FINAL REPORT

U.S. 395 Southern Sierra Corridor Study

Presented to

NEVADA DOT

Prepared by

PARSONS

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Executive Summary

STUDY RECOMMENDATIONS

Construct five projects from U.S. 395–Spooner Junction to Jacks Valley Road for an estimated cost of $164 million:

- Carson Freeway direct connectors
- Frontage roads with bike lanes, sidewalks
- Freeway section (total reconstruction)
- Old Clear Creek Road grade separation
- Topsy Lane grade separation

Implement the near-term safety improvement projects listed on page ES-4. Construction of most of these projects will take less than five years from the date of approval and will cost less than $5 million.

Construct the remaining 24 projects listed on page ES-4 under Long-Term Corridor Investments as funding permits.

PURPOSE

The U.S. 395 Southern Sierra Corridor Study provides planning-level analysis for transportation improvements proposed within the study area between 2007 and 2030. Initiated by the Nevada Department of Transportation (NDOT), this study evaluates the current traffic level of service on the roadway network and the need for future investments, based on the planned growth in population, employment and visitor traffic.

The resulting plan focuses primarily on the need for highway capacity, operational and safety improvements in the more congested sections of the study area. The study makes recommendations for project implementation, including an early action plan to implement cost-effective safety improvement projects on an expedited schedule.

STUDY AREA

Figure ES-1 shows the Corridor Study area limits from the south end of Carson City to the California state line at Topaz Lake.

Figure ES-1 *U.S. 395 Southern Sierra Corridor Study Limits*

U.S. 395 covers 1,305 miles from Interstate 15 (I-15) in Southern California to the Canadian border. The route runs along the east side of the Sierra Nevada Mountains in California's Owens Valley, which extends into Nevada near Topaz Lake. The highway descends into Carson Valley and Eagle Valley where it becomes the main street for Gardnerville, Minden and Carson City. Once certain improvements are complete in the segment from Carson City to Reno, U.S. 395 will be designated Interstate 580 (I-580).

The U.S. 395 Southern Sierra Corridor is a critical transportation and economic link between Douglas County and the Truckee Meadows area; also acting as a major trucking route connecting eastern Sierra communities in California and Nevada. U.S. 395 is the only north–south highway that links Washoe County, Carson City and Douglas County.

EXISTING CONDITIONS

Both Carson City and Douglas County experienced a significant amount of growth from 1990 to 2005. The Nevada State Demographer estimates that during this time, Douglas County population grew from 27,637 to 50,108; an increase of 81 percent. During the same time, Carson City grew from 40,443 to 57,104 residents; an increase of 41 percent. The State of Nevada 2005 population projections indicate that the third and fourth most populous counties in Nevada are Carson City and Douglas County, respectively.

In addition to the increased travel as a result of population and employment growth, transportation trends indicate that people are traveling more than ever before due to greater distances between home, work, recreation and shopping destinations. Based on data from NDOT, the U.S. Environmental Protection Agency determined that vehicle miles traveled (VMT) in Douglas County increased about 46 percent over the past 10 years, slightly higher than the county's growth in population (39 percent) over the same time. VMT in Carson City increased about 45 percent over the past 10 years, while Carson City's population grew by only 17 percent over the same period.

To evaluate the existing transportation issues, the study area is broken down into four corridor sections based on individual characteristics. Within the corridor sections are local safety and capacity issues which are most significant within that part of the corridor. This study provides an evaluation of each of these issues in subsequent chapters. Figure ES-2 shows these issues on a map of the corridor study sections. The *2007 Douglas County Transportation Plan* addresses many of these issues.

