, the full capacity of the pipe was calculated using the Manning's equation which is presented as equation 6:[20]

$$Q = 0.463 \cdot \frac{D^{8/3} \cdot S_f{}^{1/2}}{n} \qquad (6)$$

Where Q is discharge in cfs, D is pipe diameter in feet, S_f is slope of the energy grade line in feet/feet, and n is Manning's roughness coefficient.

The hydraulic capacity of the existing pipes was compared to the results of the hydrologic analysis for the design storm.

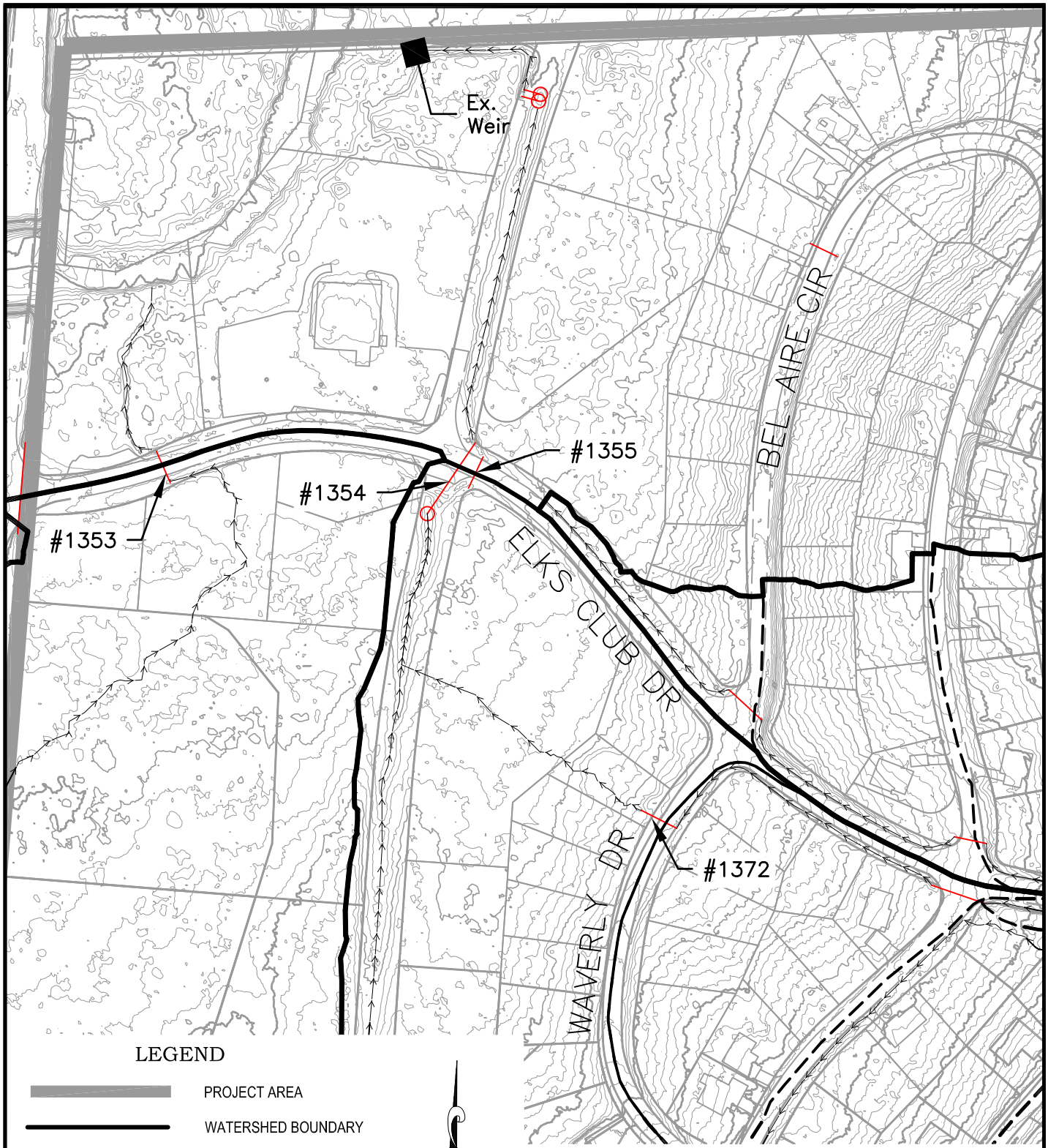
1.4.2 Hydraulic Results

There are three existing cross-culverts on Elks Club Drive within the proposed Project area. Two of the cross-culverts discharge stormwater flow into the manmade roadside swale that parallels the old Boca Raton stub road (south side of the old "Elks Club Lodge" parking lot). The other cross-culvert conveys flow into an existing swale north of the old Elks Club parking lot. The proposed shared use path will likely require one additional cross drainage culvert according to topographic features and vertical profile alignment of the path. Table 7 below contains a summary of the existing pipes, inflows, and capacities for this phase of the project.

Table 7 – Existing Pipe Characteristics

Street Crossing	WS	Pipe ID	Pipe Size / Material	Inlet / Outlet Facility[2]	Q Capacity (cfs)	Q 25-yr,1-hr	% Capacity
Elks (north of Boca)	C1-10	1353	18" HDPE	FES Inlet / Channel	10.5	6.0	57%
Waverly	D16-D22	1372	24" CMP	AC Swale / Channel	23.9	3.5	15%
Elks (south of Boca)	D1-D23	1354	30" CMP	Atrium / Channel	12.6	13.2	105%
		1355[1]	18" HDPE	FES Inlet / Channel	8.8	13.2	150%

1. Pipe 1355 is designed as overflow for pipe 1354
2. FES = Flared End Section



LEGEND

- PROJECT AREA
- WATERSHED BOUNDARY
- SUB-WATERSHED BOUNDARY
- FLOWPATH
- EXISTING PIPE AND CMP INLET
- COUNTY ROW AND/OR PROPERTY LINES

0 100' 200'
SCALE

COUNTY OF EL DORADO
COMMUNITY DEVELOPMENT SERVICES
DEPARTMENT OF TRANSPORTATION

COUNTRY CLUB HEIGHTS EROSION CONTROL PROJECT - PHASE III

EXISTING PIPES

FIGURE 13

DATE: 03/2019 | PROJECT NO.: 95191 | BY: DMG

The results in Table 7 do not reflect potential head pressure or inlet structure capacities. There are two pipes that do not appear to convey the design storm peak runoff. The pipes are located at the intersection of Boca Raton Drive and Elks Club Drive. These are currently designed to work in tandem when flows exceed the capacity of the 30" CMP, the excess flows will flow through the 18" HDPE Pipe.

1.5 Stormwater Quality

The Lake Tahoe Watershed Assessment[21] provides a synthesis of water quality data and analysis with an emphasis on watershed sediment and nutrient loadings and their effects on Lake Tahoe. According to the report, research has shown the onset of cultural eutrophication of oligotrophic Lake Tahoe, and a corresponding decline in the lake's exceptional clarity at the rate of approximately one foot per year. Research has also shown a fundamental shift in the limiting nutrient for biostimulation in Lake Tahoe from nitrogen to phosphorous.

