SR 28 East Shore Demonstration Transit Shuttle Concept Development/Feasibility Study

Final Report

Prepared for the

Tahoe Transportation District

Prepared by

LSC Transportation Consultants, Inc.

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TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

TABLE *PAGE*

FIGURE *PAGE*

Section I
Introduction

STUDY BACKGROUND

The East Shore of Lake Tahoe, stretching along Nevada State Route 28 between Lake Shore Drive in Incline Village and US Highway 50 Spooner Summit, is a very popular recreational destination, particularly in summer. This ten-mile-long corridor is largely comprised of Lake Tahoe-Nevada State Park (including the Sand Harbor area), as well as US Forest Service lands. The popularity of the scenic beaches on busy summer days exceeds the limited parking capacity. In summer 2011, this led to the mid-day closure of the Sand Harbor parking area a total of 47 days, and resulted in up to 687 vehicles observed parking along the highway shoulders. Traffic queues and shoulder parking resulting from these closures (and from drivers accessing smaller beach areas along the remainder of the corridor) results in vehicles parked within portions of the state highway traffic lanes, pedestrians walking in travel lanes, and long delays to through travel on the highway.

The issue, moreover, is getting worse. Annual counts conducted over the summer by TRPA indicate that the average number of parked vehicles observed along SR 28 between Incline Village and US 50 on Saturdays grew from 259 in 2002 to 505 in 2011 (a 95 percent increase), while the number observed on Wednesdays grew by 140 percent, from 164 in 2002 to 307 in 2011.

Nevada Division of State Parks, Nevada Department of Transportation and the Tahoe Transportation District are also planning to reduce shoulder parking availability in the immediate vicinity of Sand Harbor (over approximately a 1.5 stretch of SR 28) in Summer 2012. While much of this should parking area is already signed as no parking zones, up to 155 vehicles have been observed to park in these areas at peak times. Elimination of this parking through a combination of increased signage/striping, physical barriers and increased enforcement will increase the demand for alternative means of access to Sand Harbor.

Faced with similar problems, decision makers at other popular recreational destinations over recent years have turned to intercept parking/shuttle programs to provide access while addressing environmental/capacity problems. Examples of successful programs can be found at:

- Zion National Park, Utah
- Muir Woods (Golden Gate National Recreation Area), California
- Sabino Canyon (Coronado National Forest), Tuscan, Arizona
- Devils Postpile National Monument, California
- Glacier National Park, Montana
- Maroon Bells (White River National Forest), Aspen, Colorado
- Harpers Ferry National Historic Park, Virginia

This study was initiated to assess the potential for a summer-only intercept parking/shuttle transit program on the East Shore, and to provide a plan for such service. This transit service would be a pilot program only. As such, it considers only limited physical improvements to bus

stops and parking areas (such as signage and shelters), and does not include construction of new parking lots. This study focuses on the following:

- Intercept parking lot locations, size, amenities
- Potential ridership demand
- Route and stop locations
- Schedule and hours of operation
- Season of operation
- Stop improvements (benches, signage, amenities)
- Vehicle size and amenities
- Fare structure
- Coordination with existing BlueGO and TART transit services
- Monitoring and reporting plan

If implemented, this pilot program would provide useful “real world” experience that can be used to better define the operating parameters and ridership potential of a permanent transit service. As such, it will yield valuable information for long-term capital decisions, such as the size and location of future parking and transit facilities.

Section II
Parking and Transit Stop Alternatives

A key element in a SR 28 East Shore Transit Shuttle program is providing adequate parking for shuttle passengers in a convenient location, thereby encouraging East Shore beach goers to take the bus instead of driving the SR 28 corridor. This section considers potential parking lots in two areas: at the northern end of the transit route to intercept passengers traveling from Reno/Sparks, North Lake Tahoe and I-80 and at the southern end of the study area to intercept passengers travelling from Carson City or South Lake Tahoe. Ideally, the parking lots should have adequate parking capacity, be located close to the highway, and allow for safe ingress/egress of the shuttle and other vehicles. Other considerations in the analysis include compatibility with existing land uses, distance from Sand Harbor (as the primary destination) and minimizing development or environmental concerns. A wide variety of intercept parking alternatives were reviewed for both the north and south end of the study area. The following discussion presents the advantages and disadvantages of each alternative. Locations for each alternative parking lot are displayed in Figures 1 and 2 for the north and south ends of the corridor, respectively.

NORTH END INTERCEPT LOT LOCATIONS

Washoe County School District

One primary benefit of sharing parking uses with Incline Village schools is that they are publicly owned facilities. During the majority of the transit shuttle season, there would be little conflict between school uses and transit shuttle uses. However, the Incline Village school year begins around August 22nd which is roughly two weeks before the potential end of the transit program. The school year ends around June 13th, which is expected to avoid overlap with the transit program calendar.

Washoe County School District staff is open to the idea of shuttle intercept parking lots on school property. For each Incline Village school parking lot alternative reviewed below, the School District would require that a formal agreement be set forth outlining responsibilities and other rules of engagement, such as maintenance, repair and cleaning. TTD would also need to coordinate with the Principal of each school.

Incline Village High School

The Incline Village High School is located at 499 Village Boulevard, roughly one-half mile north of SR 28 in central Incline Village. The existing parking lot can accommodate roughly 100 vehicles. If the service vehicle lot and school bus parking area on the west side of the school were usable and additional 50 vehicles could be accommodated, for a total of approximately 150. However, summer school and other sports activities would reduce the parking activity to roughly half of total capacity. The high school also includes an adequate and convenient loading/unloading and turnaround area for buses. Good access to SR 28 is provided by a traffic signal.

FIGURE 1

Transit Shuttle Intercept Parking Lot Alternatives - North End

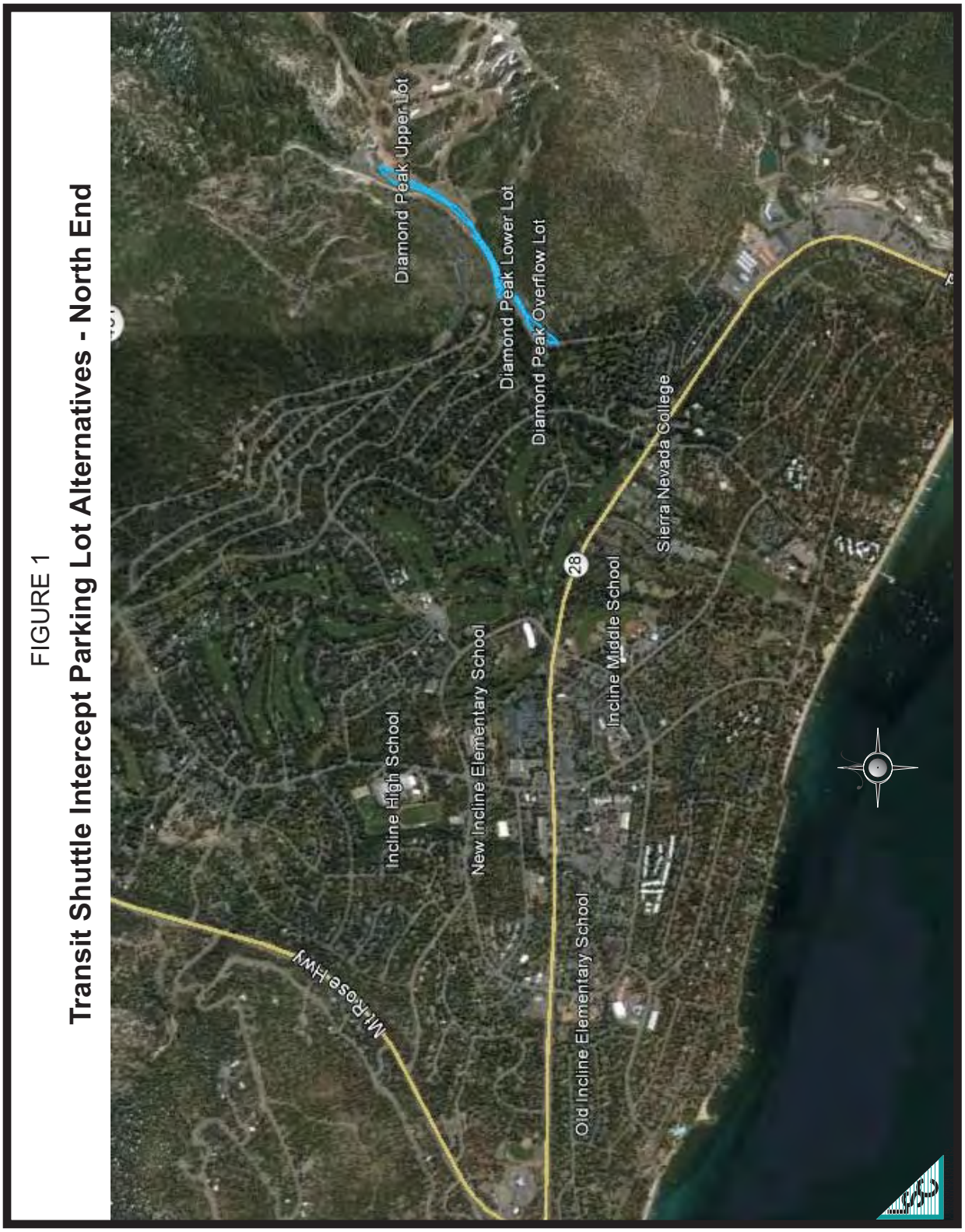


FIGURE 2

Transit Shuttle Intercept Parking Lot Alternatives - South End

Advantages

- Provides a substantial number of spaces.
- Compatible with existing land uses. Would only require travel on Village Boulevard through a largely commercial area.
- School District is willing to allow use.

Disadvantages

- Potentially difficult for visitors to find – would require signage along SR 28.
- The beginning of the school year around August 22nd would preclude use as an intercept location for the last few weeks of the season.
- Parking is spread around buildings, allowing for a longer walk for some shuttle patrons from their vehicle to the bus turnaround. Would require signage on site to guide drivers to the more remote areas.
- Not close to a TART stop.

Incline Village Middle School

The Incline Village Middle School is located on the corner of Incline Way and Southwood Boulevard just under one-quarter mile south of SR 28 in the eastern portion of Incline Village. The parking lot has 73 striped parking spaces including 2 disabled parking spaces. Good access is provided on SR 28 to and from the east and from the west at all times, though at peak times delays for traffic turning westbound onto SR 28 from Southwood Boulevard can experience long delays.

Advantages

- Closer to the East Shore than the other Washoe County Schools: 4.5 miles from Sand Harbor
- Parking is located in one large lot close to the bus turnaround, making it easier for shuttle patrons to transport coolers, chairs and other equipment
- Close to a TART stop
- School District is willing to allow use

Disadvantages

- Parking is often used for soccer and softball games in the summer, which would create conflicts with beachgoers
- Potentially difficult for visitors to find
- Limited parking capacity. Overflow parking could create impact on adjacent streets.

Old Incline Elementary School

The former Incline Elementary School on Southwood Boulevard is another potential location for a transit shuttle intercept parking lot. The school is located just 0.06 miles off of SR 28. Approximate measurements of "parkable space" were calculated. Considering only the existing parking areas, there is parking space for approximately 59 cars. This includes the staff parking areas, as well as one line of cars around the drop-off/loading zone (leaving a lane for the shuttle buses). Good access onto SR 28 is provided by a traffic signal.

The old black top play yard north of the buildings has parking potential although there is no way at present to access this area without driving through the ball field. As the ball field is not paved, allowing access (and possible use of the ball field for additional parking) would require TRPA permitting that precludes this possibility for summer 2012. Over the long term, if the existing school building structure were demolished, the Old Incline Elementary School site could be reconfigured to provide a much better layout of parking with the potential for greater capacity of at least 150 spaces. Due to asbestos abatement requirements associated with existing building and the fact that debris from the demolition of the building would require being trucked outside of the Tahoe Basin, cost estimates for demolition are on the order of $500,000 to $800,000. If demolition were chosen, TTD would also need to consider TRPA permitting requirements (such as coverage), consistency with the Community Plan and Best Management Practices (BMPs). Given the costs and time needed for physical improvements, these are not considered to be feasible for a pilot program.

Advantages

- Located close to SR 28
- Relatively close to a TART stop
- Site is not currently in use
- Site is potentially available for entire transit shuttle season.
- School District is willing to allow use

Disadvantages

- Limited parking spaces (without significant demolition or construction costs)
- Overflow parking could create impact on adjacent streets
- High cost for long-term parking capacity expansion
- Potential conflict with use by Sierra Nevada College
- Located relatively far (roughly 5.1 miles) from Sand Harbor

New Incline Elementary School

The new Incline Elementary School is located on the corner of Village Boulevard and Northwood Boulevard, roughly 0.1 miles north of SR 28. If all existing lots are used, the site has a parking capacity of 69 vehicles including 5 disabled spaces. The majority of parking is located west of the building whereas the bus turnaround is located to the north of the building. Wayfinding signage would be important to guide shuttle passengers. Good access onto SR 28 is provided by a traffic signal at Village/SR 28.

Advantages

- Located close to SR 28
- Relatively close to a TART stop
- School District is willing to allow use

Disadvantages

- Located relatively far (4.8 miles) from Sand Harbor
- Limited parking available
- Potentially difficult for visitors to find
- Bus turnaround area not adjacent to parking lot, requiring passengers to walk around building

Diamond Peak Ski Resort

The Diamond Peak Ski Resort is owned and operated by the Incline Village General Improvement District (IVGID). The ski resort uses three parking lots (along with onstreet spaces between these lots) during the winter which would allow for more than sufficient parking capacity for a shuttle program: upper lot, lower lot and overflow lot (near Big Water Grille). The parking lots are accessed via Ski Way off of Country Club Drive. Of these three lots, the overflow lot across Ski Way from the Big Water Grille would be the most convenient for potential East Shore Shuttle users. The lot has a capacity of at least 104 vehicles (with additional spaces along the side of Ski Way to the north) and is separated from Ski Way by a concrete jersey barrier. The overflow parking area is also used by the Big Water Grille restaurant. In exchange for use of the overflow lot, the Big Water Grille is responsible for maintenance of the parking area. If this lot were to be used as an intercept parking lot, the Big Water Grille landowner requests that TTD be at least partially responsible for maintenance of the parking area.

IVGID staff noted that the upper and lower Diamond Peak lots could be possibilities if proper agreements regarding maintenance and liability are arranged ahead of time and summer mountain operations are not negatively impacted. The upper lot at the base of the ski area, which is normally behind a locked gate, has the capacity for approximately 200 vehicles, although a portion of that is used for heavy equipment storage and other staff/maintenance personnel parking. The lower parking area has striped parking for approximately 135 vehicles. Good access onto SR 28 is provided by the traffic signal at Country Club Drive.

There are two main disadvantages of this alternative. First, as Diamond Peak is located one mile from SR 28, East Shore users travelling from North Lake Tahoe could perceive this location as too far out of the way. However, with a good signage and outreach program identifying the lot location, East Shore goers from Reno would find that turning left onto Country Club Drive from SR 431 to access the intercept lot provides a convenient route to the East Shore. Second, potential transit shuttle patrons from both directions would increase summer traffic on Country Club Drive, Ski Way and other residential streets (by several hundred one-way vehicle-trips per day, depending on the specific characteristics of the transit program). While this would not create a traffic congestion problem, it would increase traffic noise. If Diamond Peak is used as a shuttle intercept lot, a strong public outreach program will be important early on in the process.

