Park Avenue/US 50, Phase 1 Redevelopment – South Lake Tahoe, CA
Methodology for Landscape Performance Benefits
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October 2012

Environmental

Reduces runoff from a 2-year, 24-hour rainfall event by 500,000 gallons by reducing the total impervious surface on the site by 20%.

The clarity of Lake Tahoe has been a major concern for many years in the Lake Tahoe region. Since 1967, to test the clarity of the lake, a 25-cm white disk, called Secchi disk, has been lowered from a boat into the water. A measurement is taken of the depth that it is no longer visible, which is called the Secchi depth. This depth has been steadily decreasing. Particles and sediments being transported to the lake through stream and stormwater runoff are reducing this clarity.

To improve Lake Tahoe's water quality, stormwater runoff was reduced on site by decreasing the amount of impervious surfaces and two stormwater detention basins were created. Impervious surfaces were replaced with landscaped vegetation that promotes infiltration. Before redevelopment, impervious surfaces covered 97% of the surface area. This project, as shown in Table 5, increased the landscaped area by 42.3%.

Table 5. Land coverage calculations.

	Existing total land area (SF)	Proposed total land area(SF)	Existing impervious (SF)	Proposed impervious (SF)	Existing landscape area(SF)	Proposed landscape area (SF)
Total area	1,637,773.06	1,487,124.20	1,437,980.45	1,153,904.06	199,792.61	346,170.38
Percent change	9.2% reduction		19.8% reduction		42.3% increase	

Source: Adapted from Park Avenue Development Proposed Land Coverage Calculations L 5.3. (Design Workshop)

To calculate the runoff reduction, a curve number (CN) of 98 (e.g., with percent of impervious cover similar to paved parking areas, roofs, driveways) was used. The hydrologic soil group does not impact the CN when the percentage of impervious surfaces are high (for instance, Hydrologic soil A, B, C and D all have the same CN for paved parking areas, roofs, and driveways). The rainfall depth used was 2.97 inches, which is taken from the National Oceanic and Atmospheric Administration (NOAA) Station Fallen Leaf, which is the closest to the site (http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=ca) (Harris & Dines, 1998). The 2-year, 24-hour rainfall event was used.

Runoff volume in acre-feet was calculated for each impervious cover, and then the difference was calculated and converted to gallons. The CN formulas used are:

$$S = (1000/CN)-10;\ Q = [P- (0.2x\ S)]^2/ (P+ (0.8x2.2)$$, where

S = potential maximum retention in inches
P = rainfall depth in inches from a 24-hour duration storm

Q = depth of direct runoff in inches.

Total existing runoff: 7.4 acre-feet; New runoff after redevelopment: 5.85 acre-feet
Runoff reduction: 7.4 – 5.85 = 1.55 acre-feet * 325 851 gallons/acre-ft = 505,000 gallons

Social

Reduced the peak month Average Daily Traffic (ADT) and annual ADT on Park Avenue by 24% and 23%, respectively, between 2001 and 2009.

Traffic volumes in South Lake Tahoe vary with the season. Generally, the traffic is highest during the mid-summer periods (July and August). Winter traffic levels tend to be lower than summer traffic levels. California Department of Transportation (Caltrans) data show that the highest peak-month Average Daily Traffic (ADT) volumes in South Lake Tahoe were found in the Park Avenue and US 50 intersection. Park Avenue is the busiest roadway in South Lake Tahoe. It serves residential traffic as well as recreational traffic associated with the various hotel and retail uses located in the Stateline area. It also connects US 50 with the Lakeside Marina and commercial centers.

The design team, expanding on the community's desire for a gondola to the Heavenly Ski Resort, proposed a Consolidated Transportation System (CTS) that unified public and private transit in South Lake Tahoe. The transit center is located near the base of the gondola, promoting pedestrian movement and allowing users to eliminate use of personal automobiles. The construction of this project started in 2001 and was completed in 2003. A comparison of historical Caltrans data on Park Avenue for the period from 2000 to 2009 is shown in Table 2. As illustrated in this table, significant traffic volume decreases for both peak month ADTs and annual ADTs were observed after construction. During 2001 to 2009, the peak month ADT on Park Avenue decreased from 50,000 to 38,000, which is a 24% reduction from 2001. The annual ADT decreased from 41,000 to 31,500, which is a 23% reduction from 2001, making the average annual change 2.9%.

Table 2. Traffic Volumes on Park Avenue from 2000 to 2009.

	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000
Peak Month ADT	38,000	41,000	43,000	43,000	43,500	45,000	46,000	50,000	50,000	50,000
Annual ADT	31,500	33,000	35,000	35,500	36,000	37,500	37,500	41,000	41,000	41,000

Source: California Department of Transportation (http://traffic-counts.dot.ca.gov/).