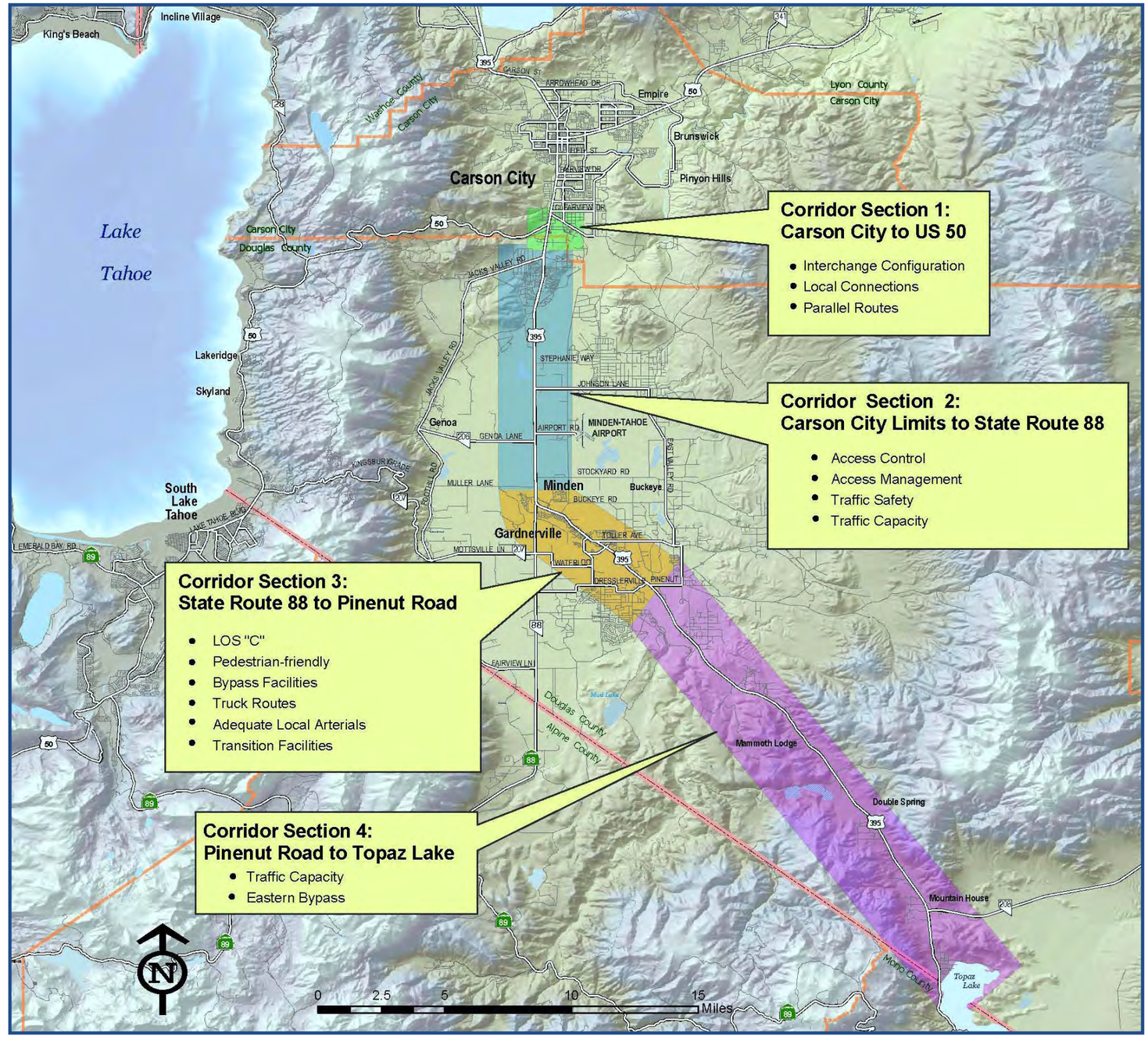


Figure ES-2 *U.S. 395 Corridor Issues Mapped According to Corridor Sections*

As a part of the travel demand model development, Parsons used data from the Nevada Department of Employment, Training and Rehabilitation (DETR) to determine the existing number of employees in the Carson City/Douglas County study area. DETR reports an employment count of 22,227 jobs within Douglas County for 2005. For Carson City, DETR reports a total of 26,050 jobs.

Traffic level of service (LOS) was measured at the major intersections along the corridor. These intersections are controlled by traffic signals or will soon be signalized. The list of intersections analyzed along U.S. 395 includes Clearview Drive, U.S. 50 (Spooner Junction), Old Clear Creek Road, Topsy Lane, Jacks Valley Road, Mica Drive, Stephanie Way, Johnson Lane, State Route 88 (SR 88), Buckeye Road/Sixth Street, Gilman Avenue, Waterloo Lane and Pinenut Road/Riverview Drive. All of the intersections with U.S. 395 currently operate at LOS C or better, except Clearview Drive and Waterloo Lane, where PM peak hour traffic operates at LOS D.

Vehicle crashes in the Corridor Study are an indicator of highway safety issues. Corridor sections 1 and 2, Clearview Drive to Muller Lane, experience increased traffic congestion in a suburban and urban highway setting. More than 55 percent of the crashes are rear end collisions, with the primary contributing factor listed as "following too closely." This crash data indicates that this roadway is in transition from urban to rural conditions and that drivers are not fully accounting for increased traffic volumes, stopping, and turning maneuvers.

Corridor section 3, Muller Lane to Pinenut Road, runs through Gardnerville and Minden. A significant jump in the number of crashes is observed in this segment, with a high number of rear end and angle crashes. Generally these crashes are the result of drivers not paying attention to the traffic in front of them, which is either entering or exiting the highway. The major contributing factors are "following too closely" and "failure to yield," typical of a roadway section with many ingress and egress points.

Crash rates can be a helpful way to understand the frequency of crashes relative to the vehicle miles traveled on a particular stretch of roadway. Table ES-1 provides crash summary data during the five-year period from 2001 to 2005. The higher crash rates in corridor section 3 indicate a relatively larger number of crashes through the more populous areas of Gardnerville and Minden. The statewide averages are significantly higher for urban principal arterials due to the higher crash frequency in the urbanized area of Clark County.