1.5.1 Priority Pollutants

It has been shown that a large portion of the total phosphorous load is transported with sediment; therefore, current research and management efforts in the Basin focus on the management of watershed sediment and erosion control. The long-term average nutrient flux from watersheds in the Basin has been significantly related to disturbance and land use, leading to sediment and the associated nutrients being the primary pollutants of concern.

1.5.2 Priority Pollutant Sources

Sediment Sources

In general, land disturbance is a primary cause of elevated sediment supply. However, the effects of land disturbance on sediment supply are manifested in different ways and may result in changes in sediment supply that vary by orders of magnitude. Because sediment transport is an exponential function of drainage discharge, identification of increased sediment supply is clearly linked to drainage or stream flows[22]. In addition, changes in hydrologic characteristics may initiate geomorphic changes in a project area or watershed that have the potential to modify land surface or channel characteristics, thereby increasing historical sediment supply by one or more orders of magnitude.

Nutrient Sources

The primary nutrients of concern with respect to Lake Tahoe clarity are phosphorous and nitrogen. Research over the past few decades has shown that primary productivity in Lake Tahoe is predominately phosphorous-limited. However, co-limitation by nitrogen and phosphorous still occurs, especially in summer months, so control of both nutrients is important. A nutrient-loading budget for Lake Tahoe indicates that atmospheric deposition, stream loading, direct runoff, and groundwater are major contributors of nutrients to Lake Tahoe. Most water quality improvement projects have little opportunity to affect atmospheric deposition. However, runoff from the Project area may contribute significantly to stream loading.

Total nutrient and sediment loads are related because a portion of the nutrient loads occur as particulates or adsorbed onto particulates. However, only a portion of the total nutrient loads may be in biologically available form. The biologically available fraction has the largest potential impact on water quality and is therefore of greatest concern in water quality projects. The atmosphere is the dominant global source of nitrogen as N_2, while rock weathering is the dominant source of phosphorous. Both nutrients are recycled and retained within the biosphere at rates that are much higher than contributions from original sources. Their uptake, retention, and recycling, in biomass is highly sensitive to landscape disturbance. Mobilization due to disturbance causes a loss of nutrients from the local biological or physical system, and transport downstream in particulate and dissolved forms.

1.5.3 Other Pollutant Sources

In addition to the priority pollutants described in Section 1.5.1 of this document, other potential pollutants have been identified based on Project area characteristics. These pollutants include typical materials used during construction such as oil and grease from equipment, vehicles, road base, concrete, and other construction materials. In order to mitigate the possibility of potential pollutants being discharged from the site, an aggressive Storm Water Pollution Prevention Plan (SWPPP) will be developed and implemented. The SWPPP will identify specific control measures to be implemented both during and after construction.

1.5.4 Pollutant Transport Processes

In addition to the identification of pollutant sources as described in Sections 1.5.2 and 1.5.3 of this document, key pollutant transport processes must be considered in order to formulate and evaluate potential control strategies in subsequent project phases. For this Project, it is anticipated that the pollutant transport process will be closely linked to the hydrology and existing impervious coverage, thus increasing the necessity of good stormwater management.

1.6 Project Opportunities and Constraints

Opportunities

This Project provides opportunities for three threshold areas: improved water quality of storm water runoff, soil conservation to address previously impacted areas, and recreation & access opportunities for the area. Completion of improvement to Waverly Drive and lower Elks Club Drive would provide for 1) additional treatment of stormwater runoff through utilization of publicly (CTC) owned lands 2) removal of hard coverage and restoration of the previously developed areas; 3) reconfiguration and reconstruction of the existing parking lot on the old Elks Lodge property including the reduction of impervious coverage and installation of BMPs; and 4) possible construction of permanent facilities for access to the Upper Truckee River for person powered boats and access to the future Tahoe Greenway multiuse shared use path. The above mentioned improvements may provide an opportunity to restore the flood plain along a short section of the Upper Truckee River.

The primary corridor for the proposed shared use path is also part of TRPA's *Linking Tahoe: Active Transportation Plan*, with the goals of providing access to local businesses, schools, and

offices for bicyclists and pedestrians, reducing vehicular transportation, and enhancing recreational opportunities within the Basin.

Improvements at this and the Waverly Drive location would provide useful locations for installation of both informational signage and wayfinding signage. Installation of signage would provide an opportunity to educate the public on the improvements, their effect on water quality, tourism impacts to the area, and flooding impacts. Quick Response (QR) codes could be used by smart phone users to take them to corresponding web pages with additional information.

Constraints

The Project faces several challenges, primarily in regard to current uses of the old "Elks Club Lodge" property. Seasonal use issues of the property, river access, parking and restroom facility constraints, and the presence of sensitive environmental resources each represent a consideration in determining the limits of parcel restoration. Any hard improvements within the existing SEZ/floodplain areas near the river will need to be avoided as much as possible during the design of the project. Impacts may involve mitigation at a 1.5:1 ratio, as needed. Sensitive environmental resources in the Project area would necessitate avoidance where possible. Specifically, the locations of wetlands, existing vegetation and mature trees, and Waters of the US will be considered and avoided to the maximum extent practicable.

The proposed alignment of the Tahoe Greenway has not been finalized as of this report. It is anticipated that the preferred alignment will be utilizing the existing STPUD access road that connects to the eastern end of the Boca Raton stub. Any design considerations for construction of a spur connection to the future Tahoe Greenway shared use trail would be limited to within the old, compacted, Boca Raton Road stub within the existing County right of way. Future maintenance of the existing underground sewer along Boca Raton Drive will need to be considered during the design.

Current public uses constrain the property for the short term. The CTC currently operates a yearly lease with the managers of the Tahoe Flea Market. This lease has been renewed on a year to year basis since CTC's acquisition of the property. Perceived benefits of the project may be impacted by the loss of this seasonal event. The parking lot was originally sized for the users of the Elks Lodge, which has since been demolished. The parking lot, with use varying by season, is used by recreational users, flea market vendors, commercial vehicle operators for load checking, staging area by local agencies/jurisdictions, and snow plow operators to check their vehicles during winter operations.

A STPUD force main line, designed and constructed in approximately 1966, is located along the south side of the Upper Truckee River. The line is currently used as a back-up if issues arise with the primary force main. The vertical and horizontal location of the line constrains opportunities to lower the flood plain above this line. During the winter of 1997 the line was exposed during high Upper Truckee River flows. Emergency work was initiated to recover the line and armor the location with large rock. Any future STPUD access for maintenance to this line will be considered in the selection of a preferred alternative.

El Dorado County initiated an emergency repair project to address storm damage from 2017 winter storms. The improvements were constructed in 2018 and included raising the finish grade elevation of lower Elks Club Drive to mitigate future flooding impacts and the need for application of sanding abrasives. Though the improvements have provided a benefit with reducing the overall amount of sanding abrasive applied in the area, there is still opportunity for flooding in high flow events. Construction of a new cross-culvert, between Boca Raton Drive and the old “Elks Club Lodge” property entrance would provide additional conveyance capacity in high flood events. Using this location for an additional cross culvert could be constrained by existing utilities that were undergrounded in this reach (gas, electric, and communications).

