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Skyway Corridor Study

for the

Butte County Association of Governments and the Town of Paradise

Final Report

February 12, 2009

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Introduction

Skyway is the Town of Paradise's "Main Street." However, traffic conditions have forced Skyway to be less of a "Main Street" and more of an expressway. This situation has limited the Town's ability to realize its potential as a center of commercial and cultural activity. The 13,000 to 24,000 vehicles per day which currently travel on Skyway at speeds of 30 to 40 mph will continue to impact the corridor and must be accounted for in any plan for Skyway. However, the traffic can be managed and drivers' behavior influenced so that the transportation network fits within the desired parameters of the community, rather than the opposite.

Critical traffic issues generated by high speeds are typical: traffic safety concerns, inability or unwillingness for pedestrians to cross the street, impacts to bicyclists, and significant difficulties for drivers on side streets trying to gain access to the corridor. The purpose of the *Skyway Corridor Study* is to develop measures that reduce travel speeds and are more conducive to downtown commercial activity while still balancing the capacity demands of 22,000 vehicles per day. Slower speeds do not necessarily mean reduced capacity. Properly managed, slow travel speeds can be created through a variety of measures while still providing the traffic flow needed. The following issues have been addressed as part of the corridor plan:

- Speed of traffic
- Pedestrian safety
- Need to enhance downtown/attract shoppers
- Conflicts with through traffic
- Need for turn lanes
- Bicycle safety

This report presents a summary of the existing background conditions, which are currently experienced in the corridor, as well as several alternatives that were considered in the process. These alternatives were intended to improve various components of the corridor including speeds, access, parking supply, and pedestrian and bicycle circulation. Finally, the preferred alternative plan is presented with analysis and discussion.

Existing Conditions

Study Area

The project study area consists of Skyway between Neal Road at the south end to Wagstaff Road at the north, which is a distance of approximately 2.8 miles. The following intersections with Skyway are specifically detailed in the analysis.

- Neal Road-Schmale Lane (existing traffic signal)
- Pearson Road (existing traffic signal)
- Foster Road (stop controlled on Foster Road approach)
- Fir Street (stop controlled on Fir Street approach)
- Elliott Road (existing traffic signal)
- Oliver Road (existing traffic signal)
- Maxwell Drive (existing traffic signal)
- Bille Road (existing traffic signal)
- Wagstaff Road (all-way stop, future traffic signal)

Within the study area, Skyway changes in characteristics, activity and personality as it climbs in elevation. (The study area is shown in Figure 1). The right-of-way in the corridor varies from 60 feet to 80 feet with the pavement width (curb to curb, excluding sidewalks) varying between 28 feet to 70 feet within the study area. For the purposes of this analysis, the study area was divided into four segments:

Segment A from Neal Road to Pearson Road is the current gateway entry to town with a mix of old and new commercial uses and a wide five-lane streetscape with no parking, transitioning to a four-lane cross-section. The proliferation of narrow driveway curb cuts makes it visibly difficult for drivers to negotiate. The segment includes four travel lanes and a two-way left turn-lane. Sidewalks are generally five feet wide with some gaps that require pedestrians to walk along dirt paths.

Segment A – Neal Road to Pearson Road

Segment B from Pearson Road to Elliott Road is the downtown district. The traffic element that visually defines the downtown area is the on-street parking. Other visual cues are the historic businesses fronting directly on the sidewalk. Alternatives for this downtown segment need to balance the multiple goals of managing vehicular traffic, providing parking, enhancing pedestrian and bicycle circulation, and providing areas for future street beautification efforts (which will be determined during the forthcoming Downtown Streetscape process). Four travel lanes are located throughout this section of roadway and sidewalks vary from five to eight feet wide for pedestrian use with six uncontrolled pedestrian crosswalks located throughout the core downtown area.

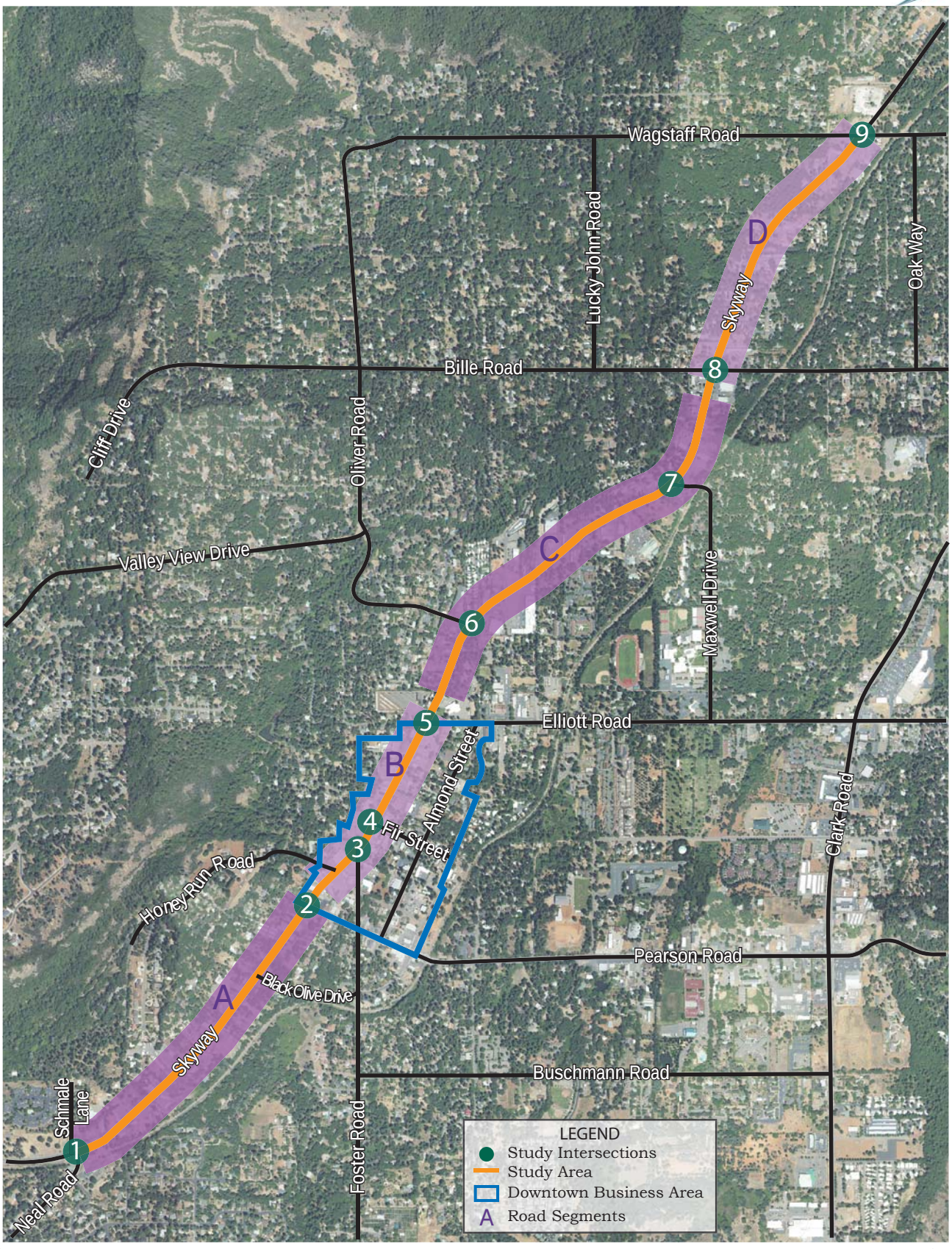
Segment B –Pearson Road to Elliott Road

Segment C from Elliott Road to Bille Road serves commercial, business, and park uses while also acting as a southbound gateway into downtown and a northbound gateway into to the more rustic environment ahead. This section is composed of four travel lanes and various left-turn pockets between Elliott Road and Center Street. Between Center Street to Bille Road, Skyway consists of four travel lanes and two way left turn lane. The segment between Elliott Road and Oliver Road fronts Terry Ashe Park and the Veteran's Hall, which is the site of Johnny Appleseed Days as well as other community events. Sidewalks are generally continuous throughout the area. The combined presence of a wide streetscape and minimal parking activity contributes to the high speeds on this section of Skyway.

Segment C – Elliott Road to Bille Road

Segment D from Bille Road to Wagstaff Road is a two-lane roadway section with significant tree coverage that has its own mountainous feel. The wide right-of-way with mix of sidewalk sections and open culverts leaves this section open to diverse improvement options.

Segment D – Bille Road to Wagstaff Road



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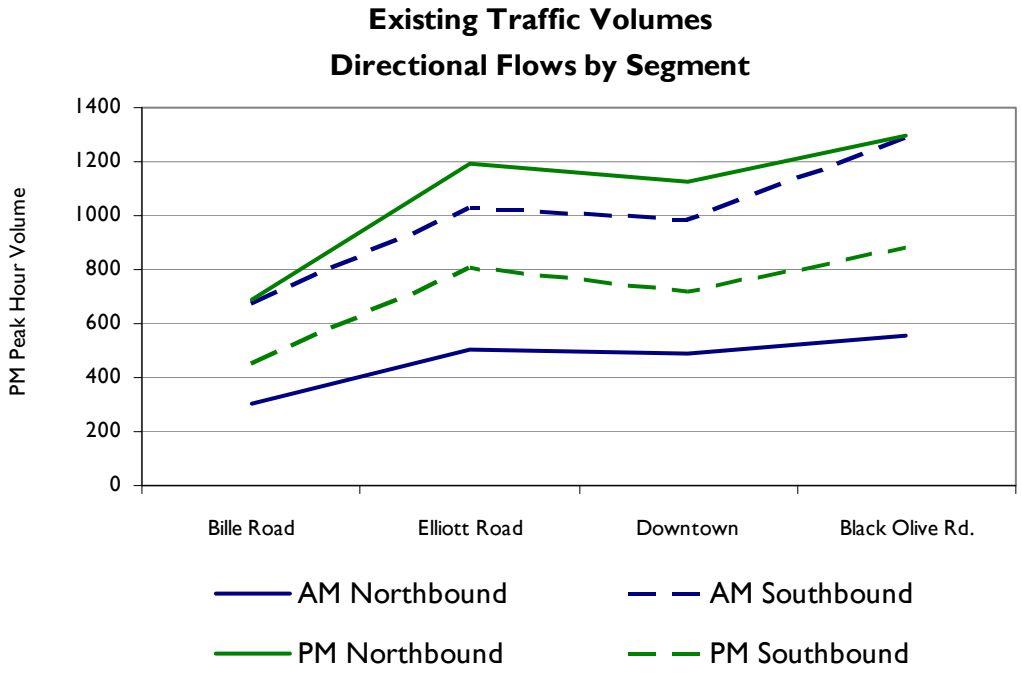
Skyway Corridor Study
Town of Paradise

Figure 1
Study Area

Existing Traffic Conditions

Traffic Counts

Traffic counts were collected for the a.m. and p.m. peak hours between April and May of 2008 for all study intersections. These existing peak hour traffic volumes are shown in Figure 2. In addition, daily traffic counts were collected on four segments along Skyway in proximity to Bille Road, Holiday Market, Honey Run Road, and Black Olive Drive. Existing daily traffic is currently estimated at 12,700 vehicles per day (vpd) north of Bille Road, 17,500 vpd north of Pearson Road in the downtown, and 23,500 vpd south of Pearson Road on the highest volume section in the study area. Traffic volumes on Skyway also experience a dominant southbound flow during the a.m. peak hour, and a dominant northbound flow during the p.m. peak hour. This phenomenon is shown graphically in the following chart.



Time and Delay Runs

Time and delay runs were conducted along the corridor in both directions on Skyway during the a.m., midday and p.m. weekly peak hour period in April of 2008. The purposes of these runs were to establish the travel time and overall speed for the entire corridor, which can then be compared with alternatives. A handheld GPS unit was used which allows recording of vehicle position at numerous points along the corridor as well as at each of the study intersections. The data was compiled and analyzed to determine average travel times and to provide additional insight as to where delays are typically encountered along the corridor. The results are shown in Table 1 and 2 for the northbound and southbound directions, respectively.