Table ES-1 *2001–2005 U.S. 395 5-Year Crash Summary and Crash Rates*

	PROPERTY DAMAGE ONLY CRASH	INJURY CRASH	FATAL CRASH	TOTAL CRASHES
CORRIDOR SECTIONS 1 AND 2, MILE 24.1 TO MILE 35.92 Clearview Drive to Muller Lane				
Total Crashes	455	335	11	801
Crash Rate	65.52	48.24	1.58	
Segment Length: 11.82 miles				
Segment AADT: 32,192				
CORRIDOR SECTION 3, MILE 18.7 TO MILE 24.09 Muller Lane to Pinenut Road				
Total Crashes	427	237	1	603
Crash Rate	235.72	130.83	0.55	
Segment Length: 5.39 miles				
Segment AADT: 18,415				
CORRIDOR SECTION 4, MILE 0 TO MILE 18.7 Pinenut Road to the California State Line				
Total Crashes	100	80	7	187
Crash Rate	43.97	35.18	3.08	
Segment Length: 18.7 miles				
Segment AADT: 6,663				
NEVADA STATEWIDE AVERAGE FOR PRINCIPAL ARTERIALS				
Urban	420.5	224.73	2.18	
Rural	59.03	28.63	2.96	

Source: NDOT Crash Data

The ability of the U.S. 395 corridor to carry traffic is largely dependent on the number and type of access points to the highway. The current access along the study corridor includes everything from single-family residential driveways to major intersections controlled by traffic signals. Within the corridor, the highway varies from a rural, multi-lane, high-speed facility with occasional low volume access points, to an urban, low speed facility with numerous access points serving small to large commercial establishments. This diversity of uses creates different access needs, which in turn impacts the traffic carrying capacity of the highway. This study provides a review of the access points along the study corridor in accordance with NDOT's Access Management System and Standards.

FUTURE CONDITIONS

Population and employment within the U.S. 395 Corridor Study area have grown significantly over the past 15 years. The transportation and land use plans for Carson City and Douglas County forecast that this area will continue to grow; reaching a combined population of 161,500 persons by 2030.

Transportation policy makers rely on travel analysis tools to evaluate the impacts of land use development and the need for infrastructure improvements. A travel demand model is one of the key technical analysis tools used for this evaluation. It uses a complex computer program to provide answers to "what if" questions about the effects of proposed development and land use policies. The model predicts travel behavior and travel demand within a specific area, over a specific time period.

The Douglas County/Carson City Travel Demand Model is a new and improved version of the travel forecasting models and model components previously developed for Douglas County and Carson City. To develop an accurate database for the model development, residential data was obtained from the Douglas County Assessor's office and employment data from the Nevada Department of Employment, Training and Rehabilitation.

Douglas County issued building permits for an average of 575 dwelling units over the past 17 years. Continuing along this same trend, with a 2 percent compound annual growth rate, Douglas County will issue 13,440 permits for new dwelling units over the next 23 years. This increase in dwelling units will result in approximately 34,000 new county residents by 2030; bringing the total Douglas County population to about 83,500.

Carson City also plans to continue to grow at a steady rate. In the 20-year period from 1982 to 2002, the number of housing units increased by 74 percent, which represents a 2.8 percent compounded annual rate of growth. The Carson City Master Plan projects a build-out of 32,000 dwelling units with a population of about 78,000 persons. The traffic demand model assumes a 2030 population control total of 75,792.

For Douglas County, the travel demand model reflects a 73 percent growth in employment from 2005 to 2030, from 19,563 to 30,798.

For the combined Carson City/Douglas County study area, the travel demand model reflects a 48 percent growth in employment as the number of employees increases from 45,622 to 67,668 between 2005 and 2030. Each county is assumed to add ±11,000 jobs over the 25-year period.

NEAR-TERM SAFETY IMPROVEMENTS

An important part of the Corridor Study was the public involvement effort, referred to as a Traffic Safety Charrette; which resulted in numerous recommendations to improve safety on U.S. 395 between U.S. 50 and the Nevada/California state line over the next three to four years. This study recommends that NDOT develop strategies for project implementation, dependent upon project type and funding available for each recommendation.

According to NDOT procedures, Douglas County must submit an application for each project that they would like NDOT to implement. Once NDOT determines that the applications are complete, NDOT prioritizes and implements the projects as funds are available. Project steps include securing funding, working with Douglas County and property owners on design and right-of-way issues, and scheduling the work. The following improvements qualify for the NDOT Safety Improvement program or as District II maintenance projects.

- Install median barrier from Mica Drive to Muller Lane
- Install rumble strips from Topsy Lane to Plymouth Drive
- Restripe shoulders and lanes with 8-inch wide markings
- Conduct Access Management Assessment
- Conduct U.S. 50 High-T Feasibility Evaluation
- Conduct speed limit evaluation from Muller Lane to SR 88
- Eliminate left-turn lane at Ironwood Drive
- Install slower right-turn lane at SR 88 intersection

The projects listed below must go through a Project Development Process as required by the Nevada Legislature.

- Install acceleration/deceleration lanes
- Install access improvements at Washoe Tribal Headquarters
- Install truck climbing lane from Mica Drive to Sunridge Drive
- Extend third lane past Jacks Valley Road
- Install half traffic signal at Stephanie Way (complete)
- Lengthen right-turn pocket on Johnson Lane
- Lengthen left-turn pocket at Genoa Lane
- Install third lane on northbound U.S. 395 between Jacks Valley Road and Old Clear Creek Road

NDOT completed construction and activation of a half traffic signal at Stephanie Lane in January 2006. The other projects will require Douglas County to submit an application for a transportation system improvement project.

