2 PROJECT ALTERNATIVES

2.1 OVERVIEW

This chapter describes a range of reasonable alternatives that would meet the purpose, need, and project objectives for the Upper Truckee River and Marsh Restoration Project (project). This range of reasonable alternatives complies with the requirements of Title 14, Section 15126.6 of the California Code of Regulations (14 CCR 15126.6), also referred to as the State CEQA Guidelines; Title 40, Section 1502 of the Code of Federal Regulations (i.e., 40 CFR 1502); Article VII(a)(3) of the Tahoe Regional Planning Agency (TRPA) Compact; and Section 5.8.B of the TRPA Code of Ordinances. Each of these alternatives is feasible, based on relevant economic, environmental, social, technological, and legal factors, although they provide different advantages and disadvantages related to environmental impacts and achievement of the project's purpose, need, and project objectives.

More specifically, this chapter discusses the development of reasonable alternatives; lists those alternatives and project elements considered but eliminated from further evaluation; and describes the elements of the four restoration (action) alternatives (Alternatives 1–4) and the No-Project/No-Action Alternative (Alternative 5), which are analyzed at a comparable level of detail as required by the Council of Environmental Quality (CEQ) regulations for implementing the National Environmental Policy Act (NEPA) (i.e., 40 CFR 1502.14). The chapter subsequently describes the resource management and monitoring, construction, and environmental commitments applicable to the alternatives.

Each of the five alternatives evaluated in this DEIR/DEIS/DEIS was named for its approach to restoration of the Upper Truckee River and the associated level of public access and recreation infrastructure:

- Alternative 1: Channel Aggradation and Narrowing (Maximum Recreation Infrastructure)
- Alternative 2: New Channel-West Meadow (Minimum Recreation Infrastructure)
- Alternative 3: Middle Marsh Corridor (Moderate Recreation Infrastructure)
- Alternative 4: Inset Floodplain (Moderate Recreation Infrastructure)
- Alternative 5: No-Project/No-Action

Alternatives 1–4 are all intended to meet the basic project objectives, but differ in river restoration treatments and recreation infrastructure that would alter public access (Exhibits 2-1 through 2-4). The differences among alternatives will assist public decision makers in selecting the alternative that best meets the project objectives as well as the needs of the community and the environment. The types of elements included in Alternatives 1–4 are listed in Table 2-1, briefly described in the following paragraphs, and their locations are displayed in Exhibits 2-1 through 2-4. The elements of the alternatives are subsequently described in greater detail in Section 2.3, "Elements of the Alternatives."

- **Alternative 1. Channel Aggradation and Narrowing (Maximum Recreation Infrastructure).** To restore the river channel and its connection to the floodplain, Alternative 1 would increase channel length and decrease channel capacity. A key element of this restoration would be the use of engineering elements (primarily structures in the channel) to cause sediment deposition that raises the channel bed and decreases channel capacity and slightly reduces the capacity of the channel mouth at Lake Tahoe. Alternative 1 would also restore a naturally-functioning lagoon in the vicinity of the existing Sailing Lagoon, lagoon and wet meadow conditions behind the east end of Barton Beach, floodplain functions at the Tahoe Keys Property Owners Association (TKPOA) Corporation Yard (contingent on TKPOA consent), and sand ridges ("dunes") at Cove East Beach. Alternative 1 would enhance forest habitat and an area of "core habitat" that contains sensitive marsh in the center of the study area by removing or relocating volunteer (i.e., user-created) trails. In addition, at the existing location where boaters enter and exit the Upper Truckee River, adjacent to East Venice Drive, the river bank would be stabilized with best management practices (BMPs) to avoid erosion and other resource damage.

Table 2-1
Elements included in Action Alternatives[1]

Element	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Restoration and Enhancement Elements				
Stabilization of Eroding Banks Downstream of U.S. 50 Bridge	✓	✓	✓	✓
River and Floodplain Restoration[2]	✓	✓	✓	✓
River Mouth Size Reduction	✓	✓	✓	
Removal of Existing Fill from Floodplain	✓	✓	✓	
Reactivation of Floodplain Terrace			✓	
Modification of Existing Stormwater Discharge Locations		✓	✓	
Reestablishment of River Overflow Lagoon	✓	✓	✓	
Removal of Existing Fill from Behind the East End of Barton Beach	✓	✓		
Beach-Dune Restoration	✓	✓		
Forest Enhancement	✓	✓	✓	✓
Core Habitat Enhancement	✓	✓	✓	✓
East Venice Drive Bank Stabilization	✓	✓		✓
Recreation and Public Access Elements				
Bicycle Path(s)	✓		✓	✓
Pedestrian Trail(s)		✓	✓	✓
Observation Areas	✓		✓	✓
Bridges	✓			
Kiosk(s)	✓		✓	✓
Parking lot	✓			
Fishing Platform	✓			
Boardwalk(s)	✓		✓	✓
Viewpoints and Signage	✓	✓	✓	✓

Notes:
[1] No-Project/No-Action Alternative does not include any of these elements.
[2] River and floodplain restoration includes river channel restoration, secondary channel reactivation, floodplain lowering, and fill of abandoned channel segments.

Legend

- Existing 1000 ft. River Station
- Existing 100 ft. River Station - Upper Truckee
- Existing 100 ft. River Station - Trout Creek
- Existing Regional Bike Trail

Proposed Habitat Features

- Core Habitat Area
- Lagoon
- Restored Meadow
- Restored Dune
- Tahoe Yellow Cress Restricted Use Area

Proposed River and Floodplain Features

- Low and Bankful Flow Channel
- Partial Fill of Existing Channel
- Removal of Reserve Fill
- Active Floodplain

Proposed Engineered Features

- Lateral Grade Control
- Vertical Grade Control
- Bank Protection
- Bulkhead/Levee

Proposed Public Access Features

- Observation Area
- Viewpoint
- Kiosk
- Parking
- Bike Path
- Pedestrian Trail
- Bridge
- Boardwalk

0 500 1000
FEET
NORTH

G 00110066.04 011

Source: Conservancy and DGS 2007a, adapted by AECOM in 2013

Exhibit 2-1

Proposed Elements of Alternative 1: Channel Aggradation and Narrowing (Maximum Recreation Infrastructure)

Legend

- Existing 1000 ft. River Station
- Existing 100 ft. River Station - Upper Truckee
- Existing 100 ft. River Station - Trout Creek
- Existing Regional Bike Trail

Proposed River and Floodplain Features

- Low and Bankful Flow Channel
- Active Floodplain
- Removal of Reserve Fill
- Partial Fill of Existing Channel

Proposed Habitat Features

- Core Habitat Area
- Lagoon
- Restored Meadow
- Restored Dune and Beach
- Tahoe Yellow Cress Restricted Use Area

Proposed Engineered Features

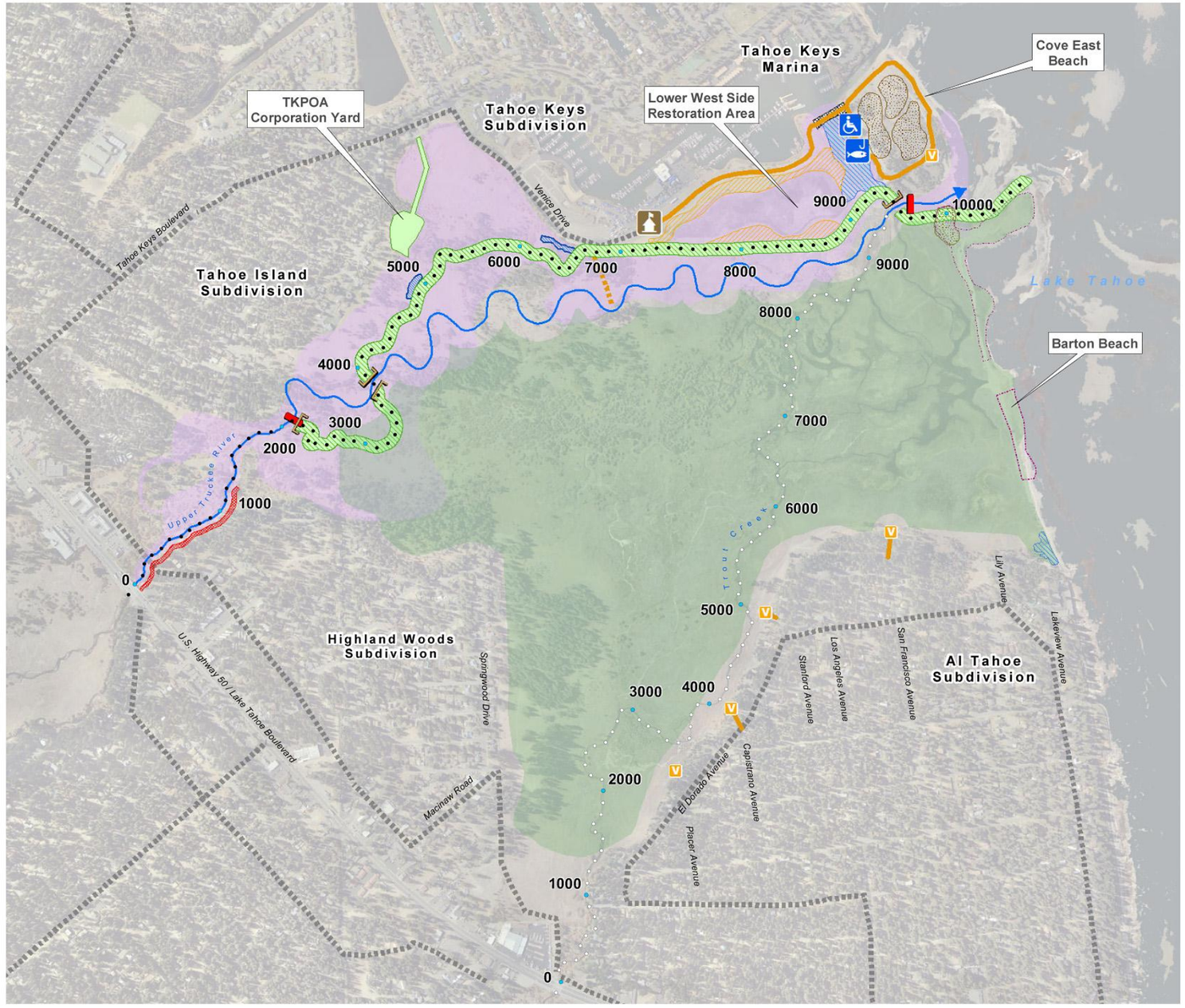
- Lateral Grade Control
- Vertical Grade Control
- Bulkhead/Levee
- Bank Protection
- Storm Water Treatment Area

Proposed Public Access Features

- Viewpoint
- Pedestrian Trail
- Boardwalk
- Fishing Platform
- ADA Accessible
- Kiosk

0 500 1000
FEET
NORTH

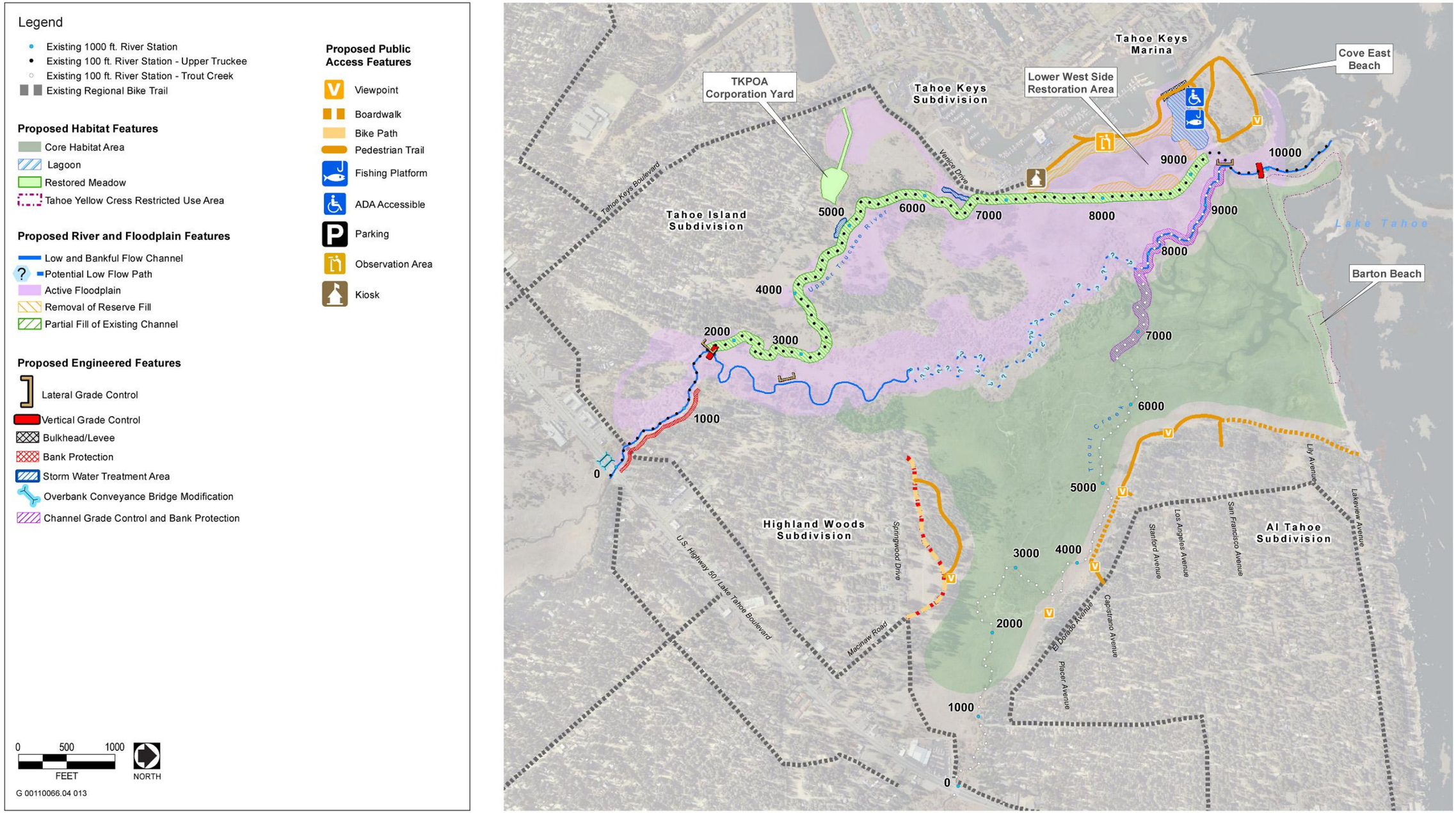
G 00110066.04 012



Source: Conservancy and DGS 2007a, adapted by AECOM in 2013

Exhibit 2-2

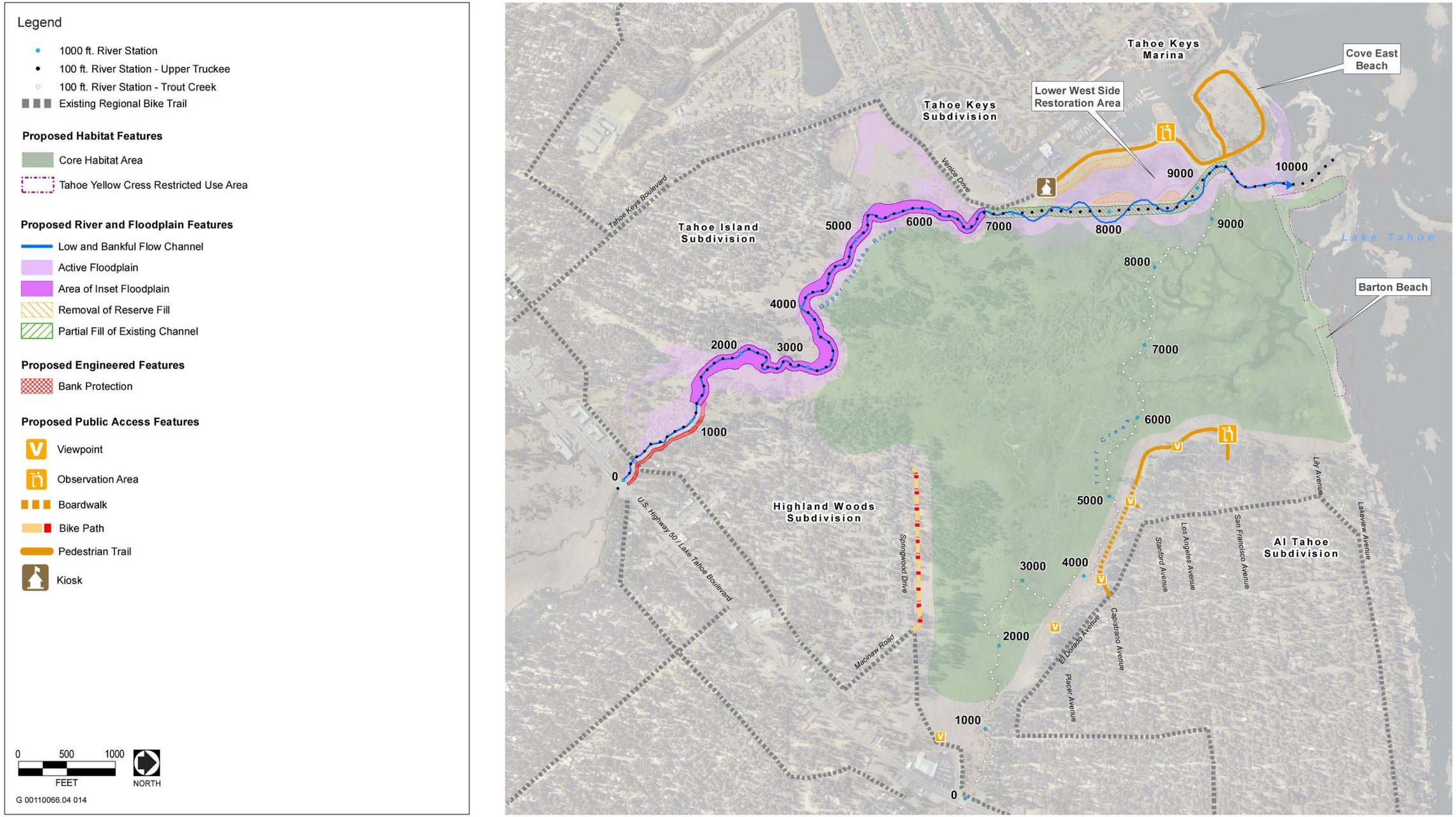
Proposed Elements of Alternative 2: New Channel–West Meadow (Minimum Recreation Infrastructure)



Source: Conservancy and DGS 2007a, adapted by AECOM in 2013

Exhibit 2-3

Proposed Elements of Alternative 3: Middle Marsh Corridor (Moderate Recreation Infrastructure)



Source: Conservancy and DGS 2007a, adapted by AECOM in 2013

Exhibit 2-4 **Proposed Elements of Alternative 4: Inset Floodplain (Moderate Recreation Infrastructure)**

Under Alternatives 1–4, recreation infrastructure is proposed near the perimeter of the study area. Alternative 1 provides a potential "maximum" level of recreation infrastructure that includes parking on the west side of the study area adjacent to the Tahoe Keys Marina, a connected system of bicycle paths, boardwalks, observation areas, two kiosks, and signage. Bicycle paths would be Class I/Shared-Use Paths (as described in TRPA and TMPO 2010). Bridges over Trout Creek and the Upper Truckee River (and a boardwalk) would connect the proposed bicycle paths. Bicycle paths would connect to existing regional trails near the study area.

- **Alternative 2. New Channel-West Meadow (Minimum Recreation Infrastructure)**. To restore the river channel and its connection to the floodplain, Alternative 2 would directly raise the streambed elevation, increase the channel length, and decrease channel capacity. A key element of this restoration would be the excavation of a new river channel that has less capacity than the existing channel. The existing river mouth would be replaced with a new smaller river mouth, similar in size to the historical river mouth prior to dredging. Unlike Alternative 1, the river channel and floodplain restoration elements of Alternative 2 would require two existing stormwater discharge locations to be modified and/or relocated. Alternative 2 also includes all of the other restoration and enhancement elements of Alternative 1. In addition, at the existing location where boaters enter and exit the Upper Truckee River, adjacent to East Venice Drive, the river bank would be stabilized with BMPs to avoid erosion and other resource damage. To protect natural resources, a boardwalk connecting the river to East Venice Drive would be constructed.

  Alternative 2 would provide a "minimum" level of recreation infrastructure that includes a modified Americans with Disabilities Act (ADA)-accessible pedestrian trail to Cove East Beach, five viewpoints, a fishing platform, and signage. Except for four viewpoints along the eastern perimeter of the study area (adjacent to the Al Tahoe neighborhood), this infrastructure is located from East Venice Drive to Cove East Beach.

- **Alternative 3. Middle Marsh Corridor (Moderate Recreation Infrastructure).** To restore the river channel and its connection to the floodplain, Alternative 3 would promote the development through natural processes of a new main channel and/or distributary channels in the central portion of the study area. A "pilot" channel, similar to the channel segments constructed under Alternatives 1 and 2, would be constructed from the existing river channel to historical channels in the center of the study area, but no construction would occur in the central or northern portions of the study area. Rather, natural processes would be allowed to dictate the flow path(s), bed and bank elevations, and capacities of the channel(s) through the central and northern portions of the study area. The existing river mouth would be retained, but its capacity would be reduced. In addition, by boring two culverts under U.S. 50, an area of isolated floodplain would be reactivated. The river channel and floodplain restoration elements of Alternative 3 would require two existing stormwater discharge locations to be modified and/or relocated. Also, like Alternatives 1 and 2, Alternative 3 would restore a natural-functioning lagoon in the vicinity of the Sailing Lagoon and floodplain functions at the TKPOA Corporation Yard and would enhance areas of "core habitat" and forest. However, Alternative 3 would not restore lagoon and wet meadow conditions behind the east end of Barton Beach (by removal of existing fill) or dunes at Cove East Beach.

  Alternative 3 would provide a "moderate" level of recreation infrastructure that includes three pedestrian trails, a bicycle path, a kiosk, one observation area, six viewpoints, a fishing platform, and signage at multiple locations. Similar to Alternative 2, the modified pedestrian trail to Cove East Beach would be ADA-accessible, as well as the fishing platform at the restored lagoon. Alternative 3 would also include a bicycle path and a pedestrian trail near the Highland Woods neighborhood, connected to Mackinaw Road, and a pedestrian trail adjacent to the Al Tahoe neighborhood, from Capistrano Avenue to East Barton Beach, two segments of which would be boardwalks.