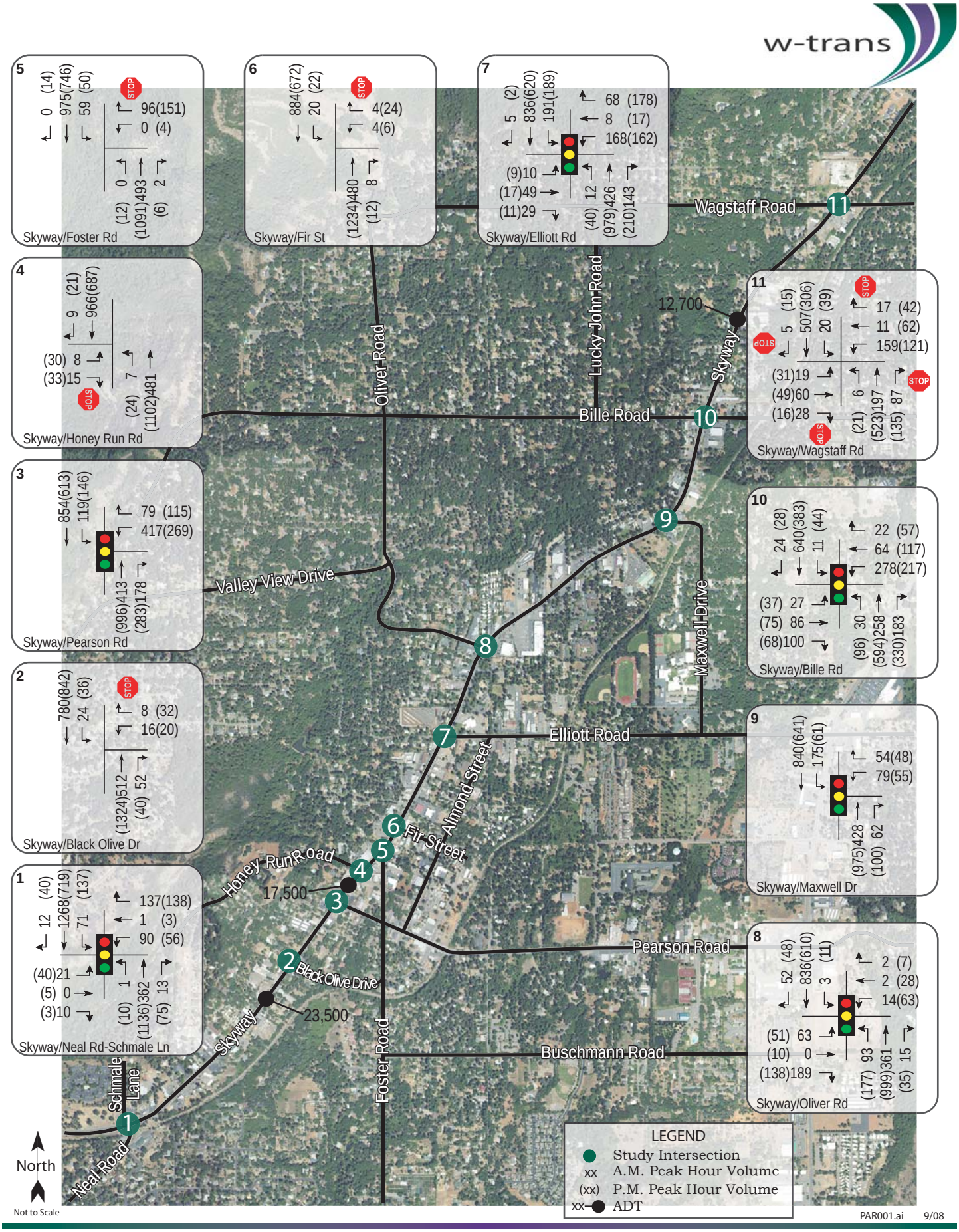


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Figure 2
Existing Traffic Volumes

Table 1
Northbound Travel Time and Delay

Location	Travel Time *			Delay *		
	AM	Midday	PM	AM	Midday	PM
Pearson Rd	94.3	100.3	74.7	16.0	22.3	5.0
Elliott Rd	81.7	72.3	71.0	32.7	24.0	22.0
Michael Ln	34.0	35.3	36.3	10.3	11.3	12.7
Maxwell Dr	65.3	63.3	70.3	9.3	7.7	15.3
Bille Rd	45.3	44.7	38.7	18.7	18.3	11.7
Wagstaff Rd	79.0	140.0	91.3	17.0	78.7	36.3
Total (secs)	399.6	455.7	382.3	103.7	162.3	103.0
Total (min)	6.6	7.5	6.3	1.7	2.7	1.7
Speed (mph)	25.5	22.4	26.6			

Notes: * Travel time and delay measured in average seconds per vehicle
Shading shows worst delay

Table 2
Southbound Travel Time and Delay

Location	Travel Time *			Delay *		
	AM	Midday	PM	AM	Midday	PM
Wagstaff Rd†	182.0	40.3	96.7	152.0	11.0	33.7
Bille Rd	97.3	74.3	26.7	34.7	12.7	0.7
Maxwell Ln	41.0	32.7	75.3	15.0	6.0	19.3
Michael Ln	67.0	69.0	28.0	11.0	13.3	3.3
Elliott Rd	33.0	31.7	50.0	9.0	7.7	2.7
Pearson Rd	73.0	60.3	48.7	24.7	12.3	1.0
Total (secs)	493.3	308.3	325.3	246.3	63.0	60.7
Total (min)	8.20	5.13	5.41	4.10	1.05	1.0
Speed (mph)	20.5	32.7	31.1			

Notes: * Travel time and delay measured in average seconds per vehicle
† Wagstaff was controlled with an all-way stop at time of surveys
Shading shows worst delay

Northbound Travel Time

Travel time was the longest during the midday peak at 455.7 seconds (7.5 minutes, 22.4 mph) and the fastest travel time was experienced during the p.m. peak at 26.6 mph. The longest delays occurred at Elliott Road

during the a.m. peak hour and at Wagstaff Road during the midday and p.m. peak. The delays at Wagstaff Road represent one-third to one-half of the total delay in the corridor. The longest overall delay for the northbound corridor was seen during the midday peak. Note that the delays experienced at Wagstaff Road were recorded when the all-way stop controls were still in place. Conditions have improved significantly since the recent installation of a traffic signal.

Southbound Travel Time

Travel time delay was the longest during the a.m. peak at 493.3 seconds (8.2 minutes, 20.5 mph) and the fastest travel time was experienced during the midday peak in the southbound direction (308.3 seconds, 5.13 minutes, 32.7 mph). The longest delays occurred at Wagstaff Road during the a.m., which accounted for 60 percent of the delay for the entire corridor. The longest overall delay for the Skyway corridor was seen during the a.m. peak.

Speed Surveys

Vehicle speed surveys were conducted using road counters for a 24-hour period in April 2008 in both the northbound and southbound directions at Honey Run Road and Black Olive Drive. The average speed in both the north and southbound direction was found to be 32 miles per hour (mph). The recorded 85th percentile speed was 37 mph for the northbound direction and 34 mph for the southbound.

Intersection Operating Conditions

Level of Service Methodology

Level of Service (LOS) is used to rank traffic operation on various types of facilities based on traffic volumes and roadway capacity using a series of letter designations ranging from A to F. Generally, Level of Service A represents free flow conditions and Level of Service F represents forced flow or breakdown conditions. The LOS designation is generally accompanied by a unit of measure that indicates a level of delay.

The study intersections on the Skyway corridor were analyzed using methodologies from the *Highway Capacity Manual*, Transportation Research Board, 2000. The determination of levels of service at signalized intersections is based on factors including traffic volumes, green time for each movement, phasing, whether or not the signals are coordinated, truck traffic, and pedestrian activity. Average stopped delay per vehicle in seconds is used as the basis for evaluation in this LOS methodology. The ranges of delay associated with the various levels of service are shown in Table 3.

Table 3
Signalized Intersection Level of Service Criteria

LOS A	Delay of 0 to 10 seconds. Most vehicles arrive during the green phase, so do not stop at all.
LOS B	Delay of 10 to 20 seconds. More vehicles stop than with LOS A, but many drivers still do not have to stop.
LOS C	Delay of 20 to 35 seconds. The number of vehicles stopping is significant, although many still pass through without stopping.
LOS D	Delay of 35 to 55 seconds. The influence of congestion is noticeable, and most vehicles have to stop.
LOS E	Delay of 55 to 80 seconds. Most, if not all, vehicles must stop and drivers consider the delay excessive.
LOS F	Delay of more than 80 seconds. Vehicles may wait through more than one cycle to clear the intersection.

Reference: *Highway Capacity Manual*, Transportation Research Board, 2000

The Town of Paradise, like most communities in California, has a standard that allows no worse than a LOS D at signalized intersections.

Existing Intersection Levels of Service

Signalized intersections in the corridor are generally operating at LOS C or better during both peak hours. The all-way stop at Wagstaff Road present at the time of data collection was operating at LOS D. A summary of these results is shown in Table 4, and copies of the calculations are provided in the Appendix A.

Table 4
Summary of Existing Intersection Level of Service Calculations

Intersection	AM Peak		PM Peak	
	Delay	LOS	Delay	LOS
Neal-Schmale Ln	14.3	C	18.9	B
Pearson Rd	16.6	B	22.7	C
Elliott Rd	20.3	C	33.7	C
Oliver St	18.4	B	16.1	B
Maxwell Dr	13.2	B	16.7	B
Bille Rd	28.0	C	29.3	C
Wagstaff Rd				
All-Way Stop	*19.6*	*C*	*31.6*	*D*
Signalized		*B*		*B*

Notes: Delay is measured in average seconds per vehicle, LOS = Level of Service

The uncontrolled intersections along the corridor have side streets that are operating with delays in the LOS E to F range during the p.m. peak hour including delays that average near 50 seconds. This level of delay is typical for uncontrolled side streets.

Parking

Parking along Skyway is permitted along various areas throughout the corridor. Although minimal in some areas between Neal Road and Pearson, on-street parking is consistent along the core downtown area that runs from Pearson Road to Elliott Road. This section was noted to have some peak parking usage during the shopping periods, but parking activity generally appears to be low to moderate given the downtown nature of the street. A public parking lot was noted on the northeast corner with Birch Street Road. Elliott Road to Maxwell Road also has on-street parking frontage. The eastern section between Bille Road and Wagstaff Road does not have on-street parking.

Collision Data

The collision history for the study area was reviewed to determine any trends or patterns that may indicate a safety issue. Collision rates were calculated based on records for 1998 through 2006 obtained from the California Highway Patrol and published in their SWITRS reports. As presented in Table 5, the calculated collision rates in the study area were compared to average collision rates for similar facilities statewide, as indicated in *Accident Data on California State Highways*, California Department of Transportation. The table also displays ratios of the calculated collision rates in comparison with statewide average collision rates, where a ratio over 1.0 to 1.25 suggests that there may be safety issues that need to be addressed. The significance of these collisions was considered when determining the appropriateness of various roadway and intersection improvements on the corridor. Copies of the spreadsheets showing the derivation of the collision rates are provided in the Appendix B. The investigation revealed the following issues:

- The most significant collision rate at signalized intersections has been at Bille Road, where the collision rate is 1.05 times higher than the statewide average for similar facilities. Collision rates at the remaining signalized intersections are below statewide averages.

- The most significant collision rates at the stop-controlled study intersections were found to be at Black Olive Drive, Foster Road, and Fir Street where the collision rates were 2.79 to 1.64 times higher than the statewide average for similar facilities. All three of these intersections are located where there is no center two-way left-turn lane, which can generally assist side street vehicles when turning onto an arterial.

- There has been an average of 2.3 collisions per year since 1998 involving pedestrians.

- There has been an average of 1.4 collisions per year since 1998 involving bicyclists.