Advantages

- Large parking capacity
- Easy to serve with a shuttle bus
- Relatively low potential for overflow onto residential streets
- With proper signage, potential to intercept shuttle users from Reno
- Owner willing to allow use (in exchange for partial funding of maintenance costs)

Disadvantages

- Residences along Ski Way will experience additional summer traffic. During the busiest hour of the peak days, this will increase traffic levels by approximately 35 percent. However, as existing traffic conditions are good, the additional traffic will only increase delays at intersections by no more than 3 seconds.
- Location roughly 1 mile off of SR 28 may be seen as inconvenient by drivers approaching from the west
- Not close to a TART transit stop

Sierra Nevada College

The Sierra Nevada College campus parking area is located 0.04 miles south of SR 28 off of Country Club Drive. The College has several parking areas located around the campus, which, if unused during the summer months, would provide sufficient capacity for an intercept parking lot. However Sierra Nevada College staff has indicated that the parking lots are shared with the UC Davis Research Center and are used for a number of conference events during the summertime. Sierra Nevada College does not have excess parking capacity at this time that could be shared with the East Shore Transit Shuttle program.

Advantages

- Located close to SR 28
- Relatively easy for visitors to find
- Close to a TART stop

Disadvantages

- Conflicts with existing summer uses
- Conflicts with school parking in September
- Would not be allowed by Sierra Nevada College

The Old Ponderosa Ranch Property

The Old Ponderosa Ranch property includes an existing paved parking area with more than sufficient space for an intercept parking lot, located just off of SR 28 between Sweetwater Drive and Ponderosa Ranch Road. The property is conveniently situated at the eastern end of Incline Village, which would minimize shuttle travel time and operating costs. Although the property is not currently in use and there are no development plans in progress, the landowner has not indicated a willingness to allow parking on the property for shuttle uses. While there is the possibility that an agreement could be entered into in the future, the old Ponderosa Ranch property would not be a possibility for an intercept parking lot in the short term.

Advantages

- Located only 2.8 miles from Sand Harbor
- Visible from SR 28
- Potential for large parking capacity
- Easy to serve with a shuttle
- Could also provide parking for the East Shore Bike Trail

Disadvantages

- Private property, use currently not permissible by landowner

SR 28 Right of Way Adjacent to Old Ponderosa Ranch Property

NDOT right of way along side SR 28 between Ponderosa Ranch Road and Lakeshore Boulevard is commonly used as parking to access Tunnel Creek Road and other biking/hiking trails as well as Hidden Beach on peak summer days. The width the existing shoulder available for parking varies from 12 feet to 28 feet, outside of the fog line. As noted in the East Shore Data Collection Memo, there is also a modest level of boat trailer parking along this section of highway.

For the short term, one alternative considered would formalize the existing parking by striping parallel parking spots along NDOT right of away and designate a bus loading/unloading area near the intersection of SR 28, Ponderosa Ranch Road and Tunnel Creek Road. There is sufficient right of way (both paved and unpaved) to accommodate up to approximately 90 parallel parked vehicles on both sides of the highway on the section of highway between the first driveway north of Ponderosa Ranch Road and the bike route sign roughly 500 feet south of Ponderosa Ranch Road. Additional vehicles could park farther south near Lakeshore Drive. It

should be noted that the east side of SR 28 from Ponderosa Ranch Road north to the first Ponderosa driveway is currently signed as illegal parking. This option would increase pedestrians walking across and along the highway in a relatively high speed (45 mph) area. For this reason, this option is considered infeasible.

Advantages

- Visible from SR 28
- Located only 2.8 miles from Sand Harbor
- Public property
- Compatible with existing land uses in the area

Disadvantages

- Overlap with other recreational non-shuttle user parking
- Inconvenient for shuttle passengers to walk from their vehicle to the shuttle stop with beach gear
- Safety issues: Passengers would be required to walk along SR 28 and/or cross SR 28 to reach the shuttle stop
- Increased potential for conflicts between parking vehicles and through traffic on SR 28
- Would encourage additional U turns on the highway
- Not close to existing TART stop

Over the long term, another option would be to provide a one-sided angled parking bay along the entire width of a state-owned parcel located between SR 28 and Ponderosa Inc. property. This parcel extends from 250 feet south of the intersection of SR 28 and Ponderosa Ranch Road to 140 feet south of Sweetwater Drive. The parcel is 58 feet wide (approximately 70 feet in width if the existing SR 28 shoulder area is included) and would require paving, clearing of bushes and removal of rock in some sections. One option would be to create one row of 75-degree angled parking (18 feet wide) with a 24 foot one-way northbound travel lane. A barrier would be placed on the highway side of the parking area to prevent conflicts between parked vehicles and vehicles travelling along SR 28. Another 2 to 3 feet would be required for a barrier. This would leave roughly 12 feet of shoulder on SR 28 between the white fog line and the barrier. The parking lot would be striped and signed for one-way travel in the northbound direction only. The shuttle bus would enter the parking area from the south and travel northward, stopping at several designated shuttle stops along the way. Intermediate exit points could be located at Ponderosa Ranch Road and the two existing driveways to the north. If the entire parcel were to be developed (roughly 1,479 feet long) there would be parking capacity for approximately 150 vehicles.

Tunnel Creek Properties

Tunnel Creek, LLC owns approximately 5 acres south of Ponderosa Ranch Road between SR 28 and Tunnel Creek Road. The northern end includes the Tunnel Creek Station (used as part of the Flume Trail Shuttle service) and a paved parking lot that can accommodate up to 36 vehicles. To the south, the central portion of the property is the site of a flat, unpaved parking area that could accommodate approximately 50 vehicles (though this would require paving and improvement of the access drive). The southernmost portion of the property includes a structure used as a bed & breakfast and for special events.

Overall parking available for a shuttle program is limited by the needs to accommodate parking for the Flume Trail Shuttle service (approximately 13 vehicles throughout the day) as well as special event parking needs (up to 60 vehicles) after 2:00 PM. Due to these other uses, only approximately 23 spaces would be available throughout the day for shuttle parking. In addition, the slope of Tunnel Creek Road and tight geometrics would limit the shuttle bus from serving any of the area south of the northernmost parking area. While this area could be part of a long-term larger strategy that also includes development of a parking bay along the NDOT right-of-way, this site by itself does not have the potential to support the pilot shuttle program.

Advantages

- Visible from SR 28
- Located only 2.8 miles from Sand Harbor
- Interested property owner
- Compatible with existing land uses in the area

Disadvantages

- Limited parking availability, also used by other uses
- Inconvenient for shuttle passengers to walk from their vehicle in the upper lot to the shuttle stop with beach gear
- Not close to existing TART stop

SOUTH END INTERCEPT LOT LOCATIONS

NDOT Sand Hut on US 50

The Sand Hut is located on the north side of US 50 approximately one mile east of the intersection of US 50 and SR 28 (roughly 8.6 miles from Sand Harbor). The NDOT facility is not used during the summer months and has the capacity for up to 78 vehicles, as shown in Figure 3. A passenger waiting area could be constructed out of temporary materials, and jersey barriers installed to separate parking areas from the roadway shoulder. Way finding signage would be required, particularly for shuttle patrons travelling from South Lake Tahoe that would need to travel east from SR 28 to access the parking area. A bus stop for BlueGO Route 21X service (between Stateline and Carson City) could be established at this facility.

FIGURE 3

Potential Sand Hut Intercept Parking Lot

Advantages

- Significant parking capacity
- Public property but will require coordination with NDOT
- Convenient and visible for residents/visitors from Carson City
- Easy to serve with a shuttle system
- Compatible with existing land uses
- Easy to serve with BlueGO Route 21X

Disadvantages

- Requires out of direction travel for residents/visitors from South Lake Tahoe

Old Highway Alignment North

There is an existing part dirt/part paved lot located just north of the US 50/SR 28 intersection on the old US 50/SR 28 intersection alignment (7.6 miles from Sand Harbor). A small portion of the lot is currently used by hikers to access Spooner State Park. The lot has the potential for approximately 45 parking spaces, with the bus turning around through the parking area.

This area is adjacent to the diverge point for the US 50 westbound free right turn lane onto SR 28. As the center of US 50 at this point has barrier striping (double double yellow), the eastbound left turn movement into the lot and southbound left turn movement out of the lot are illegal movements. In addition, buses waiting to make a left turn movement into the lot would be waiting near the end of the existing left turn acceleration lane for southbound left turn movements from SR 28 to US 50. As drivers following a bus would not expect the bus to stop in this acceleration lane, this could be an unsafe movement. Buses would therefore need to proceed east past this lot, make a U-turn at the Sand Hut site and return.

In the longer term, it may be possible to provide access to this area directly from SR 28, by paving a new access drive on the east side of SR 28 from an intersection approximately 500 feet north of US 50. While this drive could use the grade of an old turn lane, it is also where the eastbound-to-northbound ramp merges with the SR 28 northbound travel lane, which would create traffic concerns. Avoiding the merge area would require the new access point to be at least 800 feet from US 50, which would greatly increase the amount of fill needed and thus increasing the cost and impacts associated with this new access drive.

Advantages

- Visible from highway for all users travelling from the south
- Compatible with existing land uses

Disadvantages

- Small parking capacity

- Potential overlap with parking for Spooner Lake area of the state park
- Limited legal/safe access makes this site infeasible without construction of new access

Tubing Hill on Old Highway Alignment West

A similar lot exists on the west side of the US 50/SR 28 intersection on the old highway alignment. This lot and the roadway leading to it from the north are paved. Boat inspections are currently conducted in the lot during the summer months. For this reason, only a few shuttle parking spaces would be provided in the actual lot. The remainder of parking would have to be provided along the old roadway in the form of parallel parking. The roadway has the potential for approximately 50 parking spaces (one side of the road only). There is room for a bus turnaround and unloading/loading area next to the boat inspection area; however the shuttle may be required to wait in the boat inspection line if there is a long queue. If boat inspections were move to a different location, this location would become a more feasible alternative.

Advantages

- Visible from highway for all users travelling from the south

Disadvantages

- Conflict between shuttle bus, shuttle users and boat inspection program
- Small parking capacity
- Relatively long walk for shuttle users between vehicle and shuttle stop

Other Locations

Two other locations were considered for the South End of the study area:

- NDOT maintenance facility on US 50 south of the US 50/SR 28 intersection – According to NDOT staff there is a possibility this location would work as an intercept parking lot but other locations are better alternatives.
- USFS Forest Service Facility on US 50 of the US 50/SR 28 intersection – Per US Forest Service (USFS) staff, this would not be a feasible alternative.

Summary of Potential Lot Locations

Tables 1 and 2 summarize key points for each intercept parking lot alternative for the north and south ends of the study area respectively in terms of their short-term and long-term potential. In the north end of the study area, the Diamond Peak lot and Old Elementary School stand out as having the greatest potential for an intercept parking lot in the short term. The Diamond Peak Lot has sufficient parking capacity that is not in conflict with other summer uses. The Old Elementary School is not currently in use; however there is only limited parking capacity at present. The short-term option of parking along the existing SR 28 highway shoulders would create safety issues.

Table 1: Transit Shuttle Intercept Parking Lot Alternatives -- North End

Alternative	Short-Term: Distance from Sand Harbor (Miles)	Short-Term: Number of Parking Spaces	Short-Term: Overall Potential High	Short-Term: Overall Potential Med	Short-Term: Overall Potential Low	Long-Term: Number of Parking Spaces	Long-Term: Overall Potential High	Long-Term: Overall Potential Med	Long-Term: Overall Potential Low
Incline Village High School	5.0	100		☒		150		☒	
Incline Village Middle School	4.5	73			☒	75			☒
Old Incline Elementary School	5.1	60		☒		60		☒	
New Incline Elementary School	4.8	75			☒	75			☒
Diamond Peak Ski Area	4.6	200+		☒		200+		☒	
NDOT Parcel Adjacent to Old Ponderosa	2.8	90			☒	150	☒		

Source: LSC Transportation Consultants, Inc.

Table 2: Transit Shuttle Intercept Parking Lot Alternatives -- South End

Alternative	Short-Term: Distance from Sand Harbor (Miles)	Short-Term: Number of Parking Spaces	Short-Term: Overall Potential High	Short-Term: Overall Potential Med	Short-Term: Overall Potential Low	Long-Term: Number of Parking Spaces	Long-Term: Overall Potential High	Long-Term: Overall Potential Med	Long-Term: Overall Potential Low
NDOT Sand Hut	8.6	78	☒			78	☒		
Old Highway Alignment North	7.6	45			☒	100	☒		
Tubing Hill/Old Highway Alignment West	7.6	50			☒	50		☒	

Source: LSC Transportation Consultants, Inc.

Over the long-term, establishing an intercept parking lot adjacent to the Old Ponderosa Ranch has greatest potential, as this is significantly more visible and convenient for shuttle passengers and would result in a shorter and more efficient shuttle service. This could be a combination of spaces within NDOT right-of-way, potentially combined with parking on the Tunnel Creek, LLC parcels.

The south end of the study areas has fewer options. The NDOT Sand Hut has sufficient capacity and would not conflict with other uses, therefore the potential for this site is high. The Sand Hut would be less convenient for East Shore users travelling from South Lake Tahoe; however, Sand Harbor surveys have indicated that fewer visitors travel from this location.

BEACH ACCESS STOP LOCATIONS

This section considers potential shuttle stops at locations along the East Shore beaches, considered from north to south.

Rocky Point (Hidden Beach North End)

Some beachgoers currently access the shoreline between the residential area near Rocky Point and Tunnel Creek by parking, walking or being dropped off and leaving the highway at the south end of the residential area. There is a short (roughly 100 foot) shoulder parking area south of the residential only parking zone that could accommodate a southbound bus. However, there is no room in this area (or anywhere close by) that could accommodate a northbound bus. Transit service to this area is therefore not feasible.

Tunnel Creek (Hidden Beach South End)

A stop at Tunnel Creek would provide convenient access to the popular Hidden Beach area, approximately 300 feet away via an established trail. There is an unpaved dirt pullout area on the east side of SR 28 approximately 30 feet wide by 120 feet long. While not ideal, it would be possible to serve a stop on the east side of the roadway with both northbound and southbound buses. As shown in Figure 4, a passenger waiting area would be provided just north of the Tunnel Creek Road Connector, where passengers would be requested (by signage) to wait for buses in either direction. The northbound bus would pull out of the northbound travel lane and stop adjacent to this waiting area. The southbound bus would make a left turn off of SR 28 and stop north of this waiting area, which provides a better line of sight for the movement returning onto SR 28 and also allows a northbound bus to pull off of the state highway even if a southbound bus were present. (In reality, the chances of this occurring would be quite small).

A better permanent stop could be constructed at this location that provides the southbound bus loading area east of the passenger waiting area. However, this would require some vegetation removal, earthwork and pavement, and is not feasible for the summer of 2012.

Beachgoers would need to cross SR 28 at grade, at least in the short term. However, this is a viable option as (1) counts conducted in August 2011 indicates that there are adequate gaps in the traffic stream to provide for pedestrian crossings and (2) there is adequate sight distances both for pedestrians to judge the adequacy of gaps in traffic and for oncoming drivers to make safe stops. Observation of traffic gaps conducted as part of the Stateline-to-Stateline North Demonstration Project conducted on August 13th indicated that, even in the peak hour, there were 78 gaps per hour of 11 seconds or more (more than enough for a bus to pull out into traffic). On average, a gap in traffic in both directions adequate to allow a southbound bus to pull into traffic occurs once every 45 seconds. The existing deficient condition wherein the established State Park trail to Hidden Beach requires trail users to climb over a guardrail would need to be addressed, by providing a gap in the guardrail that meets NDOT design criteria.

Use of this turnout as a transit stop would require the elimination of any parking activity. It may be possible to accommodate a van and driver loading/unloading cyclists, immediately in front of the connector roadway gate.

FIGURE 4

Potential Tunnel Creek/Hidden Beach Transit Stop

Sand Harbor

Before considering specific stop locations, this discussion first evaluates possible access route for transit vehicles that could minimize delays associated with traffic congestion.