The cause of the reductions is three-fold. The first is the implementation of the CTS. The second is the implementation of the Heavenly Gondola. The Gondola allows Stateline lodging guests who previously drove or rode shuttle buses to ski base areas, to instead walk a short distance to access the ski area. The last is recessionary years of 2007-2009 saw a reduction in tourism travel, declines in employment, reduced hotel occupancy, and population decreases resulting in reduced traffic volumes.

Increased the total visible area of the natural environment by 10%. For all views of the Carson Range that were blocked by new development, the design created new views in other areas of the project site.

The scenic quality of the Lake Tahoe Basin was recognized as one of the most important assets of the region. Thus it was essential that the redevelopment did not block additional views to the surrounding landscapes. The project needed to meet "No net loss in views of the scenic resource (i.e. mountain and ridgeline)." Some views of the Carson Range were blocked by new buildings in the redevelopment plan. However, new views were opened up with the removal of the existing buildings on-site. With the replacement of all buildings except one along the east side of US 50

between the Embassy Suites Hotel and Park Avenue, this project changed the views significantly. For all visible areas of the Carson Range lost because of this project, the designers had to ensure views to the Carson Range in other areas of the project site. Even with the increased height of structures in the new development, the designers were able to increase the quantity of visible area of the natural landscape. The process they followed, which was approved by the Environmental Impact Statement (EIS) consultant and Tahoe Regional Planning Agency (TRPA), is as follows:

The project team created a set of 26 three-dimensional computer-assisted design and drafting (CADD) simulations of the proposed design from specific viewpoints. These simulations were converted into line drawings, transferred onto transparency sheets and overlaid onto photographs of existing conditions taken from the same viewpoints. Then, using a planimeter, they measured the visible natural landscape area under the existing conditions and the proposed conditions. The net gain or loss was the difference between the measured existing visible areas and the potential visible areas of the natural landscape. To ensure accuracy, both areas were measured twice, and then averaged. The following table lists the averages.

As shown in Table 6, a net gain between Embassy Suites Hotel and Park Avenue is achieved in the project. A total area of 1,644 cm^2 is visible in the study area after the project was installed. The increased visible gain area is 9% or 145cm^2.

Table 6. Park Avenue scenic resource view gain-loss evaluation

Image	Before (cm^2)	After (cm^2)	Net gain
1	64.75	143.00	78.25
2	77.35	25.95	-51.40
3	71.65	48.45	-23.20
4	70.25	37.95	-32.30
5	12.00	106.40	94.40
6	0.00	127.25	127.25
7	19.05	77.75	58.70
8	35.25	36.45	1.20
9	35.25	91.65	56.40
10	18.80	51.50	32.70
11	67.05	74.05	7.00
12	75.30	47.10	-28.20
13	75.85	2.85	-73.00
14	81.85	4.45	-77.40
15	41.00	2.35	-38.65
16	10.80	0.48	-10.32
17	24.00	11.60	-12.40
18	21.05	4.70	-16.35
19	168.30	15.50	-152.80
20	78.85	44.35	-34.50
21	88.65	39.65	-49.00
22	88.65	49.80	-38.85
23	60.95	198.30	137.35
24	46.20	197.05	150.85
25	152.00	181.35	29.35
26		23.85	
Total	1499.25	1643.78	144.53

Adapted from: Park Avenue Development Project Draft, EIR/EIS, 1996, pp.316-317, Table 6.1 and 6.2.

Figures 3 and 4 demonstrate the simulation process used at viewpoint 1 (see Table 6) to determine whether visible area of the Carson Range would be lost or gained as a result of the redevelopment.