- **Alternative 4. Inset Floodplain (Moderate Recreation Infrastructure).** To restore the river channel and its connection to the floodplain, Alternative 4 would lower bank heights by excavating an inset floodplain along

much of the river channel and by localized cutting and filling to create meanders in the existing straightened reach. The existing river mouth would be retained, and its capacity would not be reduced. Although Alternative 4 would include the enhancement of core and forest habitats, it would not include the restoration of floodplain functions at the TKPOA Corporation Yard, a natural-functioning lagoon in the vicinity of the existing Sailing Lagoon, or dunes at Cove East Beach. In addition, at the existing location where boaters enter and exit the Upper Truckee River, adjacent to East Venice Drive, the river bank would be stabilized with BMPs to avoid erosion and other resource damage.

Similar to Alternative 3, Alternative 4 would provide a "moderate" level of recreation infrastructure that includes two pedestrian trails, a bicycle path, a kiosk, two observation areas, five viewpoints, and signage at multiple locations. The bicycle path would be adjacent to the Highland Woods neighborhood, connected to Mackinaw Road, and the pedestrian trails would be near the Tahoe Keys, from East Venice Drive to Cove East Beach, in part replacing the existing pedestrian trail, and adjacent to the Al Tahoe neighborhood, from Capistrano Avenue to San Francisco Avenue, one segment of which would be a boardwalk.

- **Alternative 5. No Project/No Action.** Alternative 5 would not provide any actions to restore the river channel and its connection to the floodplain in the study area. This alternative would allow but not facilitate the long-term, passive recovery of the river system via natural processes. The existing river mouth location, size, and bed elevation would continue to adjust to lake levels, streamflows, and sediment loads. The Upper Truckee River–lagoon connection would not be restored, leaving the direct open-water connection between the Tahoe Keys Marina channel, the Sailing Lagoon, and Lake Tahoe unchanged. The previously leveled area between Cove East Beach and the Sailing Lagoon would not be modified. Alternative 5 would not protect an extensive area of core habitat. However, the Conservancy has been implementing localized decommissioning of some trails, and similar actions would likely continue to be implemented.

  Alternative 5 would not take any direct steps to construct recreation infrastructure elements that alter public access. However, this alternative would likely maintain existing infrastructure and might result in the construction of some additional, smaller elements (e.g., signage).

None of the alternatives are designated as preferred at this time; rather, the lead agencies will identify a preferred alternative after taking into consideration public comment on this DEIR/DEIS/DEIS. The preferred alternative may be one of the five alternatives or a combination of components from these concept plans, assembled into a different variation within the general scope of the range of alternatives.

This chapter presents Alternatives 1–4 at the 30 percent (conceptual) design level, which constitutes a "project-level" analysis. The descriptions include information on the design concept and design elements, modifications to existing facilities and/or new facilities that would be required, the anticipated activities and equipment needed to construct each alternative, and likely operational scenarios.

The description of Alternative 5 (the No-Project/No-Action Alternative) includes existing conditions at the time environmental analysis commenced (i.e., in October 2006, when the CEQA notice of preparation [TRPA and Conservancy 2006] was released) and as required by NEPA conditions expected to occur in the foreseeable future if the project does not occur, based on ongoing physical and ecological processes, current plans, current resource management practices, and existing infrastructure and community services. For most resource issues, existing and foreseeable future conditions are anticipated to be effectively the same. For future conditions anticipated to differ from existing conditions, impacts relative to existing and future conditions are discussed separately.

2.2 ALTERNATIVES DEVELOPMENT

2.2.1 GUIDING PRINCIPLES

Principles that guided the development of these alternatives included:

- **Fulfillment of all project objectives and design directives.** Each alternative was designed to be a "full-spectrum" alternative that addressed, to varying degrees, all project objectives and design directives.
- **Use of modular elements.** Many but not all of the elements in each alternative were modular, and thus could be included in other alternatives.
- **Embodiment of diverse concepts.** The alternatives embody a diverse range of concepts for particular components of the restoration plan.
- **Potential feasibility and implementable approach.** Each alternative is intended to be a potentially feasible and implementable approach; none is a "straw" (i.e., intentionally infeasible) alternative.
- **Critical environmental constraints.** Alternatives were developed within bounds set by various critical constraints, identified and mapped early in the planning process (Conservancy and DGS 2003). This initial information about critical environmental impact issues and the relationship of the alternatives to TRPA thresholds was incorporated.
- **Conformance to land use regulations and purposes of property acquisitions.** All alternatives were developed within the context of existing land use regulations and stated California Tahoe Conservancy (Conservancy) purposes for acquiring properties.
- **Minimal maintenance.** The public access and recreational facility design elements of the alternatives were developed to minimize the need for future maintenance within the study area.

2.2.2 ALTERNATIVES AND ALTERNATIVE ELEMENTS CONSIDERED BUT ELIMINATED FROM FURTHER EVALUATION

Alternative locations were considered but eliminated from further evaluation because off-site alternatives would not fulfill the purpose and primary objectives of the project. An important part of the project's purpose and objectives is to restore natural geomorphic processes and ecological functions to improve ecological values of the study area and help reduce the river's discharge of nutrients and sediment that diminish Lake Tahoe's clarity, while still providing safe access to vistas and environmental education to the public. Off-site actions upstream along the Upper Truckee River or elsewhere in the watershed could reduce the river's discharge of nutrients and sediment, but would not substantially improve ecological values of the study area.

While the four preliminary conceptual alternatives were being developed and refined, several facilities were removed from the alternatives, in particular a full-service visitor center and restrooms. As described further below, these facilities were determined to be inconsistent with the project objectives and the principles for alternative development given above.

Initial conceptual plans for Alternative 1 included a full-service visitor center located near the end of East Venice Drive. This facility was included to ensure that the maximum amount of recreational infrastructure that would be feasible was considered; however, the visitor center was determined to be unnecessary and incompatible with the site and, therefore, was removed from the alternative.

The need for visitor centers on the south shore of Lake Tahoe has been largely met by the Taylor Creek Visitor Center, the Meyers Visitor Center, and the Explore Tahoe Visitor Center. Creating a full-service visitor center on the project site would be an unnecessary duplication of services provided in multiple nearby locations. In addition, the infrastructure required to support the visitor center would be inconsistent with the limitations of the site. The full-service visitor center would require substantial operations and maintenance costs, which would place an ongoing financial burden on the State while providing services that are duplicated elsewhere.

The full-service visitor center also was determined to be inconsistent with the scale and type of use of the site and of the study area as a whole. The site is located adjacent to a residential neighborhood, has a small beach area, and is generally used for dispersed recreation. The visitor center had the potential to attract an increased number of users seeking an interior interpretive experience. The resulting type and amount of use could negatively affect the existing dispersed uses, which are more compatible with the size and setting of the site in the study area. Therefore, the full-service visitor center has been replaced with a kiosk that is compatible with the size and setting of the study area.

Initial conceptual plans for Alternatives 1, 3, and 4 also included restrooms at the full-service visitor center and at Cove East Beach. However, refinement of the alternatives reduced the need for these facilities, and it was determined that the reduced need would be met by the restrooms at the Tahoe Keys Marina. In part, the restroom facilities were intended to support the full-service visitor center, which has been removed from the alternatives.

2.3 ELEMENTS OF THE ALTERNATIVES

This section describes the (1) river restoration, (2) terrestrial habitat restoration and enhancement, and (3) public access and recreation elements of each alternative. For each of these three categories, the section first summarizes the elements common to multiple action alternatives, and then describes the elements or physical characteristics specific to each alternative. Additional information regarding the alternatives is provided in the appendices: Appendix C, "Schematic Plans," provides additional detail about the elements of each project alternative; Appendix D, "Construction Workers and Equipment for Action Alternatives," lists the construction workers and equipment associated with specific construction activities; and Appendix E, "Alternative Cost Estimates," provides cost estimates of the elements and the total cost of Alternatives 1–4 (which were prepared in 2006 for the *Upper Truckee River and Wetland Restoration Project Final Concept Plan Report*).

2.3.1 RIVER RESTORATION ELEMENTS

The primary objective of river restoration in Alternatives 1–4 is to decrease channel capacity and reestablish the channel's connection to an active floodplain with more frequent overbanking of river flow into adjacent marsh and wet meadow. The active floodplain is defined as the area inundated by streamflow events that occur at least once every couple of years (i.e., two- to five-year storm events). For the Upper Truckee River in the study area, two- to five-year storm events correspond to a river flow of 760–1,660 cubic feet per second (cfs).

The Upper Truckee River downstream of the U.S. 50 bridge is incised and overly wide as a result of direct and indirect human disturbances. Consequently, the channel can convey, on average, at least 800–1,000 cfs without streamflows overbanking into the meadow. This channel capacity is more than double the geomorphic channel-forming flow, approximately 450 cfs, and most of the former (i.e., predisturbance) floodplain has become an infrequently inundated terrace.

Reestablishing an active floodplain and reducing channel capacity would increase the frequency and duration of overbank flows, and thus, the deposition of suspended sediment on the meadow. These restored river processes would in turn enhance plant communities, aquatic and terrestrial habitat, groundwater recharge, water quality, and the ecological and aesthetic values of the study area.

Alternatives 1–4 each would reduce the channel capacity and reestablish an active floodplain connection, but by various means. In general, the proposed actions would reduce the width of the channel, decrease the elevation difference between the channel bed and floodplain surface, or do both.

Alternatives 1–4 share several common river restoration elements:

- stabilization of the banks downstream of the U.S. 50 bridge to reduce sediment inputs;
- restoration of the river channel to reestablish an active floodplain connection with the river and to replace the straightened and enlarged channel adjacent to the Lower West Side (LWS) Restoration Area with a more sinuous, geomorphically-sized channel;
- reactivation of an existing secondary channel to increase floodplain connection with the river;
- modification of the previously dredged river mouth to limit backwater effects from Lake Tahoe;
- lowering of portions of the floodplain to reestablish an active floodplain connection with the river; and
- removal of existing artificial fill from the floodplain to increase the area providing floodplain functions.

Some river restoration elements, however, are not shared by all alternatives:

- fill of channel segments abandoned as a result of channel restoration to increase the area providing floodplain functions (Alternatives 1, 2, and 3);
- reactivation of a floodplain terrace to increase the area providing floodplain functions (Alternative 3);
- modification of existing stormwater discharge locations to allow for river and flood plain restoration elements (Alternatives 2 and 3);
- reestablishment of a river-overflow lagoon (Alternatives 1–3);
- removal of fill from behind the east end of Barton Beach to create additional lagoon and wet meadow conditions (Alternatives 1 and 2); and
- stabilization of river bank adjacent to East Venice Drive to protect natural resources from boaters entering and exiting the Upper Truckee River (Alternatives 1, 2, and 4).

In the design of all of these river restoration elements, the potential effects on flood hazards were considered.

The specific design of the river restoration elements of each alternative and the consideration of flood hazards are described further in the tables and sections below. Table 2-2 provides representative descriptions of the engineered elements that are incorporated into the alternatives, Table 2-3 summarizes the specific elements of each alternative, and the sections below describe the elements in greater detail.

STABILIZATION OF ERODING BANKS DOWNSTREAM OF THE U.S. 50 BRIDGE

Flow constriction and redirection under the U.S. 50 bridge create large hydraulic stresses on the steep and high streambanks downstream. This has accelerated the rates of bank erosion and fine-sediment delivery to the Upper Truckee River and ultimately to Lake Tahoe. With the willing cooperation of relevant private landowners, all of the alternatives would construct permanent bank protection on the east bank downstream of the bridge, using geotechnical methods, bioengineering methods, or both.

Table 2-2
Representative Descriptions of Engineered Restoration Elements of Alternatives 1–4

Engineered Element	Units	Representative Description
River Restoration		
Vertical Grade Control	Quantity (#)	Vertical grade-control structures would be constructed of a combination of large boulders, cobbles, small rock, and logs to hydraulically hold the bed elevation required by the geomorphic design. In some cases, the vertical grade controls would be designed to promote net deposition (aggradation) of bed material, while in other cases they would be designed only to prevent net erosion (degradation) of the bed. The structures would be keyed into streambanks, and the disturbed streambanks would be bioengineered with vegetation.
Lateral Grade Control	Quantity (#)	Lateral grade-control structures would be constructed of a combination of large boulders, cobbles, small rock, and logs, bioengineered with vegetation to hydraulically hold the proposed streambank and channel position. The structures would be located where the existing channel, proposed backfilled channel, and/or proposed new channel intersect and would be designed to prevent unplanned channel migration.
Bank Protection	Length (feet)	Bank protection would be constructed with large boulders at the toe (approximately RS 0+00 to RS 13+00), and bioengineered vegetation treatment to hydraulically protect the banks from stream erosion. The protection would be designed to prevent continued side-slope erosion on the high, steep east bank.
New Channel	Length (feet) Area (square feet)	A new channel would be constructed by excavating one into the existing meadow terrace to improve geomorphic function. Flows would overbank approximately every one to two years (at or above the design flow of ±450 cfs), and the anticipated sediment load would be transported, and thus stability maintained. The bed topography would be somewhat varied, ranging from riffle to pool features where appropriate. The bed material would be composed of a combination of native material and placed clean cobbles, gravel, and sand. The banks of the new channel would be bioengineered with combinations of salvaged/transplanted willows and sod blocks, willow mattresses, and log revetments.
Recontoured Channel	Length (feet) Area (square feet)	The recontoured channel would be constructed by local cut/fill and grading within the existing channel, to improve geomorphic function. The low-flow sinuosity would be increased, bed forms would be more diverse, bank angles would be more varied, and bank materials would be strengthened by bioengineering. The existing bed elevation, channel alignment, and high-flow channel capacity would not be modified.
East Venice Bank Stabilization	Length (feet) Area (square feet)	The river bank adjacent to East Venice Drive where boaters currently enter and exit the Upper Truckee River (RS 65+00) would be treated with BMPs such as rocks, boulders, logs, and signage in order to protect natural resources. The stabilization would be designed to prevent continued soil erosion.
River Mouth Modification	Area (square feet)	River mouth modification would consist of treatments to the river between the beach ridge and the lagoon (approximately RS 100+00 to RS 95+00). Measures would vary, from bioengineering the banks for stabilization and reduced capacity or constructing a vertical grade control with bioengineered margins, to constructing a new channel at the mouth in a new location or placing piles to support a bridge at the existing location.

Table 2-2
Representative Descriptions of Engineered Restoration Elements of Alternatives 1–4

Engineered Element	Units	Representative Description
Floodplain Restoration		
Existing Secondary Channel	Area (square feet)	The existing secondary channel would be activated to improve geomorphic function. Flows would be able to access the existing secondary channel at or above the design flow of the proposed main channel, and hydraulic stress on the main channel banks would be reduced. The existing secondary channel would be activated by locally excavating the channel inlet and outlet to design elevations. Banks would be strengthened using bioengineering.
Complete Backfilling of Old Channel	Length (feet) Area (square feet)	Complete backfilling of the existing channel would involve placing fill in sections of existing channel (those that would be abandoned) up to the elevation of the adjacent terrace/floodplain. Some microtopography variations would be maintained, and the geomorphic function would be similar to the function on the adjacent terrace/floodplain (inundated only during large flood flows). Revegetation of the new surface would incorporate a mixture of salvaged/transplanted sod and willow, willow wattles, and new plantings.
Partial Backfilling of Old Channel	Length (feet) Area (square feet)	Partial backfilling of the old channel would involve placing fill in sections of existing channel that would be abandoned up to an elevation about two to three feet lower than the adjacent terrace/floodplain, to allow geomorphic function as a floodplain overflow channel during streamflows over the design flow of the proposed main channel. The old channelcould be active every few to several years. Some microtopography variations would be maintained on the new surface, but there would be a net flow direction and path to limit stagnant water after flow events. Revegetation of the new surface would incorporate a mixture of salvaged/transplanted sod and willow, willow wattles, and new plantings, and would have more resistant rock or log materials incorporated near the inlet and outlet (adjacent specific vertical and/or lateral grade controls).
Lowered Floodplain	Area (square feet)	Lowering the floodplain would involve excavating terraces between RS 0+00 and RS 29+00 to increase the opportunity for overflow to inundate these isolated floodplain areas and decrease hydraulic stress on the main channel banks. The excavation depth below existing ground would range from about one to three feet, depending on the location. Revegetation of the lowered surface would incorporate a mixture of salvaged/transplanted sod and willow, willow wattles, and new plantings.
Inset Floodplain	Area (square feet)	Inset floodplain would involve excavation directly adjacent to the existing channel to establish an active floodplain that would be inundated at or above the design flow of the proposed main channel and would reduce hydraulic stress on the channel banks. The excavation depth below existing ground would average about three feet. Revegetation of the lowered surface would incorporate a mixture of salvaged/transplanted sod and willow, willow wattles, and new plantings.
Restored Floodplain	Area (square feet)	Restored floodplain would involve excavation of existing (previously imported) fill to the approximate elevation of native ground to improve the geomorphic function of these areas to be similar to adjacent floodplain. Revegetation of the restored surface would incorporate a mixture of salvaged/transplanted sod and willow, willow wattles, and new plantings.

Table 2-2
Representative Descriptions of Engineered Restoration Elements of Alternatives 1–4

Engineered Element	Units	Representative Description
Stormwater Treatment Basin	Area (square feet)	Stormwater treatment basins would be installed as needed to replace and improve the function of existing stormwater pre-treatment outfalls or ditches in locations where the proposed channel would be relocated. The stormwater treatment basins would be excavated in existing high ground and constructed of rock and vegetation to promote sediment settling and infiltration.
Overflow Culverts	Length (feet) Area (square feet)	Overflow culverts would be installed via boring under U.S. 50 between the main channel and the fill at the commercial development located immediately west of the U.S. 50 bridge at an elevation to improve flood flow conveyance when water upstream of the bridge would be out of bank. This would improve geomorphic function by activating the isolated floodplain downstream between U.S. 50 and RS 5+00 and decrease hydraulic stress on the main channel banks.
Lagoon Restoration		
Bulkhead and Levee	Length (feet)	A bulkhead would be constructed of driven sheet pile on the Tahoe Keys Marina (west) side, with placement of an earthen levee on the east side. The bulkhead would extend the existing sheet pile bulkhead across the existing lagoon opening into the marina and be located approximately 30 feet to the east of the existing opening. An earthen levee would be contoured to match the existing embankments on the north and south sides of the lagoon. The levee would incorporate maintenance access along the crest, with remaining areas revegetated using a mixture of woody and herbaceous species suited to the range of moisture conditions from lagoon edge to levee top.
Restored Lagoon	Area (square feet)	The restored lagoon would involve a combination of local excavation, fill removal, and recontouring in areas previously dredged or filled to reestablish shallow lagoon area(s) behind the beach ridge and connected to the stream channel(s). Salvaged soil and vegetation would be used, along with plantings, to revegetate using a mixture of native plant species appropriate for the planned water depths.
Dune/Beach Restoration		
Restored Dune	Area (square feet)	The restored dune would involve excavation and recontouring, in the area between Cove East Beach and the Sailing Lagoon that was previously leveled to reestablish depressions (swales) and dunes (ridges), with increased soil and hydrologic diversity. Salvaged soil and vegetation would be used, along with plantings, to revegetate using a mixture of woody and herbaceous species suited to the range of moisture conditions in the depressions and dunes.

Notes:
cfs = cubic feet per second; RS = River Station; U.S. 50 = U.S. Highway 50
Source: Data provided by Cardno ENTRIX in 2008

Table 2-3
Engineered Restoration Elements under Alternatives 1–4

Element	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Comments
River Restoration					
Vertical Grade Control Quantity (#)	8	2	3	–	**Alt. 1:** The five grade controls between RS 17+00 and RS 29+00 would be designed to encourage bed aggradation, with crest elevations above the existing streambed. The three grade controls at RS 17+00, RS 29+00, and RS 93+00 would be designed to stabilize the bed at its existing elevation. **Alt. 2:** The two grade controls at RS 21+00 and near RS 96+00 would be designed to stabilize the existing and established bed elevations of the existing and new channels, respectively. **Alt. 3:** The two grade controls at RS 17+00 and RS 99+00 on the Upper Truckee River and one grade control near RS 92+00 on Trout Creek would be designed to stabilize the streambed at its existing elevation.
Lateral Grade Control Quantity (#)	6	6	3	–	**Alt. 1:** The four lateral controls at RS 17+00, RS 29+00, RS 63+00, and RS 93+00 would be located at the intersection of the new low-flow channel with the backfilled existing channel. The two lateral controls near RS 85+00 would be located where the new low-flow channel crosses the backfilled existing channel. **Alt. 2:** The lateral control at RS 17+00 would be located at the inlet to an existing secondary channel and be designed to prevent recapture of the secondary channel as a low-flow channel. The lateral control at RS 21+00 would be located at the intersection of the new low-flow channel with the backfilled existing channel and would be designed to prevent recapture of the backfilled channel as a low-flow channel. The lateral controls near RS 38+00 and RS 95+50 would be located where the new low-flow channel crosses the backfilled existing channel and would be designed to prevent recapture of the backfilled channel as a low-flow channel. **Alt. 3:** The lateral control at RS 17+00 would be located at the intersection of the new low-flow channel with the backfilled existing channel and would be designed to prevent recapture of the backfilled channel as a low-flow channel. The lateral control east of RS 28+00 would be located where the new low-flow channel leaves the existing secondary channel and would be designed to prevent recapture of the existing channel as a low-flow channel. The lateral control near RS 95+00 would be located where the existing channel meets the backfilled existing channel and would be designed to prevent recapture of the backfilled channel as a low-flow channel.
Bank Protection Length (feet)	1,300	1,300	1,300	1,300	**Alts. 1-4:** Bank protection would be constructed between RS 0+00 and RS 13+00, alternating sides of the channel as needed to protect the cut banks.
New Channel Length (feet) Area (square feet)	3,890 147,830	8,420 320,000	1,500 57,000	– –	**Alts. 1 and 2:** The new channel would be constructed between RS 63+00 and RS 93+00, with a top width of approximately 38 feet and an average depth of four feet. **Alt. 3:** The new pilot channel would be constructed off the existing secondary channel near RS 28+00 and would extend about 1,500 feet into the meadow, with a top width of approximately 38 feet and an average depth of four feet.