Table 5
Collision Rates at the Study Intersections

Rank and Intersection	Number of Collisions (1998 – 2006)	Calculated Collision Rate (c/mve)	Statewide Avg Collision Rate (c/mve)	Ratio of Actual to Expected
1. Black Olive Drive	29	0.39	0.14	2.79
2. Foster Rd	16	0.23	0.14	1.64
3. Fir St	15	0.23	0.14	1.64
4. Honey Run Rd-Birch St	21	0.35	0.22	1.59
5. Bille Rd	30	0.45	0.43	1.05
6. Elliott Rd	32	0.40	0.43	0.93
7. Oliver Rd	18	0.25	0.28	0.89
8. Pearson Rd	13	0.16	0.28	0.57
9. Wagstaff Rd*	9	0.20	0.41	0.49
10. Neal Rd-Schmale Ln	12	0.17	0.43	0.39

Note: c/mve = collisions per million vehicles entering
*Wagstaff Road signalized in summer of 2008, but analyzed under prior four-way stop controls

Bicycle Facilities

In recent years, bicycling has become an increasingly popular method of travel throughout Paradise and the local region. Residents are attracted to bicycling for a variety of reasons including transportation options, health and environmental benefits, energy and financial savings, recreation, and others. In response, local transportation and land-use planning within the region has been sensitive to the attributes necessary to promote and encourage bicycling and walking. The Paradise General Plan (1994) includes discussion of bicycling and walking as a component of its Circulation and the Open Space Elements, and the Town's 2006 Master Bicycle and Pedestrian Plan addresses bicycle use and facilities within Paradise.

The Paradise Urban Area is attractive to bicyclists due to its beautiful landscape and favorable climate for cycling. The centerpiece of Paradise's bicycle system is the Paradise Memorial Trailway, which runs in a northeast-southwest direction through the center of the community. The trail utilizes the old Southern Pacific Railroad right-of-way and roughly parallels Skyway from Wagstaff Road on the north end, to Neal Road on the south end. The General Plan describes the Trailway as "one of the town's greatest amenities. It provides open space and recreation opportunities for walkers, bicyclists, runners, bird watchers, equestrians, etc. It is occasionally referred to as 'the lifeblood' of Paradise." However, the Town's on-street bikeway network is limited, and currently consists of a short section of Class II bike lanes on Pearson Road between Rec Drive and Clark Road. The Town's Bicycle Plan proposes a comprehensive network of bikeways planned to provide bicycle access throughout Paradise including the following connections with Skyway:

- Class II bike lanes on Pentz Road;
- Class II bike lanes on Wagstaff Road;

- Class II bike lanes on Bille Road;
- Class II bike lanes on Maxwell Drive;
- Class II bike lanes on Honey Run Road;
- Class II bike lanes on Pearson Road; and
- Class II bike lanes on Neal Road

Trailway extensions are proposed east to Forest Service Road at the north end of the corridor; east to Paradise High School north of Elliot Road; and south from Neal Road to Skyway Crossroad.

A series of regional bikeway connections to Paradise and the Skyway corridor are proposed in the Countywide Bicycle Transportation Plan including:

- Class II bike lanes on Skyway and/or an extension of the Paradise Memorial Trailway south to Chico;
- Class II bike lanes on Neal Road from Paradise Memorial Trailway to SR 99. Class II bike lane on future overpass, with the Class II bike lane continuing to the Oroville Chico Highway and along Oroville Chico Highway to Midway;
- Class I bikeway along 230KV power line easement from Neal Road to Durham Pentz Road;
- Class II bike lanes on Old Magalia Road from Coutolenc Road to Paradise Memorial Trailway;
- Class I bike lane along the former Southern Pacific Railroad easement from Coutolenc Road and Skyway to Paradise Reservoir and, if feasible, to Stirling City;
- Class II bike lanes on Humboldt Road (at Lomo) from SR 32 to the Skyway;
- Class II bike lanes on the Skyway from Humboldt Road (at Butte Meadows) to Coutolenc Road (at Lovelock);
- Class II bike lanes on Coutolenc Road;
- Class II bike lanes on Honey Run Road from Skyway to approximately one mile past the Honey Run Covered Bridge;
- From one mile east of Honey Run Bridge, convert Honey Run Road to one-way (for bikes and motor vehicles). Add a single Class II bike route up to Honeyview Terrace. From Honeyview Terrace to Skyway, preserve two-way traffic and install a Class II bike route; and
- Class III bike route along Pentz Road from the south town limit to Lime Saddle Marina

Pedestrian Crosswalks

There are numerous pedestrian crosswalks located throughout the Skyway Corridor. A previous report, "Pedestrian Crossing Study" Report, by William E. Bishop and Thomas E. Ferrara, November 2006, included detailed information for pedestrian crosswalks located within the Skyway study corridor. Of the 14 study crosswalks in the study, 12 are located within the Skyway Corridor Study Area (see Figure 3). The Pedestrian Crossing Study documented various characteristics of the 12 crosswalks, which included PED XING legends on the pavement, advanced crossing pedestrian warning signs, crosswalk signs at the crosswalks, and minimum recommended safe sight stopping distance (SSSD) based on prevailing speeds. In addition to this information, Table 6 shows percentages of vehicles that did not yield to pedestrians during a three-hour study period per crosswalk location. These percentages range from 33% to 100%. The study documented an overall 38% of vehicles stopped for pedestrians, while 62% did not. The Pedestrian Crossing Study also documented a series of recommendations for all crosswalks that would enhance safety at the crosswalk locations. A summary of these improvements are included in Appendix C.

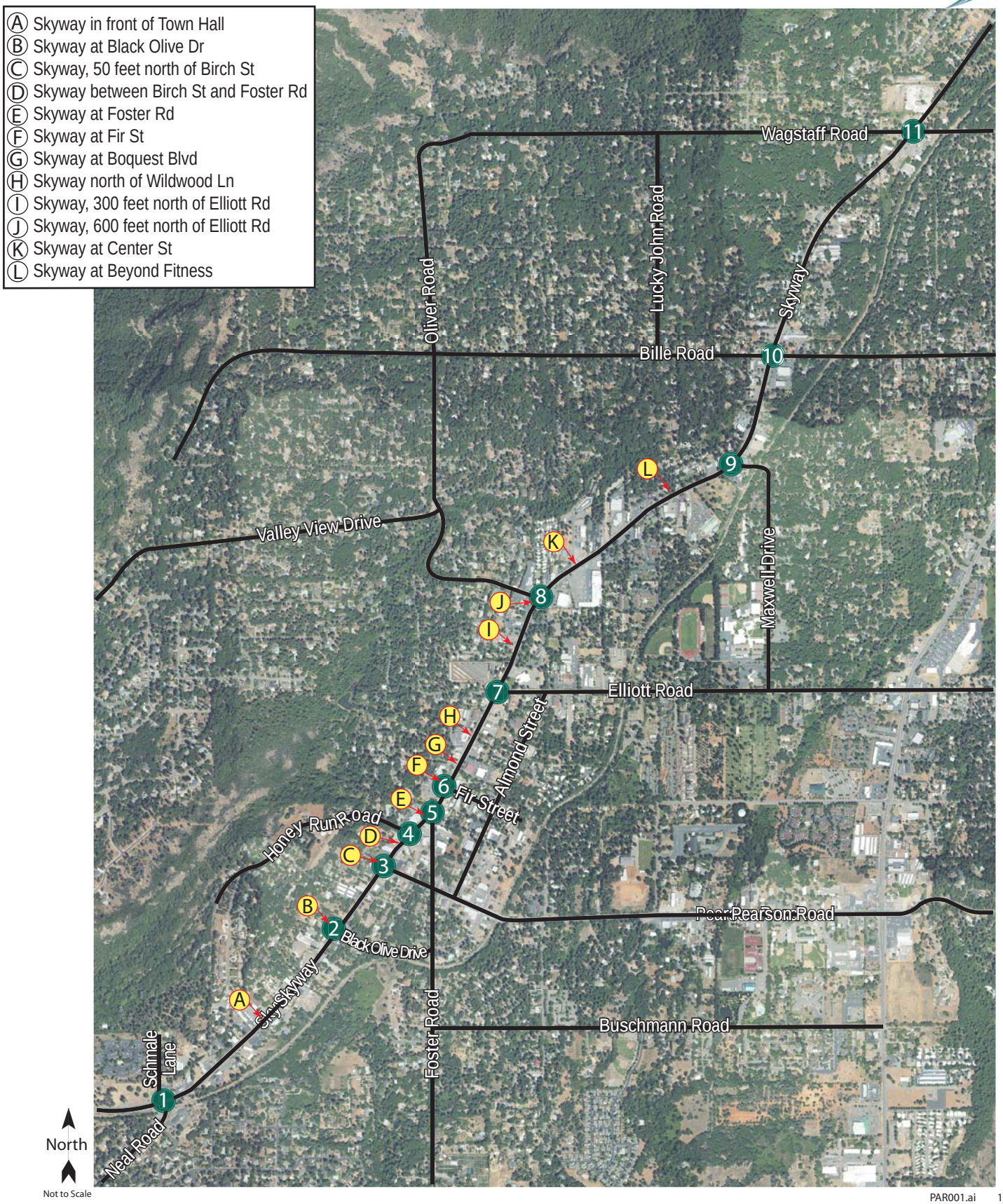

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Figure 3
Crosswalk Locations

Table 6
Summary of Existing Pedestrian Crosswalk Locations

Segment	Crosswalk Skyway	Percentage of Vehicles Not Yielding to Pedestrians	PED XING Legend on Pavement (North/South)	Advanced Crossing Warning Signs (North/South)	Crosswalk Signs at Crosswalk (North/South)	Meets Recommended SSSD Based on Prevailing Speed (North/South)
A	5500 Block, Town Hall	80%	yes / yes	yes / yes	yes / yes	yes / yes
	Black Olive Dr	100%	yes / yes	- / yes	- / yes	yes / yes
B	50 feet North of Birch St	62%	- / yes	- / yes	yes / yes	very limited / yes
	Between Birch and Foster	70%	- / yes	- / yes	yes / yes	very limited
	Foster St	73%	- / yes	yes / -	yes / yes	very limited / yes
	Fir St	66%	- / yes	- / -	yes / yes	- / yes
	Boquest	33%	- / yes	- / -	yes / yes	yes / -
	North of Wildwood	43%	- / -	- / -	yes / yes	yes / -
C	300 feet North of Elliott	64%	- / -	- / -	yes / yes	- / yes
	600 feet North of Elliott	60%	- / -	- / -	yes / yes	yes / -
	Center St	48%	yes / -	yes / -	yes / yes	yes / yes
	At Beyond Fitness	62%	yes / yes	yes / yes	yes / yes	yes / yes

Traffic Volume Projections

Future traffic volumes were developed from the updated traffic model maintained by BCAG that was completed in early 2008. Traffic model runs for base and future projections (year 2006 and year 2035) were analyzed to develop the increment of traffic growth that is expected to occur in the future. This incremental growth was then added to recent traffic volumes collected at the study intersections using the "Furness" procedure. The resulting 2035 traffic volumes for the study area are shown in Figure 4. Future 2035 daily traffic is estimated at 16,700 vehicles per day (vpd) north of Bille Road, 21,600 vpd north of Pearson Road in the downtown, and 32,400 vpd south of Pearson Road on the highest volume section in the study area. Plots of the traffic model projections provided by BCAG are shown in Appendix D.

Intersection Operating Conditions

With future traffic volumes and no changes to roadway configuration, signalized intersections in the corridor would be expected to operate at a LOS D or better during both peak hours. A summary of the LOS calculations is shown in Table 7. The uncontrolled intersections along the corridor would experience increasing delay to the side streets in the LOS F range during the p.m. peak hour, including delays that exceed 120 seconds in some cases. A copy of the level of service calculation sheets is provided in the technical Appendix E.