2.0 Formulating Alternatives

The County has proposed and evaluated three alternatives for this Report to mitigate past development of the Project area. The alternatives discussed are identified by general area below and include water quality improvements to the lower Elks Club Areas, water quality improvements to Waverly Drive, and recreation and access improvements within the lower Elks Club area. Figures 14 and 15 showcase Alternative 1 for the Lower Elks Club area and Waverly Drive, respectively. Figure 16 and 17 showcase Alternative 2 for the Lower Elks Club area and Waverly Drive, respectively. Appendix C contains a rough order of magnitude cost estimate for each of the alternatives.

2.1 Water Quality Improvements to Lower Elks Club Area

Three alignment alternatives were identified and evaluated for this Report.

- Alternative 1 – Construction of a large wet infiltration basin on CTC parcel 033-191-050. The existing compacted surface would be restored to allow for increased vegetation growth. The restoration would include removal of non-native fill material (including old concrete), ripping of the subsurface, applying seed, and mulch. The proposed basin would be sized to capture a large amount of tributary runoff from 25-year storm events. The existing parking lot would be reduced in half, allowing for placement of an additional cross culvert on Elks Club Drive to convey high flood flows into the wet basin. The parking lot could be striped to have up to 41 parking spaces, including 2 ADA spaces. A new pipe would be installed under the Boca Raton Drive stub to convey runoff collected in the manmade swale and divert it to the new basin. Once capacity of the basin has been reached flows would continue on down the manmade swale. Two feet plus of excess fill material, east of the force main alignment, would be removed to restore the flood plain. Zig-zag fencing constructed of lodge pole pine would be installed along the boundary of the basin and restoration area in order to protect restoration efforts.
- Alternative 2 – The current parking lot configuration would be reduced in size and reconstructed closer to Elks Club Drive. The reconstructed parking lot could be striped to have up to 42 parking spaces, including 2 ADA spaces. Access from both Elks Club Drive and the Boca Raton stub could be maintained with this configuration. The extent of the infiltration basin is limited to the area of current compacted surface north of the parking lot. This configuration would allow for both the restoration of the existing compacted surface and allow for capture and infiltration of stormwater runoff. The restoration would include removal of non-native fill material (including old concrete), ripping of the subsurface, applying seed, and mulch. Two feet plus of excess fill material, east of the force main alignment, would be removed to restore the flood plain. Zig-zag fencing constructed of lodge pole pine would be installed along the boundary of the basin and restoration area in order to protect restoration efforts.
- Alternative 3 – Leaving the current parking lot configuration as is. Restore the compacted surface to the north of the existing parking lot allowing for vegetation to become established. The restoration would include removal of non-native fill material,

ripping of the subsurface, applying seed, and mulch. No new drainage or treatment improvements would be constructed.

ALT 1 – Reduced parking lot and restoration of hard impacted surface for construction of wet infiltration basin

Advantages

- Removal of impervious coverage and restoration of hard compacted area impacted by previous development
- Provide additional treatment facility for capture and treatment of stormwater runoff before flows reach the Upper Truckee River
- Provide opportunity to remove additional non-native fill material to restore a portion of the floodplain
- Opportunity for additional groundwater recharge
- Further reduce localized flooding of Elks Club Drive
- Maintains access and parking for recreational users
- Provides permanent bathroom facilities eliminating the need for portable toilets

Disadvantages

- Reduction in size of existing parking lot would correspond to a reduction in certain vehicle use
- Larger temporary disturbance
- Potential higher costs to establish access to STPUDs backup force main with respect to removal of fill east of force main
- Requires agency to take on responsibility to clean and maintain of bathrooms

ALT 2 – Construction of wet basin within hard compacted surface area, while reconfiguring and reducing size of existing parking lot.

Advantages

- Restoration of hard compacted area impacted by previous development
- Provide opportunity to remove additional non-native fill material to restore a portion of the floodplain
- Provide additional treatment facility for capture and treatment of stormwater runoff before flows reach the Upper Truckee River
- Opportunity for additional groundwater recharge
- Provides parking for all afore mentioned vehicle uses and maintains vehicle access from Boca Raton
- Reduced foot print of parking lot could be reconfigured to be 1) located further away from river and 2) elevated to mitigate future impacts from flooding
- Provides permanent bathroom facilities eliminating the need for portable toilets

-

Disadvantages

- Does not address additional impacts from localized flooding
- Large temporary disturbance
- Potential higher costs to establish access to STPUDs backup force main with respect to removal of fill east of force main
- Requires agency to take on responsibility for clean and maintenance of bathrooms

ALT 3 – Address hard pack surface only.

Advantages

- Low cost alternative for the short term
- Provide opportunity to restore a portion of the flood plain

Disadvantages

- Does not address additional impacts from localized flooding
- Reduced opportunity for SEZ and flood plain restoration
- Increased future maintenance cost to maintain a parking lot that is oversized for current use

The removal of existing material to lower the flood plain locally is being evaluated as part of this Project. Figures 18 and 19 were generated to show cross sections through the Upper Truckee River with respect to the proposed improvements on the old Elks Club Lodge property. Note that the flood plain is currently lower on the north side of the Upper Truckee River. With the current alignment of the Upper Truckee River, limiting impacts to the existing STPUD force main will need to be examined as part of this alternative.

2.2 Waverly Drive Alternative

Waverly Drive is a low volume road that connects Elks Club Drive and Tam O Shanter Drive. There are three privately owned parcels which are accessible from Tam O Shanter, with the remaining parcels surrounding Waverly being owned by the CTC. The three alternatives evaluated for the project are:

- Alternative 1 – Remove the existing asphalt pavement on Waverly Drive where the road abuts CTC owned parcels. A cul-de-sac would be constructed at the southern end for emergency vehicles. A linear, zero slope, channel would be constructed on the southern edge of the old road to distribute flows from Elks Club Drive evenly across the rehabilitated area. County will work with local utilities regarding needs for access to any infrastructure in the Waverly Drive right of way. Approximately 30 feet of Waverly Drive would be kept on the northern end to allow parking for maintenance equipment during winter plow operations. Gates would be installed on either end of the rehabilitated section to limit public access with motorized vehicles.

- Alternative 2 – Same as Alternative 1 with the modification to eliminate any future access across the rehabilitated area.
- Alternative 3 – Leave Waverly in its current condition.

ALT 1 – Removal of pavement and construction of linear channel.

Advantages

- Removes unnecessary impervious coverage
- Restores land that abuts an existing meadow system
- Allows potential access by existing utilities

Disadvantages

- Eliminates a permanent connection to Tam O Shanter from Elks Club Drive

ALT 2 – Removal of pavement and removal of future access.

Advantages

- Removes unnecessary impervious coverage
- Restores land that abuts an existing meadow system

Disadvantages

- Eliminates a connection to Tam O Shanter from Elks Club Drive
- Does not allow potential vehicle access by existing utilities

ALT 3 – Address hard pack surface only.