Table 2-3
Engineered Restoration Elements under Alternatives 1–4

Element	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Comments
Recontoured Existing Channel Length (feet) Area (square feet)	 1,910 72,580	 – –	 1,500 57,000	 2,400 180,000	**Alts. 1 and 3:** The existing secondary channel (east high-flow branch) between RS 17+00 and RS 29+00 would be modified (excavated/recontoured, banks revegetated) to function as the low-flow channel, with a top width of approximately 38 feet and an average depth of four feet. **Alt 4:** The existing main channel between RS 69+00 and RS 93+00 would be modified to improve low-flow sinuosity and bed diversity and to lower bank angles along point bars (assuming an average width of approximately 75 feet).
East Venice Bank Stabilization Length (feet) Area (square feet)	 0 ~300	 150 ~300		 0 ~300	**Alt. 1 and 4:** The river bank stabilization (RS 65+00) would be designed to use natural materials such as rock and logs to stabilize the bank and minimize resource damage, **Alt. 2:** The river bank stabilization (RS 65+00) would be designed to use natural materials such as rock and logs to stabilize the bank and minimize resource damage, This alternative would incorporate a boardwalk to connect East Venice Drive with the new river channel.
River Mouth Modification Area (square feet)	~200	51,000	~750	–	**Alt. 1:** The river mouth modification would be limited to stabilization treatments such as the revegetation of immediate disturbance around the proposed bridge footings and abutments. **Alt. 2:** The river mouth modification would include part of the new channel construction (20,000 square feet), relocating a smaller capacity mouth to the west, and backfilling and revegetating the existing mouth (31,000 square feet). **Alt. 3:** The river mouth modification would include construction of a vertical grade control to raise the bed and associated revegetation to decrease capacity/increase roughness at the existing mouth (approximately 750 square feet).
Floodplain Restoration					
Existing Secondary Channel Area (square feet)	5,800	5,800	~14,550	5,800	**Alts. 1–4:** The elevation of the inlet (1,800 square feet) and outlet (4,000 square feet) of the existing secondary channel (west high-flow channel) between RS 5+25 and RS 11+00 would be excavated to allow flow into the secondary channel when the total flow exceeds design flow of the main channel. **Alt. 3 (additional):** The existing secondary channel (east high-flow branch) between RS 28+00 and RS 29+00 (8,750 square feet) would be modified (recontoured and revegetated as needed) to function as part of the lowered floodplain between the backfilled existing channel and the lateral grade control on the west bank of the proposed channel.

Table 2-3
Engineered Restoration Elements under Alternatives 1–4

Element	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Comments
Complete Backfill Old Channel					**Alt. 1:** The existing channel would be completely backfilled between RS 63+00 and RS 93+00 (3,000 feet) to match the adjacent floodplain/terrace.
Length (feet)	3,000	5,700	3,800	–	**Alt. 2:** The existing channel would be completely backfilled between RS 38+00 and RS 95+00 (5,700 feet) to match the adjacent floodplain/terrace.
Area (square feet)	150,000	285,000	190,000	–	**Alt. 3:** The existing channel would be completely backfilled between RS 17+00 and RS 33+00 (1,600 feet) and from RS 73+00 to RS 95+00 (2,200 feet) to match the adjacent floodplain/terrace.
Partial Backfill Old Channel					**Alt. 1:** The existing channel would be partially backfilled between RS 17+00 and RS 29+00 (1,200 feet) to function as a secondary channel during streamflow events when the total flow exceeded the design flow of the main channel.
Length (feet)	1,200	1,700	4,000	–	**Alt. 2:** The existing channel would be partially backfilled between RS 21+00 and RS 38+00 (1,700 feet) to function as a secondary channel during streamflow events when the total flow exceeded the design flow of the main channel.
Area (square feet)	26,000	50,000	120,000	–	**Alt. 3:** The existing channel would be partially backfilled between RS 33+00 and RS 73+00 (4,000 feet) to function as floodplain during large flood events.
Lowered Floodplain					**Alts. 1–4:** The existing terrace (83,000 square feet) from RS 5+25 to RS 11+00 between the main channel and the secondary channel would be excavated and lowered an average of three feet to increase the frequency of inundation and decrease high-flow shear stress on the main channel banks.
Area (square feet)	83,000	173,000	214,000	101,000	**Alt. 2 (additional):** The existing terrace (90,000 square feet) from RS 21+00 to RS 29+00 between the main channel and secondary channel would be lowered an average of one foot to increase the frequency of inundation and decrease high-flow shear stress on the main channel banks.
					Alt. 3 (additional): The existing terrace (41,000 square feet) from RS 0+00 to RS 5+00 between the main channel and the building pad fill of the commercial development immediately west of the U.S. 50 bridge would be lowered an average of three feet to increase the frequency of inundation, convey high flows from the proposed overflow culverts under U.S. 50 (Lake Tahoe Boulevard), and decrease high-flow shear stress on the main channel banks. The existing terrace (90,000 square feet) from RS 21+00 to RS 29+00 between the main channel and the secondary channel would be lowered an average of one foot to increase the frequency of inundation and decrease high-flow shear stress on the main channel banks.
					Alt. 4 (additional): The existing terrace (18,000 square feet) from RS 0+00 to RS 5+00 between the main channel and the building pad fill of the commercial development immediately west of the U.S. 50 bridge would be lowered an average of 2.5 feet to increase the frequency of inundation and decrease high-flow shear stress on the main channel banks.

Table 2-3
Engineered Restoration Elements under Alternatives 1–4

Element	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Comments
Inset Floodplain Area (square feet)	–	–	–	374,000	**Alt. 4:** The existing terrace (374,000 square feet) from RS 11+00 to RS 69+00 would be excavated to create an active floodplain along both sides of the existing main channel.
Restored Floodplain Area (square feet)	297,000	297,000	297,000	206,000	**Alts. 1–3:** Fill would be excavated and removed from the TKPOA Corporation Yard (91,000 square feet) and the reserved fill areas within the LWS Restoration Area (206,000 square feet) to restore the ground to native elevation. **Alt. 4:** Fill would be excavated and removed from the reserved fill areas within the LWS Restoration Area (206,000 square feet) to restore the ground to native floodplain elevation.
Stormwater Treatment Basin Area (square feet)	–	~24,000	~24,000	–	**Alt. 2 and 3:** Stormwater treatment areas would be created on existing ground near RS 46+50 (12,000 square feet) and RS 66+00 (12,000 square feet) to replace and improve treatment at the existing piped outfall and ditch, respectively.
Overflow Culverts Length (feet)	–	–	225	–	**Alt. 3:** Overflow culverts would be constructed under U.S. 50 through the embankment fill between the existing channel and the building pad fill of the commercial development immediately west of the U.S. 50 bridge. The elevation of the culverts would be at or above the existing floodplain/terrace surface. The culverts would have a flow capacity of about 150 cfs. The culverts would begin taking flow when the river is around 2,000 cfs (between a five-year and a ten-year event).
Area (square feet)	–	–	2,700	–	
Lagoon Restoration					
Bulkhead and Levee Length (feet)	290	290	290	0	**Alts. 1–3:** The existing 290-foot-long opening from the Sailing Lagoon into the Tahoe Keys Marina would be blocked to allow reconnection of the lagoon with the river. The bulkhead would be offset approximately 30 feet east of the existing opening.
Restored Lagoon Area (square feet)	~123,000	~123,000	~105,000	0	**Alts. 1–3:** The existing Sailing Lagoon (approximately 105,000 square feet) would be isolated, pumped, and drained; sediment (including invasive plants and animals) would be disposed off site; and the lagoon would be recontoured and revegetated with a mixture of native plant species appropriate for the planned water depths. **Alts. 1–2 (additional):** The existing imported fill at East Barton Beach would be excavated to native ground elevations to restore a lagoon (approximately 18,000 square feet) and would be revegetated with a mixture of native plant species appropriate for the planned water depths.
Dune/Beach Restoration					
Restored Dune Area (square feet)	~130,000	~130,000	0	0	**Alts. 1–2:** The previously cleared and leveled dunes or sand ridges (approximately 130,000 square feet) between Cove East Beach and the Sailing Lagoon would be recontoured by local excavation and fill to restore dune soil, hydrology, and vegetation diversity.

Notes:
cfs = cubic feet per second; LWS = Lower West Side; RS = River Station; TKPOA = Tahoe Keys Property Owners Association; U.S. 50 = U.S. Highway 50
Source: Data provided by Cardno ENTRIX in 2008

Under Alternatives 1–4, the streambanks immediately downstream of U.S. 50 (from River Station [RS] 0+00 to RS 13+00) would be modified. The modifications would include keyed-in boulders at the base (toe) of the bank and bioengineered revegetation above the boulders. Protection would be installed primarily on the high, actively eroding east bank, but it would also include active existing and proposed cut bank sites on the west bank. Additional protection against bank erosion would be achieved by reactivating the secondary channel from RS 5+25 to RS 11+00 and lowering the floodplain on the west bank from RS 0+00 to RS 11+00; both measures would decrease hydraulic stress on the main channel banks during high streamflows.

Under Alternative 5, the streambanks immediately downstream of U.S. 50 would continue to erode and contribute relatively large volumes of sediment per linear foot, particularly off the high side slope on the east bank.

RIVER CHANNEL RESTORATION

The straightened Upper Truckee River channel not only has excess capacity from dredging, but also has a uniform channel bed morphology that is not diverse enough to support high-quality aquatic habitat. Alternatives 1, 2, and 4 would replace the existing straightened reach near the LWS Restoration Area with a more sinuous (i.e., more curved and thus longer) channel.

The alternatives differ in the alignment of the new geomorphically-sized channel and improved active floodplain connections to the existing meadow surfaces. Alternative 3 also differs from Alternatives 1, 2, and 4 because it would not include construction of a complete new channel to Lake Tahoe. Alternative 3 would replace the existing straightened reach by construction of a short pilot channel to redirect the river flow into the center of the marsh, allowing natural processes to determine flow paths along the meadow surface (which has appropriate, historical floodplain features) and promoting self-formation of a new channel or channels.

Alternative 1: Channel Aggradation and Narrowing (Maximum Recreation Infrastructure)

Alternative 1 proposes to improve the geomorphic function of the river channel and its connection to the surrounding topography by raising the streambed elevation, increasing the channel length, and decreasing channel capacity by a combination of engineering elements in various reaches. Alternative 1 would construct five vertical grade-control structures with crest elevations above the existing bed, to promote bed aggradation within about 3,400 feet of the existing channel (from RS 29+00 to RS 63+00). Over time, bar development in the aggrading reach would also contribute to channel narrowing and reduced capacity. Alternative 1 would directly reshape and resize about 1,910 feet of existing secondary channel to become a geomorphically-sized main channel (about 38 feet wide and 4 feet deep) from approximately RS 14+00 to RS 29+00. Alternative 1 would also directly excavate about 3,890 feet of new geomorphically-sized channel (about 38 feet wide and 4 feet deep) to replace the straightened reach by the LWS Restoration Area (from RS 63+00 to RS 93+00). Existing woody vegetation would be preserved wherever possible, to help provide erosion-resistant areas. The banks of the proposed main channel would also be strengthened by bioengineered revegetation, using salvaged/transplanted willows and sod blocks, willow mattresses, and, in some areas, log revetments.

The proposed main-channel alignment and profile for Alternative 1 are a combination of modified existing reaches and wholly constructed reaches and would require additional engineered elements to stabilize the proposed channel positions and/or size at transitions between treatments and/or intersections of the old and new channels. These elements would include three vertical grade controls to stabilize the bed at existing elevations (at RS 17+00, RS 29+00, and RS 93+00) and four lateral grade controls to hold the proposed streambank and channel locations (at RS 17+00, RS 29+00, RS 63+00, and near RS 85+00). In general, the control structures would be constructed of a combination of rock material and logs, with bioengineered revegetation above the future waterline. The grade control at RS 93+00 would set the bed elevation for the reconnection between the river and lagoon; therefore, it would be designed to simulate the appearance and function of resistant subsurface geologic layers (e.g., consolidated lake sediments) that occur naturally in the study area.

No direct or indirect modifications to Trout Creek are proposed under Alternative 1.

Alternative 2: New Channel–West Meadow (Minimum Recreation Infrastructure)

Alternative 2 would improve the geomorphic function of the river channel and its connection to the surrounding topography by directly raising the streambed elevation, increasing the channel length, and decreasing channel capacity. To achieve these objectives it proposes the construction of 8,420 feet of new, geomorphically-sized channel (about 38 feet wide and 4 feet deep), to replace the existing channel from RS 20+00 to RS 95+50.

Existing woody vegetation in the areas to be disturbed, particularly along proposed finished streambank locations, would be preserved wherever possible and used for erosion control. The banks of the proposed main channel would also be strengthened by bioengineered revegetation, using salvaged/transplanted willows and sod blocks, willow mattresses, and, in some areas, log revetments.

The alignment and profile of the main channel for Alternative 2 would consist primarily of constructed reaches, with some transitions and/or intersections of old and new channels that would require additional engineered elements to stabilize the channel positions and/or size. These elements would include two vertical grade controls (at RS 21+00 and near RS 96+00) to stabilize the bed elevation, and four lateral grade controls (at RS 21+00, RS 38+00, RS 39+00, and RS 95+50) to hold the proposed streambank and channel location. In general, the control structures would be constructed of a combination of rock material and logs, with bioengineered revegetation above the future waterline. The grade control near RS 96+00 would set the bed elevation for the reconnection between the river and lagoon; therefore, it would be designed to simulate the appearance and function of resistant subsurface geologic layers (e.g., consolidated lake sediments) that occur naturally in the study area.

No direct or indirect modifications to the Trout Creek channel are proposed under Alternative 2.

Alternative 3: Middle Marsh Corridor (Moderate Recreation Infrastructure)

The geomorphic function of the river channel and its connection to the surrounding topography would be improved by both active and passive restoration means. The active measures would raise the streambed elevation, increase the channel length, and decrease channel capacity by constructing 1,500 feet of new, geomorphically-sized channel (about 38 feet wide and 4 feet deep) downstream of RS 38+00 and reshaping about 1,500 feet of existing secondary channel between RS 17+00 and RS 28+00 as a geomorphically-sized channel. The passive restoration downstream of the pilot channel in the main marsh would replace about 7,100 feet of existing single-thread channel with a network of small channels of varied capacity. No construction would occur within the main meadow channel sections. Therefore, the flow paths, bed and bank elevations, and channel capacities would be dictated by natural processes.

The proposed main-channel alignment and profile for Alternative 3 would have a relatively short constructed reach, with a couple of transitions and/or intersections of old and new channels that would require additional engineered elements to stabilize the proposed channel positions and/or size. These elements include two vertical grade controls to stabilize the bed elevation (at RS 17+00 and RS 99+00), and three lateral grade controls to hold the proposed streambank and channel location (at RS 17+00 and RS 28+00 and near RS 95+00). In general, the control structures would be constructed of a combination of rock material and logs, with bioengineered revegetation above the future waterline. The grade control near RS 95+00 would set the bed elevation for the reconnection between the river and the lagoon, and the grade control at RS 99+00 would set the bed elevation for the river mouth. Both of these would be designed to simulate the appearance and function of resistant subsurface geologic layers (e.g., consolidated lake sediments) that occur naturally in the study area.

Alternative 3 includes channel stabilization on Trout Creek because redirected flows from the Upper Truckee River would affect the lower segment of Trout Creek. Redirecting the flows of the Upper Truckee River's main channel into the remnant channel system of the marsh would be expected to increase streamflow conveyed through the lowest reach of Trout Creek, creating the potential for future channel adjustments such as bed erosion. Therefore, Alternative 3 includes installation of vertical grade control(s) and streambank stabilization measures along about 2,600 feet of lower Trout Creek (from RS 66+00 to 95+00). The vertical grade controls will be of an adequate number and design to maintain the existing average slope and elevation of the channel and remain stable under the 100-year peak flows, assuming the combined peaks of Trout Creek and the Upper Truckee River. The streambank stabilization measures will be designed to remain stable under the 25-year peak flows, assuming the combined peaks of Trout Creek and the Upper Truckee River. The design will also anticipate and address the potential effects of sheet and concentrated overflow returning to the channel off the reactivated floodplain.

Alternative 4: Inset Floodplain (Moderate Recreation Infrastructure)

Under Alternative 4, the geomorphic function of the river channel would be improved without raising the streambed elevation or increasing channel length, and without constructing vertical or lateral grade-control elements. Thus, it is fundamentally different from Alternatives 1, 2, and 3. Alternative 4 would directly decrease channel capacity by lowering bank heights.

Alternative 4 proposes to reestablish active floodplain area by creating floodplain surfaces along much of the existing river alignment and profile (from RS 0+00 to RS 69+00). About 6,900 feet of the river would be indirectly modified as part of the floodplain restoration because the new floodplains would be formed by lowering (excavating) existing river banks and adjoining terrace surfaces. The remaining banks would be strengthened by bioengineered revegetation, using salvaged/transplanted willows and sod blocks, willow mattresses, and, in some areas, log revetments.

About 2,400 feet of the river (from RS 69+00 to RS 93+00) would be modified using local cut-and-fill materials to create a more sinuous low-flow channel, increase bed form diversity, and lower bank angles within an overall area of about 180,000 square feet. Existing woody vegetation along the banks would be preserved wherever possible to help provide erosion-resistant areas. The proposed banks would also be strengthened by bioengineered revegetation, using salvaged/transplanted willows and sod blocks, willow mattresses, and, in some areas, log revetments.

Alternative 5: No-Project/No-Action

Alternative 5 would not provide any actions to reestablish and improve floodplain processes or modify the existing degraded channel throughout the study area (from RS 0+00 to RS 100+00). This alternative would allow, but not encourage, enhance, or speed up, the passive recovery of the system via natural processes. Streambank failures, bank retreat, and channel widening combined with point bar deposition within the inset channel would create small active floodplain patches over time, but the surrounding terrace would not be reactivated as floodplain. The straightened reach (from RS 69+00 to RS 93+00) would remain in its existing condition.

SECONDARY CHANNEL REACTIVATION

Alternatives 1–4 would reactivate a 5,800-foot-long existing secondary channel by excavation of its inlet and outlet on the main channel (at RS 5+25 and RS 11+00) to allow flow to enter the secondary channel whenever the total streamflow exceeded the main channel's design flow. The banks of the secondary channel would be strengthened by bioengineered revegetation in all disturbed areas. Existing woody bank vegetation along the secondary channel would be preserved to the maximum extent possible, to provide an erosion-resistant edge along the proposed lowered floodplain between the secondary channel and the main channel.

Alternative 5 would not include deliberate modification of secondary channels. Similar to current conditions, the existing secondary channels (from RS 5+25 to RS 11+00 and from RS 17+00 to RS 29+00) would be active only during moderate overbanking flow events where the capacity of the existing channel is exceeded. Although dependent on the magnitude of these events and associated sediment or debris loads, the most likely result will be sediment deposition in the secondary channels during overbank flows. However, during or following major flooding events (i.e., events with deeper and higher velocity flows on the floodplain), erosion of the secondary channels or sedimentation of the main channel may result in reoccupation of the secondary channel location by the low-flow channel, a condition that has occurred in the past.

For all reactivated channels and floodplain areas with remnant channels having accumulated fine sediment and/or organic materials, final project design and revegetation specifications would include measures to minimize the risk that such materials would become mobilized if a large flood flow occurs during the first few years after construction. As feasible, the measures would remove and/or stabilize the materials adequately to resist expected erosive forces if a large flood (i.e., 25-year and higher peak flow) occurred within the first five years after implementation:

- Remove loose, unvegetated, or otherwise unstable fine sediment and/or organic material within remnant channel sections to be reactivated (either directly connected to the restored channel or as part of reactivated floodplain) to eliminate the potential pollutant source. The excavated materials could be salvaged for soil amendment and revegetation use in off-channel areas if suitable or disposed of properly off-site.

- Revegetate loose, unvegetated, or otherwise unstable fine sediment and/or organic material within remnant channel sections to be reactivated (either directly connected to the restored channel or as part of reactivated floodplain) to increase roughness and reduce velocities. Revegetation of these areas will meet species, density, planting methods, irrigation, and success criteria similar to streambank plantings.

RIVER MOUTH SIZE REDUCTION

The incised river mouth is overly wide and deep, allowing lake water inflow even during relatively low water surface elevations in the lake (i.e., low lake stands). The mouth configuration and the incised bed of the straightened river reach allow lake backwater effects to extend more than 2,000 feet up the river during high lake stands and to a somewhat lesser extent during lower lake stands. The lake backwater reduces flow velocities, reduces hydraulic complexity, flattens the channel bed, and limits habitat diversity. Although the project is not intended to address the backwater conditions normally expected during high lake stands, Alternatives 1-3 include modifications to the river mouth that would decrease the width of the river mouth and limit inflow of lake water during low lake levels. Alternatives 1-3 would also raise the minimum bed elevation at the mouth by installing resistant materials to reestablish the approximate elevation of consolidated sediment in the channel that existed before the river was channelized. Below, restoration elements at the river mouth are described in greater detail for each alternative.

Alternative 1: Channel Aggradation and Narrowing (Maximum Recreation Infrastructure)

The present location and bed elevation of the river mouth downstream of RS 95+00 would be retained, but the minimum bed elevation would be raised and the capacity would be reduced at RS 99+00 by installing both an engineered grade control and bioengineered revegetation. The grade control structure would be created at or near the new bridge (RS 99+00) that would be designed to simulate the function of naturally-occurring subsurface geologic layers (i.e., resistant, cohesive lake sediments), to hold the minimum bed elevation at approximately 6,222 feet. This would be lower than median lake level but would restore a higher bed than the historic dredged depth. Over time, vegetation growth between RS 99+00 and near the beach ridge would increase roughness, encourage aggradation, and protect against erosion. Existing woody vegetation in the areas disturbed for grade control would be salvaged and transplanted as part of the bioengineered revegetation activities of the grade control structure and the footings and abutments of the bridge.