LONG-TERM CORRIDOR INVESTMENTS

After exploring possible alternative alignments, it was determined the majority of the 2030 traffic would need to be served on an improved U.S. 395 Corridor. Corridor improvements were identified based on the following objectives:

- Be responsive to public suggestions and concerns
- Provide a safe highway environment
- Minimize congestion and delay
- Provide user benefits for a reasonable investment
- Minimize impacts to the environment, quality of life, right-of-way requirements, floodplain/drainage, etc.

Responding to these objectives resulted in the identification of potential improvements throughout the corridor. Figure 5-2 identifies the potential corridor improvements, grouped into 12 geographic segments.

Segment 1 – U.S. 395 – U.S. 50 to Jacks Valley Road

U.S. 395 south of U.S. 50 would be developed to a four-lane freeway with frontage roads (two lanes per direction). Two-lane direct connector ramps would be used to connect the new freeway section to the Carson Freeway. The new freeway would be elevated and have overpasses at Old Clear Creek Road and Topsy Lane and an interchange at Jacks Valley Road with Jacks Valley Road passing over the freeway. Two-lane, one-way frontage roads would intersect the cross streets and be controlled by traffic signals or roundabouts.

Figure ES-3 illustrates the proposed preliminary design for the segment improvements described above.

Segment 2 – U.S. 395 – Jacks Valley Road to South of Plymouth Drive/South Sunridge Drive

U.S. 395 would become a four-lane freeway with one-lane, one-way frontage roads on each side. The freeway would have an overpass at Mica Drive and an interchange at South Sunridge Drive/Plymouth Drive. The frontage roads would intersect the cross streets and be controlled by traffic signals or roundabouts.

Segment 3 – U.S. 395 – South of Plymouth Drive/South Sunridge Drive to South of Johnson Lane

U.S. 395 would become a four-lane freeway with one-lane, one-way frontage roads on each side. The freeway would have an overpass at Stephanie Way and an interchange at Johnson Lane. The frontage roads would intersect the cross streets and be controlled by traffic signals or roundabouts.

Segment 4 – U.S. 395 – South of Johnson Lane to Muller Lane

U.S. 395 would become a four-lane freeway with one-lane, one-way frontage roads on each side. The freeway would have interchanges at Airport Road/Genoa Lane and Muller Lane. The frontage roads would intersect the cross streets and be controlled by traffic signals or roundabouts.

Segment 5 – U.S. 395 – Muller Lane to Junction of SR 88

The U.S. 395 freeway would terminate at Muller Lane and become a six-lane arterial as the frontage roads merge/diverge with the freeway lanes. If Segment 9 is implemented at the same time or before Segment 4, U.S. 395 will only need four lanes between Muller Lane and SR 88.