Advantages

- Keeps open Waverly as an alternative option to access Tam O Shanter Drive

Disadvantages

- Will require future pavement rehabilitation work to a low volume road

2.3 Recreation / Access Alternatives

The *Linking Tahoe: Active Transportation Plan* identifies a Class 1 shared use path through this reach and a Class 3 (Bike Route) along Elks Club Drive, connecting Highway 50 to Pioneer Trail. The parking lot is currently used by users for multiple recreation and access opportunities. The three alternatives evaluated for this project are:

- Alternative 1 – Design and construct a future spur of the Greenway Shared Use Trail. A 10 foot wide paved shared use trail would be constructed within the Boca Raton Drive right of way, over the existing dirt access road, terminating at Elks Club Drive. A spur connection would be constructed on the CTC owned parcel from the reduced size parking lot, connecting to the new Trail in the Boca Raton right of way. A permanent user access trail would be constructed on the north side of the parking lot to enable access from the parking lot to areas along the river, including an existing sand bar near

the south side of the Upper Truckee River, which has been used as a launch point by recreational users. The trail would be constructed of compacted decomposed granite with a boardwalk crossing over the drainage swale flowing from Elks Club Drive. Educational signage would be installed to educate users on such items as the Upper Truckee River, past development of the area, and the impact of aquatic invasive species. A 2-unit bathroom facility would be constructed on the edge of the parking lot. Existing utility connections (Sewer and Water) would be utilized in the design.

- Alternative 2 – Same as Alternative 1 with the modification to eliminate construction of a portion of the Greenway Shared Use trail and spur connection within the Boca Raton Drive right of way. A shared used trail would still be constructed on the south side of the reconfigured parking lot in order for users to gain access to the trail system off of Boca Raton. The Boardwalk crossing would be replaced with approximately 20 linear feet of 18" HDPE pipe to accommodate a trail crossing.
- Alternative 3 – No proposed improvements to the area.

LEGEND

- PROPOSED PIPE
- PROPOSED STORM BASIN / SEZ ENHANCEMENT
- PROPOSED FILL REMOVAL / RESTORATION
- PROPOSED AC REMOVAL / RESTORATION
- PROPOSED BIKE PATH
- PROPOSED TRAIL
- PROPOSED ROCK SPILLWAY
- EDUCATIONAL / INFORMATIONAL OUTREACH SIGN
- BOARDWALK
- ZIG ZAG FENCING
- BR — BATHROOM FACILITY

NOTE:
THIS PROJECT IS LOCATED IN AN ENVIRONMENTALLY SENSITIVE AREA. YOU MUST EXERCISE UTMOST CARE TO PROTECT AND MAINTAIN EXISTING VEGETATION AND MINIMIZE SOIL COMPACTION WITHIN CONSTRUCTION AREAS.

300
6268.280
78

UPPER TRUCKEE RIVER

HWY 50

ELKS CLUB DR

BOCA RATON DR

EXISTING PARKING LOT

10+00 11+00 12+00 13+00 14+00 15+00 16+00 17+00

033110011 CTC
03310106 COUNTY OF EL DORADO
033101007 CTC
033101005 STATE OF CALIFORNIA
03320101 UNITED STATES OF AMERICA
03320131 UNITED STATES OF AMERICA
033201005 CTC
033201008 CTC
033201007 CTC
033201006 CTC
033191004 CTC
033191005 CTC
033192002 CTC
033192004 CTC
033192001 CTC
033201032 CTC
033201031 STATE OF CALIFORNIA
033201033 CTC

0 20' 40'
SCALE

COUNTY OF EL DORADO
COMMUNITY DEVELOPMENT SERVICES
DEPARTMENT OF TRANSPORTATION

COUNTRY CLUB HEIGHTS PHASE III WATER QUALITY PROJECT

ALTERNATIVE 1 - LOWER ELKS CLUB DR

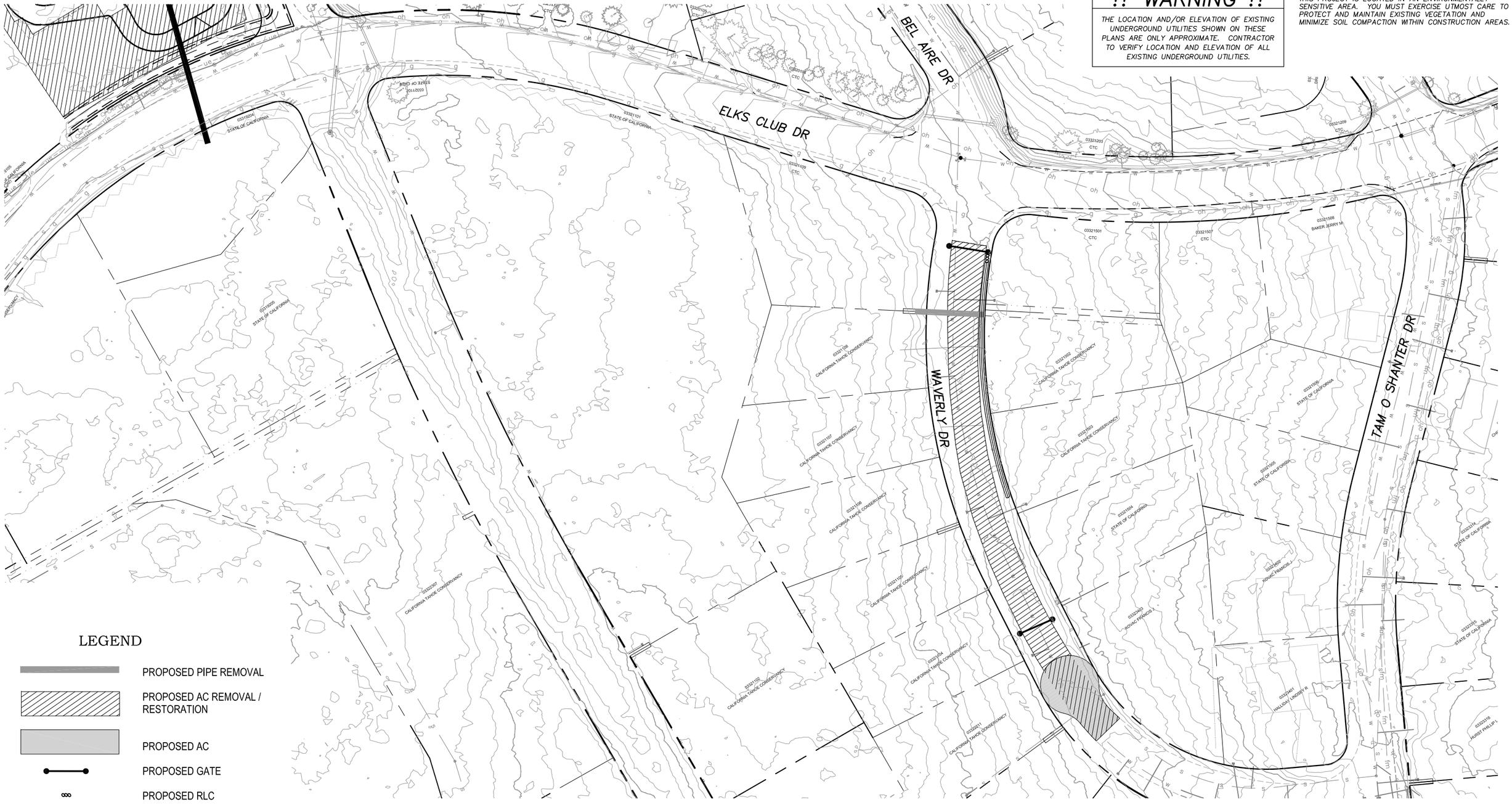
DATE: 03/2019 | PROJECT NO.: 95191 | BY: DMG

FIGURE 14

!! WARNING !!