Access Route

One option is to provide the bus drivers with the ability to actuate opening the gate on the south access drive to allow entrance at this point, allowing a clockwise circulation through the parking lot. One challenge to this is that there is only roughly 37 feet between the gate and the edge of the southbound SR 28 travel lane. A 40-foot bus (particularly one with a bicycle rack) would not have sufficient space to wait while the gate opens without partially blocking the southbound travel lane. For buses traveling in the northbound direction, the driver can pull into the center median, activate the gate and wait for it to open without proceeding. However, in the southbound direction there is not a safe place to wait, as there is only roughly 5 feet of gravel shoulder.

One means of solving this problem would be to widen the shoulder along the east side of SR 28 for roughly 60 feet north of the south park driveway. However, this would tend to encourage additional auto shoulder parking (legal or not). The other option would be to reconstruct the gate approximately 20 feet to the west (just east of the parking lot driveway), to allow buses to pull in front of the gate to and activate it. This appears to the better solution, particularly as it avoids creating new coverage.

Another option that relies on personnel rather than physical changes to aid bus movements during periods of entering traffic delays would be to momentarily stop exiting traffic at the main entrance just west of the entrance booth, allow the exiting traffic to clear, and then allow entering buses to use the exit lane. This would take advantage of the fact that exiting traffic during the morning “load in” period is relatively light. This is probably only feasible at times when the bus is waiting in the queue in the southbound right turn lane or the northbound left turn lane on the highway, as it would not be safe for the bus to stop in these lanes to wait for the outbound lane to be cleared absent an inbound queue. Two State Park personnel would probably be needed to make this strategy work: one to stop exiting traffic, and a second to prohibit auto drivers from following the bus into the outbound lane.

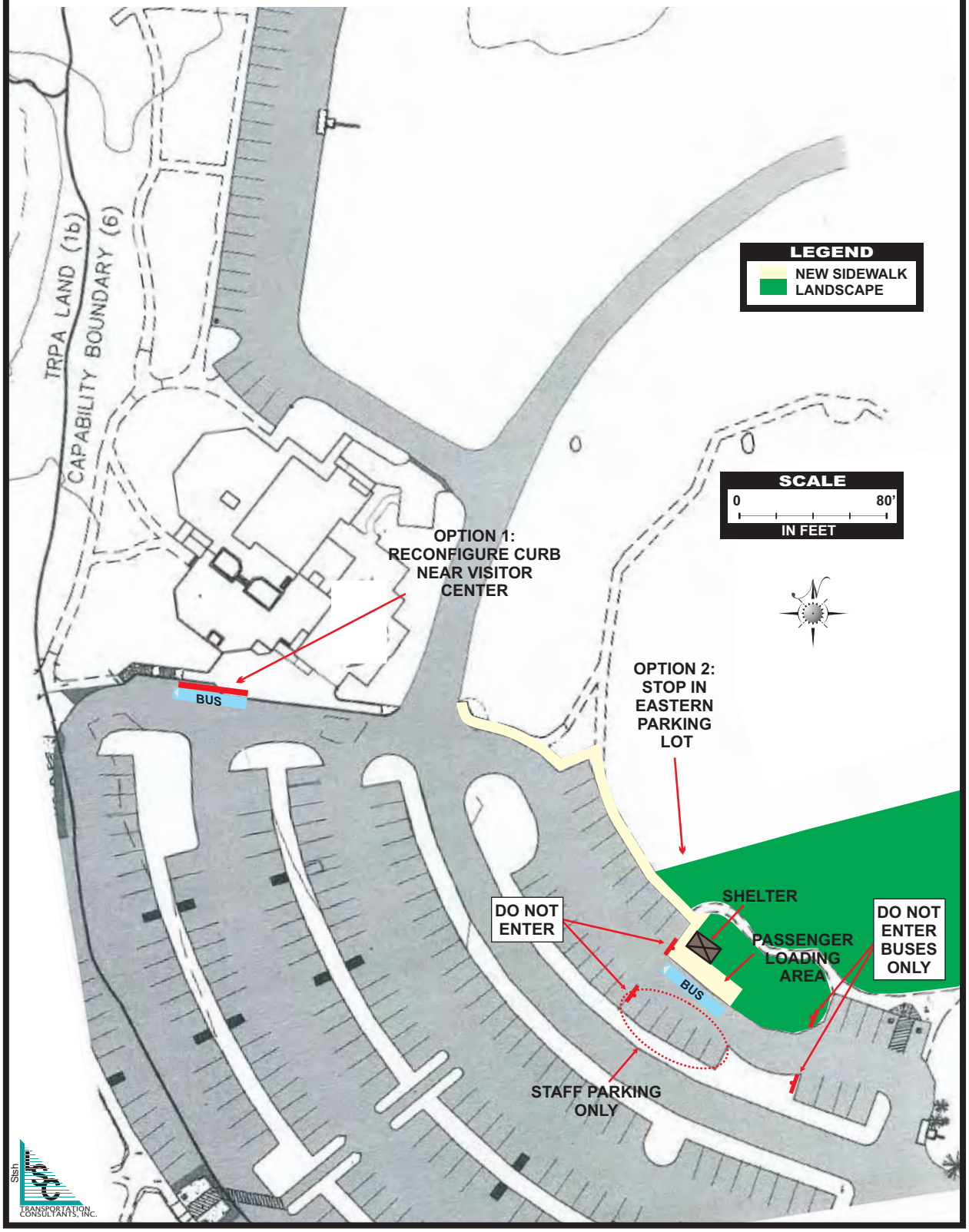
Other options were also considered that would require more extensive capital improvements, such as (1) provision of a transit-only entrance lane at the main gate, or (2) provision of a transit-only actuated gate along the boat ramp entrance road and a reconfigured driveway network providing access to the maintenance area driveway and ultimately to the main parking area access drive. Both would be infeasible for summer 2012.

It bears noting that any traffic congestion along SR 28 created by southbound drivers waiting in the through travel lane to turn right into Sand Harbor affects transit vehicles as much as other vehicles. Solving the existing traffic delays on the state highway is therefore an important consideration in the operation of an efficient and dependable transit service.

Initial Transit Stop

Two options were considered for a short-term initial transit stop in Sand Harbor: adjacent to the Visitors Center, and in the northeastern-most parking bay. Both of these options are shown in Figure 5.

FIGURE 5
Potential Short-Term Sand Harbor Transit Stop Options



The simplest option would be to designate a bus stop along the north side of the main parking lot, immediately adjacent to the Visitors Center. Optimally, the existing curb (which includes a short "jog") would be reconfigured to provide a 40 feet long straight curb section. This would provide a bus loading zone that accommodates the minimum wheelchair loading area (8 feet perpendicular to the bus and 5' parallel to the bus) needed to meet the requirements of the Americans with Disabilities Act, and would also avoid having non-wheelchair users having to step down into the drive lane before stepping up into the bus or the curb (a potential tripping hazard). Buses could access this stop from either the north or south, but would need to circulate through the westernmost parking bay when exiting. There is a relatively high potential for the bus to be delayed by traffic and pedestrian activity at this busy location.

Alternatively, a transit stop convenient to the Visitors Center and the Main Beach area could be created in the northeastern-most parking bay of the main parking area. As also shown in Figure 5, there is a center area of this parking bay that has parking on one side only where a bus bay could be created with minimal impact to parking and circulation. This site plan has the following characteristics:

- Buses would enter from the south and stop at a single loading area (there is sufficient space behind this loading area for a second bus).

- The six existing auto parking spaces opposite this bus loading area would be limited to employee and Parks vehicles only, in order to minimize the potential for conflict between the bus and auto movements. If a parks employee needs to exit while a bus is laying over between runs, the bus driver could back into the adjacent area without parking on either side.

- No Entry signs would be posted on either side of both ends of this area. Private vehicle drivers could use the remaining parking areas as single-ended parking bays, with minimal inconvenience.

- A passenger loading "sidewalk" area would need to be created, approximately 40 feet long and 10 feet wide. This area could be paved, which would allow wheelchair loading/ unloading. If paving is not possible for the first few years of transit operation, a compacted decomposed granite surface may be sufficient, with any wheelchair loading/unloading occurring roughly 100 feet to the south in the parking area adjacent to the disabled parking spaces.

- A short walkway would also be needed to tie the loading area to the existing sidewalk along the south side of the parking lot.

- A transit shelter would be installed on a temporary basis.

This transit facility would be only roughly 250 feet from the Visitors Center. Note that the geometrics of the parking lot does not allow a full-sized 40 feet bus to make an immediate U-turn between the center access drive and the adjacent parking bay (at least without eliminating some existing parking spaces). There is sufficient space, however, for buses to turn from the center access drive into the parking bay traveling in the same direction. Buses entering from SR 28 via the south access point and exiting via the north access point would be able to directly pull into and out of this parking bay. If buses must enter from the north access point, the driver would first need to make a right turn into the first parking bay southwest of the center access

drive, turn left to cross the center access drive to the south, and then turn left into the bus loading area.

An alternative site was considered at the northern end of this northeastern parking bay, just off of the center access drive. This section of the parking bay drive, however, is curved to the left, which would result in a "gap" between the curved edge of curb and the bus, which would be a potential hazard.

On balance, the first option (immediately adjacent to the Visitors Center) is recommended, so long as traffic/pedestrian congestion does not unduly impact the transit service. If this proves to be the case, the second option could be considered.

Permanent Transit Stop

While beyond the scope of an initial transit plan, an example site plan was developed for a transit station that could serve Sand Harbor over the long term. As shown in Figure 6, this consists of a new transit-only roadway loop in the northern quadrant of the main access drive and the group picnic/ramada parking area. Buses would circulate clockwise to access the two bus bays, and could enter or exit in both directions. There is sufficient space in the resulting center island for a larger transit structure (potentially with restrooms), outside seating areas, and bicycle racks.

Another potential site for a permanent transit stop would be along the eastern side of the main access drive opposite the Visitor Center between the main parking area and the group picnic/ramada parking area. Bus bays would be created by widening the east side of the access drive by approximately 12 feet for a length of approximately 100 feet, with an adjacent 10-foot-wide passenger loading area as well as a bus shelter. This option would require all buses to enter from the south drive and exit to the north, or enter and exit from the north and use the parking bays to turn around. This option would also have an impact on the adjacent picnic area.

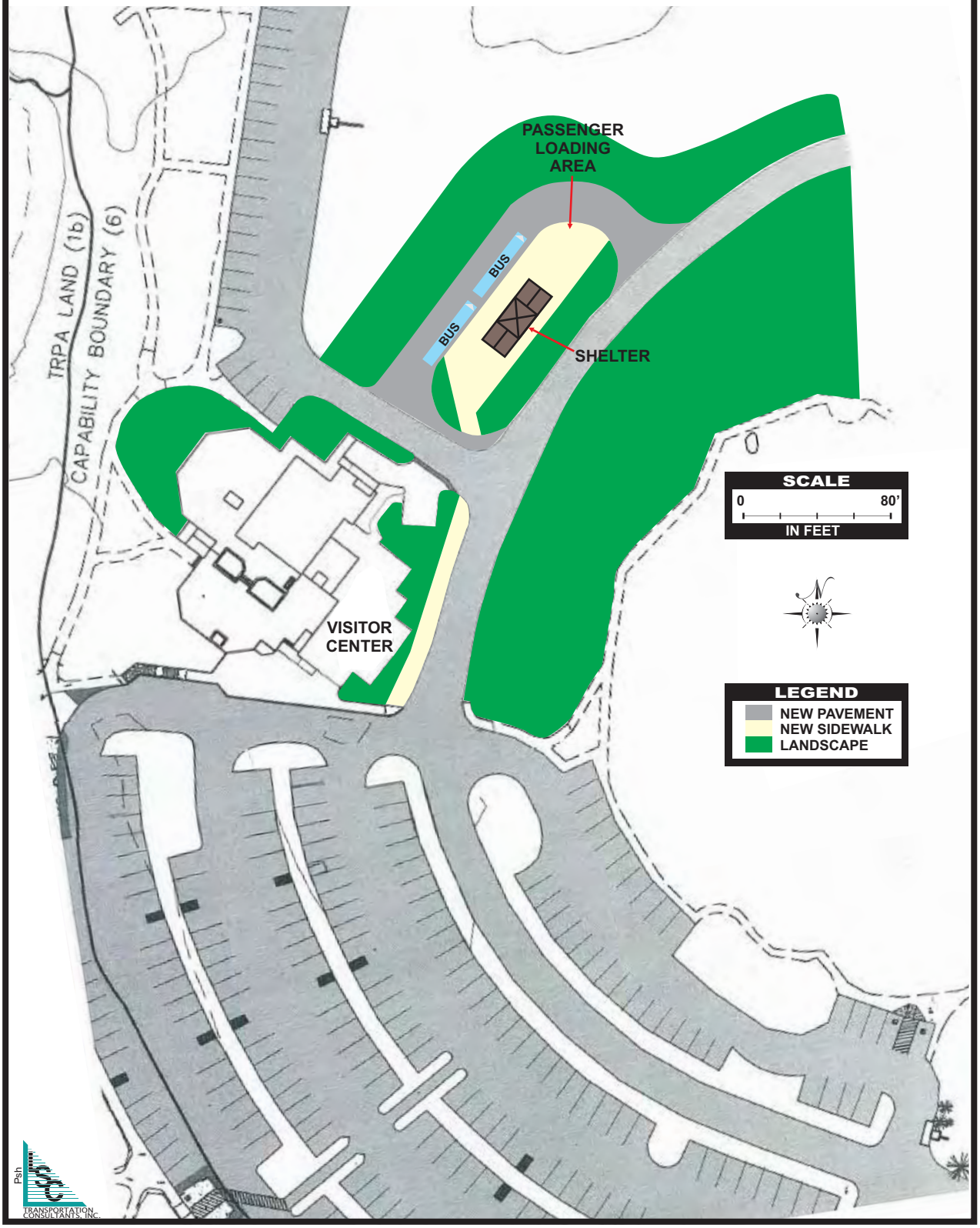
Memorial Point

A transit stop at Memorial Point could serve persons going to the nearby beaches and rocks. However, the capacity of this area to accommodate new beachgoers is very limited. It would not be feasible to turn a northbound bus in and out of the parking area to circulate through the parking area southbound, as there is not sufficient space for turning movements and due to limited driver sight distance. Northbound buses would therefore have to pull through the parking area in the northbound direction, which would require passengers to load on the east side of the parking area, and would also create a challenge to bus drivers gauging an adequate gap in northbound traffic when pulling out onto SR 28. For these reasons, a stop at Memorial Point is not recommended.

Secret Harbor

Secret Harbor, Secret Cove and Chimney Beach can be accessed from the USFS southern parking lot. Walk distance to Secret Cove and Chimney Beach is relatively short (roughly 0.6 and 0.4 miles, respectively), while the walk distance to Secret Harbor is roughly 1.1 miles. The USFS South Lot has adequate geometry for a full-sized bus to circulate through the loop (so long as vehicles are not parked in the drive lane), and adequate sight distance for exit back onto the highway. There is space for a bus bench or shelter at the south end of the loop (adjacent to

FIGURE 6
Potential Permanent Sand Harbor Transit Station



the gated dirt road leading to the beaches). If served, buses in both directions would circulate through the parking lot.

There are currently other access options to these beaches. Shoulder parking (roughly 0.5 miles to 0.8 miles south of the USFS South parking lot) is accessed by a series of formal and informal trails, providing a shorter walk to Secret Cove and Secret Harbor. However, there is no opportunity for a northbound bus stop at this location. In addition, the USFS North parking lot provides an alternate walk to Chimney Beach of equal length (0.4 miles) to that from the South parking lot. However, there is not sufficient space in this parking area to turn a full-sized bus around, and use of this lot would require transit riding beachgoers to cross SR 28. It is therefore recommended that any access to these beach areas be provided at the USFS South lot.