Table 7
Summary of Future Intersection Level of Service Calculations

Intersection	AM Peak		PM Peak	
	Delay	LOS	Delay	LOS
Neal-Schmale Ln	21.3	B	22.9	C
Pearson Rd	25.3	C	37.1	D
Elliott Rd	21.9	C	43.5	D
Oliver St	18.1	B	16.6	B
Maxwell Dr	13.6	B	14.4	B
Bille Rd	32.8	C	30.9	C
Wagstaff Rd	19.4	B	20.0	B

Notes: Delay is measured in average seconds per vehicle, LOS = Level of Service

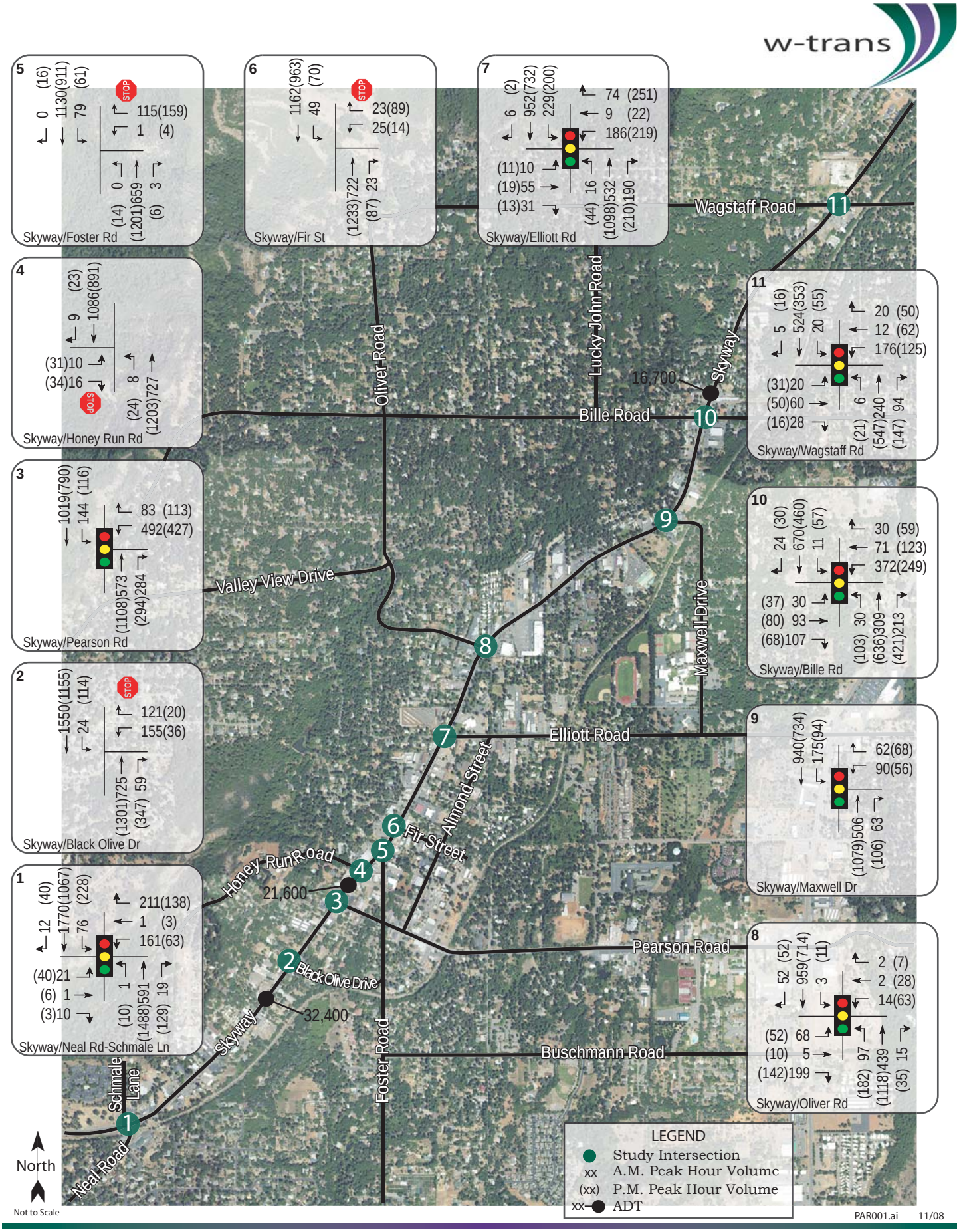

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Figure 4
Future Year 2035 Traffic Volumes

Corridor Alternatives

Based on analysis of the base traffic conditions, input received during the stakeholder interviews (discussed in next section) and discussions with Town staff, three alternatives and one sub-alternative were developed for the Skyway Corridor. Each of the four sections of Skyway, A through D, includes different recommendations under the alternatives rather than one consistent cross-section geometry for the road from one end to the other. The approach on all alternatives was to contain all street modifications including sidewalks within the existing available right-of-way.

The key components of each alternative are summarized below and in Table 8. Exhibits showing proposed cross-sections and concept layouts for representative areas are included in Appendix F. Because no topographic surveys were completed for this planning study, the concept layouts may not be exact in terms of position relative to right-of-way. Also, sidewalks may need to be designed with a narrower width in constrained locations due to constructability, utilities, street furniture, ADA requirements, transition to native ground/conform, etc.

Alternative 1 – Three Lanes Downtown

Segment A (Neal-Schmale Lane to Pearson Road)

- maintains 5-foot sidewalks
- provides a shoulder for bicycle access
- narrows the five travel lanes to 11-feet

Segment B (Pearson Road to Elliott Road in downtown)

- widens the sidewalks from 5-feet to 10.5-feet
- maintains 8-foot on-street parallel parking
- adds 5-foot bike lanes
- reduces lanes from four 13 to 14-foot lanes to two 11-foot through lanes
- adds an 11-foot, center two-way left-turn lane
- opens the potential for intermittent landscaped medians in the center lane area
- adds a small parking lot on the vacant triangular parcel adjacent to Foster Road
- includes an expanded small public gathering space at Skyway/Foster Road

Section C (Elliott Road to Bille Road)

- maintains 5-foot sidewalks
- adds 5-foot bike lanes
- narrows the five travel lanes from 14-feet to 12-feet
- adds a center two-way left-turn lane where currently missing
- eliminates on-street parking

Segment D (Bille Road to Wagstaff Road)

- adds 5-foot bike lanes
- maintains the two 12-foot travel lanes

- suggests ultimate creation of a 10-foot asphalt path for pedestrians
- provides the opportunity to maintain tree coverage adjacent to road

Alternative 1A – Three Lanes Downtown with Traffic Signals at Black Olive and Fir

- adds traffic signal at the Black Olive Drive intersection
- adds traffic signal at the Fir Street intersection
- implements coordinated signal timing between Elliott Road and Black Olive Drive
- additional signals may help regulate speeds and could potentially improve safety at two of the top three highest-collision locations on Skyway

Alternative 2 – Two Lanes and 45-degree diagonal Parking Downtown

Segment A (Neal-Schmale Lane to Pearson Road)

- widens the sidewalks to 10-feet
- narrows the five travel lanes to 11-feet

Segment B (Pearson Road to Elliott Road in downtown)

- widens the sidewalks from 5-feet to 10-feet
- adds 17-foot 45-degree diagonal parking between Honey Run Road to Fir Street
- reduces lanes from four 13 to 14-foot lanes to two 13-foot through lanes
- adds an 11-foot, center two-way left-turn lane, south of Honey Run and north of Fir Street
- closes Foster Road at Skyway which would be a cul-de-sac turnaround
- adds 45-degree diagonal parking on Foster Road
- plans for a public gathering space on the larger triangular area created by the Foster Road closer

Section C (Elliott Road to Bille Road)

- maintains 5-foot sidewalks
- adds 5-foot bike lanes
- reduces lanes from four 13 to 14-foot lanes to two 12-foot through lanes
- adds a 12-foot, center two-way left-turn lane
- maintains and widens the parallel parking areas

Segment D (Bille Road to Wagstaff Road)

- adds 5-foot bike lanes
- maintains the two 12-foot travel lanes
- add a 12-foot center two-way left-turn lane
- provides 2-foot landscape buffer separating path from road
- suggests ultimate creation of a 5-foot asphalt path for pedestrians
- provides the opportunity to maintain tree coverage adjacent to road

Alternative 3 – One Lane Southbound Downtown

Segment A (Neal-Schmale Lane to Pearson Road)

- (same as Alternative 1)

Segment B (Pearson Road to Elliott Road in downtown)

- widens the sidewalks from 5-feet to 11-feet
- maintains 8-foot on-street parallel parking
- reduces the southbound lanes from two 14-foot lanes to one 11-foot travel lane
- adds a 10-foot, center two-way left-turn lane
- narrows the two northbound lanes to an average of 10.5 feet
- opens the potential for intermittent landscaped medians in the center lane area
- restricts Foster Road to right-turn movements in and out only
- plans for a public gathering space on the triangular parcel adjacent to Foster Road

Section C (Elliott Road to Bille Road)

- Widens the sidewalks to 10.5 feet
- adds 5-foot bike lanes
- narrows the travel lanes from four lanes to two 11-foot lanes
- adds a center two-way left-turn lane where currently missing
- maintains parallel parking

Segment D (Bille Road to Wagstaff Road)

- (same as Alternative 1)

Table 8
Alternative Cross-section Details (feet)

Alternative	sidewalk	park	bike/ shldr	travel	center	travel	bike/ shldr	park	sidewalk	Est. ROW
Segment A – Neal Lane to Pearson Road										
1	5	-	4.5	2 x 11	11	2 x 11	4.5	-	5	≈74
2	10	-	-	2 x 12	12	2 x 12	-	-	10	≈80
3	5	-	4.5	2 x 11	11	2 x 11	4.5	-	5	≈74
Segment B – Pearson Road to Elliott Road										
1	10.5	8 (p)	5	11	11	11	5	8 (p)	10.5	≈80
2	10	17 (d)	-	13	-	13	-	17 (d)	10	≈80
3	11	8 (p)	-	11	10	2 x 10.5	-	8 (p)	11	≈80
Segment C – Elliott Road to Bille Road										
1	5	-	5	2 x 12	12	2 x 12	5	-	5	≈80
2	5	12 (p)	5	12	12	12	5	12 (p)	5	≈80
3	10.5	8 (p)	5	11	11	11	5	8 (p)	10.5	≈80
Segment D – Bille Road to Wagstaff Road										
1	up to 13	-	5	12	-	12	5	-	up to 13	≥60
2	5 (a/c)	2 (b)	5	12	12	12	5	2 (b)	5 (a/c)	≥60
3	up to 13	-	5	12	-	12	5	-	up to 13	≥60

Notes: (p) = parallel parking, (d) = 45 degree diagonal parking, (a/c) = asphalt meandering path, (b) = landscape buffer

Use of 11-foot Travel Lanes

Reduction of lane width is a commonly used tool for traffic calming. Information published by the Federal Highway Administration in *Mitigation Strategies for Design Exceptions*, July 2007, shows that a reduction in lane width from 12 feet to 11 feet on a two-lane highway results in an average decrease in free-flow speed by ranging between 0.4 to 4.7 miles per hour, depending on the width of the shoulder. In addition, this publication cites research that has found little difference in average collision rates for streets that have 11-foot travel lanes as compared to streets with 12-foot travel lanes. In *Traffic Calming – State of the Practice,* published by the Institute of Transportation Engineers in association with the FHWA, narrowed road widths are identified as a traffic calming method to reduce the free-flow speed of traffic.

The American Association of State Highway and Transportation Officials (AASHTO), in the publication *A Policy on Geometric Design of Highways and Street,* 2004, identifies that lane widths generally range from 9 to 12 feet with 12 feet being the prevailing standard width nationwide. AASHTO further states that lane widths of 11 feet are acceptable urban areas where pedestrian, right-of-way or existing development constrains 12-foot lanes. While the Caltrans *Highway Design Manual* indicates that travel lane widths shall be 12 feet wide, the Caltrans publication *Main Streets: Flexibility in Design and Operations*, 2005, indicates that there are some instances when Caltrans will approve design exceptions for lane widths narrower than the standard 12 feet.

For highways that serve as main streets, particularly those that operate at lower speeds, lane widths narrower than the standard 12 feet may be appropriate. Reduced lane widths in combination with other traffic calming measures may encourage slower speeds, which is desirable for a main street. Where existing right of way is limited, reducing lane widths can provide adequate shoulder width for bike lanes and sidewalks.

A key consideration for narrowed lane widths on corridors that experience frequent truck or recreational vehicle traffic is the usage of adjacent roadway spaces. On these corridors, it is desirable for some sort of "buffer" to exist between the 11-foot wide lanes and opposing traffic and on-street parking. This can be accomplished by striping a one-foot offset from adjacent vertical curbs, providing a center two-way left-turn lane, or providing an on-street bicycle lane. While large vehicles by law are limited to 8.5 feet in width and would not be expected to actively travel in these buffer areas, the separation helps to accommodate large vehicle turning movements and oversize loads.

The use of 11-foot wide travel lanes on Skyway through downtown Paradise would be expected to have little impact on large vehicles, other than a potential decrease in speeds as drivers adjust to the roadway conditions. The 11-foot wide lanes would still accommodate truck maneuverability, even for oversize loads, as they would be flanked by a center turn lane and on-street bicycle lane or shoulder.