THE LOCATION AND/OR ELEVATION OF EXISTING UNDERGROUND UTILITIES SHOWN ON THESE PLANS ARE ONLY APPROXIMATE. CONTRACTOR TO VERIFY LOCATION AND ELEVATION OF ALL EXISTING UNDERGROUND UTILITIES.

NOTE:
THIS PROJECT IS LOCATED IN AN ENVIRONMENTALLY SENSITIVE AREA. YOU MUST EXERCISE UTMOST CARE TO PROTECT AND MAINTAIN EXISTING VEGETATION AND MINIMIZE SOIL COMPACTION WITHIN CONSTRUCTION AREAS.



LEGEND

- PROPOSED PIPE REMOVAL
- PROPOSED AC REMOVAL / RESTORATION
- PROPOSED AC
- PROPOSED GATE
- PROPOSED RLC
- PROPOSED BLC

0 20' 40'
SCALE

COUNTY OF EL DORADO
COMMUNITY DEVELOPMENT SERVICES
DEPARTMENT OF TRANSPORTATION

COUNTRY CLUB HEIGHTS PHASE III WATER QUALITY PROJECT

ALTERNATIVE 1 - WAVERLY DR

DATE: 03/2019 | PROJECT NO.: 95191 | BY: DMG

FIGURE 15

LEGEND

- PROPOSED PIPE
- PROPOSED BASIN / SEZ ENHANCEMENT
- PROPOSED FILL REMOVAL / RESTORATION
- PROPOSED AC REMOVAL / RESTORATION
- PROPOSED BIKE PATH
- PROPOSED TRAIL
- PROPOSED ROCK SPILLWAY
- EDUCATIONAL / INFORMATIONAL OUTREACH SIGN
- ZIG ZAG FENCING
- BR — BATHROOM FACILITY

NOTE:
THIS PROJECT IS LOCATED IN AN ENVIRONMENTALLY SENSITIVE AREA. YOU MUST EXERCISE UTMOST CARE TO PROTECT AND MAINTAIN EXISTING VEGETATION AND MINIMIZE SOIL COMPACTION WITHIN CONSTRUCTION AREAS.

UPPER TRUCKEE RIVER

HWY 50

EXISTING PARKING LOT

ELKS CLUB DR

BOCA RATON DR

10+00 11+00 12+00 13+00 14+00 15+00 16+00 17+00

033110011 CTC
033191007 CTC
03319108 STATE OF CALIFORNIA
03319106 COUNTY OF EL DORADO
03320101 UNITED STATES OF AMERICA
03320131 UNITED STATES OF AMERICA
033191004 CTC
033191005 CTC
033192000 CTC
033192001 CTC
033192004 CTC
033201002 CTC
033201005 CTC
033201006 CTC
033201007 CTC
033201008 CTC
033211003 STATE OF CALIFORNIA

0 20' 40'
SCALE

COUNTY OF EL DORADO
COMMUNITY DEVELOPMENT SERVICES
DEPARTMENT OF TRANSPORTATION

COUNTRY CLUB HEIGHTS PHASE III WATER QUALITY PROJECT

ALTERNATIVE 2 - LOWER ELKS CLUB DR

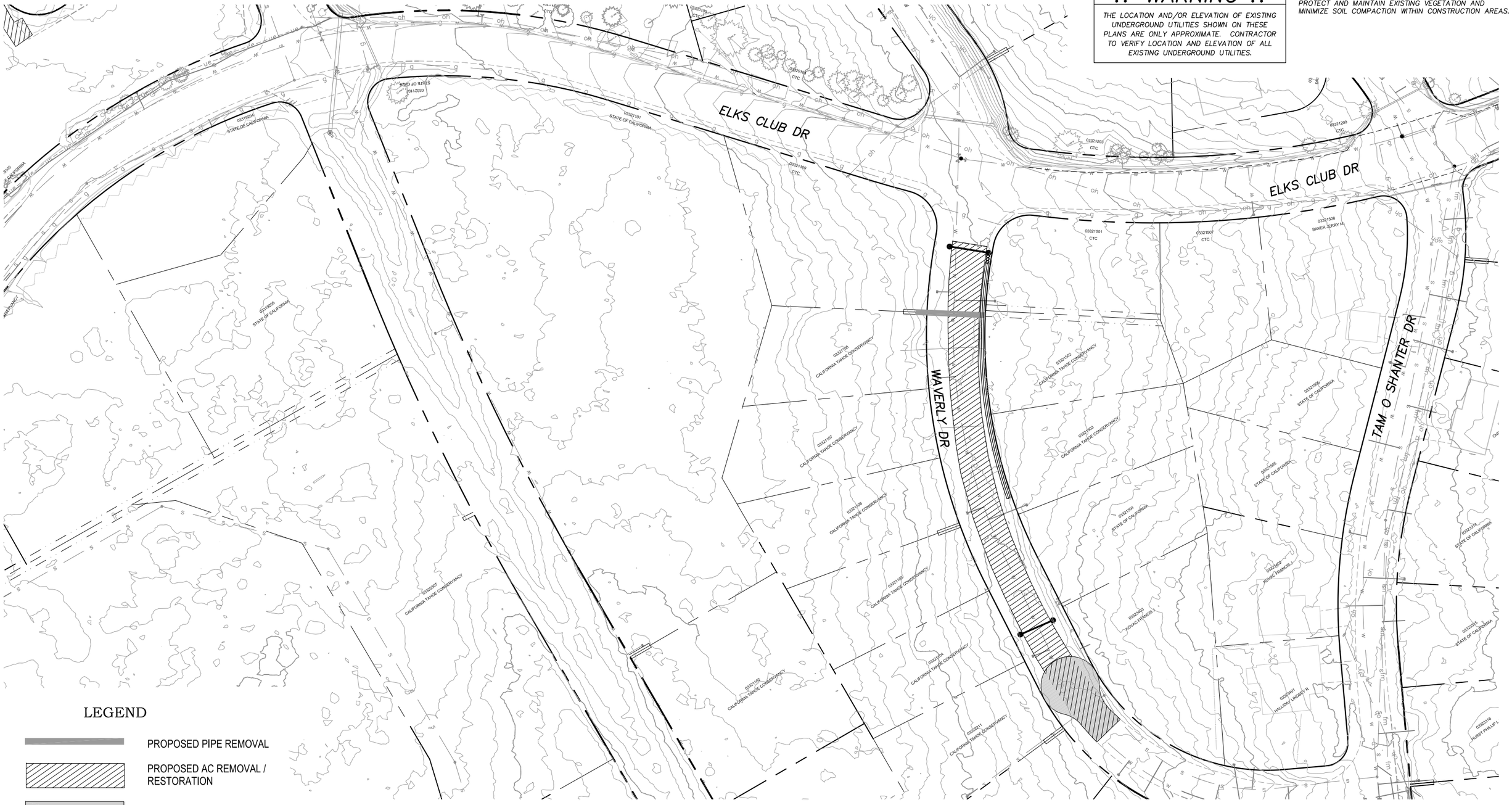
DATE: 03/2019 | PROJECT NO.: 95191 | BY: DMG

FIGURE 16

!! WARNING !!