Skunk Harbor

There is no shoulder area available on the east side of SR 28 to accommodate a bus stop in the northbound direction. While there is a shoulder area approximately 40 feet in width on the west side of the highway roughly 900 feet to the north of the Skunk Harbor access gate, this width is not sufficient for a northbound bus to safely pull off on the west side of the road and then re-enter the northbound traffic. It is therefore not feasible to serve a stop at this location without substantial construction.

Section III
Service and Fare Alternatives

This section first presents an evaluation of potential ridership for a shuttle service. Building upon this, a wide range of service options are then considered, reflecting various combinations of routes, service headways, hours of service, and days of service. Operating costs are then estimated for each alternative, along with potential passenger revenues. Based upon this analysis, a series of performance measures are assessed.

POTENTIAL RIDERSHIP

Ridership on an East Shore shuttle program would be generated in large part by parking constraints at the beach sites, along with the desire by non-auto travelers to access the beaches.

Ridership Generated by Sand Harbor Parking Constraints

The key factor that would drive transit use is the limited parking availability at Sand Harbor (and other beach areas). Surveys indicated that 96 percent of Sand Harbor visitors use a personal vehicle to enter the site, and much of the remaining 4 percent can be expected to consist of those parking along the roadway shoulders and walking in. In the summer of 2011, the Sand Harbor main lot filled on 47 days (and was closed to new entrants on-and-off for up to several hours). This includes 44 consecutive days from July 4th to August 15th. Surveys conducted in the summer of 2010 indicated that 51 percent of visitors reported that they had been unable to enter the park in the past due to lack of available parking. Of these, 55 percent indicated that they had then parked along the shoulder. The remaining 45 percent can be considered potential visitors who decided to forego their visit to Sand Harbor once they found themselves unable to easily park in the vicinity. These “discouraged visitors” are prime potential users of a shuttle program.

To quantify ridership, therefore, it is first necessary to quantify the number of vehicles per day that are not accommodated at Sand Harbor. The best available source of data regarding daily vehicle access patterns is the entrance traffic counts conducted by the State Park staff. Daily count data for July and August, 2011, was obtained. As count data for the other months in the potential transit shuttle calendar is only available by month, LSC factored the monthly totals by observed daily variation in usage at other Tahoe recreational sites to estimate the daily entrance vehicles for these other months. The resulting daily counts are shown in Figure 7, and reflect the strong concentration of visitation in July and August.

From the operational data, it was determined that parking capacity within Sand Harbor is reached on days when the daily entrance count reaches or exceeds 1,080 vehicles. Comparing the existing parking capacity (532) with this figure and the maximum entering volume (1,444) on any one day, it is estimated that there is currently an unmet demand of up to 179 vehicles per day. In addition, in the summer of 2012 shoulder parking prohibitions are planned for the segment of SR 28 from Memorial Point on the north to the IVGID Pump Station on the south (a distance of roughly 1.5 miles). Counts conducted in the summer of 2011 indicate that up to 155 vehicles were observed to be parked in this area. Considering the observed turnover rate in these spaces (1.3 vehicles per space per day), there were a total of 202 vehicles that were parked in this area over a peak summer day. The visitors in these cars are additional potential

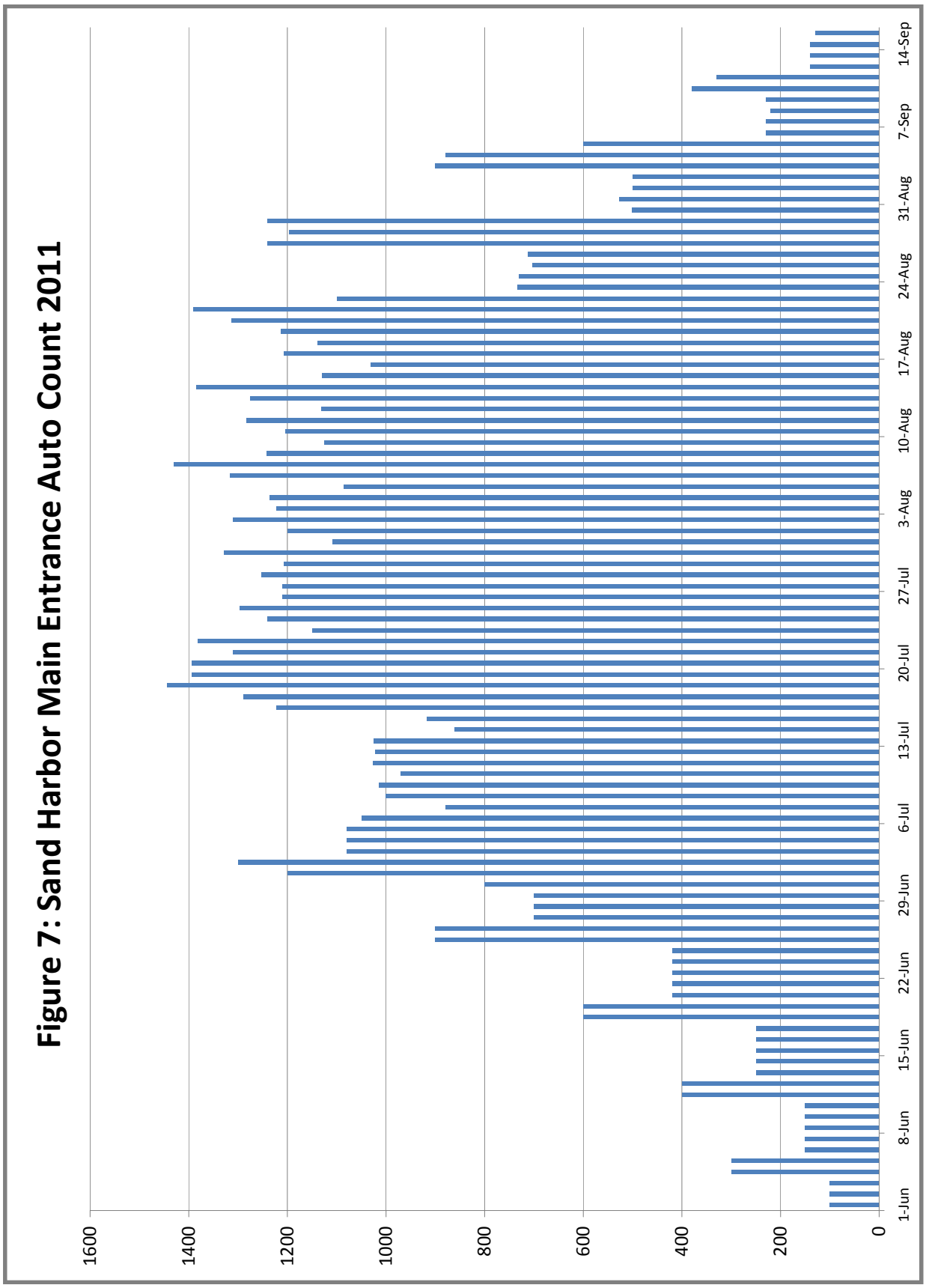


Figure 7: Sand Harbor Main Entrance Auto Count 2011
1600
1400
1200
1000
800
600
400
200
0
1-Jun
8-Jun
15-Jun
22-Jun
29-Jun
6-Jul
13-Jul
20-Jul
27-Jul
3-Aug
10-Aug
17-Aug
24-Aug
31-Aug
7-Sep
14-Sep

users of a shuttle service. With this reduction in shoulder parking, there will be a total of 381 individual vehicle travel parties on the day of highest demand that could potentially make use of an intercept parking program.

Ridership Generated by USFS Beach Parking Constraints

Parking shortage also discourages visitation at the USFS lots. Counts conducted on a summer Saturday in 2011 indicates that both lots were full to capacity even by 10 AM, and did not start to fall below capacity until 4 PM. However, there is nearby shoulder parking that has more than adequate legal capacity to accommodate beachgoers (though some require a relatively long walk along the roadway). This potential unmet parking demand (those drivers that would choose use of a shuttle program over a walk along the roadway) is therefore estimated to be relatively small (a maximum of 20 vehicles).

Ridership Generated by Hidden Beach Parking Constraints

The shoulder parking areas most convenient to Hidden Beach reach capacity at peak times. However, there is much capacity (space for 146 vehicles, of which only roughly 50 are currently used) along the highway between Lakeshore Drive and Sweetwater Road. A driver finding no parking convenient to Hidden Beach would be faced with two options, assuming the travel group does not simply choose a different beach destination:

- Walking from a parking space around the Lakeshore Drive intersection (perhaps after dropping passengers and gear at the south end of the residential only zone), which is roughly a 10-minute (half-mile) walk.

- Using the shuttle service, which entails the various factors (wait time for the bus, limited ability to bring gear and pets, etc.)

Given these options, most Hidden Beach users would opt for walking from Lake Shore Drive. A maximum of 30 vehicles per day associated with use of the Hidden Beach area is estimated to generate potential shuttle ridership.

Summary of Beach Parking Unmet Demand

In total, parking demand for up to 431 vehicles per day cannot be accommodated by parking supply within the East Shore (after the planned reduction in shoulder parking near Sand Harbor). Factoring this total by the observed variation in daily vehicle access (as reflected in Figure 7, above), yields estimates of daily unmet parking demand over the course of the summer season, as shown in Figure 8. Review of this figure yields several key conclusions regarding potential demand generated by auto drivers/passengers that cannot park within the corridor due to parking limitations:

- The large majority of the unmet parking need is generated by Sand Harbor, rather than by the smaller, more remote beaches to the north and south. Over the course of the summer, Sand Harbor represents roughly 91 percent of the overall parking shortage.

- Potential shuttle ridership associated with persons unable to park within the corridor is limited to a relatively short season stretching from the latter part of June to Labor Day.

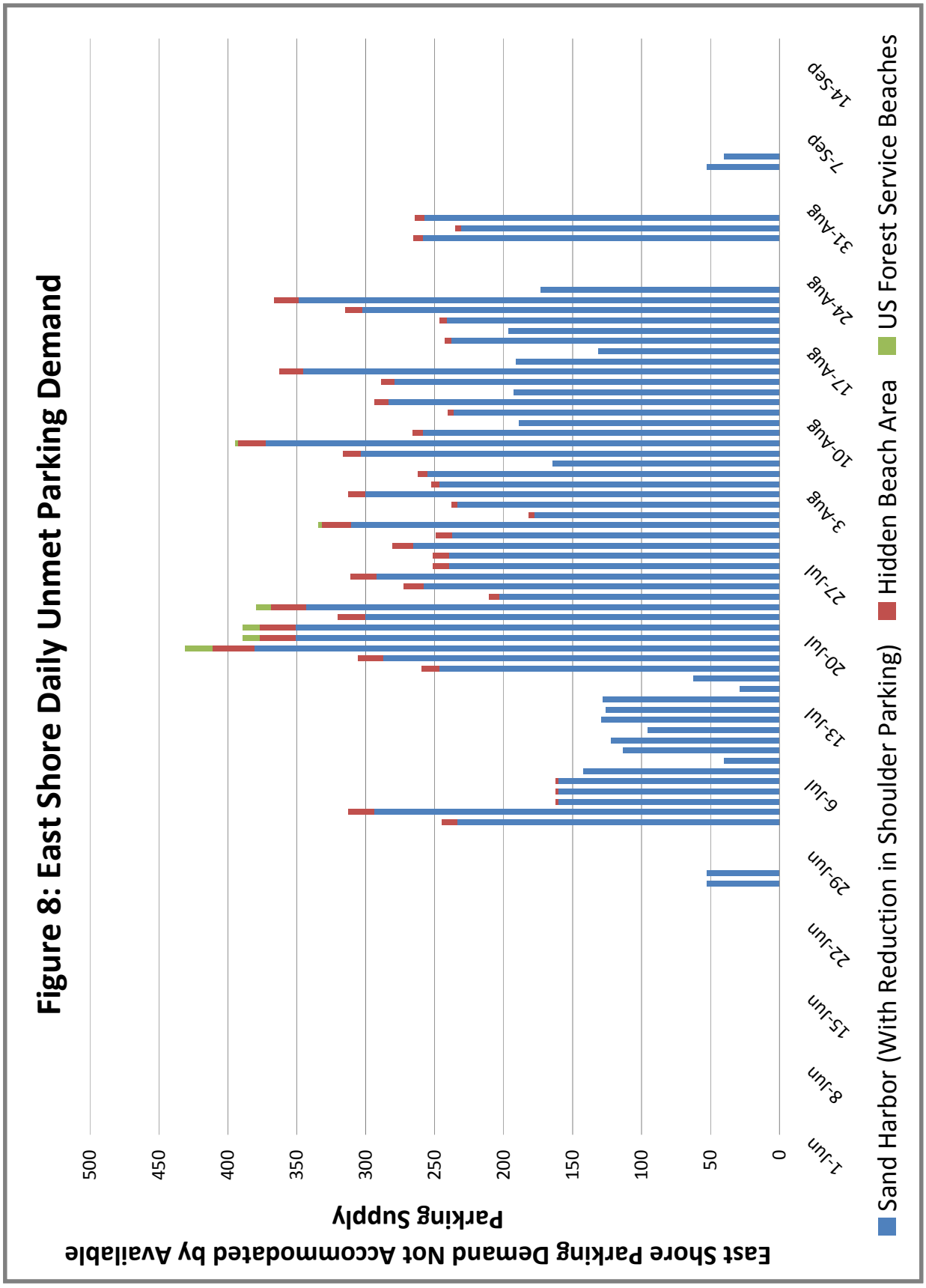


Figure 8: East Shore Daily Unmet Parking Demand
East Shore Parking Demand Not Accommodated by Available Parking Supply
500
450
400
350
300
250
200
150
100
50
0
1-Jun
8-Jun
15-Jun
22-Jun
29-Jun
6-Jul
13-Jul
20-Jul
27-Jul
3-Aug
10-Aug
17-Aug
24-Aug
31-Aug
7-Sep
14-Sep
Sand Harbor (With Reduction in Shoulder Parking)
Hidden Beach Area
US Forest Service Beaches

At Sand Harbor, the average vehicle occupancy (based on surveys) is 3.80 visitors per vehicle, while for the more remote beaches this figure is 2.9. Factored by the proportion of potential shuttle ridership to the various areas, the overall vehicle occupancy ratio is 3.7. Multiplied by the peak daily number of potential intercept vehicles, up to 1,595 individuals could be potential shuttle users due to lack of parking.

It is important to note that not all of the beachgoers traveling in these vehicles will choose to use an intercept shuttle service. Faced with an inability to park at their desired destination, individual travel groups may choose to travel to another Tahoe beach area, or simply choose another activity. A series of factors that reduce overall use of an intercept shuttle program are discussed below.

Non-Auto Access Shuttle Ridership Demand

Beyond auto drivers/passengers, it can be expected that East Shore beachgoers traveling by other modes would also make use of a shuttle service:

- Incline Village is served by the Tahoe Area Regional Transit (TART) service, which provides access along the SR 28 corridor from Tahoe City every half-hour in the summertime with connecting service at lower frequency to Truckee, the West Shore, and Squaw Valley. This could provide relatively convenient access from lodging and residential areas along the North Shore. Considering the proportion of existing TART ridership making recreational trips, if a convenient connection can be made with the East Shore shuttle service a potential demand of 30 transferring passengers per day is estimated.

- BlueGO Route 21X provides public transit service along US 50 between South Lake Tahoe and Carson City. The route serves this corridor five times per day on weekends and six times per day on weekdays (four of which are also within the potential span of service for the shuttle program). While there is not currently a stop at Spooner Summit, one could easily be established at a shuttle bus intercept lot. In Carson City, Route 21X provides connections with the Jump Around Carson (JAC) public transit program, while in South Lake Tahoe the BlueGO local routes provide access to other portions of the South Shore urbanized area. As a result, it would be possible for residents/visitors starting in the bulk of both the Carson City and South Shore areas to use transit for their entire trip to East Shore beaches. The inconvenience associated with multiple transfers, however, has been proven to dissuade a large majority of persons that might otherwise consider public transit as an option. Passengers wanting to access Lake Tahoe beaches that board Route 21X, moreover, would find it more convenient to simply travel to beaches already served by Route 21S (such as Zephyr Cove). Overall, the potential for transit passengers transferring from Route 21X is estimated to be limited to 10 persons per peak day.