Alternative 2: New Channel–West Meadow (Minimum Recreation Infrastructure)

The present river mouth location, elevation, and size would be replaced by a new mouth, excavated in existing topography west of the existing channel, along the same alignment (planform) and with the same profile (bed elevation) and capacity (about 38 feet wide and 4 feet deep) as the proposed new channel. This approach would restore a 20,000-square-foot mouth area of similar size and dimension to a configuration that likely existed before historic dredging. A grade control structure would be installed in the channel near RS 96+00 to provide resistance to vertical changes in bed elevation. The abandoned 31,000-square-foot mouth area would be backfilled to match the adjoining ground and would be revegetated with native species suited to the floodplain, lagoon, and/or beach conditions of the proposed finished elevations.

Alternative 3: Middle Marsh Corridor (Moderate Recreation Infrastructure)

The existing river mouth location downstream of RS 95+00 would be retained, but the minimum bed elevation would be raised and the capacity would be reduced at RS 99+00 by installing both an engineered grade control and bioengineered revegetation. The grade-control structure would be designed to simulate the function of naturally-occurring subsurface geologic layers (i.e., resistant, cohesive lake sediments) to hold the minimum bed elevation at approximately 6,222 feet. This would be lower than median lake level but would restore a higher bed than the historic dredged depth. Over time, vegetation growth between RS 99+00 and near the beach ridge would increase roughness, encourage aggradation, and protect against erosion. Existing woody vegetation in the areas disturbed for grade control would be salvaged and transplanted as part of the bioengineered revegetation activities.

Alternative 4: Inset Floodplain (Moderate Recreation Infrastructure)

The existing river mouth location, size, and bed elevation would be retained downstream of RS 93+00. Grade control in this lowest segment of the river is not proposed. The existing stream processes, including response to lake level fluctuations, would continue. Channel aggradation would likely occur during high lake stands; downcutting could occur during low lake stands.

Alternative 5: No-Project/No-Action

The existing river mouth location, size, and bed elevation would continue to adjust to lake levels, streamflows, and sediment loads. It would aggrade and/or widen for a few years, then flush out (erode) the accumulated sediment during high-water years and/or floods. Extensive backwater from the lake would continue to move up the deepened, straightened channel reach, particularly when the lake is above median elevation.

FLOODPLAIN LOWERING

In addition to reducing channel capacity, the hydrologic connectivity of the channel and floodplain would be increased by lowering portions of the floodplain. During floodplain lowering operations, removal of existing woody vegetation along the margins would be avoided to the extent possible, to retain the erosion resistance provided by vegetation along the edge of the lowered floodplain. The surface of lowered floodplains and all disturbed areas of the floodplain would be revegetated with a mixture of salvaged/transplanted sod and willow, willow wattles, and new plantings.

The location and extent of areas of lowered floodplain differ among alternatives. These differences are described below.

Alternative 1: Channel Aggradation and Narrowing (Maximum Recreation Infrastructure)

A lowered floodplain (covering about 83,000 square feet) would be excavated into the existing terrace west of the main channel, to improve floodplain function downstream of U.S. 50 from RS 5+25 to RS 11+00. This excavated area between the main channel and the existing secondary channel would be about three feet deep.

Alternative 2: New Channel–West Meadow (Minimum Recreation Infrastructure)

Two lowered floodplain areas (covering 173,000 square feet) would be excavated into the existing terrace between the main and secondary channels, to improve floodplain function between RS 5+25 and RS 11+00 and between RS 21+00 and RS 29+00. From RS 5+25 to RS 11+00, the excavation would cover about 83,000 square feet west of the main channel, and from RS 21+00 to RS 29+00, the excavation would cover about 90,000 square feet east of the main channel, averaging about three feet deep in both areas.

Alternative 3: Middle Marsh Corridor (Moderate Recreation Infrastructure)

Under Alternative 3, three lowered floodplain areas (covering 214,000 square feet) would be excavated into the existing terrace between the main and secondary river channels, to improve floodplain function from RS 0+00 to RS 5+00, RS 5+25 to RS 11+00, and RS 21+00 to RS 29+00. From RS 0+00 to RS 5+00, the excavation would cover about 41,000 square feet between the main channel and the building pad of the adjacent commercial development, averaging about 2.5 feet deep. From RS 5+25 to RS 11+00, the excavation would cover about 83,000 square feet west of the main channel, averaging about three feet deep. From RS 21+00 to RS 29+00, the excavation would cover about 90,000 square feet east of the main channel, averaging about one foot deep.

Alternative 4: Inset Floodplain (Moderate Recreation Infrastructure)

A lowered floodplain (covering about 101,000 square feet) would be excavated into the existing terrace west of the main channel, to improve floodplain function immediately downstream of U.S. 50 from RS 0+00 to RS 11+00. From RS 0+00 to RS 5+00, the excavation would cover about 18,000 square feet between the main channel and the building pad of the adjacent commercial development, averaging 2.5 feet deep. From RS 5+25 to RS 11+00, the excavation would cover about 83,000 square feet between the main channel and the existing secondary channel, averaging three feet deep.

An inset floodplain would be excavated into the existing terrace on both sides of the main channel from RS 11+00 to RS 69+00 to improve floodplain function. The excavation would cover about 374,000 square feet, averaging three feet deep. The width of the inset floodplain on either side of the channel would vary somewhat, to simulate natural variability and potentially to help avoid disturbing biological and cultural resources.

Alternative 5: No-Project/No-Action

The floodplain would not be lowered.

REMOVAL OF EXISTING FILL FROM FLOODPLAIN

In addition to the floodplain restoration described in the preceding section, Alternatives 1–4 would restore floodplain function by excavating the reserved fill to native ground elevation on about 206,000 square feet of the LWS Restoration Area. Under Alternative 5, the reserved fill at the LWS Restoration Area would remain in place and within the 100-year floodplain.

Alternatives 1, 2, and 3 would also restore floodplain function by excavating previously placed fill at the TKPOA Corporation Yard, similar to adjacent natural surfaces, over an area of about 91,000 square feet. (This restoration of the corporation yard would be contingent on the consent of TKPOA.) Under Alternatives 4 and 5, previously placed fill at the TKPOA Corporation Yard would remain on the terrace and in the 100-year floodplain. If

chemically and physically suitable, the excavated fill would be used to backfill channel segments; otherwise, the material would be hauled to an appropriate off-site disposal site.

After removal of existing fill, the entire restored floodplain surface and all disturbed areas would be revegetated with a mixture of salvaged/transplanted sod and willow, willow wattles, and new plantings.

FILL OF ABANDONED CHANNEL SEGMENTS

Where new channel segments would replace existing segments, the abandoned channel segments would be partially or completely filled. The backfilled channels and all disturbed areas would be revegetated with a mixture of salvaged/transplanted sod and willow, willow wattles, and new plantings. The construction specifications for the filling of abandoned channels would be prepared by a qualified engineer and include standards that minimize the potential for erosion of the backfilled channels. The specifications would include compaction standards to avoid significant differences between the density of fill and surrounding floodplain sediments and limit the potential for differential settlement of the fill. The specifications would be developed on the basis of the range of physical attributes of the soils encountered but would generally require that fill density be within ten percent of the average density of natural soils. Additionally, the specifications would specify maximum slope angles for the slope formed at the edges of the fill (also dependent on soil properties) and vegetative cover.

The alternatives differ in the extent of channel backfilling, as described below.

Alternative 1: Channel Aggradation and Narrowing (Maximum Recreation Infrastructure)

Complete backfill of about 3,000 feet of old channel (from RS 63+00 to RS 93+00) would bring the abandoned channel areas up to the elevation of adjacent terrace/floodplain surfaces and restore floodplain function to about 150,000 square feet. Partial backfill of about 1,200 feet of old channel (from RS 17+00 to RS 29+00) would bring the abandoned channel areas up to within two to three feet of the adjacent existing terrace/floodplain surface, thus providing a secondary channel function on about 26,000 square feet of the floodplain that would be active when total streamflow exceeded design flow in the main channel.

Alternative 2: New Channel–West Meadow (Minimum Recreation Infrastructure)

Complete backfill of about 5,700 feet of old channel (from RS 38+00 to RS 95+00) would bring the abandoned channel areas up to the elevation of adjacent terrace/floodplain surfaces and restore floodplain function to about 285,000 square feet. Partial backfill of about 1,700 feet of old channel (from RS 21+00 to RS 38+00) would bring the abandoned channel areas up to within two to three feet of the adjacent exiting terrace/floodplain surface, and this would provide a secondary channel function on about 50,000 square feet of the floodplain that would be active when total streamflow exceeded design flow of the main channel.

Alternative 3: Middle Marsh Corridor (Moderate Recreation Infrastructure)

Complete backfill of about 3,800 feet of old channel (from RS 17+00 to RS 33+00 and RS 73+00 to RS 95+00) would bring the abandoned channel areas up to the elevation of adjacent terrace/floodplain surfaces and restore floodplain function to about 190,000 square feet. Partial backfill of about 4,000 feet of old channel (from RS 33+00 to RS 73+00) would bring the abandoned channel areas up to within two to three feet of the adjacent existing terrace/floodplain surface and provide about 120,000 square feet of floodplain, active only when total streamflow exceeded the design flow of the main channel.

Alternative 4: Inset Floodplain (Moderate Recreation Infrastructure)

Channel segments would not be abandoned and backfilled. However, channel segments would be modified during floodplain lowering.

Alternative 5: No-Project/No-Action

No channel segments would be abandoned and backfilled.

REACTIVATION OF FLOODPLAIN TERRACE

Under Alternative 3, floodplain function and connectivity would also be improved across U.S. 50 and between the main channel and the building pad of the adjacent commercial development by boring two overflow culverts through the roadfill. Two corrugated metal pipes would be installed, with the upstream inlet at an elevation that would receive water when the channel upstream of the bridge was out of bank. The culverts would have a flow capacity of about 150 cfs. The culverts would begin taking flow when the river flow is around 2,000 cfs (between the five-year and ten-year event). The downstream outlet would have a rock-lined, energy dissipation–flared section that would activate the isolated terrace west of the channel from RS 0+00 to RS 5+00 (that would become lowered floodplain). The overflow culverts would also provide a small reduction in high flows that would be conveyed under the U.S. 50 bridge, to reduce hydraulic stress on the main channel's banks during large streamflows.

This river restoration element is not included in Alternatives 1, 2, 4, or 5.

MODIFICATION OF EXISTING STORMWATER DISCHARGE LOCATIONS

Under Alternatives 2 and 3, river and floodplain modifications would require relocating and/or modifying existing stormwater discharge locations near RS 46+50 and RS 66+00. At locations near the existing discharge points, stormwater basins would be installed (either excavated from native meadow material or a portion of the abandoned channel). The basins would replace the discharge function and increase the pretreatment of urban runoff before discharge into open surface water of the Upper Truckee River, because they would provide opportunities for settling, infiltration, and percolation. The size and volume would be determined in consultation with the City of South Lake Tahoe (CSLT) and the Lahontan Regional Water Quality Control Board (RWQCB), but the overall shape would simulate naturally occurring floodplain basins and would be vegetated with native plant species.

The restoration elements of Alternatives 1 and 4 would not include modification or relocation of existing stormwater discharge locations. Alternative 5 would not include restoration elements, and thus, also would not modify or relocate existing stormwater discharge locations.

REESTABLISHMENT OF A RIVER-OVERFLOW LAGOON

The lagoon area connected with the Upper Truckee River is a natural feature that was likely larger before human disturbance. The surface water of a dredged lagoon (the Sailing Lagoon) is hydraulically connected to Lake Tahoe through the Tahoe Keys Marina channel. The Sailing Lagoon is not connected to the river. It has been part of Tahoe Keys Marina since the 1950s, resulting from dredging and fill activities to provide for various navigation routes.

Alternatives 1, 2, and 3 would reestablish a hydrologic connection between a restored, naturally functioning lagoon in the general location of the existing Sailing Lagoon and the Upper Truckee River near the river mouth by constructing a bulkhead at the Sailing Lagoon to block its open connection with the marina and Lake Tahoe, and topographically modifying the Sailing Lagoon, including creation of a re-excavated connection with the Upper Truckee River so that the river would become a surface-water source to the lagoon. (The bulkhead would be located approximately 30 feet east of the existing opening.) The restored lagoon would be analogous to what exists behind Barton Beach near Trout Creek, but on a larger scale (approximately 105,000 square feet). For each alternative, the lagoon restoration elements are described in greater detail in the following sections.

Alternative 1: Channel Aggradation and Narrowing (Maximum Recreation Infrastructure)

To restore the natural river/lagoon connection, an engineered 290-foot-long sheet pile bulkhead and earthen levee would be constructed across the dredged west end of the Sailing Lagoon approximately 30 feet east of the existing bulkhead along the marina, and the fill blocking the east end would be removed. Final design would include a flow control feature for water flowing into the Sailing Lagoon during bank overtopping events when the lagoon starting water surface would be low. The control feature (e.g., a rock lined channel or weir structure) would be designed to control the location of overflow into the lagoon and prevent the development of a permanent, uncontrolled erosion channel connecting the river to the lagoon. Invasive species would be addressed through development and implementation of an Invasive Species Management Plan as described in Environmental Commitment 4, Table 2-6 below.

Following control and removal of invasive animals and plants, local cut and fill would then be used to recontour the topography of the lagoon and connect levee areas with adjoining ground. The lagoon, levee, and all disturbed areas would be revegetated using a mixture of woody and herbaceous species, suited to the anticipated range of moisture conditions from lagoon to levee crest. The east end of the lagoon connection with the river would be constructed as a vertical grade-control structure to simulate the appearance and function of naturally occurring resistant geologic layers and would include bioengineered revegetation to increase erosion resistance along the shared bank between river and lagoon. A grade-control structure (whose exact location would differ among Alternatives [see Exhibits 2-1 through 2-4]) would set the minimum bed elevation to protect the west bank from erosion and establish a residual lagoon water surface elevation during low lake levels.

Salvaged soil and vegetation would be used, along with plantings, to revegetate the proposed lagoon area, using a mixture of native plant species appropriate for planned water depths.

Alternative 2: New Channel–West Meadow (Minimum Recreation Infrastructure)

Alternative 2 would reestablish a river-overflow lagoon along the Upper Truckee River at the Sailing Lagoon as described for Alternative 1.

Alternative 3: Middle Marsh Corridor (Moderate Recreation Infrastructure)

Alternative 3 would reestablish a river-overflow lagoon along the Upper Truckee River at the Sailing Lagoon as described for Alternative 1.

Alternative 4: Inset Floodplain (Moderate Recreation Infrastructure)

The previously dredged/filled Upper Truckee River–lagoon connection would not be modified, leaving the direct open-water connection between the Tahoe Keys Marina channel, the Sailing Lagoon, and Lake Tahoe unchanged.

Alternative 5: No-Project/No-Action

The previously dredged/filled Upper Truckee River–lagoon connection would not be modified, leaving the direct open-water connection between the Tahoe Keys Marina channel, the Sailing Lagoon, and Lake Tahoe unchanged.

REMOVAL OF EXISTING FILL FROM BEHIND THE EAST END OF BARTON BEACH

Alternatives 1 and 2 would remove existing artificial fill from behind the east end of Barton Beach to restore lagoon and wet meadow conditions. Removal of this fill would restore lagoon and wet meadow conditions on about 18,000 square feet. Fill would be excavated to native ground elevation, at a depth averaging about two feet. Salvaged soil and vegetation would be used, along with plantings, to revegetate the restored lagoon and wet meadow, using a mixture of native plant species appropriate for planned elevations. Under Alternatives 3–5, the artificial fill behind the east end of Barton Beach would not be removed.

OVERBANK FLOW AND FLOODING CONSIDERATIONS

Under existing conditions, the incised and widened channel does not allow natural overbank flow onto the meadow during small or moderate streamflow events, an important factor for sustaining ecological values of the adjacent marsh and wet meadow. The channel is overtopped only during relatively large flows (approximately 1,000 cfs or greater). Alternatives 1–4 would use a combination of modifications to the existing channel and/or construction of a new channel to decrease the elevation difference between the channel bed and the adjacent meadow, and to reduce channel capacity to a more geomorphically-appropriate size. These changes would reestablish an active floodplain that receives overbank flows during small events (e.g., the two- to five-year storm events).

For reactivated channel and floodplain that has remnant channels with accumulated fine sediment and/or organic materials, final project design and revegetation specifications would include measures to minimize the risk that such materials would become mobilized, as described above under 'Secondary Channel Reactivation.'

The existing flood hazard affecting adjacent neighborhoods would not be increased by Alternatives 1–4. The alternatives would improve the active floodplain's storage volume and flow routing in the valley reach, but would not alter storage for the overall 100-year floodplain. During lower magnitude flow events, floodplain storage would be increased by lowering portions of the floodplain. Hydraulic modeling of existing conditions and each alternative configuration was used to verify that overbank flows could be increased for smaller flow events without an increase in flooding hazards (Conservancy and DGS 2006).

BANK STABILIZATION AT EAST VENICE DRIVE

Under existing conditions, boaters use the Upper Truckee River and Lake Tahoe for non-motorized recreational boating (kayaking, canoeing, rafting, and tubing). Boaters float down the Upper Truckee from various upstream locations and have historically taken their boats out at the point along the Upper Truckee River closest to East Venice Drive. This location has a steep and eroding bank. Boaters also use this location to put boats into the river to float out to Lake Tahoe. To protect banks from erosion from this ongoing use, the alternatives propose bank stabilization, designed to fit into the natural setting and be constructed of boulders, rocks, and logs, with biotechnical elements as feasible.

Alternatives 1 and 4 would stabilize the existing location where boaters enter and exit the river. Alternative 2 would stabilize the bank of the newly constructed channel at the point closest to East Venice Drive. To further protect resources, a boardwalk (approximately 150 feet long) would be constructed to allow users access to the river from the road. Alternative 3 has no stabilizations or infrastructure proposed in this vicinity, since the concept of Alternative 3 does not dictate the location of the channel(s) downstream of the pilot channel. Alternative 3 would allow natural processes to determine flow paths through the marsh. It is possible that boating may only be feasible during relatively high flow periods and/or high water years, but the location(s) for potential boat put in or take out, and of associated bank protection, cannot be readily predicted at this time.

2.3.2 TERRESTRIAL HABITAT RESTORATION AND ENHANCEMENT ELEMENTS OF THE PROJECT

In addition to the restoration and enhancement of aquatic habitats and floodplain hydrologic and geomorphic processes, Alternatives 1–4 would also restore and enhance terrestrial habitats. This restoration and enhancement elements would include the restoration of riparian habitats in conjunction with river channel and floodplain restoration, and also beach dune restoration, forest enhancement, and enhancement of core habitat. These terrestrial habitat restoration and enhancement elements of the project are described below.

WILLOW SCRUB–WET MEADOW RESTORATION

The restoration of willow scrub–wet meadow is included in Alternatives 1–4. The river restoration described previously would create additional willow scrub–wet meadow on the lowered or restored floodplains and other locations.

MONTANE MEADOW RESTORATION

Under Alternatives 1, 2, and 3, montane meadow would be restored from the disturbed land of the TKPOA Corporation Yard. The restoration of the corporation yard would be contingent on the consent of TKPOA.

DUNE/BEACH RESTORATION

Alternatives 1 and 2 include the restoration of sand ridges ("dunes") at Cove East Beach that were graded and leveled as part of the Tahoe Keys development. The restoration would occur in conjunction with removal of fill in the southern portion of Cove East Beach and the modification and reconnection of the Sailing Lagoon to the Upper Truckee River.

In addition, the construction of a new river mouth west of the existing one in Alternative 2 would provide the opportunity for a small area of beach restoration in the existing channel location. Because this area is near existing Tahoe yellow cress (TYC) habitat, the project under Alternative 2 would provide potential TYC habitat in this beach restoration area. Areas around the existing river mouth may also be restored to beach habitat in Alternatives 1–4 because the mouth width would be reduced, and in the case of Alternative 2, relocated.

Alternative 1: Channel Aggradation and Narrowing (Maximum Recreation Infrastructure)

The previously leveled area between Cove East Beach and the Sailing Lagoon would be modified under Alternative 1 to reestablish depressions (swales) and dunes (ridges) with increased soil and hydrologic diversity. Local cut-and-fill materials would be used to simulate linear swales and ridges, parallel to the shoreline. Approximately three acres (130,000 square feet) would be restored, but the exact layout and extent could be adjusted to provide options to protect identified existing biological and/or cultural resources. Salvaged soil and vegetation would be used, along with plantings, to revegetate with a mixture of woody and herbaceous species suited to the anticipated range of moisture conditions.

Alternative 2: New Channel–West Meadow (Minimum Recreation Infrastructure)

The previously-leveled area between Cove East Beach and the Sailing Lagoon would be modified to reestablish depressions swales and ridges as described for Alternative 1. In addition, a portion of the abandoned river mouth would be recontoured and revegetated as beach/dune ridge and face to provide for a small additional area of TYC habitat.

Alternative 3: Middle Marsh Corridor (Moderate Recreation Infrastructure)

The previously leveled area between Cove East Beach and the Sailing Lagoon would not be modified.

Alternative 4: Inset Floodplain (Moderate Recreation Infrastructure)

The previously leveled area between Cove East Beach and the Sailing Lagoon would not be modified.

Alternative 5: No-Project/No-Action

The previously leveled area between Cove East Beach and the Sailing Lagoon would not be modified.

FOREST ENHANCEMENT

Alternatives 1–4 include enhancement of Jeffrey pine and lodgepole pine forests near the Highland Woods subdivision that have been disturbed by past land uses. Enhancement measures would include the removal or relocation and restoration of user-created trails and some other disturbed areas and invasive-plant control. In particular, these enhancements would be intended to improve the quality of edge habitat between the marsh and the forest and to provide important habitat for terrestrial wildlife species. The acreage of these enhancements is proposed to be the same for Alternatives 1–4 (approximately 7.7 acres).

Alternative 5 would not implement the forest enhancement element of Alternatives 1–4. However, the Conservancy has been implementing localized habitat enhancement (e.g., removal of invasive plants, decommissioning of some trails), and similar actions would likely continue to be implemented.

ENHANCEMENT OF CORE HABITAT

Alternatives 1–4 would all enhance an area of "core habitat" that contains sensitive marsh habitats in the center of the study area (308, 344, 251, and 350 acres for Alternatives 1 through 4, respectively). The enhancement of this area would be intended to provide greater quality habitat by being exposed to less human disturbance. The edges of the core habitat areas would be approximately 150 feet from potential sources of disturbance of wildlife by humans (i.e., study area boundaries, access trails, or the river). Recreational access within the core habitat area would be discouraged through use of habitat protection elements—perimeter trails and overlooks, signs, fences, berms, wet swales, and other design elements—that would direct access away from the core habitat. In addition, existing user-created trails within the core habitat area would be restored to native vegetation, where appropriate.