THE LOCATION AND/OR ELEVATION OF EXISTING UNDERGROUND UTILITIES SHOWN ON THESE PLANS ARE ONLY APPROXIMATE. CONTRACTOR TO VERIFY LOCATION AND ELEVATION OF ALL EXISTING UNDERGROUND UTILITIES.

NOTE:
THIS PROJECT IS LOCATED IN AN ENVIRONMENTALLY SENSITIVE AREA. YOU MUST EXERCISE UTMOST CARE TO PROTECT AND MAINTAIN EXISTING VEGETATION AND MINIMIZE SOIL COMPACTION WITHIN CONSTRUCTION AREAS.



LEGEND

- PROPOSED PIPE REMOVAL
- PROPOSED AC REMOVAL / RESTORATION
- PROPOSED AC
- PROPOSED GATE
- PROPOSED RLC
- PROPOSED BLC

0 20' 40'
SCALE

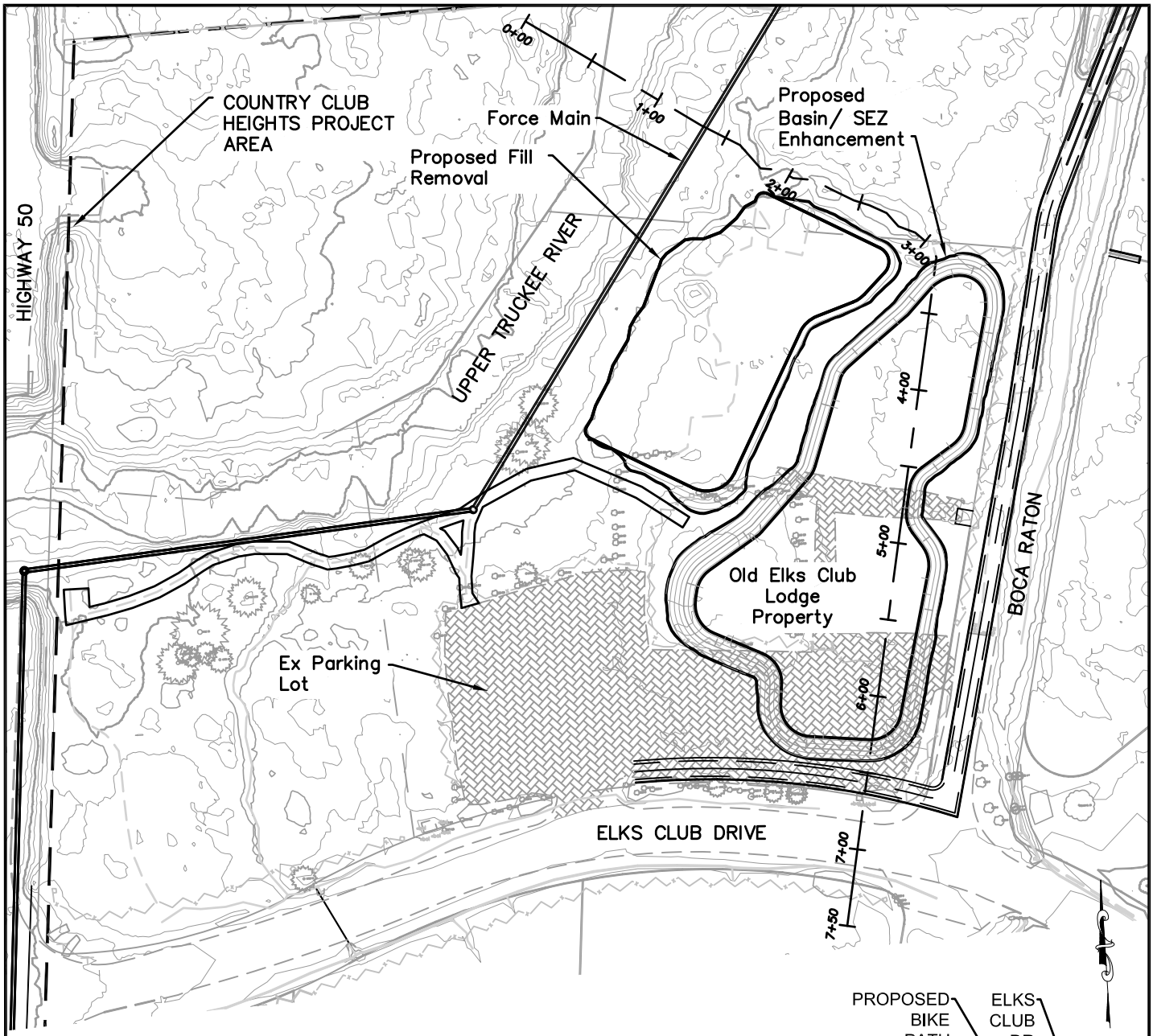
COUNTY OF EL DORADO
COMMUNITY DEVELOPMENT SERVICES
DEPARTMENT OF TRANSPORTATION

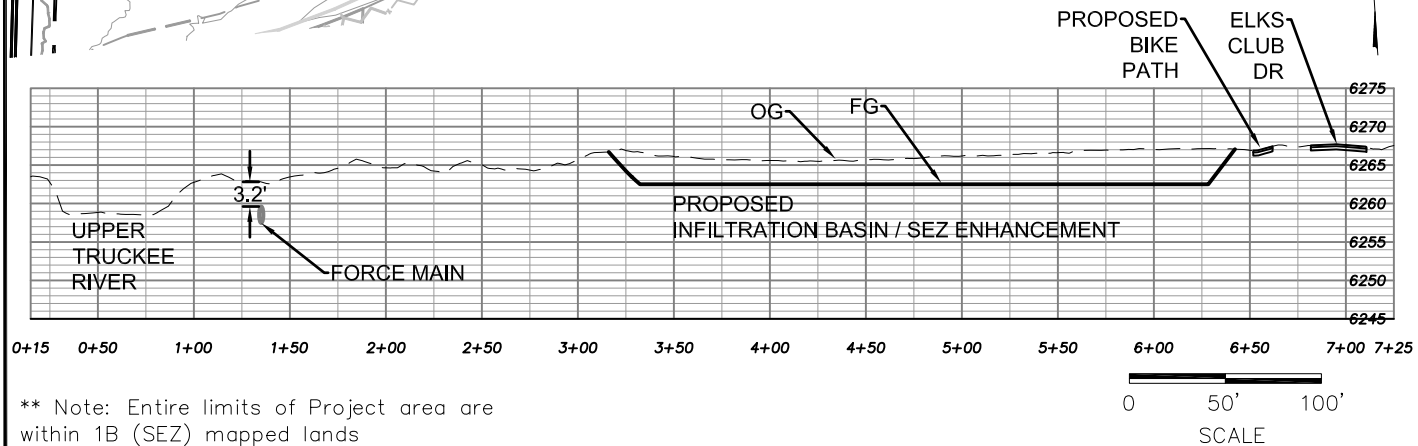
COUNTRY CLUB HEIGHTS PHASE III WATER QUALITY PROJECT

ALTERNATIVE 2 - WAVERLY DR

FIGURE 17

DATE:	PROJECT NO.:	BY:
03/2019	95191	DMG





** Note: Entire limits of Project area are within 1B (SEZ) mapped lands

COUNTY OF EL DORADO