- On the north, the shuttle service could also serve bicyclists and pedestrians coming from residences and lodging properties in the Incline Village area. Incline Village's network of multipurpose paved paths would encourage this travel pattern, particularly if a stop is convenient to the trails system. Based on observed bicycle/pedestrian activity in the area, it is estimated that a total of 30 persons per day accessing the shuttle system by walking or bicycling. As a largely undeveloped area, the number of persons that would access a Spooner Summit transit stop would be minimal.

Including the potential passengers parking in the intercept lots, a total potential demand of up to 1,665 round-trips per day is estimated.

Factors Affecting Actual Ridership

While the discussion above considers total potential demand, there are a range of factors that dissuade potential riders from actually using a transit service:

- **"Transfer Penalty" –** Any transfer between travel modes requires time and inconvenience to the traveler. In this case, an auto traveler at a minimum would be required to invest the time to access the parking lot and walk to the transit stop. Research indicates that transit use is reduced by approximately 10 percent for each transfer.

- **Service Frequency** – As the frequency of service declines, the average wait for the next departure increases. Ridership reduction associated with changes in service frequency can calculated based upon an "elasticity analysis." This reduction is estimated to equal 15 percent for a 15-minute service frequency, 25 percent for a 20-minute frequency, and 36 percent for a 30-minute frequency.

- **Hours of Service** – A 12-hour service day (8:00 AM to 8:00 PM) would accommodate 100 percent of the potential parking demand. A review of parking rates indicates that a shorter 9:00 AM – 6:00 PM span of service would serve 85 percent of the total demand, or 15 percent less.

- **Days of Service** – All of the days on which any of the parking areas reach capacity are within the shorter (June 15 – Labor Day) alternative. Therefore, no reduction in potential ridership transferring from autos is associated with this factor.

- **Carrying Equipment** – Beachgoers carrying coolers, sand chairs and other large equipment could be dissuaded from using a transit shuttle service due to the inconvenience associated with handling the equipment (even if racks are provided in the vehicles for equipment). Surveys indicate that 15 percent of beachgoers to Hidden Beach and Secret Harbor are carrying large equipment, while 40 percent of Sand Harbor beachgoers are doing so. Given that space will be provided in the vehicles and the bus stops will be conveniently close to the beaches, it is estimated that a third of persons carrying large equipment would not use the transit shuttle due to this factor. Overall, this factor is estimated to reduce ridership by 13 percent.

Actual ridership resulting from these factors will vary, depending on the specific characteristics of the service. Ridership associated with various alternatives is discussed below.

Ridership Proportion by Access Route

Surveys of visitor's home zip code indicates that approximately 80 percent live in areas that are most conveniently access via SR 28 to the north, and the remaining 20 percent via SR 28 to the south. However, this does not reflect visitors staying overnight in nearby lodging. While there is substantial lodging in South Tahoe, there are also intervening beach-going opportunities (Nevada Beach, Zephyr Cove, etc.), while Sand Harbor is the most convenient available Tahoe beach to Reno/Sparks. In addition, intersection turning movement counts indicate that roughly 90 percent of actual entering and exiting vehicles on a peak summer day are to/from the north. The access route distribution for the southern portion of the corridor is substantially different than at Sand Harbor. Counts at the two USFS parking lots indicate that approximately 38 percent of access is to/from the south, and 62 percent to/from the north.

SERVICE ALTERNATIVES

A wide range of potential service alternatives were developed for evaluation. These alternatives vary by the following characteristics:

- **Route Length** – Incline Village to Sand Harbor versus Incline Village – Sand Harbor – Spooner Summit.
- **Calendar of Service** – A longer seasons stretching from June 1 to September 15th versus a shorter season from June 15 through Labor Day.
- **Span of Service** – A longer daily period of service from 8:00 AM to 8:00 PM versus a shorter span from 9:00 AM to 6:00 PM.
- **Service Headway** – The time between successive bus departures (service headway) was evaluated for 15, 20 and 30 minutes.

A first step in evaluating these alternatives was to identify the operational "cycle length," defined as the time necessary for a single bus to make a complete round-trip and be ready for the next departure. For purposes of this analysis, the Incline Village intercept lot was assumed to be at Diamond Peak, while the Spooner Summit intercept lot was assumed to be at the NDOT sand hut. Travel time along the various routes was observed in peak summer mid-day conditions. In addition, traffic studies conducted along the corridor were referenced to identify average delays at intersections, and passenger boarding/deboarding times were estimated based on expected ridership levels. The resulting analysis of route running time is presented in Table 3. As shown, a cycle length of 31.2 minutes is conservatively estimated for the Incline Village – Sand Harbor route, and 65.0 minutes for the Incline Village – Sand Harbor – Spooner Summit route. Including recovery time, an operating schedule that assumes a 40-minute cycle length on the shorter route would provide roughly 9 minutes every round-trip for recovery time and a short driver break. Adding 10 minutes for recovery/break time, the full route could be operated on a 75 minute cycle length.

TABLE 3: Evaluation of Route Running Time

From	To	Distance (Miles)	Speed (MPH)	Base Time (Sec)	Stop Delay (Sec)	Total Time (Min)
Incline Village Stop					180	3.0
Diamond Peak Lot	Hyatt	1.36	25	196	60	4.3
Hyatt	Lakeshore Drive/SR 28	0.86	25	124	60	3.1
Lakeshore Drive/SR 28	Tunnel Creek	0.83	40	75	0	1.3
Tunnel Creek Stop					60	1.0
Tunnel Creek	Sand Harbor	1.69	35	174	0	2.9
Sand Harbor Stop					180	3.0
Sand Harbor	USFS South Lot	2.57	40	231	0	3.9
USFS South Lot Stop					80	1.3
USFS South Lot	SR 28 / US 50	5.03	45	402	0	6.7
SR 28 / US 50	Spooner Summit (Sand Hut)	1.09	45	87	30	2.0
Spooner Summit Stop					180	3.0
Total Cycle Length -- Incline Village : Sand Harbor						31.2
Total Cycle Length -- Incline Village : Spooner Summit						65.0

Considering both the cycle length and the route length, the operating characteristics of the various scenarios were calculated, as shown in Table 4. This table also reflects peak buses that would be needed on the busiest of days to provide adequate capacity during the mid-morning peak in passenger activity. Table 5 presents this analysis, assuming a seating capacity of 32 passengers per bus and no standees. As shown, up to 7 bus departures will be needed from Incline Village during the peak hour on the busiest days in order to avoid leaving passengers at the curb. As the 40-minute cycle length indicates that each bus can provide two departures in this peak hour, a total of four buses will be needed at this peak time. A review of the variation in access over the summer season indicates that these additional buses (over the buses necessary for the base schedule) will be needed approximately 33 days of the year (15 days with one additional bus and 18 days with two additional buses) at full ridership levels.

Table 4 reflects the wide variation in the scope of the transit program that would be necessary under the various alternatives. As indicated, the number of peak buses needed in day-to-day operation ranges from two to five. Including the peak buses, this figure ranges from four to six. The annual hours of service ranges from a low of 1,530 to a high of 6,456.

Alternative Operating Costs

Table 4 also presents the estimated marginal operating costs associated with the various alternatives. This was calculated at a rate of $84.00 per vehicle service hour. This rate is based on the recently-negotiated contract with the BlueGO service contractor (Keolis Transit America, Inc). It includes the following:

- Drivers
- Maintenance
- Fuel and oil
- Contractor insurance
- TTD overhead

It does not include other costs associated with the program (marketing, vehicle storage, bus stop improvements, monitoring). Note that this rate is applied to the vehicle service-hours (excluding non-service “deadhead” hours), consistent with the current BlueGO contract. Assuming provision of a vehicle storage location in Incline Village where drivers can check-in/check-out, deadhead costs should be minimal.

Marginal operating costs were calculated by multiplying the annual hours of service by this rate. As indicated, marginal operating costs range from a low of $128,500 to a high of $542,300.

FARE ALTERNATIVES

Based upon discussions of the SR 28 Corridor Management Plan Project Delivery Team, three alternatives were developed for evaluation. As a basis for comparison, the current entry fee for Sand Harbor is $10 per vehicle or $1 per walk-in visitor. The following alternatives were considered, assuming a consistent, relatively modest service plan. Under each, fares/fees would only be collected at the Incline Village stops. While the large majority of passengers are expected to make a single round-trip, this would allow passengers to make multiple stops (such as a visit to Hidden Beach as well as Sand Harbor) for no additional fee. This has the benefit of both making the service more convenient to use and understand, while also reducing boarding

TABLE 4: Evaluation of Annual Vehicle-Hours and Vehicle-Miles and Operating Costs

Service Area	Calendar of Service	Span of Service	Hrs per Day	Headway	Trips/Hr	Vehicles in Operation: All Day	Vehicles in Operation: Peak Day Peak Time Only	Vehicles in Operation: Total	Daily Round Trips	Annual Round Trips(1)	Annual Vehicle-Miles (1)	Annual Vehicle-Hours (1)	Annual Operating Costs
Incline Village -- Sand Harbor	June 15-Labor Day	9:00 AM - 6:00 PM	9	30 Minute	2	2	2	4	18	1,530	14,504	1,530	$128,500
			9	20 Minute	3	2	2	4	27	2,259	21,415	1,530	$128,500
			9	15 Minute	4	3	1	4	36	2,952	27,985	2,223	$186,700
		8:00 AM - 8:00 PM	12	30 Minute	2	2	2	4	24	2,016	19,112	2,016	$169,300
			12	20 Minute	3	2	2	4	36	2,988	28,326	2,016	$169,300
			12	15 Minute	4	3	1	4	48	3,924	37,200	2,952	$248,000
	June 1 - Sept 15	9:00 AM - 6:00 PM	9	30 Minute	2	2	2	4	18	1,998	18,941	1,998	$167,800
			9	20 Minute	3	2	2	4	27	2,961	28,070	1,998	$167,800
			9	15 Minute	4	3	1	4	36	3,888	36,858	2,925	$245,700
		8:00 AM - 8:00 PM	12	30 Minute	2	2	2	4	24	2,640	25,027	2,640	$221,800
			12	20 Minute	3	2	2	4	36	3,924	37,200	2,640	$221,800
			12	15 Minute	4	3	1	4	48	5,172	49,031	3,888	$326,600
Incline Village -- Sand Harbor - Spooner Summit	June 15-Labor Day	9:00 AM - 6:00 PM	9	30 Minute	2	3	3	6	18	1,458	39,503	2,295	$192,800
			9	20 Minute	3	4	2	6	27	2,259	61,018	2,988	$251,000
			9	15 Minute	4	5	1	6	36	2,952	79,461	3,681	$309,200
		8:00 AM - 8:00 PM	12	30 Minute	2	3	3	6	24	2,052	55,458	3,024	$254,000
			12	20 Minute	3	4	2	6	36	2,988	80,599	3,960	$332,600
			12	15 Minute	4	5	1	6	48	3,924	105,569	4,896	$411,300
	June 1 - Sept 15	9:00 AM - 6:00 PM	9	30 Minute	2	3	3	6	18	2,034	54,975	2,997	$251,700
			9	20 Minute	3	4	2	6	27	2,961	79,874	3,924	$329,600
			9	15 Minute	4	5	1	6	36	3,888	104,602	4,851	$407,500
		8:00 AM - 8:00 PM	12	30 Minute	2	3	3	6	24	2,676	72,219	3,960	$332,600
			12	20 Minute	3	4	2	6	36	3,924	105,740	5,208	$437,500
			12	15 Minute	4	5	1	6	48	5,172	139,091	6,456	$542,300

Note 1: Includes 2 additional runs per peak-only bus on peak 18 days per season between Incline Village and Sand Harbor to provide adequate passenger capacity.

Note 2: At a marginal cost per total vehicle hour of $84. Assumes Diamond Peak intercept lot location.

TABLE 5: Calculation of Peak-Hour Capacity Requirements

Assuming 20 Minute Headways and Shorter Span of Service

	North End			South End		
	Auto	Non-Auto	Total	Auto	Non-Auto	Total
Number of Non-Auto Persons		70			10	
Design Daily Vehicle Parking Usage(1)	164			21		
Turnover Rate	1.3			1.3		
% In Peak Hour	40%	30%		27%	30%	
Peak Hour Cars Parked	50.3958			4		
Average Vehicle Occupancy	3.7			3.7		
Peak Hour Transit Demand	186	21	207	16	3	19
Bus Seating Capacity			32			32
Required # Peak Hour Departures			7			1
Peak Hour Departures per Bus			2			1
Required # Buses in Operation			4			1

(1) 5th highest day.

times at the other stops. Also, under all alternatives transit shuttle passengers would not be charged additional fees to enter Sand Harbor.

Intercept Parking Fee of $10 and $3 per Non-Auto Passenger

Under this option, a parking lot attendant would charge arriving drivers $10 per vehicle and would provide individual tickets for persons in the vehicle. Upon boarding the bus at the intercept lot, passengers would either present a ticket or would be required to purchase one for $3.

This has the advantage of ensuring that persons arriving by car are charged the same fee they would if they were to enter Sand Harbor. However, there are several disadvantages associated with this option. As transit drivers cannot monitor how drivers arrive, it requires an additional staffer to collect fees. Over the course of a summer, this could incur a cost of approximately $15,000 (at a total unit cost of $20 per hour). It would tend to encourage beachgoers in smaller groups (such as a couple) to park near the intercept lot, walk or bike to the bus stop and then pay the per-person fare. Without additional staff for enforcement, there would be no way to distinguish the legitimate versus non-legitimate pedestrians and cyclists.

As shown in Table 6, assuming a relatively modest service plan, this fare option would generate approximately $71,400 per year in revenues. However, the cost of the parking attendant would reduce the net revenues of this option to $56,820.

Flat Transit Fare of $3.00 per Round-Trip

This option would require all persons boarding the shuttle bus in Incline Village or Spooner Summit to pay a $3.00 fare upon boarding the bus. Like a typical public transit program, the driver would be responsible for collecting fares and tracking ridership. The service contractor

TABLE 6: Revenue Alternatives

All Scenarios Assume North Intercept Only, Short Season, 20-minute Service from 9:00 AM to 6:00 PM

	$10 Per Car + $3 Per Non-Auto Beachgoer	$3 Per Beachgoer	$3 Per Beachgoer, With Children 12 and Under Half Price
Annual Vehicles Parked	5,810	5,234	5,579
Annual Non-Auto Beachgoers	4,429	4,429	4,721
Annual Total Beachgoers Using Intercept Service	25,926	23,795	25,362
Percent of Beachgoers 12 Year of Age and Under	--	--	33%
Annual Beachgoers Paying Full Fare	--	--	16,992
Annual Beachgoers Paying Half Fare	--	--	8370
Auto Fee Revenues	$58,100	--	--
Non-Auto Fare Revenues	$13,300	$71,400	$63,500
Total Revenues	$71,400	$71,400	$63,500
Average Fare Per Passenger Round-Trip	*$2.75*	*$3.00*	*$2.50*
Cost of Revenue Collection (1)			
Annual Hours of Parking Lot Attendent	729	0	0
Annual Cost of Parking Lot Attendent(2)	$14,580	$0	$0
Net Revenues	$56,820	$71,400	$63,500

Note 1: Time/cost of revenue counting/deposit assumed to be negligable.
Note 2: Assuming total cost of $20 per attendent hour.

would be responsible for depositing and accounting for fare revenue (the associated costs would be covered by the per-service-hour rate). For travel groups of 3 to 4 persons (around the average size of Sand Harbor visitor groups), this yields a cost comparable to the $10 entry fee.