Road Diets

The term "Road Diet," generally refers to the conversion of streets from four-lanes (two through lanes in each direction) to three-lanes, (one through lane in each direction and a center two-way left-turn lane. These conversions have been used by communities throughout the Country to address traffic safety, accessibility and bicycle facilities. Road diets in a downtown corridor often result in an environment that is safer and friendlier to drivers, bicyclists and pedestrians. The slowing of vehicular traffic generally results in a reduction of collisions and increase of comfort level for pedestrians and bicyclists. The installation of a two-way left turn lane and turn lanes at intersections provides refuge for turning vehicles without obstructing the flow of following vehicles, which also increases the comfort to the driver and decreases collisions. The reduction in lanes also provides enough room to add bicycle lanes. Despite the decrease in travel lanes, road diets have been seen to increase the average daily traffic of a roadway by making it operate more efficiently. At the same time, road diets may increase the availability of on-street parking, and make off-street parking easier to access.

The combination of increased safety, efficiency and user comfort has been seen to have a positive impact on businesses located along road diet corridors. Case studies have shown that downtown corridors that undergo a road diet generally experience an increase in sales and property values while experiencing a decrease in vacancy. This is often attributed to the fact that after an implementation of a road diet, it is easier for drivers and bicyclists to access a business and since pedestrians feel more comfortable, they are more likely to visit multiple businesses during one trip. (Discussion of specific examples is included in Appendix G)

Operational Analysis

Each of the alternatives was tested to determine potential impacts to vehicle travel speeds on Skyway using a simulation software application. All scenarios assume that the traffic signal at Wagstaff Road is operational. The results of this analysis are included in Appendix H.

Stakeholder Interviews – May 2008

At the start of the process, the Town arranged interviews with key stakeholders including business owners, public safety officials and community organizers. Following is a summary of the issues and solutions discussed during the Stakeholder Interviews.

Greatest Concern or Opportunity that can come out of this effort:

- Increase Pedestrian Safety- very difficult/dangerous to cross Skyway
- Slow Traffic Speeds – Skyway is used as a freeway corridor to Chico and Magalia
- Sidewalks are too narrow and are not continuous throughout downtown
- Lack of pedestrian connections to and through downtown
- Not safe to bike on Skyway
- Entice drivers to engage surroundings and acknowledge downtown Paradise
- Parking is an issue, difficult/unsafe to park on the street and not enough parking in convenient locations
- Smother less congested traffic flow
- Keep businesses in Paradise (pedestrian-friendly streetscape can help achieve that)
- Need a distinctive element/character that defines the downtown area
- Increase foot traffic by enhancing pedestrian-orientation
- Need more landscaping
- Infrastructure (mainly lack of wastewater system) a major issue
- Consider redirecting traffic off of Skyway and/or establish downtown along parallel streets (i.e. Almond Street)

Potential Solutions

- Incorporate consistent large leaf trees at street edge to soften appearance of downtown and provide much needed shade along the sidewalks.
- To encourage pedestrian activity, connect and widen sidewalks and provide a landscape, furniture, and pedestrian lighting zone. If can't fit landscaping on the sidewalks consider introducing them on the street at the edge of the curb to define parallel parking areas
- Narrow the perception of motorist to encourage them to reduce speeds. This can be accomplished by:
  - ◇ Reducing the lanes from five to three lanes with a south and northbound lane and center turn lane/median with parallel (or 45-degree diagonal if possible) parking lanes on both sides of the street.
  - ◇ Bulb-outs at pedestrian crosswalks to shorten the crossing distance and heighten awareness. If raised medians are built, they can also act as a pedestrian refuge while crossing.
  - ◇ Add bike lanes on Skyway that connect back to the trail along the railroad tracks and anticipated traffic coming off Honey Run (particularly during the Wildflower Race).
- To help give the Downtown an identity the notion of establishing a community gathering space (i.e. a town green/square) was supported. A viable location for that is at the triangle between Birch Street, Foster Street, and Skyway. There is also potential to locate it off Birch Street near Cedar Street, though this location would lack a gateway presence and would not be surrounded by buildings/businesses, both of which are key aspects of successful urban plazas.

Public Workshop – September 2008

On Thursday September 18, the first public workshop for the Skyway Corridor Plan was held in the Town Hall of the Town of Paradise. This streetscape improvement project is a collaboration of BCAG, the Town of Paradise, W-Trans, and RRM Design Group. At the workshop, approximately 30 participants signed in and the group was formed mostly of residents, business owners, and local property owners. Some participants were representing the nearby town of Magalia and the Upper Ridge Coordinating Council.

The purpose of this initial workshop was to obtain public input for the potential streetscape design of the 2.8-mile stretch of Skyway Corridor. The workshop consisted of two phases, the first being a power point presentation by W-Trans and RRM on the background of the project, the four road segments of Skyway with alternative road sections, and the three alternatives of the proposed Gateway Park/Plaza. The second phase of the workshop encouraged participants to vote on their preferred alternative street section, Gateway park/plaza concept, and preferred circulation scheme for Foster Road. The duration of the workshop also allowed participants to fill out the comprehensive report cards handed out at the workshop entry.

Following is a summary of the voting and report card exercises, noting areas of commonalities and differences in levels of support.

Segment Alternative Street Sections

The following is a summary of the support from both the report card and voting exercises.

Segment A – Neal Road to Pearson. A majority, 63%, supports **Alternative A.1**. This alternative places a 5-foot bike lane and a 5-foot sidewalk on each side of the street. It also includes four 12-foot travel lanes, two in each direction, and a 12-foot center turning lane.

Segment B – Pearson Road to Elliott Road. This segment is the downtown portion of Paradise. **Alternative B.1 and B.1a** were the most supported collectively, with a **62%** approval rating, but were split on the issue of added traffic signals. Both sections consist of the same alignment, and have 10.5-foot sidewalk, 8-foot parallel parking, 5-foot bike lane, and an 11-foot travel lane in each direction, with an 11-foot center turn lane. The public showed mixed support for placing diagonal parking in this segment, with an even split of nine votes for and against the parking.

Segment C – Elliott Road to Bille Road. Voting was split with **38% each** for **Alternative C.1 and C.3**. These two are vastly different, but two commonalities are a 5-foot bike lane and a center turn lane. The controversial issues begin with having one or two travel lanes in each direction. If there were one lane in each direction, there would be opportunity to have parallel parking and a 10.5-foot sidewalk, as seen in Alternative C.3. However, the two travel lane option allows for the average 5-foot sidewalk and no parking. Public comments on this segment favor the one-lane option because it can cause a "possible slowdown of traffic" with "more parking, bike lanes." In addition, the larger sidewalks can provide space for street trees for "aesthetics."

Segment D – Bille Road to Wagstaff Road. Overwhelming majority, **73%**, supports **Alternative D.2**, which has a 7-foot multi-use path, 5-foot bike lane, and 12-foot travel lane in each direction, with a 12-foot center turning lane.

The following summarizes the general written comments for the preferred alternatives.

A. What do you like about the alternatives you chose?

- Made the downtown area prominent
- Safety, charm, city identity, and promotes foot traffic for businesses
- Adds bike lanes; Allows safe biking
- Slows traffic, more pedestrian friendly
- A middle turn lane flanked by single lane
- Traffic calming
- Black Olive signal
- Uniformity of the entire street

B. What would you improve about the alternatives?

- Diagonal parking up to Elliot Road
- Trash cans
- No trucks downtown except during restricted hours
- Stop signs at every block before anything else
- Traffic signal, pedestrian, Black Olive, Fir, Elliot
- Off road sidewalks or paths are needed

Report Card Support Levels

The following table depicts the percentages of support for the features of the streetscape design of Skyway.

Skyway Corridor Features	Support	Moderate Support	No Support
One lane in each direction with a center median	67%	29%	5%
On-street parallel parking	62%	33%	5%
On-street diagonal parking in downtown core	37%	11%	53%
Bike lanes	52%	19%	29%
Safety enhanced pedestrian crossings	**92%**	8%	0%
Wide sidewalks	64%	36%	0%
Sidewalk furniture (benches, etc.)	67%	33%	0%
Sidewalk lighting	**88%**	13%	0%
Large canopied trees	**86%**	9%	5%

Foster Road Circulation

Per public comment, the intersection of Skyway and Foster Road presents travel concerns and pedestrian safety hazards due to the sharp angle of the intersection. Left hand turns out of Foster Road can be dangerous due to this awkward angle. W-Trans has responded to this issue by providing three options for

the roadway represented through: 1) Existing Circulation, 2) Foster Road One-Way and 3) Foster Road/Skyway intersection closure.

Workshop participants voted on these three options by way of placing voting dots and filling in the report card. The results of the votes are a combination of all supporting votes from both of the available methods. The table below shows that the main support is for the closure of Foster Road, with a close second place level of support for the one-way northbound Foster Road option.

Circulation Alternatives	Support	No Support
Existing	20%	6%
One-Way Alternative	34%	0%
Foster Road/Skyway intersection closure	**40%**	0%

Gateway Park/Plaza Alternatives

The site of the Gateway Park/Plaza is at the northern corner of the Foster Road and Skyway, and is intended to provide an aesthetically pleasing community-oriented gateway into the Downtown area of the Town of Paradise. The public was given two chances to vote on the three options of park designs, just as they had with the Foster Road Circulation. The following is the description of each of the park/plaza concepts, along with a table of how each faired with the public.

Alternative 1 – This alternative encompasses the entire triangular block bordered by Foster Road, Skyway, and Birch Street. The main features of this design include ample turf area, a geometric design of decomposed granite pathways, paved crosswalks around the entire park, diagonal parking on Birch and Foster, and lots of trees within and surrounding the park. One centrally located south facing building is fronted with flagstone paving, an ideal location for gatherings such as Farmer's markets. This design gained the most votes with **30% support**, and received comments such as "Need entire plot to give gateway presence" and "maintain circulation."

Alternative 2 – This alternative design uses the most northern parcel of the site and creates a one-way northbound Foster Road. Features include: a large fountain, specially paved crosswalks, a trellis seating area alongside Foster Road, and diagonal parking on Skyway. Turf area is the central focus and a decomposed granite pathway divides the turf area and the existing buildings on the south. The positive feedback on this design includes that "Foster one-way = better/safer travel."

Alternative 3 – The design of this park/plaza places new buildings at Birch and Skyway, a trellis walkway along Skyway leading up to a gazebo/ bandstand, outdoor dining areas, a water feature, a northerly specially paved plaza, paved crosswalks, and a cul-de-sac closure of Foster Road. The support for this option was mixed.

Park/Plaza Alternatives	Support	No Support
No Park/Plaza	11%	0%
Alternative 1	**30%**	2%
Alternative 2	20%	7%
Alternative 3	22%	9%

Park Features

The following table represents how individual park features faired with the public. Special paving on crosswalks, benches and seating, and a plaza gained the most support.

Gateway Plaza/Park Feature	Support	Moderate Support	No Support
Turf area	53%	24%	24%
Plaza	**84%**	5%	11%
Gazebo/Bandstand	50%	6%	44%
Trellis structures	61%	22%	17%
Special paving at bulb-outs and crosswalks	**82%**	6%	12%
Water feature	65%	18%	18%
Benches/seating areas	**84%**	5%	11%

Summary of Workshop Input

From the results of the voting and report card exercises at the first public workshop, it is evident the participants were eager to enhance Skyway and create a more prominent downtown area by means of bike lanes, specially paved crosswalks, and well located parking. Pedestrian and bicyclist safety is also imperative. The findings and conclusions derived from this first workshop include the following:

- A majority of participants highly support a center turn lane throughout the corridor, with some support for one lane travel in each direction.

- A gateway park/plaza is highly supported for the entry to the Downtown, and there is support for using the entire triangular block of parcels at the intersection of Birch Street, Foster Road, and Skyway.

- Due to split public opinion, the segment of Elliott Road to Bille Road needs to be studied more to verify if one lane in each direction will be efficient for traffic flow.

- There was overwhelming support for the pedestrian safe features of: safety enhanced pedestrian crossings, sidewalk lighting, and large canopied trees.

- All of the preferred street sections include a 5-foot bike lane.