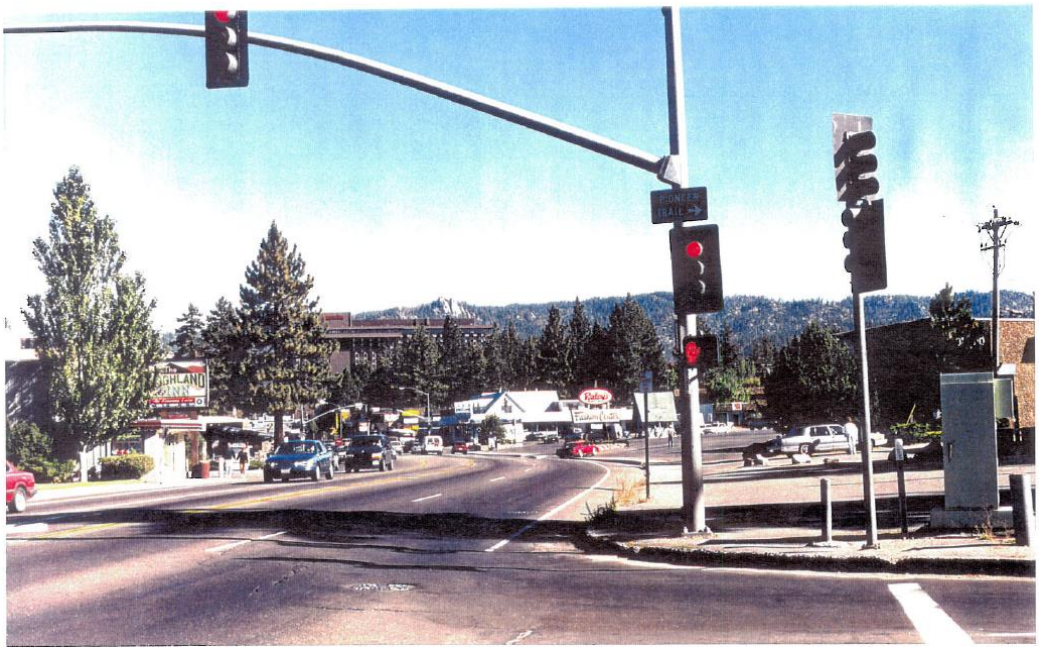

Figure 3. Predevelopment Conditions from Viewpoint 1. Source: Draft EIR March 4 1996, p 265.

Figure 4. Simulation of Proposed Project from Viewpoint 1. Source: Draft EIR March 4 1996, p 267.

Increased the scenic quality of the roadway, as measured by the Tahoe Regional Planning Agency's Travel Route Rating, which increased from 7.5 in 1996 to 14 in 2006.

Another method used to evaluate the scenic quality of an area is the Travel Route Ratings. This system was adopted by the TRPA in 1971, is consistent with the Forest Service methods, and is an effort to rate the visual experience along a travel route for both natural and man-made

components (http://tahoemonitoring.org/people/viewscape/351.html). The system identifies distinguishable landscape segments differentiated from surrounding areas because of their individual scenic traits and gives each a corresponding scenic threshold.

The scenic quality thresholds were set by the TRPA to gauge the scenic impact of future development. Each unit was evaluated and given a threshold number that represents a minimum scenic standard that all development in the unit must maintain or attain. This standard is a composite number based on six criteria: (1) man-made features along the roadway and shoreline, (2) physical distractions to drive along the roadways, (3) roadway characteristics, (4) view of the lake from the roadways, (5) general landscape views from the roadways and shoreline, and (6) variety of scenery from the roadways and shoreline. Each unit is given 1-5 points for each criteria based on how well they satisfy the criteria, with 1 representing poor scenic quality and 5 good scenic quality. This means that composite ratings for units can range from 5-30. Ratings are designated based on observation by trained scenic quality professionals.

The TRPA originally identified 46 roadway units and 33 shoreline units. Roadway units are areas visible by motorists travelling along major roads in the area. Shoreline units are landscape units seen from the lake. This Park Avenue project area falls within Roadway Unit 32 and 33. The threshold for this project was set at 15, but has been increased to 15.5. On the 30 point Roadway Unit scale, this project has its goal to achieve a minimum of 15.5 points. When the Environmental Impact Report (EIR) was being completed in 1996, the Roadway Unit had a rating of 7.5. In 2006, the unit rating reached 14 points. The TRPA has measured the composite travel route ratings since 1982. Table 7 gives the travel route rating points given for each criterion. Other factors that contribute to the increased rating are also described in this table.

Table 7. Travel Route Rating for Unit 33 (the Strip).

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	6	1	1	1	1	1	1
1991	7	1	1	1	1	2	1
1996	7.5	1	1.5	1	1	2	1
2001	11.5	3	3	1	1.5	2	1
2006	14	4	4	1	1.5	2.5	1
1991 Comments: Increase in landscape views subcomponent due to demolition of unsightly foregrond structures permitting visual access to mountain backdrop.							
1996 Comments: The site design and architectural quality of several remodeled and redeveloped uses (e.g. McDonald's, Fantasy Inn), combined with the removal of several older structures and related cur cuts and signs, have slightly improved the roadway distractions subcomponent.							
2001 Comments: Major improvements in this unit have occurred in the last five years. Improvements that increase both the man-made features and roadway distractions scores include: beginning implementation of the Park Ave. Project, completion of the Embassy Suites Vacation Resort and marina buildings, several hotel remodels along the strip, and completion of the linear park and the drainage features with their park-like appearance. The lake view near the marina is improved with better view access due to improved site design. This unit is not in threshold attainment.							
2006 Comments: This unit continues to improve with completion of the Park Ave. project and Raley's Shopping Center. Landscape views continue to improve as the native vegetation installed along wildwood has matured.							