The location and extent of the core habitat area varies among alternatives, depending on the location of the restored river corridor, which would continue to act as both a disturbance corridor and a barrier to entry into the center of the marsh from the western side of the study area. Alternatives 1, 2, and 4 would keep a river corridor barrier near the existing river corridor. Thus, the river and its associated floodplain would continue to limit access from the west side of the study area. Because Alternative 3 would move the river to the middle of the marsh, this alternative could potentially allow recreational use to expand further into the marsh from the west side of the study area than Alternatives 1, 2, 4, and 5. However, Alternative 3 would create additional wet marsh conditions east of the existing channel, a condition that would limit human activities during spring and early summer.

Alternative 5 would not protect an extensive area of core habitat. However, the Conservancy has been implementing localized decommissioning of some trails, which may help to improve core habitat, and similar actions would likely continue to be implemented.

2.3.3 PUBLIC ACCESS AND RECREATION INFRASTRUCTURE ELEMENTS OF THE PROJECT

Project objectives include balancing public access and recreation infrastructure construction and operation with habitat restoration and protection. Five main assumptions guided the design of the public access and recreation infrastructure in Alternatives 1–4:

1. Based on the study area's location (i.e., adjacent to neighborhoods and a high-use recreation area [Tahoe Keys Marina]) and existing use patterns, people would continue to use the Upper Truckee Marsh to some degree, even with some level of access restrictions.

2. To most effectively protect sensitive wildlife and plant habitat, public access would need to be allowed and managed to the extent that most visitors would be satisfied with their level of access and would not intrude into sensitive areas.

3. Excessive levels of recreation infrastructure and access would compromise the quality and function of sensitive habitats by promoting high levels of disturbance. However, too many overall restrictions would encourage uncontrolled access to sensitive areas.

4. Although public-access and recreation elements, such as pedestrian trails, would disturb vegetation and wildlife directly and indirectly, these elements, if designed appropriately, could be valuable tools for directing most access away from sensitive habitats while maintaining existing recreation opportunities.

5. Some level of well-designed public access infrastructure in non-sensitive areas, combined with protective elements and environmental education, would be the most effective approach to protecting sensitive wildlife habitat in the study area.

Also, the 1988 litigation settlement leading to the acquisition of the Cove East Beach property in the northwest corner of the study area requires that recreational beach access west of the river mouth be maintained (People of the State of California vs. Dillingham Development Company and TRPA, CIV-S-85-0873-EJG [February 25, 1988]). Therefore, the focus of the elements west of the Upper Truckee River, near the LWS Restoration Area and Cove East Beach are intended to provide public access and recreation, while most of the elements proposed for the east and south sides of the study area are intended to protect habitat and direct public access away from sensitive areas of the marsh and thus contribute to the protection of wildlife and sensitive habitat.

Some key design parameters for maintaining access that were evaluated during alternatives development included the number and location of scenic viewpoints, the level of interconnectivity (via trails) between viewpoints or other destinations, connection to trails outside the study area, and access to non-sensitive destinations near the beach or river.

Based on these assumptions and considerations, Alternatives 1–4 each provide infrastructure for public access and recreational use of the site, but at different levels:

- Alternative 1 would provide for a potential "maximum" level of public access and recreation infrastructure that includes two bridges, two kiosks, a 27-space parking lot, three observation areas, signage, boardwalks and pedestrian trails, and bicycle paths.

- Alternative 2 would provide a "minimum" level of infrastructure that includes a pedestrian trail to Cove East Beach (which would replace the existing pedestrian trail), five viewpoints, a fishing platform, and signage.

- Alternative 3 would provide a "moderate" level of infrastructure that includes three pedestrian trails (two segments of which would be boardwalks), a kiosk, one observation area, six viewpoints, a fishing platform, and signage at multiple locations.

- Alternative 4 would provide a "moderate" level of infrastructure that includes three pedestrian trails, a kiosk, two observation areas, five viewpoints, and signage at multiple locations.

- Alternative 5 (No-Project/No-Action) would not take any direct steps to construct public access and recreation infrastructure (e.g., viewpoints or additional trails). This alternative would maintain existing infrastructure and might result in the construction of some additional, smaller elements (e.g., signage).

The infrastructure proposed for recreation and public access elements of each alternative are summarized in Table 2-4 and described in the sections below. In each alternative, the public access and recreation infrastructure and the river restoration elements would not be interdependent. Thus, different combinations of these elements could be feasible. However, the final design and locations of public access and recreational infrastructure elements would be influenced by the restoration elements of the alternative that is selected.

Table 2-4
Public Access and Recreation Infrastructure Elements of the Action Alternatives

Element	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Observation Areas				
Number	3	–	1	2
Area of each (square feet)	200-500	–	200-500	200-500
Materials	Local granite	–	Local granite	DG
Color	Gray	–	Gray	DG color
Viewpoints				
Number	6	5	6	5
Area of each (square feet)	44	0	32	32
Materials	Local granite	Wood/composite/ metal	DG	DG
Color	Gray	Brown	Brown	Same as DG paving
Fishing Platform				
Number	–	1	1	–
Area (square feet)	–	300	517	–
Materials	–	Wood/composite/ metal	Wood/composite/ metal	–
Color	–	Brown	Brown	–
Bicycle Paths				
Length (feet)	13,250	–	2,080	1,600
Width (feet)	8 or 10	–	8 or 10	10
Materials	DG/AC	–	DG	AC
Pedestrian Trails				
Length (feet)	560	5,360	7,850	3,400
Width (feet)	6	4 - 6	4 - 6	4 - 6
Materials	Native surface	Native surface	Native surface	Native surface
Bridges				
Length (feet)	225/34	–	–	–
Width (feet)	12/8	–	–	–
Materials	Concrete/metal/wood/ composite	–	–	–
Color	Brown	–	–	–
Boardwalks				
Length (feet)	4,000	–	2,273	1,040
Elevated Height (feet)	~2	–	~2	~2
Materials	Metal/wood/composite	–		Powder-coated metal
Color	TBD	–	Same as wood/ composite color	TBD

Table 2-4 Public Access and Recreation Infrastructure Elements of the Action Alternatives				
Element	**Alt. 1**	**Alt. 2**	**Alt. 3**	**Alt. 4**
Kiosk				
Number	2	0	1	1
Dimensions of each (feet)	5 x 12	–	5 x 12	5 x 12
Materials	Wood/stone/metal	–	Wood/stone/metal	Wood/stone/metal
Color	Brown	–	Brown	Brown
Signage				
Dimensions (inches)	TBD	TBD	TBD	TBD
Materials	Wood/metal/ composite	Wood/metal/ composite	Wood/metal/ composite	Wood/metal/ composite
Color	Brown	Brown	Brown	Brown
Parking Lot				
Number	1			
Area (square feet)	20,720			
Materials	AC			
Notes: AC = Asphalt Cement DG = Decomposed Granite				

To minimize the potential for adverse hydrology or water quality effects of any proposed public access infrastructure, Environmental Commitment 11, Incorporate Effective Permanent Stormwater Best Management Practices, would be applied as part of the final design.

OBSERVATION AREAS AND VIEWPOINTS

Each alternative proposes a combination of observation areas and viewpoints. These facilities would be interspersed throughout the project area in the various alternatives as can be seen in Exhibits 2-1 – 2-4 and Appendix C, "Schematic Plans." The elements for each of the specific alternatives are described below.

Alternative 1: Channel Aggradation and Narrowing (Maximum Recreation Infrastructure)

Under Alternative 1, an observation area would be constructed on a platform at the end of the boardwalk near East Barton Beach to provide an overlook of the lake, beach, and marsh, yet discourage visitors from entering the beach and using the lagoon. This segment would tie into the proposed boardwalk that would cross the northern edge of the marsh and connect to the proposed bridge over the Upper Truckee River, and thus, connect the east and west sides of the study area. (The bridge is described in "Bicycle Paths, Pedestrian Trails, Boardwalks and Bridges" below.) Final siting of the observation area would emphasize a location that would provide visitors with views of a scenic destination (e.g., well-placed overlooks and vistas and views of Lake Tahoe).

Six viewpoints in addition to the observation area would be constructed along the perimeter path. One of these viewpoints would be located along the loop path near the Highland Woods subdivision, and five would be distributed along the east edge of the study area. In Alternative 1, all six viewpoints would be interconnected via the bicycle path. Like the observation area, the viewpoints would be sited in locations with scenic views across the marsh, providing an alternative that would discourage physical entry into the marsh interior.

Alternative 2: New Channel–West Meadow (Minimum Recreation Infrastructure)

Under Alternative 2, four new viewpoints would be constructed along the east edge of the study area. These viewpoints would be sited in locations with scenic views across the marsh to provide an alternative to and discourage entry into the core marsh habitats. They would be accessed by short pedestrian trails extending from the regional bicycle trail on El Dorado Avenue or other streets in the Al Tahoe subdivision. None of the viewpoints would be interconnected by a trail between them (i.e., they would be "terminal" viewpoints).

Also, on the west side of the study area, one viewpoint would extend from the northeast corner of the loop trail near Cove East Beach. The existing shore zone and river mouth in this area experience high levels of recreational use and disturbances to vegetation, soils, and wildlife. The new viewpoint would provide views across the river mouth and out across the lake as well as views of the meadow and lagoon to the east. This viewpoint would direct some recreation use away from those areas, reducing disturbances to waterfowl and shorebirds.

Alternative 3: Middle Marsh Corridor (Moderate Recreation Infrastructure)

Under Alternative 3, five viewpoints would be constructed along the pedestrian trails and bicycle path. One of these viewpoints would be located along the bicycle path near the Highland Woods subdivision, near the junction of the proposed pedestrian trail and bicycle path in that area; four would be distributed along the eastern edge of the study area. Three of the viewpoints along the eastern edge of the study area would be connected by the eastern pedestrian trail; the remaining viewpoint, near the end of Placer Avenue, would not be connected by formalized trails.

West of the Upper Truckee River, by Cove East Beach, a viewpoint would be connected to the pedestrian trail, near Lake Tahoe and the mouth of the Upper Truckee River. An observation area would be connected to the pedestrian trail to Cove East Beach, near the proposed river-connected lagoon. All observation areas and viewpoints these facilities would be sited in locations with scenic views across the marsh and/or lake to provide an alternative to and discourage entry into the marsh interior.

Alternative 4: Inset Floodplain (Moderate Recreation Infrastructure)

Under Alternative 4, along the eastern edge of the study area, an observation area would be constructed along the pedestrian trail near the end of San Francisco Avenue to provide an overlook of the marsh, yet discourage users from entering the marsh itself. Five viewpoints in addition to the observation area would also be constructed. One of these viewpoints would be located in the southeastern portion of the study area along the existing bicycle trail near Trout Creek. The other four would be distributed along the eastern edge of the study area. Three of them would be connected by the eastern pedestrian trail.

West of the Upper Truckee River, by Cove East Beach, an observation area would be connected to the pedestrian trail to Cove East Beach, adjacent to the marina and restored wetlands with scenic views of the marsh and/or lake. All observation areas and viewpoints would be sited in locations with scenic views across the marsh and/or lake to provide an alternative to and discouraging entry into the marsh interior.

Alternative 5: No-Project/No-Action

No viewpoints or observation areas would be added to the existing trail system under Alternative 5.

FISHING PLATFORM

Alternatives 2 and 3 include a fishing platform. This fishing platform would be constructed on the edge of the new river-connected lagoon; it would be connected to and accessed by the loop trail around the perimeter of Cove East Beach which would replace the existing pedestrian trail.

BICYCLE PATHS, PEDESTRIAN TRAILS, BOARDWALKS AND BRIDGES

Each alternative proposes a combination of bicycle paths, pedestrian trails, and bridges. All bicycle paths would be Class I/Shared-Use Paths [as described in TRPA and TMPO 2010].) Alternative 1 also includes bridges connecting paths across the Upper Truckee River and Trout Creek. Although these elements are for public recreation and access, the designs will emphasize protecting habitat, especially east of the river. The specific locations of the proposed infrastructure can be seen in Exhibits 2-1 – 2-4. The elements for each of the specific alternatives are described below.

Alternative 1: Channel Aggradation and Narrowing (Maximum Recreation Infrastructure)

Under Alternative 1, the existing trail that provides public access to Cove East Beach would be modified to a bicycle path. The bicycle path would connect to the existing Class 2 bike lanes on East Venice Drive. This path would be eight to ten feet wide and composed of decomposed granite or asphalt concrete. The total length of the bicycle path from East Venice Drive to Cove East Beach, including the loop at the beach, would be approximately 1,040 feet.

Alternative 1 would also include a new boardwalk and bridge, connecting the east and west sides of the study area. The mouth of the Upper Truckee River would be spanned by the bridge that would connect the eastern and western portions of the boardwalk. The boardwalk would be constructed behind (south of) the barrier beach (outside of TYC habitat). On the west side of the study area, the boardwalk would connect with the loop of the bicycle path around the perimeter of Cove East Beach; on the east side, it would tie into a proposed boardwalk and bicycle path along the eastern perimeter of the study area. The boardwalk and bridge would be approximately 4,000 feet and 225 feet long, and 12 feet and eight to ten feet wide, respectively. At its highest point, the bridge would be approximately ten feet above the Upper Truckee River. The boardwalk would be elevated approximately two feet above the ground surface. The final design of the bridge and boardwalk for the trail crossing the river and marsh would ensure that the structure would not obstruct flood flows to cause any effective increase in the elevation of the 100-year event in the study area. The final design would be supported by a hydraulic analysis that evaluates the potential for significant changes to flooding hazards and littoral processes. The design would be adjusted (e.g., for deck height, location of bridge or boardwalk supports, and cross-sectional area of those supports) to ensure that flow capacity through the structure is sufficient to pass the 100-year event without increasing the effective flood elevation.

The bicycle path would continue along the east perimeter adjacent to the Al Tahoe neighborhood with two access points from the regional bicycle trail network along El Dorado Avenue. The path would then continue north across a new bridge constructed over Trout Creek (at approximately RS 21+00 on Trout Creek), and run between the Al Tahoe and Highland Woods subdivisions. On the Highland Woods side the proposed path could be accessed from the regional bicycle trail at the end of Mackinaw Road and along Springwood Drive. The path would include a loop route through the wooded area north of the Highland Woods subdivision. The trail in Alternative 1 is proposed as decomposed granite or asphalt concrete. The path would be approximately 8,650 feet long and eight to ten feet wide, with two-foot-wide shoulders of decomposed granite on either side. The path would emphasize habitat protection through directing and managing use in areas already used by the public and discouraging access to sensitive habitats and the marsh interior.

Alternative 2: New Channel–West Meadow (Minimum Recreation Infrastructure)

Under Alternative 2, the existing trail providing public access to Cove East Beach would be maintained as a pedestrian trail. No additional trails, bicycle paths, or bridges would be constructed under Alternative 2. Access along the eastern perimeter of the study area would end at a series of formal viewpoints with no connecting trails.

Alternative 3: Middle Marsh Corridor (Moderate Recreation Infrastructure)

Under Alternative 3, the existing trail providing public access to Cove East Beach would be maintained as a pedestrian trail. In the southern portion of the study area, adjacent to the Highland Woods subdivision, a bicycle path approximately 0.4 mile long would loop through the wooded area. At its eastern end, the proposed path could be accessed from the regional bicycle trail at the end of Mackinaw Road, and at its western end, it could be accessed from along Springwood Drive. The trail would be decomposed granite, eight to ten feet wide; it would also have two-foot-wide shoulders of decomposed granite on either side.

Two pedestrian trails also would be included under Alternative 3. One would be connected at both ends to the bicycle path described above, looping through the same wooded area as the bicycle path. The second pedestrian trail would extend along the northeastern perimeter of the study area from near Capistrano Avenue to near San Francisco Avenue, connecting three viewpoints. Two portions of this second trail would be raised boardwalks that would discourage access to the wetter portions of the study area where people [and dogs] presently walk and disturb wetland vegetation.

Alternative 4: Inset Floodplain (Moderate Recreation Infrastructure)

Under Alternative 4, the existing trail providing public access to Cove East Beach would be maintained as a pedestrian trail.

A pedestrian trail would extend along the northeastern perimeter of the study area from near Capistrano Avenue to near San Francisco Avenue. A portion of this trail would be a raised boardwalk. The boardwalk would allow visitors to view the meadow and the lake beyond, while keeping them out of the wetter portions of the study area where they presently walk and disturb wetland vegetation. This trail would be in an area that already experiences recreational use, but would end at an observation area prior to reaching Barton Beach and the lake.

In the southern portion of the study area, a bicycle trail (approximately 0.3 mile long) would run along Springwood Drive at the boundary of the study area and the Highland Woods subdivision. This area already experiences recreational use. This path would be asphalt concrete, ten feet wide, and have two-foot-wide shoulders of decomposed granite on either side.

Alternative 5: No-Project/No-Action

No bicycle paths, pedestrian trails, bridges, or boardwalks would be added to the existing trail system with implementation of Alternative 5.

KIOSKS

Alternatives 1, 3, and 4 include interpretive kiosks that would provide information to support public access, recreation infrastructure, and visitor education and interpretation of the ecological values of the Upper Truckee Marsh (e.g., maps and information regarding sensitive resources). With maximum recreation infrastructure development (Alternative 1), a kiosk would be constructed on high-capability land near the end of East Venice Drive adjacent to the Tahoe Keys Marina, and a second, smaller kiosk would be constructed along the existing bicycle path near the Trout Creek Bridge at U.S. 50, in the southeastern corner of the study area. With moderate recreation infrastructure development (Alternatives 3 and 4), a small kiosk would be constructed at one of two possible locations: the one-acre Conservancy-owned parcel south of the cul-de-sac at the end of East Venice Drive, or just north of the cul-de-sac at the LWS Restoration Area. With minimum recreation infrastructure development (Alternative 2) and the No-Project/No-Action Alternative (Alternative 5), no kiosks would be constructed.

SIGNAGE

Alternatives 1–4 would include development of an interpretive program and installation of additional signage in appropriate locations throughout the site (e.g., along trails, in observation areas, at viewpoints, and near sensitive habitats). This signage would include educational, directional, and safety information to provide public access and dispersed recreation opportunities. Signs would provide maps at trailheads to illustrate the location of open public trails and bicycle path routes and closed areas throughout the study area. Signs would also be placed near sensitive habitats to discourage disturbance of those areas by people and pets, and to engender a resource stewardship ethic in users.

PARKING LOT

Alternative 1 includes a paved parking lot on Conservancy property at the end of East Venice Drive on the left side just before the Tahoe Keys Marina entrance, near the proposed kiosk (shown on sheet S-1). The parking lot is expected to be approximately 280 feet by 74 feet with 27 parking spaces (2 ADA), a four-space bike rack, and one trash can. The final number of spaces and other amenities would be decided in the later stages of design development. No additional parking is proposed under Alternatives 2 through 5. TRPA and the CSLT approved additional Tahoe Keys Marina parking in 2009 and 2010, respectively, but a final agreement has not been completed. This final long-term lease agreement would create more than 100 spaces and would provide additional parking for visitors to the marina and the study area alike. The agreement is not a component of the Upper Truckee River and Marsh Restoration project. As feasible, the final design would include a low-energy parking lot lighting system (e.g., low wattage LED lamps and/or solar lighting).

2.4 RESOURCE MANAGEMENT

The Conservancy has been maintaining existing infrastructure as part of its management of land in the study area implements management actions supporting public access, recreation, and habitat protection. The agency's ongoing management actions in the study area include the following:

- **Maintenance of Facilities.** The Conservancy monitors the condition and use of existing facilities, removes litter and fire pits, and eliminates potentially hazardous conditions (e.g., user-created facilities such as makeshift bridges). Also, the Conservancy funds the Tahoe Resource Conservation District to contract with the Clean Tahoe Program for trash removal services, including weekly inspection and maintenance of 12 garbage cans located throughout the property.

- **Monitoring and Outreach.** Through a Land Steward, the Conservancy conducts outreach to educate visitors regarding the importance of resource protection and to discourage incompatible uses. The Conservancy also monitors recreational use and compliance with Conservancy use policies and CSLT ordinances.

- **Enforcement of Policies.** The Conservancy contracts with El Dorado County Animal Control for assistance with enforcement of CSLT and El Dorado County dog leash ordinances and of the closure to dogs of the area east of the Upper Truckee River during the waterfowl breeding season (May 1 through July 31). The Conservancy also contracts with CSLT to provide security patrols within the study area and to enforce ordinances for City-owned parks.

- **Mosquito Control.** The Conservancy regularly communicates with El Dorado County Vector Control District regarding mosquito production and control. In consultation with the El Dorado County Vector Control District, the Conservancy provides necessary measures for controlling mosquito production.

- **Invasive Plant Control.** The Conservancy monitors for presence of priority invasive species, and to the extent practicable, implements appropriate measures to control and eradicate populations. The Conservancy

also coordinates with the Lake Tahoe Basin Weed Coordinating Group and the Aquatic Invasive Species Working Group regarding the control of aquatic invasive species.

- **Management of TYC Habitat.** The Conservancy has prepared and implements a management plan for TYC in the study area. This management plan contains a number of management actions including the following:

  - maintaining an exclosure to protect the Upper Truckee East TYC population and regularly evaluating the effectiveness of its design and placement;

  - participating in annual basin-wide TYC monitoring activities; and,

  - implementing the Imminent Extinction Contingency Plan, if necessary.

Under the action alternatives and the No-Project/No-Action Alternative, this management would continue. Additional management actions that would be implemented as part of the project are described in Section 2.7, "Environmental Commitments."

2.5 MONITORING

A monitoring plan was developed for the project to:

- characterize baseline conditions;
- track project performance related to desired outcomes from the concept plan report (Conservancy and DGS 2006:2-1 through 2-14);
- document effects on relevant TRPA environmental threshold carrying capacities;
- establish tentative approaches to monitoring for regulatory requirements; and
- provide information to direct adaptive management.

The plan is intended to coordinate prior, existing, and anticipated monitoring to the extent practicable and to be consistent with the guidance on monitoring plans for the Upper Truckee River developed by the Upper Truckee River Watershed Advisory Group (Conservancy 2007).