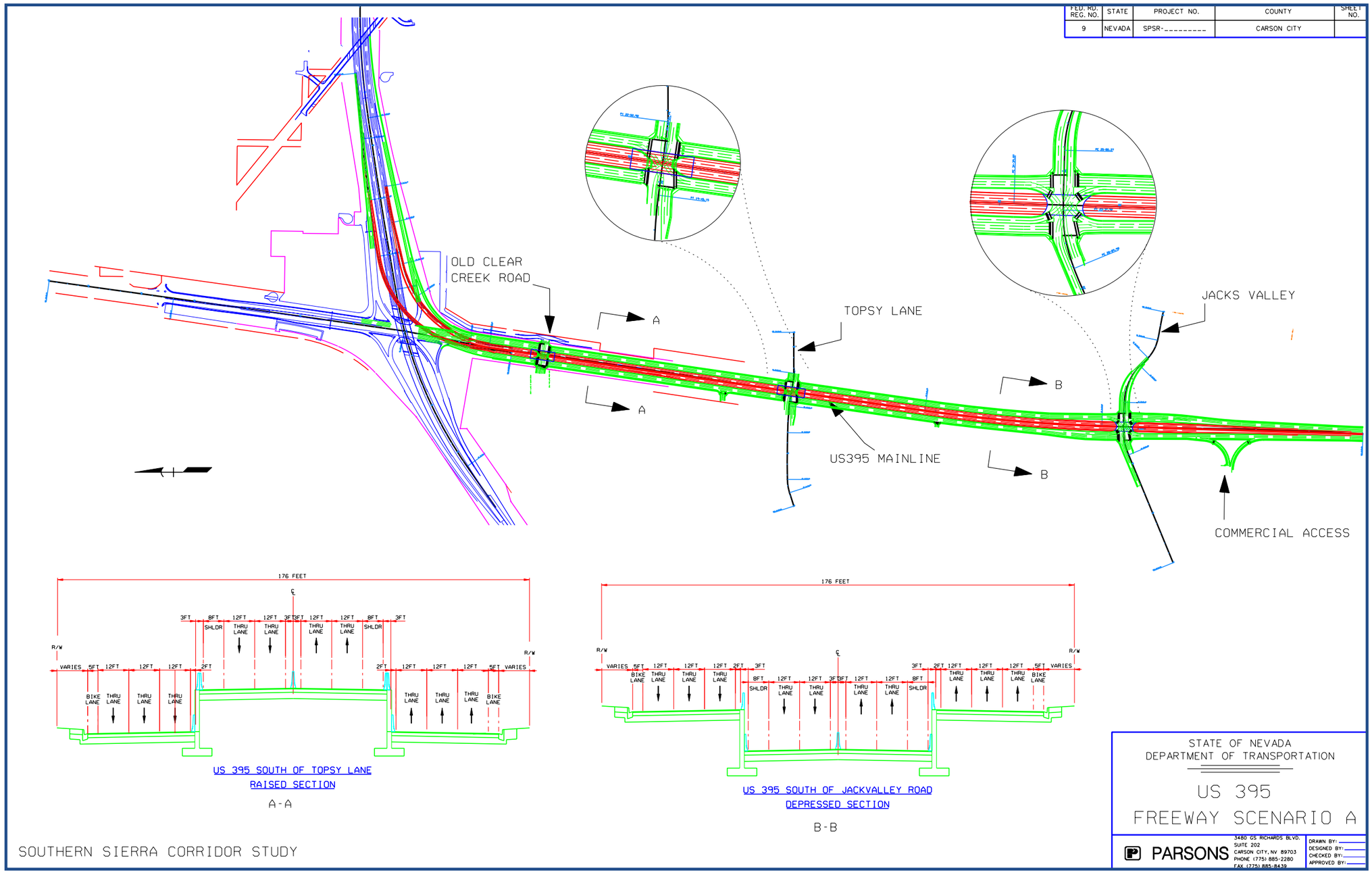


Figure ES-3 *Proposed Preliminary Design for U.S. 395 Segment 1*

Segment 6 – U.S. 395 – Junction of SR 88 to Pinenut Road

U.S. 395 would remain as a four-lane arterial through the towns of Minden and Gardnerville. A coordinated traffic signal system would be implemented to include the existing and future traffic signals between Muller Lane and a future connection from the East Ranchos residential development at U.S. 395.

Segment 7 – U.S. 395 – Pinenut Road to South of Palomino Lane

U.S. 395 would be widened to four lanes with a center left-turn lane. Acceleration and deceleration lanes may be implemented at selected locations.

Segment 8 – U.S. 395 – Extend Truck Climbing lane to the Double Springs Area

The existing southbound truck climbing lane would be extended to the Double Springs area.

Segment 9 – U.S. 395 – West Side Bypass (Two Stages)

Stage 1 would develop a four-lane bypass facility that intersects as a half-interchange with U.S. 395 between Airport Road/Genoa Lane and Muller Lane, overpasses Muller Lane with an alignment west of the Ironwood subdivision, crosses the Carson River, and connects to SR 88 as a freeflow facility continuing the four-lane section to Kimmerling Road. Stage 2 would be Segment 11, the Dressler Lane extension from SR 88 to U.S. 395.

Segment 10 – SR 88 – County Road to Kimmerling Road

If Segment 9, West Side Bypass, is not implemented or is delayed, SR 88 will need to be widened to four lanes from County Road to Kimmerling Road.

Segment 11 – Dressler Lane Extension – SR 88 to U.S. 395

A two-lane Dressler Lane extension from SR 88 to U.S. 395 could be implemented as a stand alone project or as part of the West Side Bypass described as Segment 9.

Segment 12 – East Side Bypass (Future Project)

An east valley alignment corridor has been identified that would create a future bypass facility east of Carson Valley and the towns of Minden and Gardnerville. The proposed bypass would connect to a future interchange on the Carson Freeway. The bypass alignment would primarily utilize the Bureau of Land Management (BLM) land along the foothills east of Carson Valley and tie into U.S. 395 at a point south of Gardnerville.

A number of improvement scenarios were developed and analyzed using the segments described above. The U.S. 395/Douglas County/Carson City ravel Demand Model was used to generate future traffic volumes and a roadway segment level of service was determined from the traffic volume threshold table. Chapter 5 of this report provides a description of each scenario along with the advantages and disadvantages of each scenario.

COST BENEFIT ANALYSIS

The Build Alternative includes the eleven major highway improvement components listed above; a twelfth project, constructing an East Side Bypass approximately seven miles east of U.S. 395 at Minden, has been identified as a potential future project.

Chapter 6, Costs and Benefits, identifies the costs and estimated benefits associated with implementing the Build Alternative. Cost estimates have been developed for each element of the Build Alternative. The costs include the capital cost of construction, right-of-way acquisition, and project engineering expenses. These costs, expressed in 2006 dollars, total $641.4 million.

The Build Alternative services more vehicles on U.S. 395 than the No-Build Alternative, meaning that vehicles traverse fewer miles on arterial streets and more miles on U.S. 395. Under the No-build Alternative, traffic cascades across the highway network seeking available capacity. Hence, traffic volume impacts are regional in addition to the U.S. 395 Corridor.

To provide a regional comparison of U.S. 395 Build versus No-Build traffic-related impacts, Parsons calculated regional benefits using the Douglas County/Carson City Travel Demand Model and STEAM 2.0, a system-wide analysis tool.

The Build Alternative will produce net savings in travel time, crashes, emissions and vehicle operating expense. Collectively, these will amount to $36.4 million annually based on Year 2030 traffic volumes. These findings are summarized in Table ES-2 and are sorted by benefit type.