Source: TRPA 2006 Threshold Evaluation September 2007, Chapter 8 – Scenic Resources and Community Design Appendix 1. Available from: http://www.tiims.org/Data-Repository/Documents/Lake-Tahoe-Basin/Science-and-Reporting/Data-Synthesis,-Reporting,-and-Management/Reporting/TRPA/2006/2006-TRPA-Threshold-Evaluation---Chapter-8-Scenic.aspx, p 11.

The project site encompasses 33% of Roadway Unit 32. But the project occurs only on one side of the road. Therefore, half of the rating (half of 33% i.e.,16 %) for Unit 32, can be attributed to this project.

The description of the unit was given as "cluttered commercial with virtually no views out to the natural environment". Additional comments about elements degrading the scenic quality of Roadway Unit 32 were: "The visual problems are those typical of strip development: sign proliferation, inadequate landscaping, and the visual prominence of the automobile. The overall effect is a visually cluttered and confusing environment that fails to take advantage of the scenic value of its natural setting" (Draft Environmental Impact Report, March 4, 1996. p 263). Figure 5 below shows the progression of the Travel Route Ratings of Roadway Unit 33.

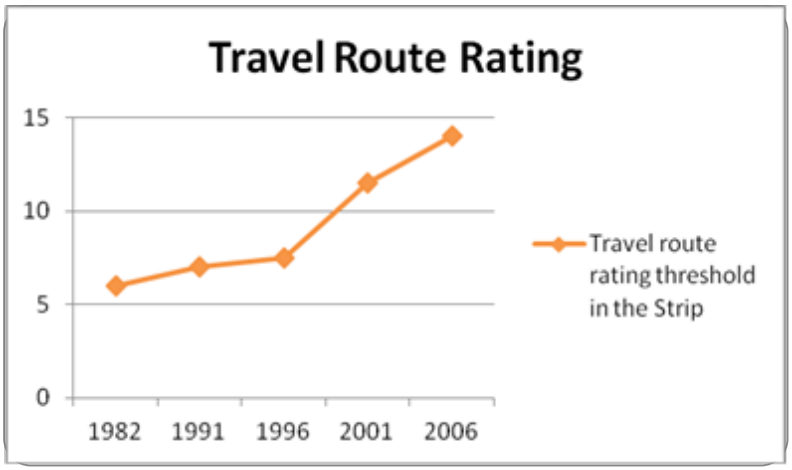

Figure 5. Observed Travel Route Ratings of Roadway Unit 33.

Economic

Reduces fertilizer consumption by 70% by using slow-growing turfgrass and organic fertilizer, which saves an estimated $880 annually.

The University of California Agriculture and Natural Resources recommend the fertilizer application rate for the traditional turfgrass as 1 lb per 1,000 square feet, 4 times a year (i.e., 4 lbs/1,000 square feet/year) (http://www.ipm.ucdavis.edu/TOOLS/TURF/MAINTAIN/fertamt.html). In comparison, this project uses approximately 1.3 lbs of Biosol or other organic fertilizer per 1,000 square feet/year.

The site has 5.9 acres (257,004 square feet) of dwarf turf grass (Aurora Hard Fescue, Mokelumne Fescue, or other types). Biosol costs around $83 for a 55 lb bag from a California distributor (http://www.ssseeds.com/ssseeds/display.php?key1=fertilizer&olimit=0&zid=1&lid=1&cartid=201210166152409). A 40 lb bag of traditional fertilizer from Lowe's costs $54 (http://www.lowes.com/pd_90204-446-31115_0__?productId=3047138). Fertilizer cost savings is calculated below.

Traditional turfgrass fertilizer cost:
4 lbs/1,000 sq. ft/yr × (257,004/1,000) = 1,028 lbs
$54/40= $1.35/lb; $1.35/lb×1,028 lbs = $1,387/yr

Dwarf turfgrass with Biosol fertilizer cost:
1.3 lb/1,000sq. ft/year×(257,004/1,000) = 334 lbs
$83/55lb = $1.51/lb; $1.51/lb×334 lbs = $504/yr

Fertilizer consumption reduction:
(1,028 lbs —334 lbs)/1,028 lbs = 68%

Annual fertilizer cost savings:
$1,387-$504 = $883

Cost Comparison Methods

By using 5.9 acres of slow-growing turfgrass instead of conventional high-maintenance turf and requiring that Biosol or an equivalent organic nitrogen fertilizer be applied instead of conventional fertilizer, fertilizer use is reduced by 70%, saving an estimated $880 annually.

See method for Performance Benefit #5.

References

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6) Tahoe Monitoring. (n.d.). Travel Route Ratings for Shoreline Travel Units. Retrieved from Travel Route Ratings for Shoreline Travel Units: http://tahoemonitoring.org/people/viewscape/351.html

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8) U.S. Department of Transportation Federal Highway Administration. http://ops.fhwa.dot.gov/publications/mitig_traf_cong/lake_tahoe_case.htm