This monitoring plan describes the variables selected as indicators, a summary of each protocol, quality assurance mechanisms, and reporting procedures. The protocol summaries include sampling design (i.e., location and timing of data collection), data collection methods, and guidance for data analysis. These protocol summaries are provided for all of the following:

- topographic surveys;
- groundwater elevation measurements;
- discharge measurements;
- overbank flow measurements;
- inundation mapping;
- vegetation mapping;
- quantitative vegetation sampling;
- stream bioassessment;
- avian counts;
- nest searching and monitoring;
- small-mammal trapping;
- electrofishing; and

- qualitative site assessment.

Wildlife monitoring would not directly inform as many aspects of project implementation as other variables. Thus, wildlife monitoring would be more dependent on the availability of the necessary staff and budget than other variables. Also, funding may limit implementation of certain components of the plan.

Although this monitoring plan is intended to identify tentative approaches to anticipated regulatory requirements for monitoring of project impacts on the river, riparian, and marsh habitats, additional monitoring might be required. Permit conditions will not be known until a restoration plan has been approved by regulatory agencies.

Monitoring of the condition of TYC on the study area is described in a separate management plan prepared for that plant species (Conservancy and DGS 2007b:24–31). The monitoring of TYC is part of the interagency monitoring of the species throughout the Tahoe Basin that includes a census of all known populations and systematic searches of areas supporting unoccupied, potentially suitable habitat.

2.6 CONSTRUCTION

2.6.1 OVERVIEW

This section summarizes the proposed construction activities and schedule for Alternatives 1–4. Construction would occur between May 1 and October 15 for approximately four years. The actual schedule and construction phasing may vary from what is presented below depending on permit requirements, final design, and contractor selection.

Each year, construction activities would begin with mobilization, including construction and maintenance of haul roads and staging areas, and installation of BMPs and signage in the project vicinity. Similarly, each year, closing activities would include winterization (i.e., installing BMPs in disturbed areas, demobilizing equipment, stabilizing access roads, and shutting down the irrigation system), and in Year 4, project shutdown.

2.6.2 CONSTRUCTION ACTIVITIES AND SCHEDULE

For the action alternatives, construction activities that would occur each year, their location, and duration are described in greater detail in Table 2-5. Appendix C, "Schematic Plans," also contains additional information regarding construction activities. The anticipated construction workers and equipment associated with each of these activities are listed in Appendix D, "Construction Workers and Equipment for Action Alternatives." Access locations, proposed haul routes, and potential storage/staging areas for each alternative are shown in Exhibits 2-5 to 2-8.Construction activities would occur from 8:00 a.m. to 6:30 p.m. pursuant to Section 68.9 of the TRPA Code of Ordinances. The construction activities scheduled for each year are summarized below.

The No-Project/No-Action Alternative (Alternative 5) would not conduct specific, planned construction activities. Other than routine maintenance, the only construction activities under Alternative 5 would be emergency response/repair, which could be required in the event that flooding and/or streambank failures on Conservancy portions of the channels adversely threaten or damage public infrastructure or private property.

YEAR 1

Year 1 construction activities would commence with mobilization activities that would take up to one month to complete. These mobilization activities would include constructing staging areas and haul roads, installing BMPs, and placing signage. The initial and primary staging areas for this period would be the California Avenue, LWS, and Sailing Lagoon staging areas. Expected activities would include delivery and storage of construction equipment and materials and worker parking. Public road access to these staging areas would be from Tahoe Keys

Boulevard to California or Washington Avenues or East Venice Drive. All construction equipment and haul trucks would be operated on internal haul roads.

Subsequent activities would include much of the earthwork required for the river and floodplain excavation: recontouring existing channels, lowering the floodplain, modifying the existing secondary channel, constructing the new channel, and lowering the floodplain. Most of these activities would take a month or less to complete, except for new-channel construction under Alternatives 1–3 and floodplain lowering under Alternatives 2–4. These activities would require one to three months to complete.

Significant excavation and soil movement activities would occur onsite in Year 1. The volume of soil excavated under Alternatives 1–4 would be approximately 32,000; 48,000; 48,000; and 253,000 cubic yards, respectively. Under Alternatives 1, 2 and 3, excavated material would be either stockpiled on site at the TKPOA Corporation Yard, LWS, Sailing Lagoon, Rubicon Trail, and/or Highland Woods storage areas. The excavated materials would be transported to the staging areas by truck on internal haul roads. The excavated materials would be temporarily stored in stockpiles with heights generally ranging between three to eight feet and then used for channel backfilling in Year 3. Due to the large volume of excavation required for floodplain lowering under Alternative 4, the majority of this material (except the volume needed for on-site backfilling) would be hauled off site to a location yet to be determined (as approved by TRPA, Lahontan, and other regulatory agencies). After excavation, permanent revegetation and temporary irrigation would be installed in work areas at final grade, as soon as possible.

During construction of new and recontoured channels, it is possible that dewatering of excavations (i.e., removal of collected water) may be required. For all alternatives, a similar strategy for management of dewatering will be applied. To minimize the potential for dewatering, construction activities within the live channel will be avoided whenever possible. When construction within the live channel cannot be avoided, the work areas would be isolated from the live channel by berms. Seepage into the isolated work areas would be pumped and used for irrigation and dust control. If the quantities of water exceed the demands of dust control or could result in irrigation runoff, temporary and portable detention basins would be constructed. The basins would be created using portable containment berms and used to store and treat the groundwater effluent. The stored water would be used for irrigation or dust control or treated to meet surface water discharge requirements and discharged back into the live channel.

During Year 1, the use of staging areas differs among the alternatives. For Alternative 1, the Sailing Lagoon and LWS staging areas would be used for mobilization and storage of equipment for new-channel construction work, soil stockpiling and revegetation/irrigation, and winterization activities. The California Avenue and, if available, TKPOA staging areas would be used for staging equipment for recontouring the existing channel, lowering the floodplain, soil stockpiling, and working on the existing secondary channel. Alternatively, stockpiling of soil generated in these areas may occur at the LWS staging area.

For Alternative 2, all activities would also utilize the Sailing Lagoon and LWS staging areas for equipment staging and stockpiling for channel construction in the lower (northern) channel segments. The California Avenue staging area would be used for construction equipment staging for secondary channel modification, channel construction, and floodplain lowering in the middle and upper (southern) segments. Soil stockpiling would occur at the TKPOA and LWS staging areas, and if necessary, at the Rubicon Trail and Highland Woods staging areas.

For Alternative 3, the Sailing Lagoon and LWS staging areas would be used for mobilization and floodplain lowering activities. The Washington Avenue staging area would be utilized for revegetation/irrigation and winterization activities, recontouring the existing channel, work on the existing secondary channel, and construction of the pilot channel and vertical and lateral grade controls. Stockpiling of excavated materials generated by these activities would occur at the TKPOA, and/or the Rubicon Trail and Highland Woods staging areas. All soil/sediment transport would occur along internal haul roads.

For Alternative 4, the Sailing Lagoon and LWS staging areas would be used for mobilization, channel construction and recontouring, stockpiling, revegetation/irrigation, and winterization activities in the northern portion of the study area. The California Avenue staging area would be utilized for work in the southern portion of the study area, including lowering the floodplain, inset floodplain construction, and work on the existing secondary channel. Stockpiling of soils excavated by these activities that would be needed for backfilling would occur at the LWS, TKPOA, and/or Rubicon Trail staging areas. The volume of excavated materials in excess of the backfill needs would be transported offsite to an out-of-basin storage or reuse site. The general haul route for the offsite sediment transport would likely be from Dover Drive or Washington Avenue to Tahoe Keys Boulevard, then to U.S. 50.

YEAR 2

During Year 2, work would continue on new and modified sections of river channel. Bank protection would be constructed on both sides of the channel, and for Alternatives 1–3, vertical grade controls would be constructed as well. Under Alternative 3, overflow culverts would be constructed under U.S. 50 through the embankment fill.

Under Alternative 4, reserve fill located at the LWS Restoration Area would be excavated and hauled off site, and then the floodplain existing main channel would be recontoured. After recontouring, permanent revegetation and temporary irrigation would be installed in work areas at final grade as soon as possible. Each of these activities would take one to two months to complete.

Throughout the construction season, the revegetation treatments conducted during Year 1 would be irrigated and inspected.

Under Alternatives 1–3, work related to the modification of the Sailing Lagoon would occur during Year 2. The Sailing Lagoon and LWS staging areas would be used for mobilization, equipment and materials storage, and worker parking. The lagoon would be isolated from the Tahoe Keys Marina by installing the bulkhead and levee along the Tahoe Keys Marina channel. The isolated lagoon would then be drained, recontoured, and revegetated for connection to the Upper Truckee River during Year 3. Recontouring of the Sailing Lagoon would entail excavation of sediment that would be hauled offsite to an out-of-basin storage or reuse site. The general haul route for the off-site sediment transport would likely be from Venice Drive to Tahoe Keys Boulevard and then to U.S. 50.The Sailing Lagoon modification activities could take as long as four months to complete. Additionally, these staging areas would be used to stage and store equipment associated with inspection, revegetation, and irrigation of channel areas constructed in Year 1 (Alternatives 1 – 4) and vertical grade control construction (Alternative 1) in the northern portion of the study area.

The California Avenue staging area would be utilized for staging equipment and materials for the bank protection (Alternatives 1–4) and vertical grade control installation (Alternatives 1, 2, and 3) activities in the southern portion of the study area.

Under Alternative 4, the Sailing Lagoon and LWS staging areas would be used to provide access for mobilization, soil stockpiling, parking, and equipment material storage for Year 2 activities in the northern portion of the site. These activities would include inspection and irrigation of previously constructed channels, recontouring of the existing channel, and removal of the LWS reserve fill. The California Avenue staging area would be used for bank protection–related construction activities downstream of U.S. 50.

YEAR 3

Except for mobilization, revegetation, irrigation, and project shutdown during Year 4, project construction would be completed during Year 3. Year 3 would also include continued inspection and irrigation of revegetation treatments installed in Years 1 and 2.

Lagoon and dune restoration would continue during Year 3. Under Alternatives 1–3, the eastern end of the Sailing Lagoon would be recontoured, and the lagoon connected to the river. Under Alternatives 1 and 2, fill would be removed at East Barton beach to restore lagoon and the restored lagoon revegetated; at Barton Beach, dune swales and ridges would be recontoured and revegetated. Under each of these alternatives, the Sailing Lagoon and LWS staging areas would be used to stage equipment/materials for these activities.

Connecting points between the new and old channels would be graded, and under Alternatives 1–3, vertical and lateral grade controls constructed. Water would be pumped into new and recontoured channel segments to pre-wet margins and then flows would be redirected into the new channels. Fill would be placed in the old channel sections to be abandoned. Under Alternatives 1–3, excavation would take place at the LWS Restoration Area and the TKPOA Corporation Yard to provide materials for use in backfilling the existing channel, and these areas would subsequently be recontoured. Permanent revegetation and temporary irrigation would be installed in all work areas at final grade as soon as possible. For Alternatives 1–3, the LWS and Venice Drive staging areas would serve as the primary areas for storage of equipment/materials and parking for these activities.

Under Alternatives 2 and 3, a stormwater treatment area would be constructed along the western edge of the Upper Truckee River, adjacent to Venice Drive, and an additional treatment area would be constructed near Colorado Avenue. The LWS and Venice Drive staging areas would serve these activities.

Public access and recreation infrastructure would be constructed during Year 3. Under Alternative 1, this would include construction of the bridge and boardwalk running west to Cove East Beach; the kiosk, parking area, and boat take-out near Venice Drive; and a trail system and viewpoints at the eastern margin of the meadow. Alternative 2 would include construction of viewpoints and an ADA-accessible fishing platform. The Lily Avenue, Bellevue Avenue, and Highland Woods staging areas would be used to serve construction activities on the east side of the study area; the LWS and East Venice Drive staging areas would serve construction activities on the west side of the study area.

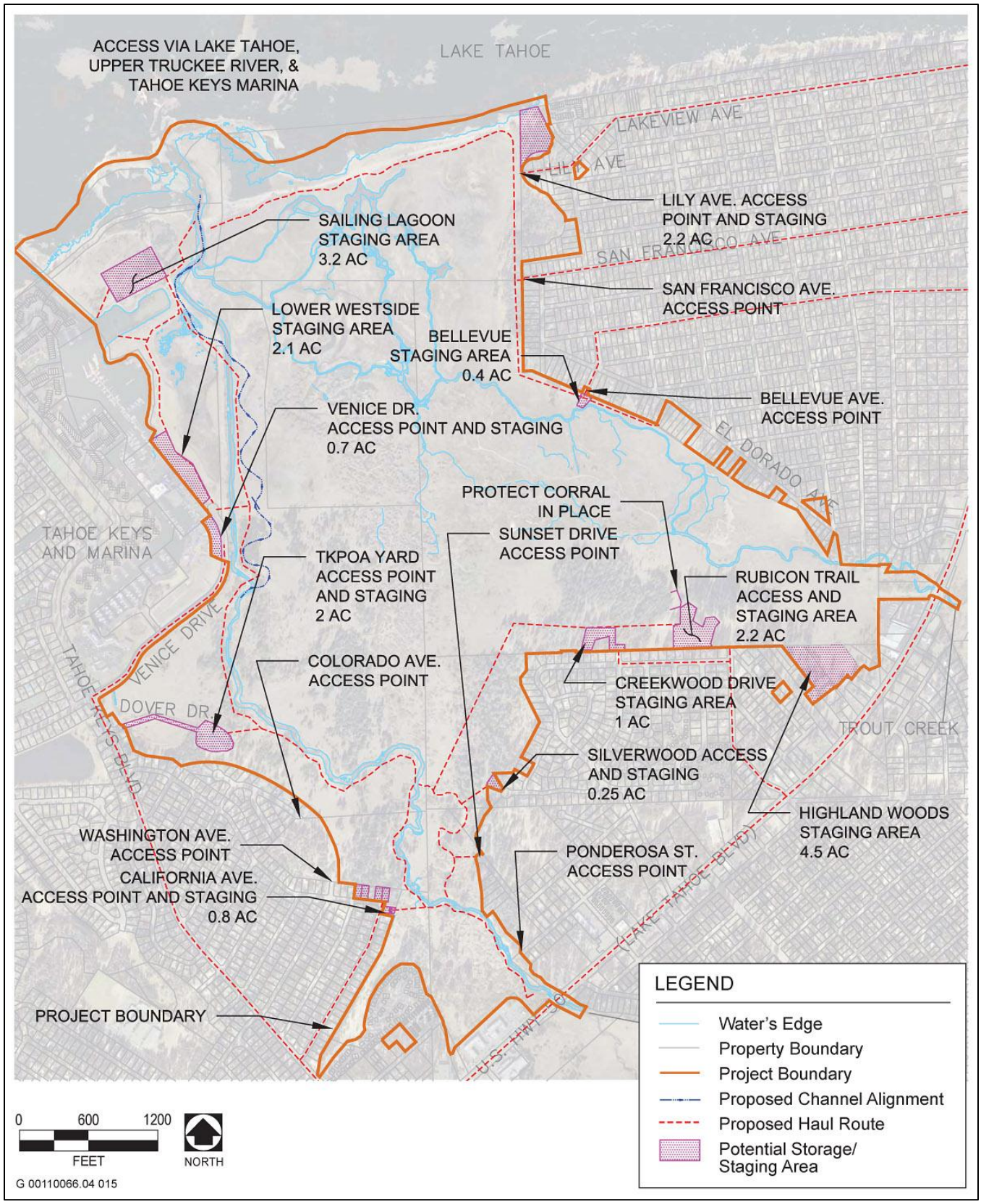
YEAR 4

Under Alternatives 1–4, construction activities in Year 4 would consist of mobilization and maintenance of roadway and staging areas, revegetation and irrigation, winterization, and project shutdown. Although some ground disturbance would be associated with these activities, cut and fill of materials would not be substantial. All work in Year 4 would utilize either the East Venice Drive (west) or Bellevue (east) staging areas.

2.7 ENVIRONMENTAL COMMITMENTS

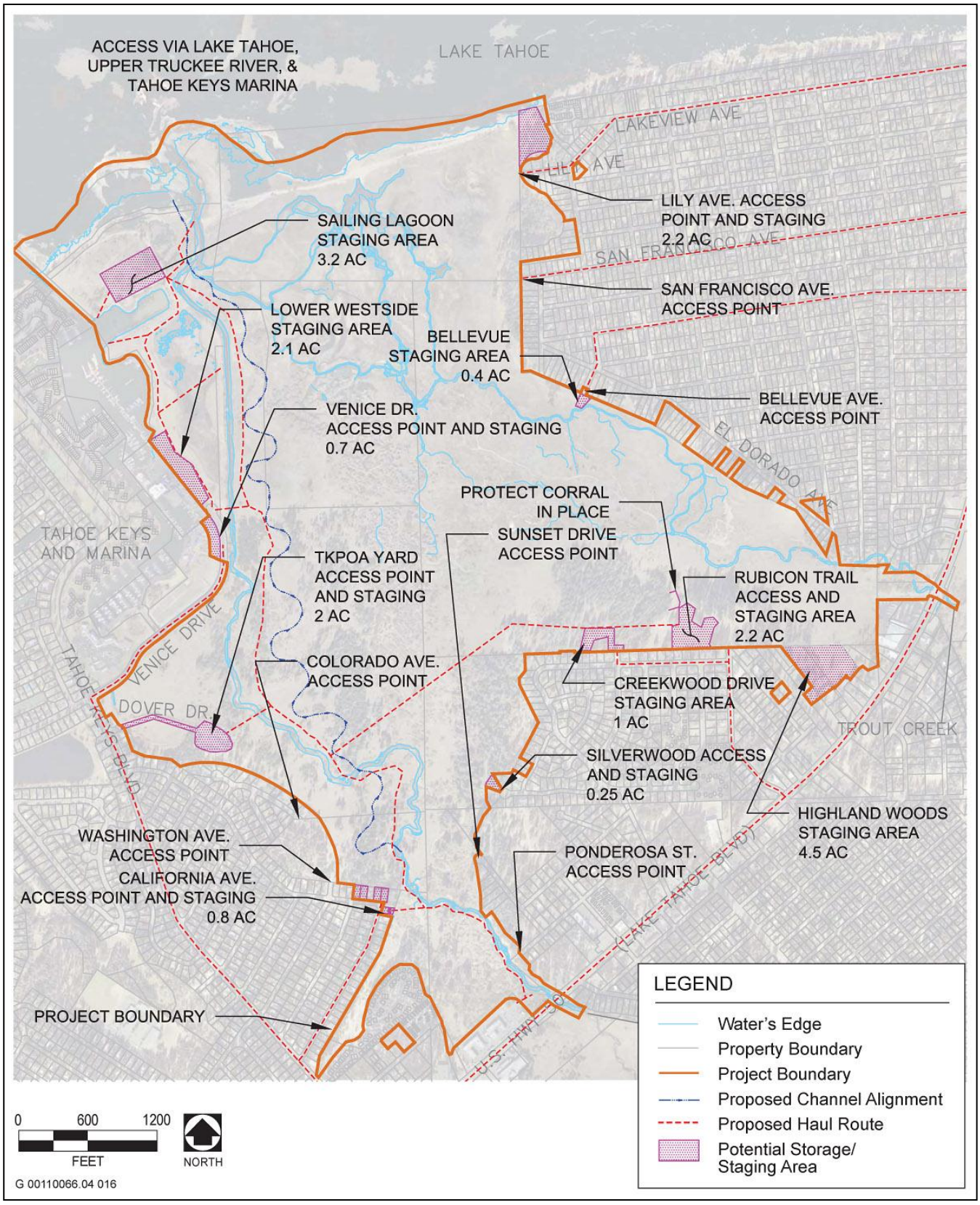
Proposed project alternatives include environmental commitments listed in Table 2-6 to avoid or minimize adverse effects on the environment. The environmental analysis assumes implementation of these commitments prior to determination of environmental impacts. In some instances these environmental commitments were insufficient to fully avoid potential impacts, therefore, mitigation measures are proposed when feasible.

To document fulfillment of these commitments, the Conservancy will prepare an Environmental Commitments Record (ECR). The ECR will contain a summary of required permits and environmental commitments that must be incorporated into the project. This summary will be completed on approval of this environmental document. The ECR also will record when required actions are taken, and changes and additions to environmental commitments or permit conditions made during construction. After project construction, the Conservancy will maintain a record of the completed ECR.