This alternative has the benefit of lower operational costs. In addition, there would be no incentive to avoid parking in the designated intercept parking area. There may be some beach-going drivers who choose to minimize their out-of-pocket costs by dropping passengers near the beach and driving back to the intercept lot, but this is expected to be minimal given the additional travel distance and time that would be incurred.

As the average fee per travel group would be higher, an elasticity analysis indicates that this option would reduce potential ridership by approximately 10 percent from the previous alternative. Overall fare revenues would be $71,400.

<u>Transit Fare of $3.00 per Round Trip, With Half-Fares for Children 12 and Under</u>

One concern with the flat $3.00 fare is that larger travel groups would pay substantially higher fees. (For instance, a family of five would pay $15.) A common means that transit programs use to address this is to provide reduced fares for children (typically 12 years and age or younger). This is relatively easy for the driver to administer.

While survey data of the proportion of beachgoers of various ages is not available, the data regarding travel size was evaluated, resulting in an estimate of 33 percent of all Sand Harbor visitors age 12 and under. This was corroborated qualitatively by State Parks staff. Applying this factor, this fare option would yield approximately $7,900 less in annual revenues, but would

serve approximately 7 percent more passengers per year than the flat $3.00 fare. Overall, this is recommended as the fare alternative that best generates revenues while limiting the barrier to recreational access.

RIDERSHIP BY SERVICE ALTERNATIVE

The characteristics of the various alternatives can next be used to estimate the actual ridership that would result, given the impact of these characteristics. The total potential demand discussed above was adjusted down by the various factors discussed above. In addition, the impact of the recommended fare alternative was applied. The resulting ridership estimates are presented in Table 7. As shown, annual ridership (in one-way passenger-trips) ranges from a low of roughly 38,100 to a high of 72,000. Of note, the ridership associated with the longer route between Incline Village and Spooner Summit is only roughly 15 percent greater than the ridership associated with the route between Incline Village and Sand Harbor, reflecting that the large majority of overall corridor access is to/from the north.

POTENTIAL PASSENGER REVENUES

The annual ridership can next be factored by the average fare per passenger (as shown in Table 6) to yield the passenger revenues, as also shown in Table 7. These figures range from a low of $50,200 to a high of $94,700.

OPERATING SUBSIDY REQUIREMENTS

Subtracting the annual passenger revenues (from Table 7) from the annual marginal operating costs (from Table 4) yields the annual operating subsidy requirements. This figure ranges from a low of $68,300 to a high of $447,600, as shown in Table 7.

COMPARISON OF ALTERNATIVES

The figures for the various service alternatives shown in Tables 4 and 7 can then be used to develop two key performance measures that are typically used to assess transit services, as shown in the right hand portion of Table 7. A key measure of service effectiveness is the **passenger-trips per vehicle-hour of service**, calculated by dividing the total one-way passenger-trips for each alternative by the total vehicle-hours of service. This ranges from a lowest value of 11.2 to a highest value of 29.9. A higher value reflects a more effective service. As a point of comparison, a value of 10.0 is typically considered a reasonably productive transit service in a rural area. The most effective service is the Incline Village – Sand Harbor alternative with the shorter calendar and span of services and 20-minute headways. Its effectiveness is improved by the fact that the 20-minute service headway makes more effective use of the 40-minute route cycle length.

The key measure of financial efficiency is the **subsidy per passenger-trip**. This directly relates the key public-sector “input” to a transit program (public funding) to the key “output” (passenger-trips). For this performance measure, a lower value represents a better alternative. Values range from a low of $1.49 to a high of $6.22. Again, the Incline – Sand Harbor alternative with the shorter calendar and span of service and 20-minute headway service is the best alternative by this measure.

TABLE 7: Evaluation of Ridership, Parking and Revenue Generation

Service Area	Calendar of Service	Span of Service	Headway	Annual Impacts: Intercept Auto Parking (Vehicles)	Annual Ridership (1-Way Psgr-Trips): Auto Access Psgrs	Annual Ridership (1-Way Psgr-Trips): Non-Auto Access Psgrs	Annual Ridership (1-Way Psgr-Trips): Total Psgrs	Annual Impacts: Fare Revenue(1)	Annual Impacts: Transit Operating Subsidy Required	Performance Measures: Psgrs per In-Service Vehicle-Hour	Performance Measures: Subsidy per Psgr-Trip
Incline Village -- Sand Harbor	June 15-Labor Day	9:00 AM - 6:00 PM	30 Minute	4,649	34,402	3,679	38,081	$50,200	$78,300	24.9	$2.06
			20 Minute	5,579	41,283	4,429	45,712	$60,200	$68,300	29.9	$1.49
			15 Minute	6,392	47,303	5,110	52,413	$69,000	$117,700	23.6	$2.25
		8:00 AM - 8:00 PM	30 Minute	5,463	40,423	4,329	44,752	$59,000	$110,300	22.2	$2.46
			20 Minute	6,625	49,023	5,210	54,233	$71,500	$97,800	26.9	$1.80
			15 Minute	7,555	55,904	6,012	61,916	$81,600	$166,400	21.0	$2.69
	June 1 - Sept 15	9:00 AM - 6:00 PM	30 Minute	4,649	34,402	3,906	38,308	$50,400	$117,400	19.2	$3.06
			20 Minute	5,579	41,283	4,702	45,985	$60,500	$107,300	23.0	$2.33
			15 Minute	6,392	47,303	5,425	52,728	$69,300	$176,400	18.0	$3.35
		8:00 AM - 8:00 PM	30 Minute	5,463	40,423	4,595	45,018	$59,200	$162,600	17.1	$3.61
			20 Minute	6,625	49,023	5,532	54,555	$71,800	$150,000	20.7	$2.75
			15 Minute	7,555	55,904	6,383	62,287	$81,900	$244,700	16.0	$3.93
Incline Village -- Sand Harbor -- Spooner Summit	June 15-Labor Day	9:00 AM - 6:00 PM	30 Minute	5,380	39,809	4,204	44,013	$58,000	$134,800	19.2	$3.06
			20 Minute	6,456	47,771	5,061	52,832	$69,600	$181,400	17.7	$3.43
			15 Minute	7,397	54,737	5,840	60,577	$79,800	$229,400	16.5	$3.79
		8:00 AM - 8:00 PM	30 Minute	6,321	46,776	4,946	51,722	$68,200	$185,800	17.1	$3.59
			20 Minute	7,666	56,728	5,954	62,682	$82,600	$250,000	15.8	$3.99
			15 Minute	8,742	64,690	6,870	71,560	$94,300	$317,000	14.6	$4.43
	June 1 - Sept 15	9:00 AM - 6:00 PM	30 Minute	5,380	39,809	4,467	44,276	$58,300	$193,400	14.8	$4.37
			20 Minute	6,456	47,771	5,377	53,148	$69,900	$259,700	13.5	$4.89
			15 Minute	7,397	54,737	6,204	60,941	$80,200	$327,300	12.6	$5.37
		8:00 AM - 8:00 PM	30 Minute	6,321	46,776	5,255	52,031	$68,500	$264,100	13.1	$5.08
			20 Minute	7,666	56,728	6,326	63,054	$83,000	$354,500	12.1	$5.62
			15 Minute	8,742	64,690	7,299	71,989	$94,700	$447,600	11.2	$6.22

Note 1: At $3 per adult round-trip and $1.50 for children 12 and under.

Overall, the alternatives providing service to Spooner Summit have poorer measures of performance than those limiting service to Incline Village – Sand Harbor. While not directly reported in Table 7, the figures can be used to measure the performance of the route segment south of Sand Harbor. Considering the difference between the alternatives, this southern route segment would carry on the order of 5 passenger-trips per vehicle-hour and require $16 per passenger-trip.

Section IV
Recommended East Shore Transit Shuttle Demonstration Program

Based on the findings presented in the previous sections and the goals of the program, the recommended plan is presented in this section. It should be noted that this plan describes a short-term demonstration program only -- a permanent program (that can justify new parking lots and more extensive bus stop improvements) could vary from this plan.

OPERATIONS PLAN

Route and Schedule

The service should be operated between a shuttle parking area in Incline Village (at the overflow Diamond Peak parking area) and Sand Harbor. At least for an initial program, the costs associated with a longer service to Spooner Summit would not be warranted by the additional ridership that would be served. Focusing on a more limited program provides a greater opportunity for a successful program, and is in line with currently available funding. As shown in Figure 9, this route will travel along Ski Way, Country Club Drive, Lakeshore Drive, and SR 28.

Along this route, four stops will be served:

- **Overflow Diamond Peak Lot** – The lot provides 104 spaces, and an additional 70 spaces are available immediately north of this lot along the side of Ski Way (between the lot and the intersection with Fairview Boulevard). Approximately 20 spaces should be reserved for the Big Water Grille to accommodate lunch patrons. As shown in Figure 10, two spaces along the base of the hill in the middle of this lot should be used as a bus stop, leaving 82 spaces for shuttle parking in the lot, and 152 spaces including the adjacent spaces along the roadway. Table 8 presents the estimate of the number of parking spaces required at the Diamond Peak intercept lot. As shown, a maximum of 138 spaces are estimated to be needed on the busiest day of the summer (once full ridership potential is reached). However, the number of days requiring a relatively high number of spaces will be quite limited. As also shown in Table 8, on the 5th busiest day 121 spaces will be needed, while on the 10th highest day this figure drops to 101 spaces. As full ridership potential will not be achieved in the first year of the program, the maximum use in Year 1 is expected to equal 89 spaces. As also shown in Figure 10, on these busiest days when parking along the roadway occurs, a temporary stop could also be served (designated by a bus stop sign on a stand, placed at the beginning of days expected to have high ridership) at the upper end of this parking area.

- **Stop Along Country Club Drive** – An important element of this plan is to provide an opportunity for connectivity to the regional transit program (Tahoe Area Regional Transit), as well as for bicyclists and pedestrians. As TART does not serve the Diamond Peak lot (nor does the current TART route have adequate running time to serve this lot directly), it is necessary to serve a stop convenient to one of the existing TART stops along Country Club Drive between Lake Shore Drive and SR 28 (at Lakeshore Drive, Incline Way, and Mill Creek near Sierra Nevada College). All of these locations are within 200 feet of existing TART stops, and are along a multipurpose bicycle/walking path. Once a final stop location is