Table ES-2 *Summary of Build Alternative Benefits*

BENEFIT TYPE	$/YEAR IN YEAR 2030
User Benefits	
In-vehicle travel time	$23,030,800
Fuel costs	7,028,100
Non-fuel operating costs	477,200
Internal accident costs	5,365,900
Revenue transfers	(1,603,400)
Reduction in External Costs	
Emissions	631,900
Global warming	106,600
Noise	7,800
Accident	836,700
Other mileage based	477,200
TOTAL BENEFITS	**$36,358,800**

Source: Parsons

STUDY RECOMMENDATIONS

Chapter 5, Alternatives Development, provides a detailed description of the improvements recommended for each segment, along with 29 individual projects that could be constructed as individual elements of the overall improvement program. Completion of any of these projects will provide a benefit to the entire corridor.

The highest current and future traffic volumes are located in the northern section of the corridor study area. Project construction in this area would therefore provide the most cost/benefit to the overall system. **This study recommends construction of five projects identified in Segment 1, U.S. 395 – Spooner Junction to Jacks Valley Road, as the highest priority package of projects in this corridor, at an estimated cost of $164 million.** This segment package will require significant partnership between NDOT, Douglas County, and Carson City. These projects will be especially important to the roadway network when the U.S. 395 Carson City bypass completes its connection to U.S. 50, estimated to occur by 2012.

If the bypass is finished and this package of projects is not complete, the traffic level of service is projected to fall below the NDOT standard of LOS D. After the five projects in Segment 1 are complete, **the study recommends construction of the remaining 24 projects listed in the Long-Term Improvements section (page ES-4) of the Executive Summary and described in Chapter 5, Alternatives Development, and Chapter 6, Costs and Benefits, as funding permits.**

The total cost of the 29 individual long-term projects is estimated at $641 million. The highway projects will require a large investment of time and money by the local partners. Considering the current state of highway funding in Nevada, Carson City and Douglas County, implementation of these projects could take a long time to accomplish. These entities are evaluating methods to acquire additional funding for transportation projects in the future.

To provide a noticeable improvement in traffic safety within the U.S. 395 corridor, **the study recommends implementation of the near-term safety improvement projects listed on page ES-4. Construction of most of these projects will take less than five years from the date of approval and will cost less than $5 million.** In addition to improving safety in the corridor, these projects respond positively to the input that Douglas County and NDOT received from the Corridor Study public outreach effort.

PUBLIC INVOLVEMENT

Community involvement in the U.S. 395 Southern Sierra Corridor Study has been an important part of the project from its inception. Shortly after the project began, a number of serious crashes occurred on U.S. 395 between the intersection with U.S. 50 in Carson City and the intersection with SR 88 in Gardnerville. These crashes made public participation even more crucial and resulted in community requests to address safety issues in this section of the corridor. In response, NDOT representatives conducted a Traffic Safety Charrette for the entire U.S. 395 Study Corridor to obtain public input on traffic safety and planning issues. The term *charrette* is used to describe a series of events, including meetings, in which citizens and staff work together to define concerns, establish priorities, and develop solutions.

In addition to the Traffic Safety Charrette, the public outreach effort included four basic components:

- Meeting with city and county representatives
  - Stakeholder Working Group of government representatives
  - Technical input/comment
- Meeting with local key stakeholders
  - Public stakeholder contacts and interviews
- Preparing public materials; coordinating and responding to comments using the following methods:
  - Outreach informational materials
  - Project website
  - Direct mail
  - Notices in public places
  - Media outreach
  - Electronic notification
- Public meetings and activities
  - Focus groups
  - Conduct public scoping meetings
  - Community workshop
  - U.S. 395 Corridor evaluation field review
  - Public workshops to report recommendations, January 2007
    - Jacks Valley Elementary School
    - CVIC Building, Minden
  - Carson Area Metropolitan Planning Organization

Completing the public outreach process in January 2007, NDOT and its representatives held two public workshops to update the public and take comments on the draft results of the corridor study. Approximately 75 people attended a public meeting at Jacks Valley Elementary School, on January 23, 2007 in the northern area of Douglas County. More than 100 people attended a similar meeting on January 31 at the CVIC Building in Minden. Representatives from the Nevada Department of Transportation, the Nevada Highway Patrol and Douglas County were present. Participants completed a questionnaire to indicate their preferences for various projects, with the combined results from both community meetings provided in Chapter 8, Public Involvement, of this report.

Members of the public expressed their concerns regarding corridor issues and the seven different concepts for long-term roadway network development. A number of people requested a study of an eastern bypass in the Minden/Gardnerville area. Participants also commented on increasing traffic congestion, especially in the Topsy Lane area of northern Douglas County. Some people requested construction of interchanges at Stephanie Way, Johnson Lane and Airport Road. All of these comments and the NDOT responses are included in Appendix K, Responses to Public Comments, of this report.