RDA Citizens Advisory Committee Meeting – November 2008

On November 17, 2008, a presentation of the draft study findings and recommendations was made to the RDA Citizens Advisory Committee with the public invited to attend and comment). Following is a summary of the comments received:

- Foster Road intersection with Skyway should allow for full access.
- Segment D should include the three-lane section with bike lanes, a landscape buffer and a pedestrian path.
- Address truck loading and unloading on Skyway downtown with three-lane section.
- Does a reduction in lanes downtown result in economic success?
- Discuss bus stops.
- Include analysis of queuing on Skyway at Pearson with preferred alternative.
- Address bike crossing maneuvers and enhancements between Honey Run and Birch.
- Include Implementation Plan (See RDA 5-year plan).

Description

Based on input from the public workshop and subsequent discussions with Town staff, the following preferred alternative was developed for further analysis.

Segment A (Neal-Schmale Lane to Pearson Road)

- maintains existing 5-foot sidewalks
- adds up to 4.5-foot shoulders to improve bicyclist safety where road width allows
- narrows the five travel lanes to 11-feet
- add a center two-way left-turn lane where currently missing
- eliminates existing on-street parking
- adds a traffic signal at the Black Olive Drive intersection

Segment B (Pearson Road to Elliott Road in downtown)

- widens the sidewalks from 5-feet to a maximum of 10.5-feet
- maintains 8-foot on-street parallel parking
- adds 5-foot bike lanes
- reduces through lanes from four to two 11-foot through lanes
- adds an 11-foot, center two-way left-turn lane
- adds a traffic signal at the Fir Street intersection
- implements coordinated signal timing between Oliver Road and Black Olive Drive
- maintains full access at Foster Road, but eliminates right-turn channelization
- plans for additional parking on the triangular parcel adjacent to the Skyway/Foster Road intersection
- plans for a small public gathering space at the southeast corner of Skyway/Foster Road
- uses decorative pavement in the center lane area through downtown
- accommodates two southbound lanes in times of emergency evacuation

Note: For this alternative, new sidewalks may need to be designed with a narrower width in constrained locations due to constructability, utilities, street furniture, ADA requirements, transition to native ground/conform, etc., but in no case shall be less than five feet.

Section C1 (Elliott Road to Oliver Road)

- adds 5-foot bike lanes
- reduces the lanes to three 12-foot lanes
- widens the sidewalks to a maximum of 9 feet
- provides for 8 feet of parallel parking

Note: As in Segment B, new sidewalks may need to be designed with a narrower width in constrained locations, but shall in no case be less than five feet.

Section C2 (Oliver Road to Bille Road)

- maintains 5-foot sidewalks
- adds 5-foot bike lanes
- narrows the five travel lanes from 14-feet to 12-feet
- adds a center two-way left-turn lane where currently missing
- eliminates existing on-street parking

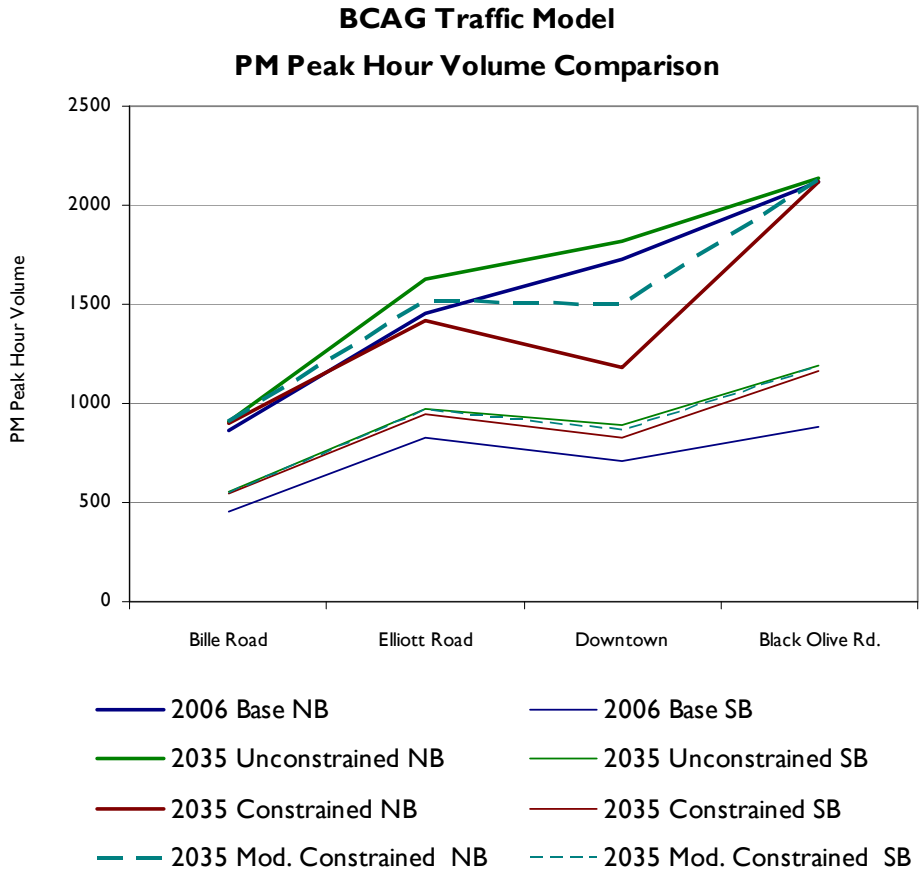
Segment D (Bille Road to Wagstaff Road)

- adds 5-foot bike lanes
- maintains the two 12-foot travel lanes
- add a 12-foot center two-way left-turn lane
- suggests ultimate creation of a 5-foot asphalt path for pedestrians
- provides 2-foot landscape buffer separating path from road
- meandering path provides the opportunity to maintain tree coverage adjacent to road

Traffic Pattern Implications

In order to gauge the potential shifts in regional traffic patterns that could occur with lane reductions and constrained traffic capacity through downtown Paradise, BCAG conducted additional traffic model runs for the year 2035 a.m. and p.m. peak hours. The model runs, referred to as "Future Constrained," were coded to reflect single through traffic lanes on Skyway between Pearson Road and Elliott Road. Because Skyway experiences dominant commute flows that are southbound in the morning and northbound in the evening, the model results were considered by travel direction. The northbound p.m. peak hour traffic volumes were chosen to demonstrate the relative changes to traffic flow projected by the BCAG model. Similar trends would be evident in the southbound direction during the a.m. peak hour.

The comparison of p.m. peak hour volumes suggests that year 2035 constrained northbound traffic volumes through the narrowed downtown segment would be about 35 percent lower than year 2035 unconstrained volumes without the narrowing. In fact, the model shows year 2035 constrained volumes to be about 30 percent lower than the 2006 base volumes on the same segment. Note that year 2035 traffic volumes on Skyway to the north of Bille Road and to the south of Black Olive Road would remain similar, however, with either downtown configuration according to the BCAG model. The traffic volume trends are shown graphically by direction in the following chart.



The reduction in lane capacity through downtown Paradise would clearly have an influence on traffic volume patterns. The degree to which drivers will choose to divert will be influenced by intersection configurations, roadway conditions on alternate routes, and land use characteristics. Traffic signal operation on Skyway could also play a major role in the degree of congestion that drivers may actually experience. The presence of a center two-way left-turn lane on the narrowed downtown section may also result in a somewhat higher roadway capacity than assumed by the BCAG traffic model. For these reasons, it was deemed appropriate to evaluate an additional traffic volume scenario that considers the average of the 2035 unconstrained and constrained volumes, referred to herein as "moderately constrained." Through consideration of traffic operation with unconstrained, moderately constrained, and constrained traffic model volume projections, a full range of potential outcomes may be considered.

A qualitative assessment of which roadways drivers would divert to with the narrowed downtown section was conducted based on the BCAG 2035 p.m. peak hour model run. The prevailing traffic shifts show volumes on Clark Road increasing by approximately 28 percent between Pearson Road and Elliott Road, with east-west volumes increasing most clearly on Bille Road and Pearson Road. The projections also show an approximate 74 percent increase in traffic on Almond Street than would exist without the downtown narrowing on Skyway. In other words, the model output suggests that the two primary bypass routes around downtown would be via Bille-Clark-Pearson and via Elliott-Almond-Pearson.

For informational purposes, BCAG also prepared year 2035 peak hour model runs with the constrained downtown lanes *in addition to* the potential extension of Buschmann Road to Skyway. The results indicate

that the Buschmann extension would provide modest decreases in volume on Skyway between Buschmann and Pearson, as well as some decrease in volumes on Pearson between Skyway and Clark. Because the incremental volume changes were somewhat modest and would only affect a small portion of the Skyway corridor, a separate operational analysis was deemed unnecessary.

It is important to note that the BCAG model is regional in nature, and as previously discussed, lacks details on information such as intersection control, signal coordination, roadway conditions on alternate routes, and other environmental factors that affect driver decisions. Plots of the various BCAG model runs are provided in Appendix D.

Operational Analysis

In all scenarios, it was determined that the existing and planned traffic signals at Black Olive Drive, Pearson Road, Fir Street, Elliott Road, and Oliver Road must be coordinated in order to achieve smooth traffic flow through downtown. It was also determined that further operational improvements could be achieved through modifications to Elliott Road intersection by converting the existing channelized westbound right turn lane into a traditional right turn lane with right turn overlap signal phase. All three traffic analysis scenarios for the Preferred Plan assume the above modifications to be in place.

Intersection Analysis

As would be expected, intersection levels of service along Skyway are somewhat better using BCAG's constrained model projections, which assume single through lanes through downtown, versus using the unconstrained projections, which assume no changes to capacity. Regardless of the year 2035 volumes applied, all intersections are projected to operate acceptably at LOS D or better, with one exception. The Skyway/Elliott Road intersection would be expected to operate unacceptably at LOS E assuming the unconstrained model volumes. This impact would be attributable to an increased flow in traffic from southbound Skyway onto eastbound Elliott Road as drivers divert from downtown to other routes. A potential mitigation resulting in acceptable LOS D operation would be to install dual southbound left turns from Skyway onto Elliott Road, in tandem with widening Elliott Road to provide two accepting eastbound lanes. The Elliott Road widening would logically extend to Almond Street, where the outer eastbound lane would become a "trap" right turn lane onto Almond, facilitating this corridor as a minor bypass route serving traffic destined to downtown. Note that this mitigation would not be required from a LOS perspective if the constrained or moderately constrained future volumes were applied. A summary of the future level of service calculations is provided in Table 9.

Table 9
Summary of Future Intersection Level of Service Calculations

Intersection on Skyway	Future Base (No Project)		Future with Preferred Plan					
			Unconstrained Model		Moderately Constrained		Constrained Model	
	AM	PM	AM	PM	AM	PM	AM	PM
Neal-Schmale Ln	21.3/B	22.9/C	22.4/C	21.6/C	20.9/C	21.4/C	21.4/C	19.3/B
Black Olive Dr	n/a	n/a	9.6/A	9.2/A	9.3/A	8.9/A	12.3/B	8.1/A
Pearson Rd	25.3/C	37.1/D	24.7/C	54.6/D	20.0/C	51.5/D	17.8/B	47.0/D
Fir St	n/a	n/a	9.5/A	34.0/C	7.2/A	46.4/D	4.5/A	38.7/D
Elliott Rd	21.9/C	43.5/D	24.0/C	56.9/E	26.0/C	49.1/D	26.6/C	36.1/D
Mitigated	-	-	*23.2/C*	*47.04/D*	-	-	-	-
Oliver St	18.1/B	16.6/B	22.6/C	20.4/C	25.8/C	20.5/C	21.0/C	20.7/C
Maxwell Dr	13.6/B	14.4/B	13.7/B	14.6/B	15.5/B	14.3/B	14.9/B	14.5/B
Bille Rd	32.8/C	30.9/C	30.5/C	31.2/C	29.7/C	30.3/C	26.6/C	29.8/C
Wagstaff Rd	19.4/B	20.0/B	23.9/C	20.0/C	19.6/B	19.7/B	19.7/B	19.6/B

Notes: Results are indicated as Delay/LOS, Delay is measured in average seconds per vehicle, LOS = Level of Service

Corridor Analysis

The projected average corridor speeds by segment both with and without the Preferred Plan are summarized in Table 10. The results shown are for year 2035 using the unconstrained BCAG traffic model projections. Note that the corridor speeds are averages that include both driving time and time spent waiting at traffic signals, and are therefore intended to be used primarily for comparative purposes when considering no-project versus project conditions.