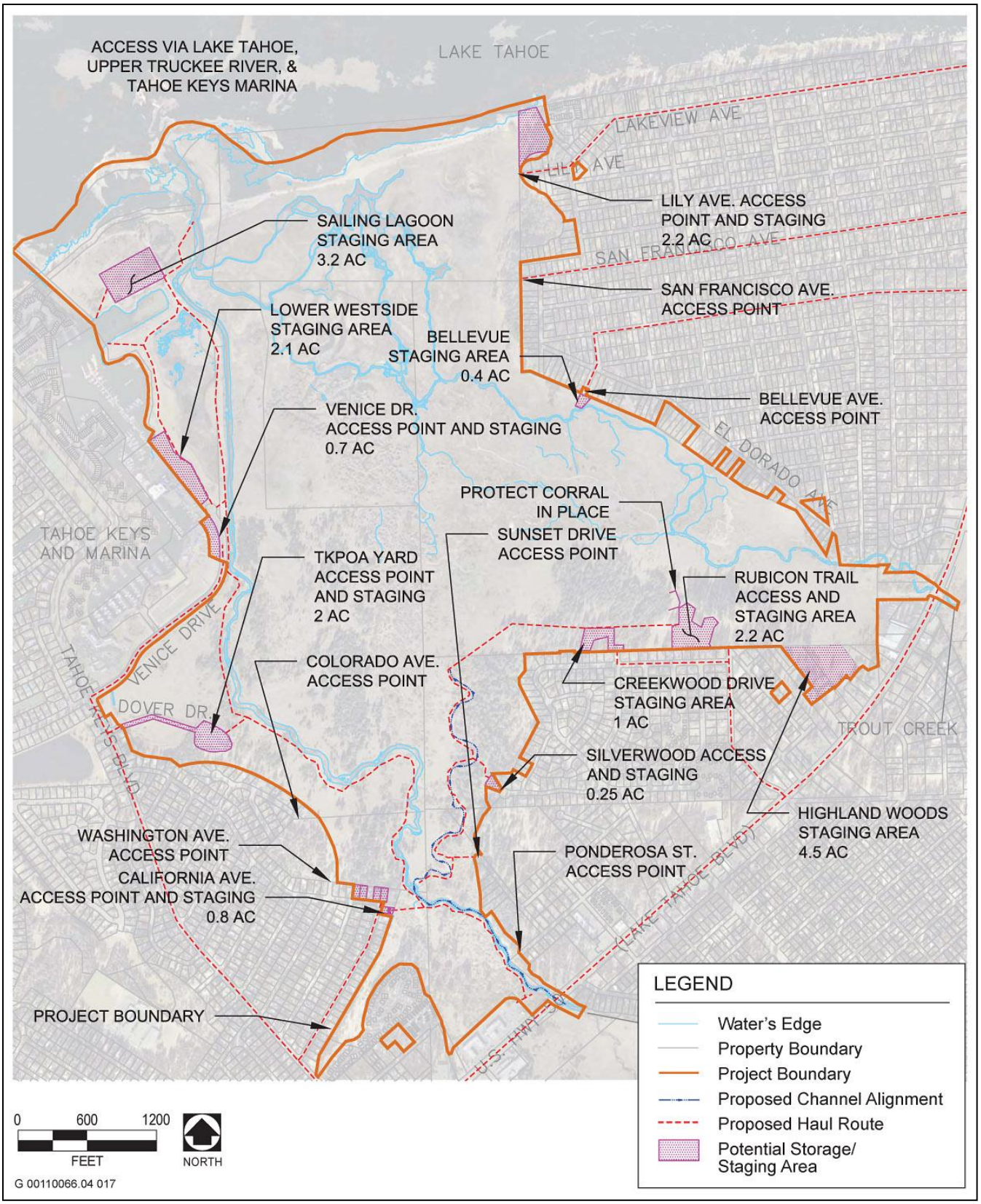
Source: Conservancy and DGS 2013 (aerial image from 2002), adapted by AECOM in 2013

Exhibit 2-5 **Alternative 1—Storage/Staging and Access Plan**



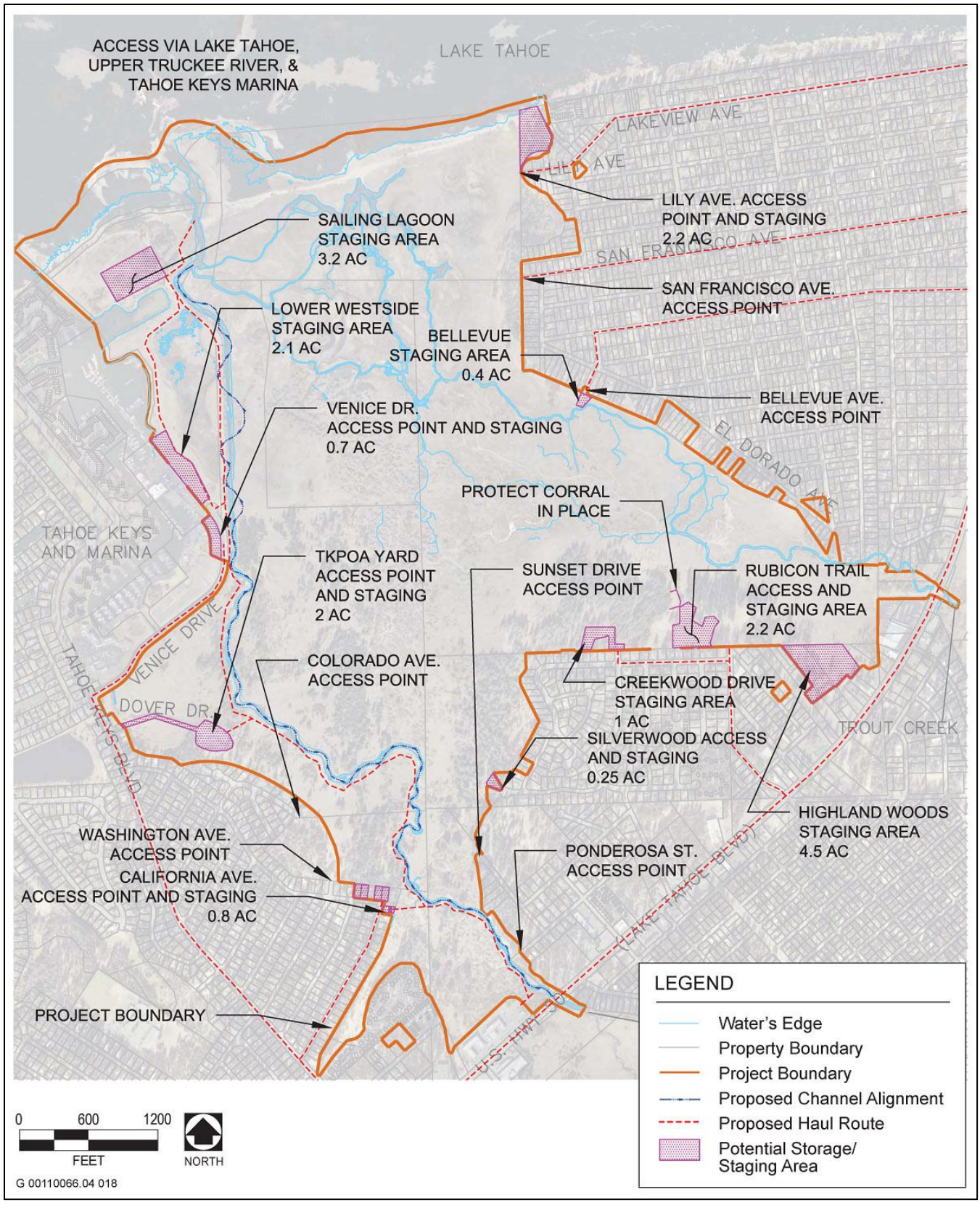
Source: Conservancy and DGS 2013 (aerial image from 2002), adapted by AECOM in 2013

Exhibit 2-6 **Alternative 2—Storage/Staging and Access Plan**



Source: Conservancy and DGS 2013= (aerial image from 2002), adapted by AECOM in 2013

Exhibit 2-7 **Alternative 3—Storage/Staging and Access Plan**



Source: Conservancy and DGS 2013 (aerial image from 2002), adapted by AECOM in 2013

Exhibit 2-8 **Alternative 4—Storage/Staging and Access Plan**

Table 2-5
Construction Schedule for Action Alternatives

Activities/Engineered Element	Duration (Months)			
	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Year 1				
Mobilization. **Alts. 1–4:** Build haul roads and staging areas. Install BMPs and place signage.	1	1	1	1
Recontour Existing Channel. **Alt. 1:** Recontour the existing secondary channel between RS 17+00 and RS 29+00. Construct the vertical grade controls at RS 17+00 and RS 29+00. **Alt. 3:** Recontour the existing secondary channel (east high-flow branch) between RS 17+00 and RS 28+00 to function as the low-flow channel with top width of approximately 38 feet and average depth of 4 feet.	1	–	1	–
Lowered Floodplain. **Alt. 1:** Excavate the existing terrace between RS 5+25 and RS 11+00. Haul excavated material to the on-site TKPOA Corporation Yard, LWS, or Sailing Lagoon staging areas for stockpiling until it is used for backfill in Year 3. **Alt. 2:** Excavate the existing terrace between RS 5+25 and RS 11+00 and between RS 17+00 and RS 21+00. Haul excavated material to the onsite TKPOA Corporation Yard, LWS, or Sailing Lagoon staging areas (or alternatively to the Rubicon Trail or Highland Woods staging) for stockpiling until it is used for backfill in Year 3. **Alt. 3:** Excavate the existing terrace between RS 0+00 and RS 5+00, RS 5+25 and RS 11+00, and RS 21+00 and RS 29+00. Haul excavated material to the onsite TKPOA Corporation Yard, LWS, or Sailing Lagoon staging areas (or alternatively to the Rubicon Trail or Highland Woods staging) for stockpiling until it is used for backfill in Year 3. **Alt. 4:** Excavate the existing terrace between RS 0+00 and RS 5+00 and between RS 5+25 and RS 11+00. Off-haul excavated material to an approved out-of-basin location.	1	1.5	2	1.5
Inset Floodplain. **Alt. 4:** Excavate the elevation of the inlet and outlet of the existing secondary channel (west high-flow channel) at RS 05+25 and RS 11+00 to an elevation that allows flow into the secondary channel when the total flow exceeds the design flow of the main channel.	–	–	–	0.5
Existing Secondary Channel. **Alts. 1–4:** Excavate the elevation of the inlet and outlet of the existing secondary channel (west high-flow channel) at RS 05+25 and RS 11+00 to an elevation that allows flow into the secondary channel when the total flow exceeds the design flow of the main channel. **Alt. 3:** Same as above, but also recontour the existing secondary channel (east high-flow branch) between RS 28+00 and RS 29+00 to function as part of the lowered floodplain.	0.5	0.5	0.5	0.5
New Channel. **Alt. 1:** Construct a new channel between RS 63+00 and RS 93+00, not including the area at approximately RS 85+00 where the new channel and existing channel intersect. Haul excavated material to the onsite TKPOA Corporation Yard for stockpiling until it is used for backfill in Year 3.	3	–	–	–

Table 2-5
Construction Schedule for Action Alternatives

Activities/Engineered Element	Duration (Months)			
	Alt. 1	Alt. 2	Alt. 3	Alt. 4
New Channel and River Mouth Modification. **Alt. 2:** Construct a new channel between RS 20+00 and RS 100+00, not including the areas at approximately RS 38+00 and RS 95+50 where the new channel and existing channel intersect. Haul excavated material to the onsite TKPOA Corporation Yard for stockpiling until it is used for backfill in Year 3.	–	3	–	–
New Channel and Vertical and Lateral Grade Controls. **Alt. 3:** Excavate the new pilot channel off the existing secondary channel near RS 28+00 with a top width of approximately 38 feet and average depth of 4 feet. Haul excavated material to the TKPOA Corporation Yard for stockpiling until it is used for backfill in Year 3. Construct a vertical grade-control structure at RS 17+00 on the new low-flow alignment (pilot channel) to stabilize the elevation of the inlet of the new channel. Construct a lateral control east of RS 28+00 where the new low-flow channel leaves the existing secondary channel.	–	–	2.5	–
Revegetation/Irrigation. **Alts. 1–4:** Conduct permanent revegetation and install temporary irrigation as soon as feasible in all work areas at final grade.	1	1	1	1
Winterization. **Alts. 1–4:** Install BMPs on all disturbed areas, "demobilize" all equipment from the site, remove or stabilize all access roads, and shut down the irrigation system.	0.5	0.5	0.5	0.5
Year 2				
Mobilization. **Alts. 1–4:** Inspect and/or rebuild haul road and staging areas. Reinstall BMPs as needed and restart the irrigation system.	1	1	1	1
New Channel and Lowered Floodplain. **Alt. 1:** Inspect to evaluate the condition of Year 1 grading and revegetation. Initiate irrigation as soon as possible and inspect revegetation monthly.	5	–	–	–
New Channel, River Mouth Modification, and Lowered Floodplain. **Alt. 2:** Inspect to evaluate the condition of Year 1 grading and revegetation. Initiate irrigation as soon as possible and inspect revegetation monthly.	–	5	–	–
New Channel, Recontoured Existing Channel, Existing Secondary Channel, and Lowered Floodplain. **Alt. 3:** Inspect to evaluate the condition of Year 1 grading and revegetation. Initiate irrigation as soon as possible and inspect revegetation monthly.	–	–	5	–
Existing Secondary Channel, Inset Floodplain and Lowered Floodplain. **Alt. 4:** Inspect to evaluate the condition of prior grading and revegetation. Initiate irrigation as soon as possible and inspect revegetation monthly.	–	–	–	5
Bank Protection. **Alts. 1–4:** Construct bank protection between RS 0+00 and RS 13+00 on both sides of the channel.	2	2	2	2

Table 2-5
Construction Schedule for Action Alternatives

Activities/Engineered Element	Duration (Months)			
	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Overflow Culverts. **Alt. 3:** Construct overflow culverts under U.S. 50 through the embankment fill. Culverts are to be plugged and remain so until lowered floodplain has sufficient revegetation.	–	–	1.5	–
Vertical Grade Controls. **Alt. 1:** Construct vertical grade-control structures at RS 35+00, RS 42+00, RS 50+00, and RS 57+00.	2	–	–	–
Vertical Grade Controls and River Mouth Modification. **Alt. 3:** Construct vertical grade-control structures at about RS 92+00 on Trout Creek to stabilize the existing bed elevation, and at RS 99+00 on the Upper Truckee River to raise existing bed elevation. Install bioengineered revegetation at and around structures.	–	–	2	–
Restored Floodplain. **Alt. 4:** Excavate reserve fill located at the LWS Restoration Area, recontour to match adjoining floodplain elevations, revegetate, and irrigate. Off-haul excavated material to an approved out-of-basin location.	–	–	–	1
Recontoured Existing Channel. **Alt. 4:** Recontour the existing main channel between RS 69+00 and RS 93+00. Off-haul material excavated from the banks and import clean gravel/cobble to build point bars.	–	–	–	3
Bulkhead and Levee. **Alts. 1–3:** Install vertical sheet pile bulkhead extending from approximately 30 feet east of the existing sheet pile along the Tahoe Keys Marina channel. Isolate the Sailing Lagoon, pump/drain, and excavate sediment (including invasive plants and animals if present). Haul sediment to an off-site disposal area. Construct an earthen levee along the east side of the sheet pile bulkhead.	2	2	2	–
Restored Lagoon. **Alts. 1–3:** Recontour the Sailing Lagoon, aside from the area near RS 93+00 where it will be reconnected to the river (in Year 3). Revegetate/irrigate areas at grade.	1	1	1	–
Revegetation/Irrigation. **Alts. 1–4:** Conduct permanent revegetation and install temporary irrigation at final grade as soon as feasible in all work areas.	1	1	1	1
Winterization. **Alts. 1–4:** Install BMPs on all disturbed areas, "demobilize" all equipment from the site, remove or stabilize all access roads, and shut down the irrigation system.	0.5	0.5	0.5	0.5
Year 3				
Mobilization. **Alts. 1–4:** Inspect and/or rebuild haul road and staging areas. Reinstall BMPs as needed, and restart the irrigation system.	1	1	1	1

Table 2-5
Construction Schedule for Action Alternatives

Activities/Engineered Element	Duration (Months)			
	Alt. 1	Alt. 2	Alt. 3	Alt. 4
New Channel, Recontoured Existing Channel, and Lowered Floodplain. **Alt. 1:** Inspect to evaluate the condition of prior grading and revegetation. Initiate irrigation as soon as possible and inspect revegetation monthly.	5	–	–	–
New Channel, River Mouth Modification, and Lowered Floodplain. **Alt. 2:** Inspect to evaluate the condition of prior grading and revegetation. Initiate irrigation as soon as possible and inspect revegetation monthly.	–	5	–	–
Recontoured Existing Channel, Existing Secondary Channel, and Lowered Floodplain. **Alt. 3:** Inspect to evaluate the condition of prior grading and revegetation. Initiate irrigation as soon as possible and inspect revegetation monthly.	–	–	5	–
Existing Secondary Channel, Inset Floodplain, Lowered Floodplain, and Recontoured Existing Channel. **Alt. 4:** Inspect to evaluate the condition of prior grading and revegetation. Initiate irrigation as soon as possible and inspect revegetation monthly.	–	–	–	5
Excavation of Reserve Fill at LWS Restoration Area and Fill at TKPOA Corporation Yard. **Alts. 1, 2, and 3:** Excavate reserve fill located at the LWS Restoration Area and fill at the TKPOA Corporation Yard for use in backfilling the existing channel. **Alt. 4:** Excavate reserve fill located at the TKPOA Corporation Yard for use in backfilling the existing channel.	1	1	1	–
Public Access and Recreation Infrastructure Elements. **Alts. 1–4:** Construct all public-access facilities and recreation infrastructure elements.	3	3	3	3
Restored Lagoon. **Alts. 1 and 2:** Excavate fill from East Barton Beach and revegetate/irrigate areas at grade.	0.5	0.5	–	–
River Mouth Modification. **Alt. 1:** Install revegetation/bioengineering treatments at completion of bridge/boardwalk construction.	0.5	–	–	–
Restored Dunes. **Alts. 1 and 2:** Excavate new dune swales, recontour new dune ridges, and revegetate/irrigate areas at grade.	0.5	0.5	–	–
New Channel and Recontoured Existing Channel. **Alt. 1:** Pump water into the new and recontoured channel sections to pre-wet channel margins. Implement diversion(s) to construct the tie-in locations between the new channel and the existing channel as well as the vertical and lateral grade controls.	2	–	–	–
New Channel and River Mouth Modification. **Alt. 2:** Pump water into new channel sections to pre-wet channel margins. Implement diversion(s) to construct the tie-in locations between the new channel and the existing channel as well as the vertical and lateral grade controls.	–	3	–	–

Table 2-5
Construction Schedule for Action Alternatives

Activities/Engineered Element	Duration (Months)			
	Alt. 1	Alt. 2	Alt. 3	Alt. 4
New Channel. **Alt. 3:** Pump water into new channel to pre-wet channel margins. Implement diversion to construct the tie-in location between the new channel and the existing channel as well as the vertical and lateral grade controls at RS 17+00.	–	–	2	–
Vertical and Lateral Grade Controls. **Alt. 1:** Construct vertical grade control at RS 93+00, and lateral grade controls at RS 17+00, RS 29+00, and RS 63+00 where the new alignment and existing alignment converge and at RS 85+00 where the new alignment crosses the existing alignment. **Alt. 2:** Construct vertical and lateral grade controls at RS 96+00 and RS 95+50 (respectively) where the new alignment and existing alignment diverge, and at RS 38+00 where the new alignment crosses the existing alignment. **Alt. 3:** Construct the lateral and vertical grade controls at RS 17+00 at the intersection of the new low-flow channel with the backfilled existing channel, and the lateral grade control near RS 95+00 where the existing channel meets the backfilled existing channel.	1	1	1	–
Partial Backfill and Complete Backfill of Old Channel. **Alts. 1, 2, and 3:** Bring areas of new and old channel connections to grade and redirect flows into new channels. Place fill within the old channel sections that are abandoned, revegetate, and irrigate.	1	2	2	–
Restored Lagoon. **Alt. 1:** Recontour the east end of the Sailing Lagoon to reconnect the lagoon to the river, in association with construction of vertical and lateral grade controls at RS 93+00. **Alt. 2:** Recontour the east end of the Sailing Lagoon to reconnect the lagoon to the river, in association with construction of vertical and lateral grade controls and backfilling of the old channel. **Alt. 3:** Recontour the east end of the Sailing Lagoon to reconnect the lagoon to the river, in association with construction of vertical and lateral grade controls and backfilling of the old channel.	0.5	0.5	1	–
Restored Floodplain. **Alts. 1, 2, and 3:** Recontour the former TKPOA Corporation Yard to match adjoining floodplain elevations, revegetate, and irrigate.	1	1	1	–
Stormwater Treatment Basins. **Alts. 2 and 3:** Construct stormwater treatment facilities at RS 45+00 and RS 63+00.		1	1	–
Revegetation/Irrigation. **Alts. 1–4:** Conduct permanent revegetation and install temporary irrigation at final grade as soon as feasible in all work areas.	1	1	1	1
Winterization. **Alts. 1–4:** Install BMPs on all disturbed areas, "demobilize" all equipment from the site, remove or stabilize all access roads, and shut down the irrigation system.	0.5	0.5	0.5	0.5

Table 2-5
Construction Schedule for Action Alternatives

Activities/Engineered Element	Duration (Months)			
	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Year 4				
Mobilization. **Alts. 1–4:** Inspect and/or rebuild haul road and staging areas as needed for the final year of work. Reinstall BMPs as needed, and start up the irrigation system.	1	1	1	1
Revegetation/Irrigation. **Alts. 1–4:** Inspect to evaluate the condition of all prior grading, revegetation, and BMPs. Initiate irrigation as soon as possible and inspect revegetation monthly. Reinstall BMPs as needed.	5	5	5	5
Winterization and Project Shutdown. **Alts. 1–4:** Remove all construction-related BMPs, and restore all disturbed areas, "demobilize" all construction equipment and related facilities from the site, remove and stabilize all access roads, and shut down the irrigation system. No additional work is planned by the contractor, except for maintenance during the warranty period.	0.5	0.5	0.5	0.5

Notes: BMP = best management practice; RS = River Station; TKPOA = Tahoe Keys Property Owners Association; U.S. 50 = U.S. Highway 50
Source: Data provided by Cardno ENTRIX in 2008

Table 2-6
Environmental Commitments of the Upper Truckee River and Marsh Restoration Project

Environmental Commitment 1: Reduce the Generation of Construction-Related Emissions of ROG, NO_X, and PM_{10}. In accordance with the TRPA Code of Ordinances, the Conservancy will implement the following measures to reduce the emission of ROG, NO_X, and PM_{10} during construction:

- The Conservancy will obtain all necessary TRPA permits and approvals and will follow all required TRPA codes and procedures with respect to BMPs (TRPA Code Section 60.4), project grading (TRPA Code Section 33.3), excavation, and construction-related emissions-generating activities (TRPA Code Section 65.1: Air Quality Control).
- The Conservancy will obtain all necessary El Dorado County permits and approvals and will follow all required County laws and procedures with respect to BMPs, project grading excavation, and construction-related emissions-generating activities.
- Activities disturbing the soil will occur between October 15 and May 1 of each year, unless approval has been granted by TRPA and Lahontan RWQCB. All construction sites will be winterized before October 15 of each construction year in accordance with the provisions of Section 33.3.1.D of the TRPA Code of Ordinances and the National Pollutant Discharge Elimination System (NPDES) permit.
- Dust control measures will be required for any grading activity creating substantial quantities of dust. Dust control measures will be approved by TRPA before groundbreaking and will comply with the provisions of Section 33.3.3 of the TRPA Code of Ordinances.