The Traffic Safety Charrette resulted in a list of projects that will be pursued by NDOT and a list of projects that will require further action by a local agency to be considered for state programming and funding. Many of the projects on this list are recommended for implementation in this study. The public outreach process also resulted in some suggestions for long-term improvements in the U.S. 395 Corridor Study area. These suggestions will receive additional consideration as NDOT considers implementing the recommendations of the U.S. 395 Southern Sierra Corridor Study. Section 4.10, Implementation of Near-Term Improvements, provides a complete list of the projects that were considered for implementation.

1 Study Introduction

The U.S. 395 Southern Sierra Corridor Study provides planning-level analysis for transportation improvements proposed within the study area between 2007 and 2030. Under contract with the Nevada Department of Transportation (NDOT), Parsons has evaluated the current traffic level of service on the roadway network and the need for future investments based on the planned growth in population, employment and visitor traffic.

The resulting plan focuses primarily on the need for highway capacity, and operational and safety improvements in the more congested sections of the study area. The study makes recommendations for project implementation including an early action plan to implement cost-effective projects on an expedited schedule.

In addition to receiving extensive input from a Stakeholder Working Group, the plan has garnered strong support from state and local officials and area residents.

1.1 STUDY AREA DESCRIPTION

U.S. Highway 395 (U.S. 395) covers 1,305 miles from Interstate 15 (I-15) in Southern California to the Canadian border. The route runs along the east side of the Sierra Nevada Mountains in California's Owens Valley, which extends into Nevada near Topaz Lake. The highway descends into the Carson Valley and Eagle Valley where it becomes the main street for Gardnerville, Minden and Carson City. Once certain improvements are complete, U.S. 395 will be designated Interstate 580 (I-580) in the segment from Carson City to Reno.

The U.S. 395 Southern Sierra Corridor is a critical transportation and economic link between Douglas County and the Truckee Meadows area; also acting as a major trucking route connecting eastern Sierra communities in California and Nevada. U.S. 395 is the only north–south highway that links Washoe County, Carson City and Douglas County.

This corridor study will provide NDOT with the information to determine which improvements are needed over the next 23 years to meet capacity and safety requirements. Figure 1-1 shows the corridor study area limits from the south end of Carson City to the California state line at Topaz Lake.

Figure 1-1 *U.S. 395 Southern Sierra Corridor Study Limits*

In addition to the overall corridor, this study analyzes the following major intersections along U.S. 395:

- Clearview Drive
- U.S. 50 (Spooner Junction)
- Old Clear Creek Road
- Topsy Lane
- Jacks Valley Road
- Mica Drive
- Stephanie Way
- Johnson Lane
- State Route 88 (SR 88)
- Buckeye Road/Sixth Street
- Gilman Avenue
- Waterloo Lane
- Pinenut Road/Riverview Drive

1.2 STUDY PURPOSE

Both Carson City and Douglas County have experienced a significant amount of growth over the past 15 years. The Nevada State Demographer estimates that Douglas County population increased 81 percent between 1990 and 2005. The population in Carson City grew at a rate of 41 percent during the same time period.

Table 1-1 provides the comparative population figures for all Nevada counties from 1990 to 2005. The 2005 projections indicate that the third and fourth most populous counties in Nevada are Carson City and Douglas County, respectively.

In addition to the additional travel as a result of population and employment growth, transportation trends indicate that people are traveling more than ever before due to greater distances between home, work, recreation and shopping destinations. Using data obtained from NDOT, the U.S. Environmental Protection Agency estimates that vehicle miles traveled (VMT) in Douglas County increased about 46 percent over the past 10 years, slightly higher than the county's growth in population (39 percent) over the same time. VMT in Carson City increased about 45 percent over the past 10 years, while Carson City's population grew by only 17 percent over this 10-year period.

Employment has also shown a healthy increase in Carson City and Douglas County over the past 10 years. The Nevada Department of Employment, Training and Rehabilitation reports that Douglas County employment increased by 18 percent to 21,720 from 1996 to 2006; Carson City employment increased by 25 percent to 33,300 during this time.

Because of the increased travel, population and employment in Douglas County and Carson City, NDOT officials determined that the U.S. 395 corridor would benefit from the development of a comprehensive long-term improvement plan. The purpose of this plan is to identify and recommend solutions for existing safety issues and prepare the roadway network for future growth without sacrificing regional mobility.

Table 1-1 *Comparative Population Figures*

LOCATION	POPULATION			PERCENT INCREASE (1990–2005)†
	1990*	2000*	2005**	
State of Nevada	1,201,833	1,998,257	2,518,869	110%
Clark County	741,459	1,375,765	1,796,380	142%
Washoe County	254,667	339,486	396,844	56%
Carson City	40,443	52,457	57,104	41%
Douglas County	27,637	41,259	50,108	81%
Lyon County	20,001	34,501	48,860	144%
Elko County	33,530	45,291	47,586	42%
Nye County	17,781	32,485	41,302	132%
Churchill County	18,100	23,982	26,585	47%
Humboldt County	12,844	16,106	17,293	35%
White Pine County	9,264	9,181	9,275	0%
Pershing County	4,336	6,693	6,736	55%
Lander County	6,266	5,794	5,509	-12%
Mineral County	6,475	5,071	4,629	-29%
Storey County	2,526	3,399	4,012	59%
Lincoln County	3,775	4,165	3,886	3%
Eureka County	1,550	1,651	1,485	-4%
Esmeralda County	1,350	971	1,276	-5%

Sources: * Official U.S. Census—April 1
** Nevada State Demographer esimates—July 1
† U.S. Census

1.3 CORRIDOR STUDY PROCESS

The U.S. 395 Southern Sierra Corridor Study defines and analyzes options for transpor-tation improvements in the corridor area. Although the study concentrates on major highway projects along U.S. 395, the study also considers minor safety improvements, transit services, intelligent transportation system projects and congestion management actions.