Table 10
Skyway Corridor Average Vehicle Speeds – PM Peak Hour Unconstrained

Segment	Future 2035 (No Project)		Future 2035 with Preferred Plan	
	NB	SB	NB	SB
Segment 1 – Neal to Pearson				
AM Peak Hour	27	30	25	28
PM Peak Hour	24	29	25	31
Segment 2 – Pearson to Elliott				
AM Peak Hour	23	24	25	18
PM Peak Hour	20	24	14	19
Segment 3 – Elliott to Bille				
AM Peak Hour	24	26	24	22
PM Peak Hour	22	24	22	21
Segment 4 – Bille to Wagstaff				
AM Peak Hour	28	25	29	24
PM Peak Hour	28	27	29	27

Notes: NB = Northbound, SB = Southbound; Results are expressed in miles per hour (mph)

The Preferred Plan would result in notable drops to average travel speeds, particularly on the downtown segment during the p.m. peak hour. Average northbound speeds would be expected to reduce from 20 mph without the project to 14 mph with the project, which is still considered to be LOS D though near the LOS E threshold. The remaining three segments would be expected to operate generally within the LOS C range.

Summary of Corridor Operations through Downtown Segment

The results shown in Table 9 present a range of potential impacts to year 2035 traffic developed through different runs of the BCAG traffic model. The most conservative assumptions are based on "unconstrained" model run, which assumes no capacity reductions such as lane reductions through downtown (in other words, there would be less traffic diverted from Skyway and higher traffic volumes assumed through downtown). Using these volumes and assuming new signals at Fir Street and Black Olive Street, plus coordination of the signal system between Oliver Road and Black Olive Street, the analysis shows that acceptable traffic flow can be maintained along the corridor. The only intersection requiring additional mitigation would be at Elliott Road.

Bypass Traffic

In reality, it is likely that some drivers would still choose to divert from Skyway, even if the corridor is operating acceptably. Elliott Road, Clark Road, and Pearson Road would likely experience increments of additional traffic associated with this diversion. The likelihood for drivers to divert onto the Almond Street corridor is less certain, and will depend largely on whether or not the Town makes improvements to

Almond Street and its intersections to make this an attractive route. If the street remains relatively unchanged, only modest increases in traffic associated with diversion would be likely to occur. Again, it is important to note that Skyway is expected to continue operating acceptably with the recommended improvements, and that severe congestion would not be expected to occur.

Over time as the Town obtains funds for roadway improvements, Almond Street could be improved and encouraged as a bypass route to the section of Skyway between Pearson Road and Elliott Road. Bypass traffic may not necessarily consist of through traffic on Skyway that diverts to Almond Street, then back to Skyway. In contrast, it would be expected mostly to consist of drivers travelling between northern Skyway and eastern Pearson Road, as well as between southern Skyway and eastern Elliott Road. The route would also serve drivers destined to and from the downtown core area. In order to encourage the bypass movements, intersection enhancements could be provided at Almond Street's intersections with Elliott and Pearson Roads. These enhancements would primarily assist left-turn movements onto and off of Almond Street through the use of either the addition of a center two-way left-turn lane and/or the installation of a traffic signal. The center two-way left-turn lane can be used as a refuge lane for vehicles turning onto the main street, thereby reducing delay to these movements. On Elliott Road, the addition of the turn lane would require widening of the road. On Pearson Road, one of the two eastbound through lanes could be restriped as a center lane.

Safety Implications

The Preferred Plan would be expected to result in improved safety along the corridor for several reasons. First, statewide collision data suggests that a conversion of four-lane roadways to three-lane roadways leads to lower collision rates. This is largely due to the removal of stopped traffic in uncontrolled travel lanes associated with drivers waiting to turn left, as well as the provision of a center "refuge area" that enables drivers wishing to make left turn movements from side streets to do so in two stages.

The existing collision rates on Skyway at Black Olive Drive, Foster Road, Fir Street, and Honey Run-Birch Street substantially exceed statewide averages for similar facilities. The Preferred Plan would be expected to substantially improve safety at Black Olive Drive and Fir Street by providing new traffic signals. The minor realignment of Foster Road combined with the Skyway road diet and creation of additional breaks in traffic by the signal at Fir Street would also be expected to improve safety.

The Preferred Plan's provision of a center turn lane on Skyway at the Honey Run Road – Birch Street offset intersection would likely lead to some safety benefit, but one set of concerning conflicting movements would remain. The northbound left turn from Skyway onto Honey Run and the southbound left turn from Skyway onto Birch would compete for the same center turn lane area. In order to reduce the potential for this potential head-on collision situation to occur, it is recommended that Birch Street be restricted to a right-turn in and right-turn out intersection. Installation of either a "ribbon" median on Skyway or striping of the center lane to an exclusive left-turn lane for Honey Run Road access to reinforce this prohibition could also be desirable. The left turn prohibitions would cause minimal driver inconvenience due to the proximity of the Skyway/Pearson Road traffic signal, as well as the future signal at Skyway/Fir Street. Turn prohibitions onto and off of Honey Run Road are not recommended since few alternative routes for drivers exist. In order to facilitate bicycle crossings of Skyway between the Honey Run recreational bike route and the Paradise Memorial Trailway, the crosswalk near Honey Run Road can be relocated to the south side of Honey Run Road intersection. In addition, future consideration should be given towards the realignment of

Birch Street to align with Honey Run Road. This realignment would allow for full movements at the intersection and would more fully facilitate bicycle movements across Skyway.

Bicyclist safety would be expected to improve along the entire corridor with the provision of striped bike lanes south of Bille Road and the off-street multi-use path north of Bille Road.

Pedestrian Crossings

With the conversion to three lanes in the downtown area, pedestrian exposure to through traffic will decrease dramatically, and therefore, increase the potential safety conditions. Because of the emergency evacuation needs of the corridor (discussed below), raised medians are not recommended in the corridor. Therefore, in order to more fully assist pedestrians, the following measures are recommended:

- Curb "bulbouts" or "extensions" should be provided where possible at crosswalks, reducing the crossing distance for pedestrians and increasing pedestrian visibility to oncoming drivers. The curb extensions would shadow the parallel parking area, but not extend into the bike lane. Bulbouts would need to be designed to accommodate trucks and buses where these larger vehicles routinely make right turn maneuvers.
- In addition, a decorative paving of the center two-way left-turn lane is recommended for the downtown section to further calm traffic through visual narrowing. Pedestrians will be able to cross one direction of traffic at a time with refuge in the center lane area. Design treatments are recommended which would deter vehicle traffic from using the center lane through area with pedestrian crossings.
- High visibility pedestrian crossing signs should be installed both at the crossing location and in advance per MUTCD guidance.
- Pedestrian warning lights should be installed at uncontrolled crossing locations to add to the "package" of pedestrian safety improvements. Potential options include a combination of flashing beacons, electronic crossing signs, in-pavement warning lights, and/or LED flashing signs. The flashing beacons and flashing signs could be mounted with either an overhead mastarm or sidewalk pole depending on the visibility and travel speed at the location in question.

Recommendations from the previous crosswalk study, *Pedestrian Crossing Study, Skyway and Pearson Road*, California State University, Chico, should be implemented with the following changes:

- Maintain crosswalk markings at Skyway/Black Oliver Drive where a traffic signal is now proposed.
- Construct curb extensions at all unsignalized crossings between Pearson Road and Oliver Road.
- Construct pedestrian medians at all unsignalized crossings between Neal Road to Pearson Road and between Oliver Road and Wagstaff Road.
- Install warning light enhancements such as in-pavement lights at all unsignalized pedestrian crossings.

Emergency Evacuation Traffic

Due to the potential for fires in the Paradise hillside areas, Skyway should be designed to accommodate two travel lanes in the downhill direction, which may be needed to serve vehicle evacuation during emergencies such as fire. Because the section of Skyway between Pearson Road and Oliver Road is recommended as a three-lane section, the center two-way left-turn lane will need to operate as a second southbound through lane in emergencies. Because of this operation, the lane cannot be designed with raised medians within the center lane's space. Changeable message signs will need to be implemented which would inform drivers of

the two-lane southbound operation during times of evacuation. This signage could be supplemented with police traffic control including cones.

Commercial Loading and Unloading

While important to the success of businesses within the downtown corridor, the loading and unloading of commercial vehicles can be very disruptive to the flow of traffic. Currently, delivery vehicles may occasionally block a lane of traffic while making deliveries, causing disruptions in traffic; however, this can be absorbed by the fact that there are two through lanes in each direction in the downtown area. When the road is reduced to one lane in each direction, blocking of one of those lanes becomes more significant and much more disruptive to traffic.

To accommodate need for commercial loading and unloading with minimal disruption to traffic, it is recommended that local businesses work with their suppliers to ensure that deliveries occur in parking areas, either on-street or off-street, if available. Since most deliveries will occur during morning hours, parking should be readily available. If individual businesses are having trouble with parking for deliveries, they should approach the Town to create commercial loading zones.

Transit Services

Since there are numerous bus stops along the corridor, the final design process should ensure that areas for bus pullouts are provided. In the downtown area, bus pullouts can be provided along the curbs where parking would normally be provided. Outside of downtown, consideration for additional shoulder width should be considered, if appropriate.

Large Vehicles

It should be noted that Foster Street is proposed to be redesigned to accommodate a new parking lot and public gathering space. The concept has been designed to allow for truck movements onto Foster Street, through placement of the pedestrian crosswalk and curb extensions on Skyway to the north of Foster Street. The curb return, south of Foster Street is intended to accommodate large vehicle turns. Because the plans are conceptual in nature at this planning stage, the final design phase should include proper design to accommodate potential truck turning movements at all intersections in the downtown area.

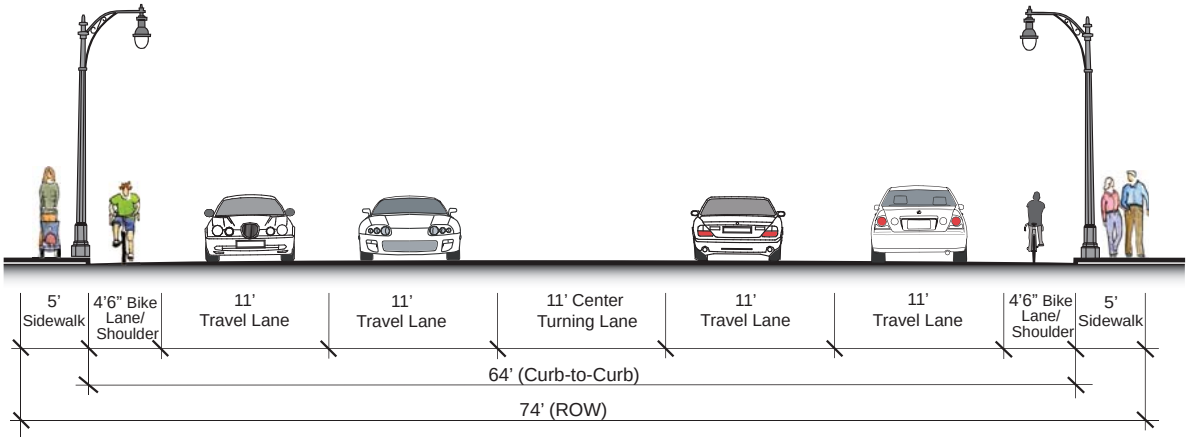
Recommended Roadway and Intersection Improvements

The corridor modifications recommended in this study would likely be implemented over many years. The first improvements are likely to be made within the downtown area and extended to other areas as funding permits. Some improvements such as signalization of the intersections at Fir Street and Black Olive Drive would facilitate the narrowing of lanes through downtown, but would also address existing safety concerns. Those types of improvements would therefore serve multiple purposes and should be prioritized accordingly. Recommendations for other modifications such as improvement to Almond Street and the intersection at Elliott Road are less imperative, and may be deemed unnecessary over time. It is also important to emphasize that the BCAG model projections that form the foundation of the corridor study are for the year 2035, and that the Town can continue to monitor the long-term performance of Skyway and accumulate funds for improvements as deemed appropriate.

The recommended concept plans follow and are included in Appendix I.