COMMUNITY DEVELOPMENT SERVICES
DEPARTMENT OF TRANSPORTATION

COUNTRY CLUB HEIGHTS EROSION CONTROL PROJECT

Phase 3

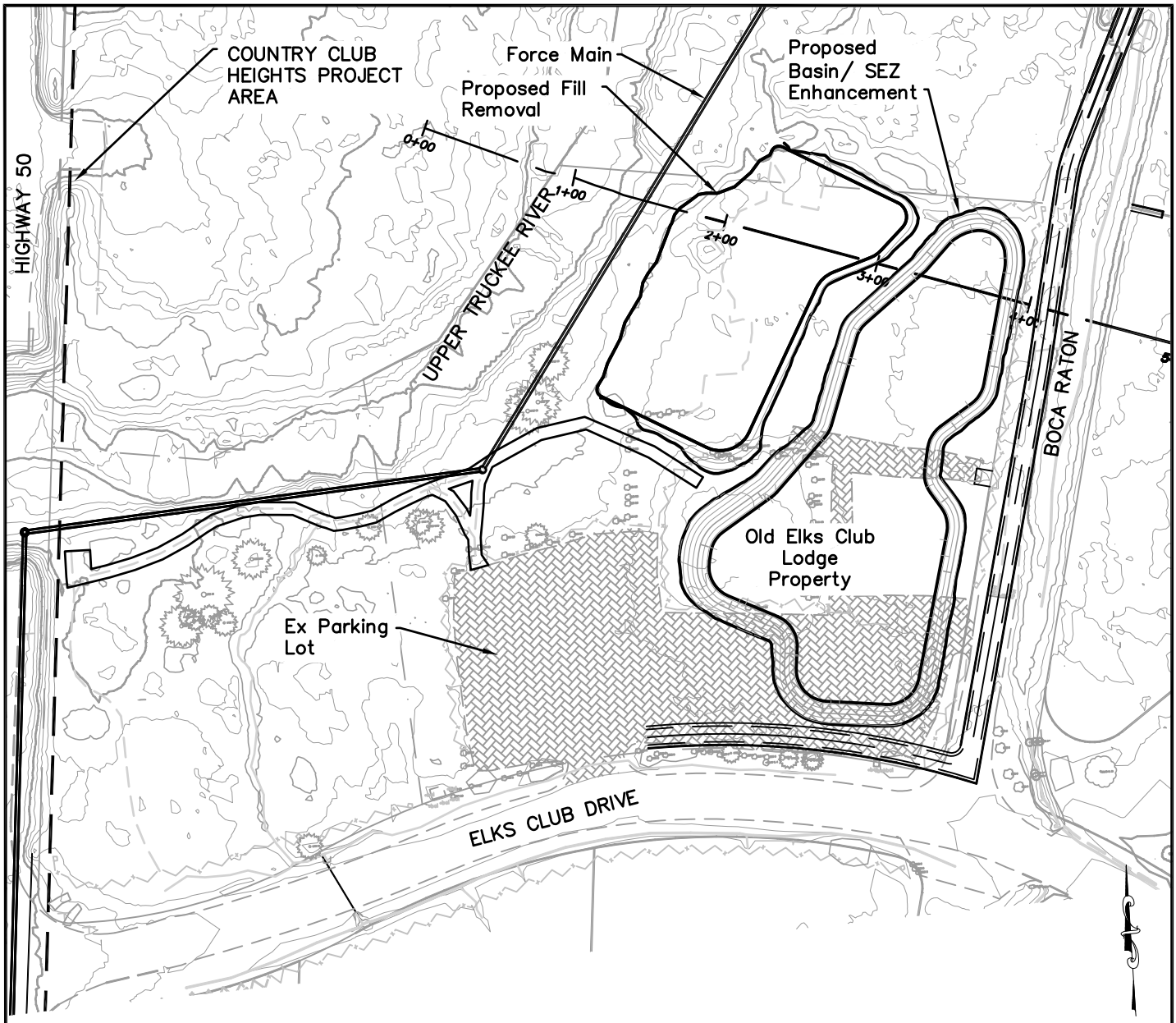
PROPOSED SECTION VIEW

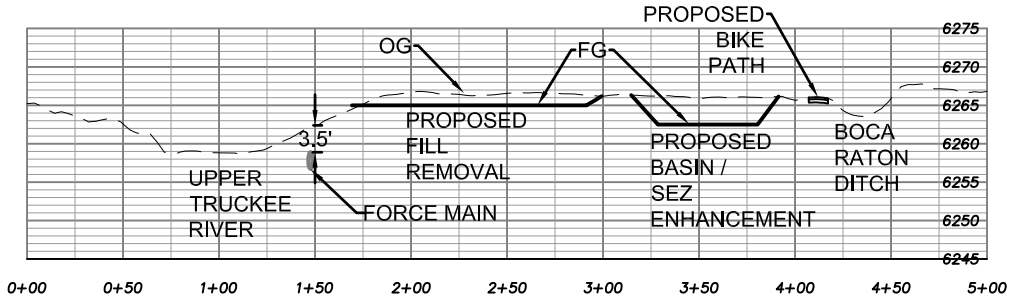
BASIN OUTLET, BASIN, & ELKS CLUB DR

DATE:	PROJECT NO.:	BY:
03/2019	95191	DMG

FIGURE

18





** Note: Entire limits of Project area are within 1B (SEZ) mapped lands

0 50' 100'
SCALE

COUNTY OF EL DORADO
COMMUNITY DEVELOPMENT SERVICES
DEPARTMENT OF TRANSPORTATION

COUNTRY CLUB HEIGHTS EROSION CONTROL PROJECT

Phase 3

PROPOSED SECTION VIEW

UPPER TRUCKEE RIVER, BASIN, & BOCA RATON DITCH

DATE:	PROJECT NO.:	BY:
05/2019	95191	DMG

FIGURE 19

3.0 Summary

3.1 Existing Conditions

This Report has sought to describe the existing conditions of the Project area in which proposed water quality and recreational access improvements are proposed to be constructed.