FIGURE 9

Recommended East Shore Express Demonstration Transit Route

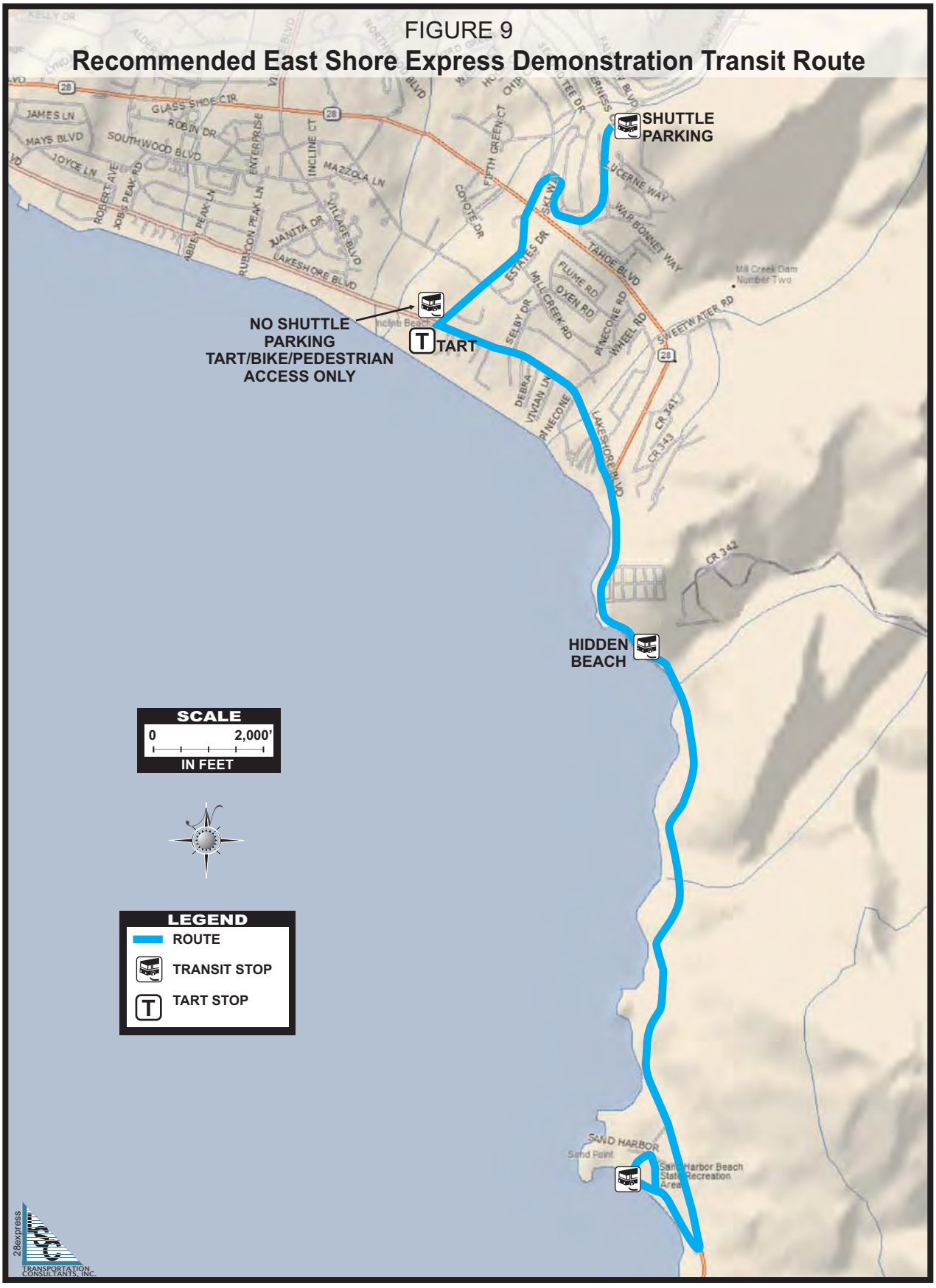


FIGURE 10

Proposed Shuttle Parking at Diamond Peak

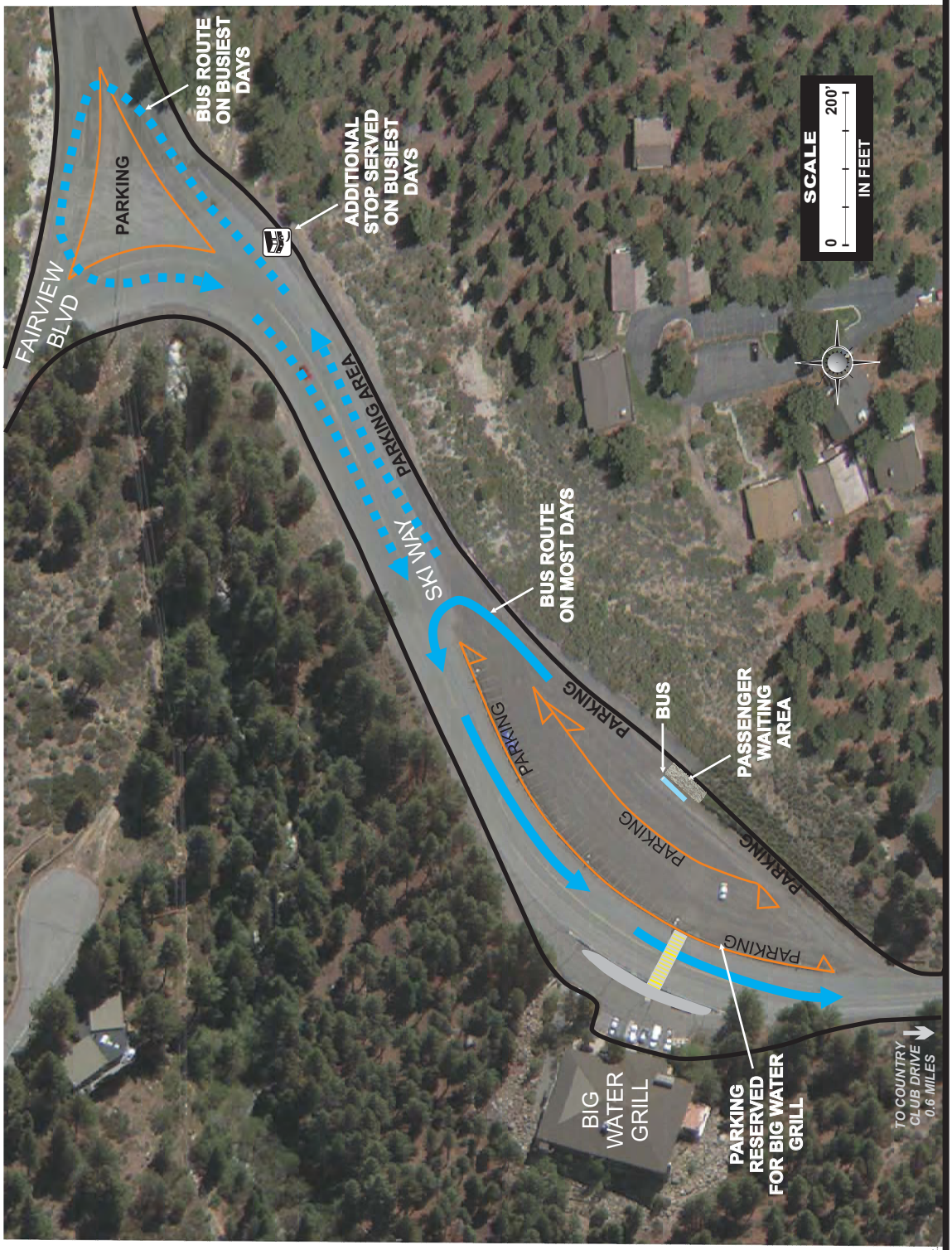


TABLE 8: Required Parking Capacity at Incline Village Intercept Lot Under Plan

	Peak Day	5th Highest Day	10th Highest Day
Year One Ridership Demand			
Daily Total Number of Autos	116	102	85
Turnover Rate (Vehicles per Space)	1.3	1.3	1.3
Required Number of Spaces	89	78	65
Ultimate Ridership Demand			
Daily Total Number of Autos	179	157	131
Turnover Rate (Vehicles per Space)	1.3	1.3	1.3
Required Number of Spaces	138	121	101

selected, all route maps and schedules will show this stop as limited to pedestrians, bicyclists and TART transfers only, with no shuttle parking available.

- **Tunnel Creek/Hidden Beach** – Buses in both directions should serve a stop on the east side of SR 28, so long as a break in the guardrail at the end of the established trail to Hidden Beach can be created, as shown in Figure 4, above. Serving this stop is important, as it (1) provides access to popular Hidden Beach, (2) reduces the number of pedestrians walking along SR 28 immediately adjacent to the travel lanes, and (3) provides the opportunity to observe how beachgoers use the shuttle service to access less formal beach areas outside of Sand Harbor. This stop will require signage and enforcement to eliminate auto parking. If illegal parking continues to occur, it would preclude the ability of southbound buses to exit and re-enter the highway with an adequate angle of view for the bus driver. If this occurs, service at this stop could be limited to a northbound stop only, requiring passengers traveling to this area to ride through the Sand Harbor stop.

- **Sand Harbor** – As discussed in greater detail in the previous section, buses will enter Sand Harbor at the existing southern access point (modified to provide a radio-actuated gate). After traveling north to serve a stop at the south side of the Visitors Center, the bus will travel south through the westernmost bay of the main parking area, and then exit Sand Harbor via the south gate. Delays in the Visitor Center area should be monitored to determine if signage or prohibition of parking in a few parking spaces is needed to minimize delays.

This route has a total one-way length of 4.75 miles, or 9.5 miles round-trip. It should be operated using a 40-minute cycle length, which will typically provide 8 minutes per run for schedule makeup and driver break time (taken at the Diamond Peak lot).

Hours of operation are recommended to extend from 8:55 AM to 6:03 PM. The last departure from Sand Harbor will be at 5:50 PM. This will serve the large majority of beachgoers, and avoid provision of ineffective service in the early morning and evening hours. A schedule is shown in Table 9. This provides good connections with passengers transferring from the TART buses arriving at 12 minutes past the hour (a 7-minute wait for the next shuttle departure), as well as passengers transferring from the shuttle to the TART buses arriving at 42 minutes past the hour

TABLE 9: Recommended Schedule

→→ TO THE BEACH →→				→→ FROM THE BEACH →→			
Depart Diamond Peak (Auto Parking)	Hyatt (TART Transfer) (1)	Hidden Beach	Arrive Sand Harbor	Depart Sand Harbor	Hidden Beach	Hyatt (TART Transfer) (1)	Arrive Diamond Peak
8:55 AM	8:59 AM	9:03 AM	9:08 AM	9:10 AM	9:15 AM	9:19 AM	9:23 AM
9:15 AM	9:19 AM	9:23 AM	9:28 AM	9:30 AM	9:35 AM	9:39 AM	9:43 AM
9:35 AM	9:39 AM	9:43 AM	9:48 AM	9:50 AM	9:55 AM	9:59 AM	10:03 AM
9:55 AM	9:59 AM	10:03 AM	10:08 AM	10:10 AM	10:15 AM	10:19 AM	10:23 AM
10:15 AM	10:19 AM	10:23 AM	10:28 AM	10:30 AM	10:35 AM	10:39 AM	10:43 AM
10:35 AM	10:39 AM	10:43 AM	10:48 AM	10:50 AM	10:55 AM	10:59 AM	11:03 AM
10:55 AM	10:59 AM	11:03 AM	11:08 AM	11:10 AM	11:15 AM	11:19 AM	11:23 AM
11:15 AM	11:19 AM	11:23 AM	11:28 AM	11:30 AM	11:35 AM	11:39 AM	11:43 AM
11:35 AM	11:39 AM	11:43 AM	11:48 AM	11:50 AM	11:55 AM	11:59 AM	12:03 PM
11:55 AM	11:59 AM	12:03 PM	12:08 PM	12:10 PM	12:15 PM	12:19 PM	12:23 PM
12:15 PM	12:19 PM	12:23 PM	12:28 PM	12:30 PM	12:35 PM	12:39 PM	12:43 PM
12:35 PM	12:39 PM	12:43 PM	12:48 PM	12:50 PM	12:55 PM	12:59 PM	1:03 PM
12:55 PM	12:59 PM	1:03 PM	1:08 PM	1:10 PM	1:15 PM	1:19 PM	1:23 PM
1:15 PM	1:19 PM	1:23 PM	1:28 PM	1:30 PM	1:35 PM	1:39 PM	1:43 PM
1:35 PM	1:39 PM	1:43 PM	1:48 PM	1:50 PM	1:55 PM	1:59 PM	2:03 PM
1:55 PM	1:59 PM	2:03 PM	2:08 PM	2:10 PM	2:15 PM	2:19 PM	2:23 PM
2:15 PM	2:19 PM	2:23 PM	2:28 PM	2:30 PM	2:35 PM	2:39 PM	2:43 PM
2:35 PM	2:39 PM	2:43 PM	2:48 PM	2:50 PM	2:55 PM	2:59 PM	3:03 PM
2:55 PM	2:59 PM	3:03 PM	3:08 PM	3:10 PM	3:15 PM	3:19 PM	3:23 PM
3:15 PM	3:19 PM	3:23 PM	3:28 PM	3:30 PM	3:35 PM	3:39 PM	3:43 PM
3:35 PM	3:39 PM	3:43 PM	3:48 PM	3:50 PM	3:55 PM	3:59 PM	4:03 PM
3:55 PM	3:59 PM	4:03 PM	4:08 PM	4:10 PM	4:15 PM	4:19 PM	4:23 PM
4:15 PM	4:19 PM	4:23 PM	4:28 PM	4:30 PM	4:35 PM	4:39 PM	4:43 PM
4:35 PM	4:39 PM	4:43 PM	4:48 PM	4:50 PM	4:55 PM	4:59 PM	5:03 PM
4:55 PM	4:59 PM	5:03 PM	5:08 PM	5:10 PM	5:15 PM	5:19 PM	5:23 PM
5:15 PM	5:19 PM	5:23 PM	5:28 PM	5:30 PM	5:35 PM	5:39 PM	5:43 PM
5:35 PM	5:39 PM	5:43 PM	5:48 PM	5:50 PM	5:55 PM	5:59 PM	6:03 PM

NOTE 1: No auto parking for shuttle service.

(a 3-minute wait for the TART departure). To provide adequate capacity during the morning peak period, one additional bus will be necessary approximately 15 days per year, while two additional buses will be required an additional 18 days per year. (These days of additional service may be lower in the first few years of service, as ridership grows.)

The days of service should extend from Friday June 15th through Monday September 3rd (Labor Day). This period, totaling 82 days of service, includes all days that parking demand for Sand Harbor are expected to be exceeded (with the planned reduction in nearby shoulder parking). This calendar provides one day to work out any operational issues before a weekend, and also provides several weekends to refine the service with relatively modest expected ridership levels before peak demands occur.

Animals (other than service animals) should not be allowed on the shuttle buses. This is the norm of the transit industry, in order to avoid dog bites or other incidents (particularly if there is more than one dog onboard). An exception could be considered for dogs in carrier containers.

Service Provider

This service should be operated as an additional work task under the existing contract between the TTD and Keolis Transit America, Inc. (for the BlueGO service in the South Shore area). This contract was recently developed as part of a thorough Request For Proposal process, and allows modifications in the contracted work scope within a 20 percent change in the number of annual vehicle-hours of service (well in excess of the impact of the shuttle service). This approach provides several advantages:

- It simplifies the shared use of the buses in the TTD BlueGO fleet that are used in winter for winter-only services.
- It avoids the substantial staff effort and time needed to select a contractor through a separate RFP process.
- It takes advantage of the experience that Keolis Transit America, Inc. staff has in serving Tahoe visitors.

This work task should be negotiated on a year-to-year basis, to allow the opportunity to reflect changes in the service plan based on the results of the program.

CAPITAL PLAN

Buses

As discussed above, two buses will be required in operation on the majority of days, though on peak days up to four buses will be needed to provide adequate capacity. Including a spare vehicle, a total of five buses are necessary. These buses can be provided from the existing TTD fleet used for winter BlueGO services, which consists of seven BlueBird XCEL buses with capacity of up to 40 seated passengers.

Given than 40 to 50 percent of surveyed beachgoers are bringing coolers, sand chairs, etc., roughly six seats (three seats with a capacity of two persons each) should be removed and luggage racks (similar to those found on airport rental car shuttle buses) installed.

Bicycle racks should be provided on the front of the buses. Bicycle trailers are not recommended as part of this demonstration program, for several reasons. Most importantly, there is not sufficient room at the Sand Harbor and Tunnel Creek/Hidden Beach stops to accommodate the additional length without creating traffic hazards. In addition, loading/ unloading bikes would add to the route travel time. Also, prior to construction of the Stateline-to-Stateline bicycle trail, there is little good opportunity for bicycling starting at Sand Harbor.

Transit Stop Improvements

As also discussed above, improvements to the stop locations consist of the following:

<u>Overflow Diamond Peak Lot</u>

- Cone off two parallel parking spaces in the center of the southeast side of the lot (against the hill) for a bus stop location.

- Provide a shelter on a temporary basis (bolted to a wooden frame or concrete blocks, along with two benches and a trash can. A pop-up tent could suffice.

- Install two bus stop signs for the lower stop, as well as a sign on a moveable pole (metal base) to be placed in the upper parking area near Fairview Boulevard on the busiest days when the lower parking lot is filled.

- Provide two Sanihuts at the lower stop.

- Install six to eight "NO SHUTTLE PARKING – BIG WATER GRILL ONLY" signs at the spaces nearest the restaurant.

- Install a sign directing arriving drivers into the parking lot at the lower entrance.

Country Club Drive Stop

- Install a shuttle bus stop sign and bench, preferably at a location that is relatively flat, and where a wheelchair user can access the bus. Ensuring that the existing bike rack is moved to this location would also be preferable.

- Install a sign at the TART stop directing deboarding passengers to the shuttle bus stop, and vice versa.

Tunnel Creek/Hidden Beach

- Define a passenger waiting area by pinning down timbers into the dirt parking lot (with a gap at least 30 feet for wheelchair access). A layer of wood chips in this area would help to keep the dust down, so long as it is not so thick as to prohibit use by wheelchair users.

- Provide two bus benches

- Provide a bus stop sign

- Sign/stripe crosswalk and construct break in guardrail with guardrail end protection

- Provide 5 to 6 "TOW AWAY ZONE NO STOPPING STANDING TRANSIT ONLY" signs.

Sand Harbor

- Construct new South Entrance Drive gate, with radio actuated gate

- Reconstruct 40 feet of existing curb area southwest of Visitors Center to provide straight section of curb adjacent to bus stop, aid in providing a direct deployment of a wheelchair lift in a location with adequate sidewalk width, and aid in moving the bus out of the travel lane.

- Install two bus stop signs (one facing each direction) along sidewalk

- Provide two bus benches

- Cone/sign prohibition of parking in nearby parking spaces, if needed to maintain adequate bus movements

- In addition, approximately four “A-frame” or flip signs should be provided for placement around the north entrance to Sand Harbor indicating “Parking Full – Shuttle Parking Available 5 Miles North – Follow Signs.”

- If necessary to address traffic congestion once service is initiated, signs can be posted at either end of the western-most parking bay (two signs indicating “BEGIN ONE WAY” at the north end and two signs indicated “DO NOT ENTER” at the south end), in order to encourage one-way southbound traffic flow.

In total, one shelter, seven benches, and 31 signs will be required, along with other minor site improvements. It is assumed that benches can be provided from current inventory at nearby transit programs. It is further assumed that costs associated with the reconstruction of the curb at Sand Harbor are funded by State Parks, and that NDOT funds the cost of the guardrail break and crosswalk at Tunnel Creek. While further discussion is needed to identify whether existing crews (NDOT, IVGID, or Washoe County) could provide the staff to install the bus stop improvements at no cost to the program, for purposes of planning a cost of $5,000 is included for preparation of signs, purchase of equipment, and installation of stop improvements.

Bus Storage

Buses are proposed to be stored in the upper Diamond Peak parking lot. None of the public agency lots in the Incline Village area (Washoe County Roads, IVGID) have adequate space within a fenced and gated lot to accommodate bus storage, and the NDOT facility is not fenced. Considering the community, the potential for vandalism in an unsecured lot is expected to be low. Using the upper Diamond Peak lot would reduce the visual impact of the stored buses. The number of buses that will need to be parked overnight in Incline Village will range from three to five.

Static and Changeable Roadway Signage

While the program is in operation, fixed directional signage should be installed directing drivers to the shuttle paring areas:

- On SR 431 north of SR 28 facing north “East Shore Shuttle Parking ←”

- On Country Club Drive north of Ski Way facing north “East Shore Shuttle Parking ←”

- On SR 28 west of Country Club Drive facing west “East Shore Shuttle Parking ←”

- On SR 28 east of Country Club Drive facing east “East Shore Shuttle Parking →”

- On Country Club Drive south of Ski Way facing south “East Shore Shuttle Parking →”

- On Ski Way one-fourth mile east of Country Club Drive facing east “East Shore Shuttle Parking ↑”

Producing the signs will require approximately $2,000. Annual installation and removal costs would optimally be provided by NDOT and Washoe County road crews, at no cost to the program. However, $800 is included in the budget to address annual installation/removal.