Environmental Commitment 2: Prepare and Implement a Cultural Resources Protection Plan. Before construction begins, a cultural resource protection plan will be prepared and implemented before and during construction. Measures will include, but are not limited to assuring final design placement and orientation of recreation infrastructure will incorporate visual screening or barriers as appropriate to minimize visibility and access which could otherwise lead to damage or destruction of prehistoric site CA-Eld-26; installing barriers or fencing during construction to protect identified sites, including CA-Eld-26; jobsite education on protocol to identify potential uncovered resources and response (stop work) protocol; and presence of a qualified cultural resource specialist to oversee grading activities that are in the vicinity of eligible resources, including initial grading activities within the vicinity of the bluff and CA-Eld-26. Before project-related ground disturbance begins, the Conservancy will train all construction personnel regarding the possibility of uncovering buried cultural resources. The Conservancy will retain a qualified cultural resources specialist to educate personnel as to how to identify prehistoric and historic-era archaeological remains. If unusual amounts of stone, bone, or shell or significant quantities of historic-era artifacts such as glass, ceramic, metal, or building remains are uncovered during construction activities, work in the vicinity of the specific construction site at which the suspected resources have been uncovered will be suspended, and the Conservancy will be contacted immediately. At that time, the Conservancy will retain a qualified professional archaeologist, who will conduct a field investigation of the specific site and recommend measures deemed necessary to protect or recover any cultural resources concluded by the archaeologist to represent significant or potentially significant resources as defined by CEQA, NEPA, and TRPA. These measures may include but will not necessarily be limited to avoidance, archival research, subsurface testing, and excavation of contiguous block units. Conservancy will implement the measures deemed necessary by the archaeologist before construction resumes within the area of the find. The purpose of this oversight will be to ensure that cultural resources potentially uncovered during ground-disturbing activities are identified, evaluated for significance, and treated in accordance with their possible National Register of Historical Places (NRHP) and California Register of Historical Resources (CRHR) status. Potential treatment methods for significant and potentially significant resources may include but will not be limited to taking no action (i.e., resources determined not to be significant), avoiding the resource by changing construction methods or project design, and implementing a program of testing and data recovery, in accordance with all applicable Federal and State requirements.

Environmental Commitment 3: Stop Work Within an Appropriate Radius Around the Discovered Human Remains, Notify the El Dorado County Coroner and the Most Likely Descendants, and Treat Remains in Accordance With State and Federal Law. In accordance with Section 7050.5(b) of the California Health and Safety Code, if human remains are uncovered during ground-disturbing activities, the contractor and/or the Conservancy will immediately halt potentially damaging excavation in the area of the burial and notify the El Dorado County Coroner and a professional archaeologist to determine the nature of the remains. The coroner will examine all discoveries of human remains within 48 hours of receiving notice of the discovery. If the coroner determines that the remains are those of a Native American, he or she will contact the Native American Heritage Commission (NAHC) by phone within 24 hours of making that determination (California Health and Safety Code, Section 7050[c]). Following the coroner's findings, the Conservancy, an archaeologist, and the NAHC-designated Most Likely Descendant (MLD) will determine the ultimate treatment and disposition of the remains and take appropriate steps to ensure that additional human interments are not disturbed. The responsibilities for

Table 2-6
Environmental Commitments of the Upper Truckee River and Marsh Restoration Project

acting upon notification of a discovery of Native American human remains are identified in California Public Resources Code (PRC) Section 5097.9.

Upon the discovery of Native American remains, the Conservancy will ensure that the immediate vicinity (according to generally accepted cultural or archaeological standards and practices) is not damaged or disturbed by further development activity until consultation with the MLD has taken place. The MLD will have 48 hours after being granted access to the site to complete a site inspection and make recommendations. A range of possible treatments for the remains, including nondestructive removal and analysis, preservation in place, relinquishment of the remains and associated items to the descendants, or other culturally appropriate treatment may be discussed. California PRC Section 5097.9 suggests that the concerned parties may extend discussions beyond the initial 48 hours to allow for the discovery of additional remains. The following are site protection measures that the Conservancy will employ:

- Record the site with the NAHC or the appropriate Information Center of the California Historical Resources Information System.
- Utilize an open-space or conservation zoning designation or easement.
- Record a document with El Dorado County.

The Conservancy or its authorized representative will rebury the Native American human remains and associated grave goods with appropriate dignity on the property in a location not subject to further subsurface disturbance if the NAHC is unable to identify a MLD or if the MLD fails to make a recommendation within 48 hours after being granted access to the site. The Conservancy or its authorized representative may also reinter the remains in a location not subject to further disturbance if it rejects the recommendation of the MLD and mediation by the NAHC fails to provide measures acceptable to the Conservancy.

Environmental Commitment 4: Prepare and Implement an Invasive Species Management Plan. In consultation with TRPA and other relevant agencies, the Conservancy will prepare an Invasive Species Management Plan to address existing and potential terrestrial and aquatic invasive species. The plan will specifically address Eurasian watermilfoil as it is known to be present in the study area and is a species of particular concern. The plan will be divided into two sections: one addressing terrestrial species and the other addressing aquatic. The aquatic portion will be consistent with the State of California's Aquatic Species Management Plan (CDFG 2008), and will be completed, reviewed, and approved by the California Department of Fish and Game (CDFG) prior to initiation of construction. The plan will address how the project will address invasive species currently in the project area in addition to how the project will prevent introducing new species.

The following will be part of the plan to address both invasive aquatic and terrestrial species:

- A qualified biologist with experience in the Tahoe Basin will conduct a preconstruction survey to assess current populations of invasive plants in the project area. Invasive species presence will be documented, and an action plan in the context of the project will be developed to remove them prior to construction and/or prevent their spread due to construction activities. Control measures may include herbicide application, hand removal, or other mechanical control.
- All equipment entering the study area from areas infested by invasive plants or areas of unknown infestation status will be cleaned of all attached soil or plant parts before being allowed into the study area All motorized and non-motorized equipment used for in-channel work will be thoroughly cleaned prior to use on the project site and then be cleaned before leaving the site. This includes waders, nets, seines, water quality monitoring equipment, boats, kayaks, life jackets, and construction vehicles.
- To reduce the import of seed or other materials potentially containing invasive plants, the project will use on-site sources of seed and materials to the extent practicable. Seed, soil amendment, and erosion control materials that need to be imported to the study area will be certified weed-free or will be obtained from a site documented as uninfested by invasive plants.
- With regard to aquatic invasive species, habitat within construction sites with aquatic invasive species will be isolated prior to in-channel work. A qualified biologist(s) with expertise in Tahoe Basin aquatic plant and animal species will be present during construction and will supervise the removal and disposal of non-native invasive species from the project area. All biologists working on this program will be qualified to conduct non-native aquatic species removal/disposal in a manner that avoids and/or minimizes all potential risks to native aquatic species, particularly any special status species potentially encountered. Biologists will be on site when work sites are isolated and/or dewatered, if necessary, in order to capture, handle, and safely remove or dispose of any non-native aquatic invasive species encountered. This program will be closely coordinated with the Aquatic Species Rescue and Relocation Program, described below as Environmental Commitment 7.

Table 2-6
Environmental Commitments of the Upper Truckee River and Marsh Restoration Project

After project construction, the project site will be annually monitored for occurrence of invasive plants for four years. If invasive plants are documented during monitoring, they will be treated and eradicated to prevent further spread.

Environmental Commitment 5: Prepare and Implement Effective Construction Site Management Plans to Minimize Risks of Water Quality Degradation and Impacts to Vegetation. Permits and approvals from several entities (e.g., TRPA, Lahontan RWQCB, U.S. Army Corps of Engineers (USACE), CDFG, U.S. Fish and Wildlife Service (USFWS), and CSLT) will impose conditions and requirements to minimize construction risks of water quality and vegetation degradation. The Conservancy will develop and implement several site management plans as part of various permit and approval requirements, including but not limited to a grading and erosion control plan, a dewatering and channel seasoning plan, a diversion plan, a winterization plan, and a monitoring and construction management plan. The following measures will be implemented by the Conservancy and their contractor within these plans to be developed for specific permits or as independent measures:

- Restrict the area and duration of construction disturbance to the absolute minimum necessary to accomplish work. Protect existing vegetation outside construction area and salvage and re-use riparian vegetation where it needs to be disturbed.
- Design, install, and maintain temporary BMPs to protect disturbed areas and minimize soil erosion, prevent surface runoff interaction with disturbed surfaces, and limit the potential for release of sediment to surface water bodies for storm events up to the 20-year precipitation event.
- Design, install, and maintain internally draining construction area(s) within the study area to prevent discharge of untreated stormwater into surface water bodies. Anticipate runoff from adjacent lands and reroute it around the construction zone.
- Salvage topsoil to be reused on-site during project-related grading.
- Provide winterization that isolates and protects disturbed areas from high streamflow on the Upper Truckee River and Trout Creek (up to the 50-year event).
- Secure a source of transportation and a location for deposition and/or storage of all excavated and imported materials at the project site and minimize use of nonlocal materials and importation of materials from off-site.
- Protect stockpiled and transported materials or debris from wind or water erosion. Store soil and other loose material at least 100 feet from the active channel during the construction season. Designate staging areas and haul routes in existing developed or disturbed areas where feasible, and where not feasible, in the least sensitive natural areas feasible.
- Flag and/or fence boundaries of staging areas, haul routes, and construction sites.
- Restrict the placement of materials or equipment to designated staging areas or construction sites and prohibit the use of vehicles off of roads and haul routes.
- Minimize overwinter storage of materials, vehicles, equipment, or debris within the 100-year floodplain.
- Provide site-specific and reachwide dewatering/diversion plans that indicate the scheduling approach and/or maximum diverted flows to minimize risks from summer thunderstorms, specific diversion/bypass/ dewatering methods and equipment, defined work areas and diversion locations, the types and locations of temporary BMPs for the diversions and reintroduction points, measures and options for treating turbid water before release back to the channel, and stated water quality performance standards.
- Salvage and reuse plant materials to the extent practicable.
- Avoid fertilizer application to revegetated areas.
- Provide flushing flows before activation of new and reconnected river channel sections based on a "channel seasoning" plan that indicates the water source(s); volumes and duration required; phased placement of clean, washed gravels; and the measures and options for treating potentially turbid water.
- Require all contractors to develop Spill Prevention Plans (SPP) and Storm Water Pollution Prevention Plans (SWPPP). These plans will contain BMPs to be implemented to minimize the risk of sedimentation, turbidity, and hazardous material spills. Applicable BMPs may include permanent and temporary erosion control measures, including the use of straw bales, mulch or wattles, silt fences, filter fabric, spill remediation material such as absorbent booms, proper staging of fuel, out of channel equipment maintenance, and ultimately seeding and revegetating. Preventing contaminants from entering the river during construction and operation of the project will protect water quality and the aquatic habitat.

Table 2-6
Environmental Commitments of the Upper Truckee River and Marsh Restoration Project

Maintain the effectiveness of temporary erosion control, stormwater facilities, and flood flow protections throughout the construction area. Monitor the status and effectiveness of temporary erosion control, stormwater facilities, and flood flow protections throughout the construction area, including each of the internally draining zones that could separately discharge to various surface water bodies. Monitor turbidity upstream of the Upper Truckee River and Trout Creek, and where feasible, downstream of the construction zone. Monitoring will be conducted by qualified personnel on a regular basis during summer construction and on an event basis when runoff equals or exceeds the BMP design standards. Document failures and/or threats of BMP failures, and identify remedial measures implementation. Repair BMP failures within 24 hours of documentation.

Environmental Commitment 6: Obtain and Comply with Federal, State, Regional, and Local Permits. The Conservancy and its contractor will obtain and comply with the terms and conditions of all permits required by applicable federal, state, regional, and local statutes and regulations. The anticipated compliance, consultation, and coordination are described in Chapter 5.

Environmental Commitment 7: Prepare and Implement an Aquatic Species Rescue and Relocation Plan. The Conservancy will prepare and implement an Aquatic Species Rescue and Relocation Plan to reduce the direct loss of native fish or desired sport (trout) and native mussels from impacts associated with construction of the project. The objective of the rescue and relocation effort is to reduce harm and avoid potential mortality of important aquatic species, especially sensitive fish species and mussels, which may be present within the project area. The plan will be completed, reviewed, and approved by both CDFG and USFWS (for Lahontan cutthroat trout) prior to initiation of construction.

Aquatic habitat within work areas will be isolated (using block nets, silt curtains, or coffer dams) prior to in-channel work. A qualified biologist with expertise in Tahoe Basin aquatic species, including the collection, handling, and relocating of fish and freshwater mussels, habitat relationships, and biological monitoring of Tahoe Basin fish species will supervise the fish and mussel rescue and relocation program for the project. All biologists working on the fish rescue and recovery program will be qualified to conduct fish and mussel collections in a manner that minimizes all potential risks to collected animals, particularly any special status species potentially encountered.

Aquatic organisms isolated within the work area(s) will be removed by hand, seine netting, or, if necessary, electrofishing. Partial dewatering of the site will facilitate removal of aquatic species, but dewatering should not expose or strand individuals to be rescued, and water temperature and dissolved oxygen levels should be monitored to maintain levels supporting the most sensitive species. Should western pearlshell mussels be found in the site, the mussels shall be removed prior to fish rescues to minimize injury from foot traffic or electrofishing. Mussels can be located and removed by hand in wadeable streams; snorkeling and hand removal may be needed in deeper water. If electrofishing is necessary, it will be performed by qualified biologists and conducted according to established guidelines provided by CDFG and USFWS. Biologists will be on site when work sites are isolated and/or dewatered, in order to capture, handle, and safely relocate sensitive fish species (i.e. Lahontan cutthroat trout and western pearlshell mussels). Appropriate rescue methods should consider both general (low conductive water) and site-specific conditions (substrate, bed morphology).

All captured native fish and mussels will be relocated, as soon as possible, to another Upper Truckee River site that has been pre-approved by CDFG and USFWS and/or USFS biologists, and in which suitable habitat conditions are present.

All captured invasive fishes (e.g., bluegill, bass, and catfish) or aquatic invasive plants will be disposed of, consistent with the approved EC 4: Prepare and Implement an Invasive Species Management Plan, described above.

Environmental Commitment 8: Prepare a Final Geotechnical Engineering Report, and Implement All Applicable Recommendations. Before construction begins, the Conservancy will obtain the services of a licensed geotechnical engineer to prepare a final geotechnical engineering report for the project. The final geotechnical engineering report will address and make recommendations on the following as necessary:

- structural/seismic design of bridges;
- site preparation;
- appropriate sources and types of fill;
- potential need for soil amendments;
- access roads, pavement, and asphalt areas;
- shallow groundwater table; and
- soil and slope stability.

Table 2-6
Environmental Commitments of the Upper Truckee River and Marsh Restoration Project

In addition to the recommendations for the conditions listed above, the geotechnical investigation will include subsurface testing of soil and groundwater conditions for proposed project elements and will determine appropriate bulkhead and levee and bridge foundation designs that are consistent with City code requirements. All recommendations contained in the final geotechnical engineering report will be implemented by the Conservancy. Special recommendations contained in the geotechnical engineering report will be noted on the grading plans and implemented as appropriate before construction begins. Design and construction of all phases of the project will be in accordance with current City code requirements at the time of construction.

Environmental Commitment 9: Develop and Implement a Construction Management Program. The Conservancy and its contractor will develop a construction management program to avoid or minimize potential impacts to health and safety during project construction, to the extent feasible. The construction management program will inform contractors and subcontractors of work hours, modes and locations of transportation and parking for construction workers, location of overhead and underground utilities, worker health and safety, truck routes, stockpiling and staging procedures, public access routes, the terms and conditions of all project permits and approvals; and the health and safety plan (HASP) information described below.

The Conservancy and its contractor will develop and implement a HASP that clearly notifies all workers of the potential to encounter hazardous materials during demolition and construction activities. The HASP will identify proper handling and disposal procedures for contaminants expected to be on-site as well as maps and phone numbers for local hospitals and other emergency contacts. All protocols outlined in the HASP will be complied with throughout project implementation.

Any stored hazardous materials present in the study area will be removed and disposed at appropriately permitted locations, as appropriate.

The HASP shall describe fire prevention and response methods, including fire precaution, prevention, and suppression methods that are consistent with the policies and standards in South Lake Tahoe. The plan shall include a requirement that all construction equipment must be equipped with spark arrestors. All construction personnel shall be made familiar with the contents of the plan before the start of construction activities. A copy of the plan shall be posted in the trailer used by the on-site construction superintendent.

The HASP would also include construction notification procedures for CSLT police, public works, and fire department and schools within one-quarter mile prior to construction activities. As required by Public Resource Code Section 21151.4, the Conservancy shall provide written notification of the project to the Lake Tahoe Unified School District at least 30 days before certification of the EIR/EIS/EIS and shall consult with the school district regarding proper handling and disposal methods associated with substances subject to California Health and Safety Code Section 25532. Notices would also be distributed to neighboring property owners, local agencies, and public works, police, and fire departments, and the Lake Tahoe Unified School District.

Environmental Commitment 10: Establish and Implement a Management Agreement with the El Dorado County Vector Control District. The Conservancy will establish and implement a management agreement with the El Dorado County Vector Control District (EDCVCD) to adequately control mosquito populations in the study area. As a performance criterion for the management agreement, the terms and conditions of the agreement will be designed to ensure that EDCVCD can maintain mosquito abundance at or below pre-project levels. The agreement will include, but not be limited to, the following:

- measures that ensure necessary access for monitoring and control measures;
- EDCVCD review of project plans and provision of recommendations for management of mosquito populations; and
- applicable best management practices from the California Department of Public Health's *Best Management Practices for Mosquito Control on California State Properties* (CDPH 2008), including
  - procedures for coordinating Conservancy and EDCVCD management activities, and
  - providing public information for visitors and the community regarding control measures being implemented, the risk of transmission of mosquito-borne disease, and personal protective measures.

Table 2-6
Environmental Commitments of the Upper Truckee River and Marsh Restoration Project

Environmental Commitment 11: Incorporate Effective Permanent Stormwater Best Management Practices. The Conservancy shall ensure that the final design of all recreation features with impervious or partially pervious surfaces will incorporate effective permanent BMPs for the protection of water quality and will conform with all applicable ordinances and standard conditions established by TRPA and Lahontan RWQCB. At a minimum, the stormwater design will:

- minimize the area of disturbance and coverage for all permanent features;
- maximize the use of porous media (e.g., porous pavement, decomposed granite fill) for trail surfaces;
- optimize trail slopes for proper drainage;
- provide for at-the-source infiltration of roof or other cover runoff; and
- provide for collection of runoff from impervious pavements and direct the runoff through oil/water separator(s) and advance treatment prior to discharge to Stream Environment Zones (SEZs).

Environmental Commitment 12: Prepare and Implement Traffic Control Plans. To ensure consistency with City Code 26-16 and state safety orders, rules, and regulations of the Division of Industrial Safety, the Conservancy will prepare and implement traffic control plans for construction activities that may encroach on CSLT and California State road rights-of-way. The traffic control plans will follow California Department of Transportation's (Caltrans) Standard Plans, Standard Special Provisions, and Non-Standard Special Provisions for Temporary Traffic Control Systems and will be signed by a professional engineer. Measures typically used in traffic control plans include advertising of planned lane closures, warning signage, a flag person to direct traffic flows when needed, and methods to ensure continued access by emergency vehicles. During project construction, access to existing land uses will be maintained at all times, with detours used as necessary during road closures. Traffic control plans will be submitted to the CSLT Public Works Department for review and approval before construction of project phases whose implementation may cause encroachment on CSLT or California State road rights-of-way. The Traffic Control Plan will address safety conflicts between construction traffic and of local traffic, pedestrians, and bicyclists. The plan will include advance public advisories, construction-period signage, flag personnel, and other special traffic-control actions as necessary. Specific measures contained in the plan include the following.

- Distribute or mail flyers to residents in the nearby Al Tahoe, Highlands Woods, and Tahoe Keys subdivisions advising about upcoming project traffic prior to the initiation of construction.
- Place advisory signs along construction routes in advance of construction to alert traffic, pedestrian, and bicyclists about the upcoming construction traffic activity.
- Install construction area signage on designated haul routes to inform the public of the presence of trucks.
- Provide flag personnel at when truck activity is heavy (i.e., more than ten trucks per hour).
- Provide information to all truck drivers identifying haul routes, speed limits, location of flaggers, and any other pertinent public safety information.
- Monitor truck and traffic conditions to identify traffic congestion, safety concerns regarding truck, vehicle, and pedestrian and bicycle conflicts and adjust management approach as needed.

Environmental Commitment 13: Prepare and Implement a Public Outreach Plan. The Conservancy will prepare a Public Outreach Plan (POP) to inform the general public and partnering agencies, such as the CSLT, El Dorado County Vector Control, and El Dorado County Animal Control, of construction-related activities within the Project Area. Further, in consultation with the construction contractor, every effort will be made to maintain access to and within the Study Area, including trail access to Lake Tahoe, insofar as the public's health and safety can be assured. There may be periods of time when it is deemed unsafe for the public to be within the study area and/or on trails to the lake during certain construction activities. These periods of restricted access are alternative and construction season dependent.

The POP will include strategies to inform the general public and partnering agencies of access restrictions and their anticipated timelines, alternate locations for passive recreation activities, and site access information. Communication of this information may be through signage at access points, messages posted to the Conservancy website, and Public Service Announcements and news articles in the local and regional newspapers, online and in print.

Table 2-6
Environmental Commitments of the Upper Truckee River and Marsh Restoration Project

Environmental Commitment 14: Prepare and Implement a Waterway Traffic Control Plan for Alternatives That Affect the Sailing Lagoon and/or all accessible reaches of the Upper Truckee River within the Upper Truckee River and Marsh Restoration Project Area. The Conservancy will prepare a waterway traffic control plan to ensure safe and efficient vessel navigation during construction at the junction of the Sailing Lagoon and the adjacent channel of the Tahoe Keys Marina and within all accessible reaches of the Upper Truckee River within the project area. The plan will include vessel (motorized and unmotorized) traffic control measures to minimize congestion and navigation hazards to the extent feasible. Construction areas in the waterway will be barricaded or guarded by readily visible barriers, or other effective means to warn boaters of their presence and restrict access. Warning devices and signage will be consistent with the California Uniform State Marking System and effective during non-daylight hours and periods of dense fog.

The Conservancy will maintain safe boat access to public launch and docking facilities, businesses, and residences of the Tahoe Keys Marina and will minimize the partial closure of the waterway. Where temporary channel closure is necessary, a temporary channel closure plan shall be developed. The waterway closure plan shall include procedures for notification of the temporary closure to the United States Coast Guard, boating organizations, Tahoe Keys Marina, boat/kayak rental businesses within the area, and all other effective means of notifying boaters.

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