- **Topography**. In general, the topography of the Project area is relatively flat/level, with the grade of the parking lot now lower than Elks Club Drive. The topography rises to the east along Elks Club Drive in the direction of Waverly Drive.

- **User Trail**. An existing natural ground trail/path/access road is present along the STPUD access road north of Elks Club Drive along the old Boca Raton Drive roadway. The existing alternatives provide for connection to this trail via a spur trail from the Elks Club parking lot. This project could include the construction of a section of paved shared use trail along the existing shared use trail on the Boca Raton stub to minimize impact to existing land use.

- **Soils**. The Project area soils fall primarily within group A, signifying a moderate to low runoff potential.

- **Land Use**. Depending on the size of the constructed infiltration area, there is an opportunity to restore a large compacted area providing increased benefit to botanical and water quality thresholds. It is expected that any construction of the proposed shared use path as part of this project would be located within an existing disturbed, compacted area, and therefore the Project would likely not conflict with existing land uses in the area.

- **Land Capability**. The land within the Project area fits into land capability Classes 1b, 4, 5, and 6, with the majority falling into Class 1b and therefore having a moderate to low potential for erosion. The land capability verification has not yet been completed by TRPA, however, preliminary research indicates SEZ areas in addition to the Upper Truckee River within the Project area requiring a 25-foot setback.

- **Land Ownership**. As discussed in the Report, construction of an infiltration basin and restoration of the compacted areas would occur on lands owned by the California Tahoe Conservancy. Any construction involving reconfiguration of the parking lot and construction of a section of the shared use path would require both utilizing public lands (CTC) and El Dorado County right of way (Boca Raton Drive stub); the County will pursue the needed license agreements for any affected parcels during the development of the preferred project alignment.

- **Utilities**. A South Tahoe Public Utility District (STPUD) backup force main is a consideration for the extents of the infiltration basin. The County will consult with STPUD should any planned improvements conflict with this feature. Currently on Waverly Drive STPUD infrastructure includes laterals and mains for sewer and water lines in addition to one fire

hydrant. The County will coordinate possible abandonment, access to, or relocation of the above assets as part of the project.

- **Environmental Resources**. Initial environmental inventories including, biological, wetland/Waters of the US and cultural, have been conducted and sensitive resources identified. The short section of proposed shared use path will avoid these resources. The County will utilize a consultant to update the environmental inventories before moving forward with design of the project. If new resources are identified and cannot be avoided (e.g., possibly some vegetation and wetlands areas), potential impacts will be mitigated to the maximum extent feasible.

- **Hydrology**. Water quality improvements, utilizing low impact development principles, will be part of the Project. The design of the infiltration area will utilize existing channels or depressions to convey excess flows away from any improved parking lot or shared use trail.

3.2 Formulating Alternatives

The Three alternatives for the three areas were described and evaluated in this Report. The CTC purchased the old “Elks Club Lodge” property with the intent of restoring the parcel to as close to its predevelopment condition. Evaluating the alternatives with respect to current use of the parcel indicates an opportunity to meet the CTCs intent while providing both a water quality and recreational benefit.

In general, Alternative 1 will provide the greatest water quality and recreational benefit. Modifications to the size of the parking lot will provide parking for recreational use and access surrounding the property. Construction of a large wet infiltration basin will provide benefits of treating stormwater runoff, recharging groundwater, increasing meadow vegetation and wildlife habitat establishment. Removal of the pavement from the identified section of Waverly Drive will reduce stormwater runoff, provide additional area for the treatment of stormwater runoff, decrease long term maintenance costs, and increase vegetation and restoration of wildlife habitat. Alternative 2 is a reduced project scope that will provide reduced water quality and recreational benefits. Reducing the size of the parking lot and reconfiguring/reconstructing the parking lot to be closer to Elks Club Drive provides an opportunity to raise the grade of the parking lot to limit future flooding impacts. The number of possible parking spaces with Alternative 1 and Alternative 2 are near identical. Alternative 3 addresses the hard pack coverage on the old “Elks Club Lodge” property, providing for possible re-establishment of vegetation, but will not provide an additional treatment area to benefit water quality.

4.0 References

4.1 References

[1] Storm Water Quality Improvement Committee, *Lake Tahoe Basin Storm Water Quality Improvement Committee (SWQIC), Formulating and Evaluating Alternatives for Water Quality Improvement Projects*, July 2004.

[2] Tahoe Regional Planning Agency (TRPA) and Tahoe Metropolitan Planning Organization (TMPO), *Linking Tahoe: Active Transportation Plan*, March 2016, page 4-40.

[3] Nichols Consulting Engineers for Tahoe Resource Conservation District, *Stormwater Resource Plan for the Tahoe-Sierra Region*, February 28, 2018.

[4] TRPA, Environmental Improvement Program (EIP) (2001). *Recreation - EIP #00612 "CTC Elks' Club Upper Truckee River Access*, page 281.

[5] TRPA, EIP (2001). *Soil Conservation/SEZ - EIP #00948 "Upper Truckee Elks Club to Airport SEZ Restoration*, page 472.

[6] TRPA, EIP Project Tracking System. https://eip.laketahoeinfo.org. Project Number 01.02.01.0027 – Upper Truckee Restoration Project – Elks Club.

[7] TRPA, EIP Project Tracking System. https://eip.laketahoeinfo.org. Project Number 01.01.01.0021 Country Club Heights Stormwater Management and Erosion Control Project.

[8] TRPA and Tahoe Metropolitan Planning Organization (TMPO), *Linking Tahoe: Active Transportation Plan*, March 2016, page 4-45.

[9] Entrix (2005), Final opportunities and constraints report for the sunset stables restoration and resource management plan project. Page 4-17.

[10] United States Department of Agriculture, Natural Resources Conservation Service. 2007. *Soil Survey of the Tahoe Basin Area, California and Nevada*. Accessible online at: http://soils.usda.gov/survey/printed_surveys/.

[11] Saucedo, G. (2005). California Dept. of Conservation California Geological Survey, "Geologic Map of the Lake Tahoe Basin."

[12] TRPA (March 2012). Tahoe Regional Planning Agency, Plan Area Statements.

[13] County of El Dorado, *Drainage Manual*, March 1995, Section 2.

[14] TRPA, Lake Tahoe (208) Water Quality Management Plan. June 19, 2013

[15] Mays (2001) Mays, L. W. Storm Water Collection Systems Design Handbook, McGraw-Hill.

[16] Mays (2001) Mays, L. W. Storm Water Collection Systems Design Handbook, McGraw-Hill.

[17] Ford, D. (March 1995). County of El Dorado Drainage Manual. pg 2-17

[18] Ford, D. (March 1995). County of El Dorado Drainage Manual. Pg 2-13

[19] Ford, D. (March 1995). County of El Dorado Drainage Manual. Pg 2-10

[20] Ford, D. (March 1995). County of El Dorado Drainage Manual. Pg 4-4

[21] United States Department of Agriculture, Forest Service. 2000. *Lake Tahoe Watershed Assessment*.

[22] Northwest Hydraulic Consultants, *Formulating and Evaluating Alternatives for Water Quality Improvement Projects*, May 2004. Page A-81.