Changeable Message Signs (CMS's) are also recommended to increase awareness and provide timely information on parking availability:

- On Mt Rose Highway approximately a quarter mile downhill from the hairpin curve west of the summit (1 mile east of Country Club Drive), facing westbound traffic.
- On SR 28 at Winding Way, facing eastbound traffic.
- On SR 28 at the Pump Station (1/2 mile south of Sand Harbor, at the base of the hill) facing northbound traffic.

Optimally, the message could be remotely changed by State Park staff. During shuttle operating hours, the "default" message would direct drivers to the East Shore Express shuttle. When Sand Harbor parking is full (or about to fill, considering the number of arriving drivers that have passed the CMS signs), an alternating message indicating that Sand Harbor parking is full could be triggered. Opportunities to use existing NDOT or Washoe County CMS signs should be explored.

Production and installation of the static signs is estimated to cost $2,800. While further discussion is needed regarding the potential use of existing changeable message signs, $10,000 per year is assumed for rental and staff time for moving and maintaining CMS signs.

MARKETING PLAN

A strong marketing effort will be critical to the success of the transit program, particularly in the first year. This marketing effort should include efforts in advance of the service to build overall community awareness and support, as well as "real time" information to allow travelers to make decisions on the fly as part of their trip. It should reflect that there are numerous "audiences" that need to be included:

- Residents of the local North Tahoe community
- Residents "off the hill," with a particular focus on Reno/Sparks residents (as a key source of East Shore recreationalists)
- Visitors staying in the North Tahoe/Reno area
- Front desk staffs at lodging properties in the greater region, as key sources of contact with arriving visitors

Individual elements of the marketing plan are as follows:

- Selection of a unique program name that communicates the service area as well as the convenience of the service. As an example, "East Shore Express" communicates both the area served as well as the fact that the limited number of stops results in a short (13 minute) travel time. "ESE" as an abbreviation could also be useful in marketing messages (i.e., "the new service is ESE to use"). While "Sand Harbor" may be a more widely known geographic term (this would be a useful question to explore in surveys), the service is planned to serve more of the East Shore than simply Sand Harbor.

- Logo design
- Preparation of a simple, color map/schedule handout
- Website design
- Links/Information on Other Websites:
  - Tahoe Transportation District
  - TNT-TMA
  - Nevada State Parks
  - IVGID
  - IVCVCB
  - Hyatt
  - SNC
  - TART
  - Washoe County
  - Washoe Regional Transportation Commission
  - Tunnel Creek Station
- Production and installation of bus stop signs at all stops (as discussed above)
- Installation of temporary graphics (such as a partial plastic wrap) on at least three buses, with the project name and logo
- Participation in the "TouchTour" interactive kiosk program at major lodging properties throughout the Tahoe/Truckee region
- Participation in the "TahoeTV" in-room cable channel
- Rack cards distributed throughout the North Tahoe/Truckee/Reno/Sparks region
- Ongoing contact with all lodging properties in the North Shore area (provided as in-kind service by the Truckee – North Tahoe Transportation Management Association (TNT/TMA)
- Flyers for posting at all lodging properties and visitor information centers in the North Shore area
- Inclusion in the TNT/TMA summer transit brochure (provided as in-kind service by the TNT/TMA)
- Inclusion in the TNT/TMA posters provided at transit centers, transit stops and visitor information centers in the North Shore area (provided as in-kind service by the TNT/TMA)
- Advertisements in the pocket-sized "Sunny Day Guide"
- Ads in the "101 Things to Do in Tahoe" guide
- Participation in social media, such as Facebook and Twitter. Establishing and actively managing a Facebook page is an important means of reaching younger demographics in particular, and can provide an opportunity to present real-time information regarding services and parking availability.
- Provision of information to groups making reservations for use of Sand Harbor facilities through State Parks

- Community outreach – Rotary, Kiwanis, Business Associations, Tuesday Morning Breakfast Club, others (provided as in-kind service by the TNT/TMA)

- Print advertising:

  - Sierra Sun
  - North Tahoe Bonanza
  - Reno Gazette Journal
  - Carson City
  - Moonshine Ink
  - Tahoe Weekly
  - Ahora News (Reno Hispanic Paper)

- Press release and public service announcements

- Preparation and posting of posters at key activity centers

  - Supermarkets
  - Restaurants
  - Bars
  - Lodging properties
  - Casinos and resorts
  - Sierra Nevada College
  - IVGID Recreation Center
  - The North Lake Tahoe Resort Association's Reno-Tahoe International Airport
  - Welcome Center

A total of $68,000 is budgeted for marketing and media costs in Year 1, with $38,000 budgeted in subsequent years.

MONITORING PLAN

An important element of this program is to serve as a "laboratory" with regards to visitor shuttle programs in the Lake Tahoe region, and to provide information on actual visitor use patterns that can increase the cost effectiveness of future investments in capital improvements (such as parking facilities, transit stops, and transit fleets). As such, monitoring the performance of the service will be a key step. Recommended tasks in this monitoring plan are as follows:

- Collection and evaluation of detailed ridership by day, by stop and by run, along with on-time performance data.

- Surveys of passengers, gathering information on the following:

  - Demographics (age, gender, permanent resident / seasonal resident / overnight visitor / day visitor status, disability status)
  - Size of travel group
  - Travel mode to and from the transit stops
  - Parking location
  - How the traveler learned of the service (marketing effectiveness)
  - How the traveler would have accessed the East Shore beaches if not for the shuttle service
  - Perception of the shuttle service

These surveys should be conducted a minimum of four days over the course of the season, with a surveyor riding the buses and interviewing passengers. This is expected to generate approximately 200 completed surveys, adequate to provide an accuracy of plus or minus 5

percent at the 95th percentile confidence level. In addition, an on-line survey should be established and made available throughout the service season, and the website advertised on the buses and on marketing materials.

- Interviews with State Parks, IVGID, transit contractor, and TTD regarding perceptions and problems

- Review of public comments/input received by State Parks, TTD, and other organizations regarding the service

- Review of costs and revenues

Within a month of the end of each operating season, this information should be summarized as an annual monitoring report. This document will also include recommendations for future operations. Estimated cost for data collection, report preparation and presentation is $13,400 per year. Examples of data collection forms are provided in Appendix A.

FINANCIAL PLAN

Costs of the program, as summarized in Table 10, are estimated as follows. Note that a 3 percent inflation rate is applied to costs in the second year of the program.

- Costs of bus stop improvements, signs, marketing and monitoring/reporting are summarized, as discussed above.

- Contractor costs are estimated at a 2012 rate of $84 per vehicle service-hour (including drivers, fuel, maintenance and TTD overhead). Annual hours are estimated based upon the scheduled hours and frequency of service, as well as the number of days per year that additional peak service may be needed to accommodate high passenger loads once the full potential ridership is achieved. Note that, as this full ridership is not expected to be reached until after the second year of the program, this would result in a conservatively high estimate of annual service levels and costs.

- While final discussion are needed to establish a firm cost, $5,000 is included for annual payment to IVGID to cover the shared cost of use/maintenance of the lower Diamond Peak lot (for shuttle parking) as well as overnight storage of buses in the upper Diamond Peak lot.

Total costs are estimated to equal $261,100 for the 2012 summer season, dropping to $205,963 for the 2013 summer season.

Transit Fares and Ridership

A base transit fare of $3.00 will be charged to persons boarding at Diamond Peak or the Country Club Drive stop, except that $1.50 will be charged to persons age 12 and younger. No fares will be charged for persons boarding at the Tunnel Creek/Secret Harbor or the Sand Harbor stops. No discounts will be provided to persons transferring to or from the TART service

TABLE 10: Annual East Shore Demonstration Transit Shuttle Budget

	Summer Season 2012	Summer Season 2013 (1)
Costs		
Bus Stop Improvements/Maintenance	$5,000	$1,030
Sand Harbor South Gate Reconstruction (2)	$15,000	$0
Static Directional Signs Production/Annual Installation	$2,800	$824
Fabrication/Installation of Luggage Racks on Buses	$10,000	$1,000
Changeable Message Signs Rental/Deployment	$10,000	$10,300
Transit Contractor		
Vehicle Hours (Days/Yr; Vehicle Hours/Day)		
Base Service (2 Buses in Operation) (49; 17.60)	*862*	*862*
Moderate Days (1 Additional Peak Bus) (15; 19.60)	*294*	*294*
High Days (2 Additional Peak Buses) (18; 21.60)	*389*	*389*
Total In-Service Vehicle-Hours	*1,545*	*1,545*
Total Contractor Costs	$129,800	$133,694
Marketing Program	$68,000	$38,000
Monitoring/Reporting	$13,400	$13,802
Shuttle Lot and Bus Storage	$5,000	$5,150
Sanihut Rental	$2,100	$2,163
Total Costs Including Sand Harbor Gate	$261,100	$205,963
Total Costs Excluding Sand Harbor Gate	$246,100	$205,963
Total Annual Ridership (1-Way Psgr-Trips)	33,000	45,600
Operating Revenues	$41,300	$57,100
Net Subsidy Requirement Including Sand Harbor Gate	$219,800	$148,863
Net Subsidy Requirement Excluding Sand Harbor Gate	$204,800	$148,863
Subsidy Funding		
FTA 5311 (3)	$122,880	$89,318
Southern Nevada Public Land Mgmt Act (4)	$81,920	$59,545
FTA 5309, With Local Match By Nevada State Parks	$15,000	$0
Total Subsidy	$219,800	$148,863

Note 1: Assumes 3 percent annual inflation.
Note 2: Funded by FTA 5309, with local match provided by Nevada State Parks.
Note 3: 60 percent of subsidy requirement, excluding Sand Harbor gate costs
Note 4: 40 percent of subsidy requirement, excluding Sand Harbor gate costs.

in Incline Village as part of this demonstration program. Overall, this fare program yields an estimated average fare per passenger round-trip of $2.50.

The ultimate potential ridership of this program is estimated to be 45,700 one-way passenger-trips per year (or 22,850 individuals making round-trips). This figure reflects the various service quality factors discussed in Section III, above, which together are forecast to reduce actual ridership below the potential ridership by 52 percent for persons accessing by auto and by 45 percent by persons accessing by transit, bicycle and on foot.

However, transit ridership of a new service typically requires up to three years to achieve full potential, as it takes time for potential passengers to become aware of a new service. While these proportions vary by the extent and success of a marketing program, in general ridership is found to equal 65 of full potential in the first year of a new service and 90 percent in the second year, before reaching full potential in the third year. Applying these factors, ridership in the 2012 season is forecast to equal 29,700 one-way passenger-trips, rising to 41,100 in 2013.

The daily variation in Sand Harbor visitation can be used to estimate the total ridership by day, for the 2012 season. As shown in Figure 9, the busiest day is expected to carry on the order of 540 one-way passenger-trips (or 270 individuals making round-trips). A total of 400 or more passengers are expected to be carried on roughly 12 days over the course of the season.

Factoring the ridership estimates by the average fare, annual fare revenues are estimated to equal $41,300 in 2012, rising to $57,100 in 2013.

Subsidy Funding Program

Annual subsidy funding requirements are calculated by subtracting fare revenues from the annual costs. As also shown in Table 10, this indicates a total subsidy need of $219,800 in 2012, dropping to $148,863 in 2013. Subsidy funding is proposed to be generated from the following sources:

- The Federal Transit Administration's Public Transportation for Rural Areas (Section 5311) funding program is managed in Nevada by the Nevada Department of Transportation's Transit Section. This program is planned to fund 60 percent of the subsidy needs, excluding the cost of the Sand Harbor gate reconstruction.

- The Southern Nevada Public Lands Management Act (SNPLMA) is planned to fund the remainder of the subsidy needs, excluding the cost of the Sand Harbor gate reconstruction. These funds are available only through May of 2014.

- The Federal Transit Administration's Bus and Bus Facilities (Section 5309) will fund the bulk of the Sand Harbor gate reconstruction, with the local match provided by Nevada State Parks.

APPENDIX A

Service Monitoring Data Collection Forms

East Shore Express Service Log

Driver: _____ Shift Start Time: _____

Date: _____ Shift End Time: _____

Bus Number: _____

Southbound						Northbound				
Scheduled Departure Time	Actual Departure Time	Number of Passengers Boarding by Stop: Diamond Peak	Number of Passengers Boarding by Stop: Country Club Drive	Number of Passengers Boarding by Stop: Tunnel Creek	Arrival Time	Scheduled Departure Time	Actual Departure Time	Number of Passengers Boarding by Stop: Sand Harbor	Number of Passengers Boarding by Stop: Tunnel Creek	Arrival Time

Operational Issues (Interruptions in service, passenger incidents, etc. -- include time, location):

East Shore Express Passenger Survey

Surveyor: _____

Date: _____

Time					
1. Number of Persons in Travel Party					
2. Purpose of your trip today?					
Beach	☐	☐	☐	☐	☐
Other (Write In)					
3. Where did you board the bus for this trip?					
Diamond Peak	☐	☐	☐	☐	☐
Country Club Drive	☐	☐	☐	☐	☐
Tunnel Creek/Hidden Beach	☐	☐	☐	☐	☐
Sand Harbor	☐	☐	☐	☐	☐
3. Where will you get off the bus?					
Diamond Peak	☐	☐	☐	☐	☐
Country Club Drive	☐	☐	☐	☐	☐
Tunnel Creek/Hidden Beach	☐	☐	☐	☐	☐
Sand Harbor	☐	☐	☐	☐	☐
4. Travel Mode to the Shuttle					
Auto -- Parked in Lot	☐	☐	☐	☐	☐
Auto -- Dropped Off	☐	☐	☐	☐	☐
TART	☐	☐	☐	☐	☐
Bike	☐	☐	☐	☐	☐
Walk	☐	☐	☐	☐	☐
Other (Write In)					
5. Are you a visitor to the area, full time resident, or part-time resident?					
Visitor	☐	☐	☐	☐	☐
Part-Time/Seasonal Resident	☐	☐	☐	☐	☐
Full-Time Resident	☐	☐	☐	☐	☐
6. Lodging/residence location in the area					
Incline Village/Crystal Bay	☐	☐	☐	☐	☐
Kings Beach/Tahoe City/West Shore	☐	☐	☐	☐	☐
Truckee/Squaw/Northstar	☐	☐	☐	☐	☐
Reno/Sparks	☐	☐	☐	☐	☐
Carson City	☐	☐	☐	☐	☐
South Lake Tahoe	☐	☐	☐	☐	☐
Other (Write In)					
7. How did you learn of the shuttle program?					
Flyer	☐	☐	☐	☐	☐
Newspaper	☐	☐	☐	☐	☐
Radio	☐	☐	☐	☐	☐
Facebook	☐	☐	☐	☐	☐
Website	☐	☐	☐	☐	☐
Twitter	☐	☐	☐	☐	☐
Employer	☐	☐	☐	☐	☐
Other (Write In)					
8. Why are you using the shuttle program?					
Lack of parking at the beach	☐	☐	☐	☐	☐
Avoid traffic	☐	☐	☐	☐	☐
Improve the environment	☐	☐	☐	☐	☐
Other (Write In)					
9. On a scale of 1 to 5 (1 being worst and 5 being best), please rate the following regarding the East Shore Express:					
Parking Location					
Buses					
Hours of Operation					
Frequency of Service					
Fares					
Ability to Bring Gear					
Drivers					
Availability of Information					
10. Do you think the East Shore Express should be provided in future years?					
Yes	☐	☐	☐	☐	☐
No	☐	☐	☐	☐	☐

Please note any rider comments on the back.