Skyway Corridor - Final Preferred Plan

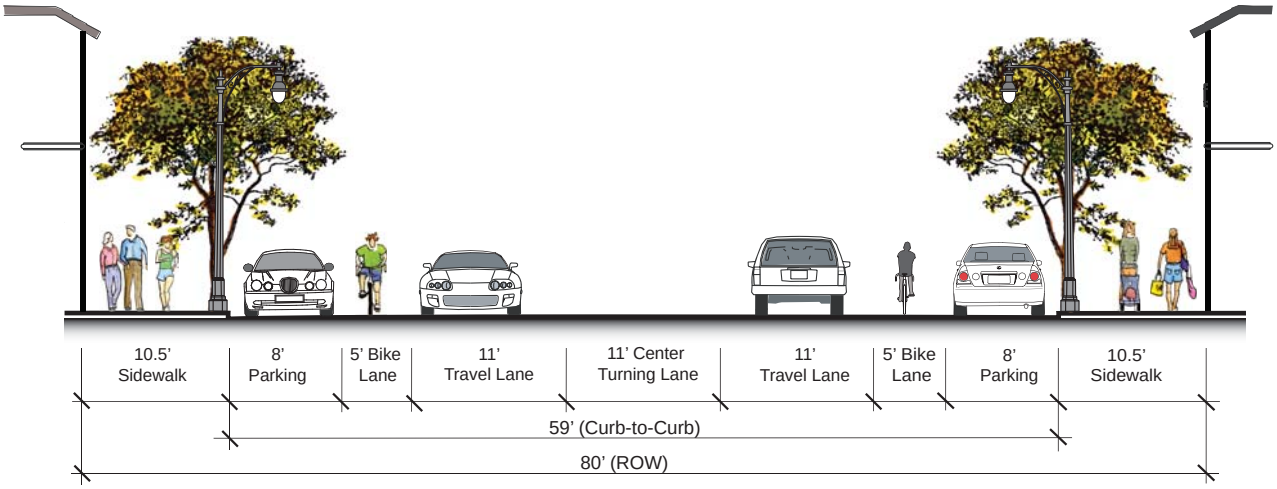
Segment A - Neal Road to Pearson Road



Segment A (Neal-Schmale Lane to Pearson Road)

- Maintains existing 5-foot sidewalks
- Adds up to 4.5-Foot shoulders for bike use if road width allows
- Narrows the five travel lanes to 11-feet
- Add a center two-way left-turn lane where currently missing
- Eliminates existing on-street parking
- Adds a traffic signal at the black olive drive intersection

Segment B - Pearson Road to Elliott Road

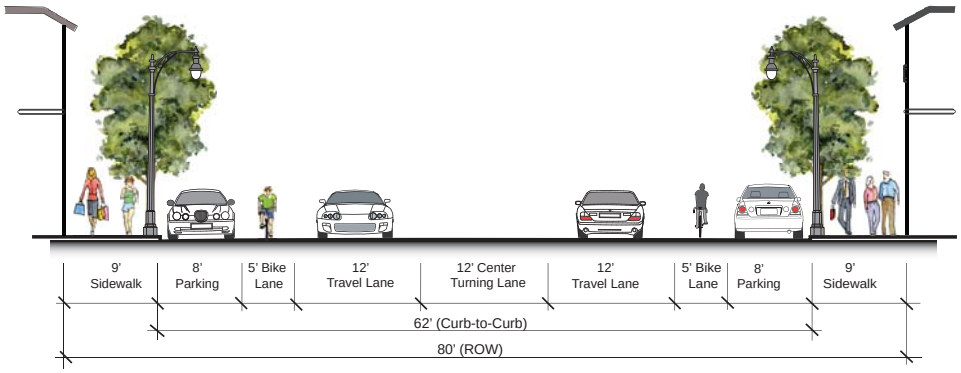


Segment B (Pearson Road to Elliott Road in downtown)

- Widens the sidewalks from 5-feet to a maximum of 10.5-Feet
- (Sidewalk width may be narrower due to a number of design factors)
- Maintains 8-foot on-street parallel parking
- Adds 5-foot bike lanes
- Reduces through lanes from four to two 11-foot through lanes
- Adds an 11-foot, center two-way left-turn lane
- Adds a traffic signal at the fir street intersection
- Implements coordinated signal timing between oliver road and black olive drive
- Maintains full access at foster road, but eliminates right-turn channelization
- Plans for additional parking on the triangular parcel adjacent to the skyway/foster road intersection
- Plans for a small public gathering space at the southeast corner of skyway/foster road
- Uses decorative pavement in the center lane area through downtown
- Accommodates two southbound lanes in times of emergency evacuation

Skyway Corridor - Final Preferred Plan

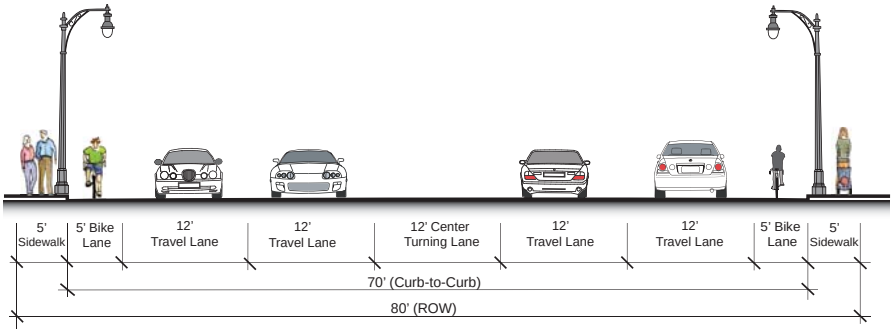
Section C1 - Elliott Road to Oliver Road



Section C1 (Elliott Road to Oliver Road)

- Adds 5-foot bike lanes
- Reduces the lanes to three 12-foot lanes
- Widens the sidewalks to a maximum of 9-feet
- (Sidewalk width may be narrower due to a number of design factors)
- Provides for 8 feet of parallel parking

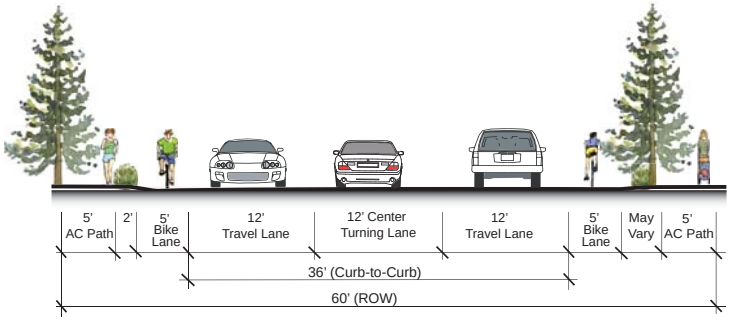
Section C2 - Oliver Road to Bille Road



Section C2 (Oliver Road to Bille Road)

- Maintains 5-foot sidewalks
- Adds 5-foot bike lanes
- Narrows the five travel lanes from 14-feet to 12-feet
- Adds a center two-way left-turn lane where currently missing
- Eliminates existing on-street parking

Segment D - Bille Road to Wagstaff Road



Segment D (Bille Road to Wagstaff Road)

- Adds 5-foot bike lanes
- Maintains the two 12-foot travel lanes
- Add a 12-foot center two-way left-turn lane
- Suggests ultimate creation of a 5-foot asphalt path for pedestrians
- Provides 2-foot landscape buffer separating path from road
- Meandering path provides the opportunity to maintain tree coverage adjacent to road

Following is the recommended phasing plan.

Phase I: 2009-2014

Segment A – Neal Road to Pearson Road

- Restriping of Skyway between Neal Road and Pearson Road to include five 11-foot travel lanes, 4.5-foot shoulders for bike usage and no parking
- Addition of a landscaped gateway median on Skyway, south of Pearson Road, within the center lane area (See Appendix I)
- New traffic signal at Skyway/Black Olive Drive with southbound left-turn phasing
- Construction of a pedestrian refuge median, pedestrian crosswalk warning signs and warning light enhancements such as in-pavement lights at the uncontrolled pedestrian crossing on Skyway near Town Hall

Segment B – Downtown

- Widening of the existing sidewalk from 5-feet to a maximum of 10.5-feet between Pearson Road and Elliott Road; new sidewalks may need to be designed with a narrower width in constrained locations due to constructability, utilities, street furniture, ADA requirements, transition to native ground/conform, etc., but shall in no cases be less than five feet
- Restriping of Skyway between Pearson Road and Elliott Road to include three 11-foot lanes, two five-foot bike lanes and two 8-foot parallel parking aisles
- Addition of decorative paving in the center lane between Pearson Road and Elliott Road (see concept plans in Appendix I)
- New traffic signal at Skyway/Fir Street with southbound left-turn phasing
- Elimination of the right-turn channelization on Foster Road at the intersection with Skyway
- Creation of a small public gathering space at the NE corner of Skyway/Foster Road (see Appendix I)
- Addition of a parking lot on the vacant triangular parcel adjacent to Foster Road
- Birch Street limited to right-turn in and out only through signing and striping
- Curb bulbouts extending 7-8 feet beyond the proposed sidewalk at all uncontrolled pedestrian crossings of Skyway in the downtown area
- Pedestrian crosswalk warning signs and warning light enhancements such as in-pavement lights for all uncontrolled pedestrian crossings of Skyway in the downtown area
- Addition of street lighting and other landscaping in downtown

Corridor Operations

- Implementation of coordinated signal timing between Oliver Road and Black Olive Drive
- Accommodation in the Town's Emergency Response Plan to provide equipment such as changeable message sign trailers and/or construction cones to convert the center lane in downtown as a second southbound lane in times of emergency

Phase 2: 2014 – 2019

Segment C1 – Elliott Road to Oliver Road

- Widening of the existing sidewalk from 5-feet to 9-feet between Elliott Road and Oliver Road; new sidewalks may need to be designed with a narrower width in constrained locations due to constructability, utilities, street furniture, ADA requirements, transition to native ground/conform, etc., but shall in no cases be less than five feet
- Restriping of Skyway between Elliott Road and Oliver Road to include three 12-foot lanes, two 5-foot bike lanes and two 8-foot parallel parking aisles

Corridor Operations

- Update the coordinated signal timing between Oliver Road and Black Olive Drive due to change in lanes south of Oliver Road
- Update the Town's Emergency Response Plan to extend the conversion of the center lane to Oliver Road as a second southbound lane in times of emergency

Segment C2 – Oliver Road to Bille Road

- Restripe Skyway between Oliver Road and Bille Road to include five 12-foot travel lanes, 5-foot bike lanes, and no parking

Segment D – Bille Road to Wagstaff Road

- Reconstruction of Skyway between Bille Road and Wagstaff Road to include three 12-foot travel lanes, two 5-foot bike lanes, a narrow landscape buffer and a pedestrian asphalt path aligned to minimize impacts to existing trees

Phase 3: 2019-2024

- Intersection enhancements at Almond Street's intersections with Elliott Road and Pearson Road intended to promote Almond Street as a bypass route
- Restriping of Skyway, north of Elliott Road to provide a second southbound left-turn lane
- Restriping and/or widening of Elliott Road, east of Skyway to provide a second eastbound lane on Elliott Road to receive the southbound double-left turn; one of the lanes would become an eastbound right-turn lane at Almond Street

Resulting Conditions

This preferred alternative will address many of the goals of the study including:

- Reduction in travel speeds in the corridor
- Increased pedestrian safety
- Creation of traffic conditions which are more conducive to a walkable downtown
- Provision of separate left-turn lane on the corridor
- Accommodation of bicycle travel with new on-street lanes and off-street paths

- Enhanced access for side streets with a center refuge lane and traffic signals
- Improvement in safety at high-frequency collision locations
- Maintenance of on-street parking through downtown

These benefits do come with the trade-off of reducing speed and capacity on Skyway, especially in the downtown area. However, with the recommended mitigation, there will still be adequate capacity on Skyway to continue to meet the Town's intersection level of service standards. Travel time through downtown during the worst-case timeframe, which is the p.m. peak hour in the northbound direction, is anticipated to increase over current levels as follows:

- Existing Conditions: 71 seconds with an average speed of 24 mph
- Future Year 2035 with no changes: 85 seconds with an average speed of 20 mph
- Future Year 2035 with Preferred Plan: 158 seconds with an average speed of 14 mph

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