The study began with the formation of a Stakeholder Working Group (SWG), which provided project direction and oversight to the NDOT and consultant study team. The SWG also reviewed the modeling results, the study alternatives, the funding options and the public participation plan. This group consisted of representatives from the following local and statewide agencies and groups:

- Nevada Department of Transportation
- Carson City
- Douglas County
- Washoe Tribe
- Town of Gardnerville
- Town of Minden
- Federal Highway Administration
- California Department of Transportation

Next, data was collected from various sources including:

- Previous studies of U.S. 395 and U.S. 50
- Traffic counts and level of service analysis along the corridor
- Traffic accident data and system reports
- Aerial mapping and topographic surveys
- *Carson Area 2004 Transportation Plan*
- *2006 Douglas County Master Plan*
- *1996 Douglas County Transportation Plan*
- *Draft 2007 Douglas County Transportation Plan*
- Douglas County transit providers
- Carson City transit providers

To analyze existing traffic patterns and plan for future travel, Parsons developed a new travel demand model that encompasses both Douglas County and Carson City. The model reflects the regional nature of travel in these two counties and the shared model provides an opportunity for policy makers to coordinate proposed land use and transportation improvements.

At the next stage of the process, the Stakeholder Working Group reviewed investment alternatives including estimated project costs. Using the travel demand model to determine which improvements were necessary to accommodate the projected traffic, the group recommended adding or deleting projects as needed to achieve the highest system capacity at the lowest cost.

At the last stage of the process, the group completed a technical evalua-tion of investment alternatives, considered how the proposed projects score relative to the evaluation criteria, and determined whether the projects were consistent with the *2007 Douglas County Transportation Plan* and *Carson City 2004 Transportation Plan*. The SWG reviewed a cost/benefit analysis to determine the relative value of the overall investment package.

Public involvement played a key role in the U.S. 395 Southern Sierra Corridor Study process. Officials conducted a traffic safety charrette from October to December 2005 to involve the public and other stakeholders in a process to identify concerns, priorities, and suggestions for the corridor that lies between U.S. 50 and SR 88. The term *charrette* describes a series of events in which citizens and staff work together to define concerns, establish priorities and develop solutions.

Charrette activities included focus groups, a community workshop, a corridor field evaluation, data compilation and evaluation, analyses of input, and a community meeting where project recommendations were presented. The U.S. 395 Corridor Study website also provided informa-tion about the public involvement process and invited the public to submit comments electronically. The charrette identified the issues listed in the following section and helped to develop recommendations for specific projects that can be implemented within a three- or four-year timeline. Please see Appendix B, Bibliography of Land Use/Transportation Planning Documents Consulted, for a complete report on the traffic safety charrette and the subsequent recommendations.

1.4 ISSUES WITHIN CORRIDOR SECTIONS

To evaluate the existing transportation issues, the study area is broken down into four corridor sections based on individual characteristics. Within the sections are local safety and capacity issues which are most significant within that part of the corridor. The *2007 Douglas County*

Transportation Plan also addresses many of these issues. This study provides an evaluation of each of these issues in subsequent chapters. Figure 1-2 shows these issues on a map of the Corridor Study sections.

CORRIDOR SECTION 1:
Carson City, U.S. 50/U.S. 395 Interchange

- Determine interchange configuration adequacy for future traffic volumes
- Provide local roadway connection adequacy
- Determine need for parallel connection points

CORRIDOR SECTION 2:
Carson City Line to SR 88/U.S. 395 Intersection in Minden

- Control access for driveway connections
- Implement access management program
- Install traffic control signals
- Construct interchanges
- Consolidate access points along frontage roads
- Resolve traffic safety concerns
- Cooperate with Douglas County to implement NDOT projects that maintain traffic flow (high speed and capacity) on U.S. 395

CORRIDOR SECTION 3:
Minden/Gardnerville Area, SR 88/U.S. 395 Intersection to Pinenut Road

- Maintain a traffic level of service "C" or better on Douglas County streets and roadways
- Develop a pedestrian-friendly U.S. 395 Main Street corridor through Minden and Gardnerville
- Support future bypass facilities to keep traffic moving through Minden and Gardnerville
- Coordinate with Douglas County on a truck routes plan to keep excessive truck traffic out of neighborhoods and downtown Gardnerville and Minden
- Resolve/prevent local neighborhood traffic issues by providing adequate capacity on major collectors and arterials
- Provide traffic transitional facilities (such as traffic circles/roundabouts) in the Minden/Gardnerville area

CORRIDOR SECTION 4:
Pinenut Road to Topaz Lake

- Determine whether future development will require additional capacity
- Resolve issue of eastern Carson Valley bypass

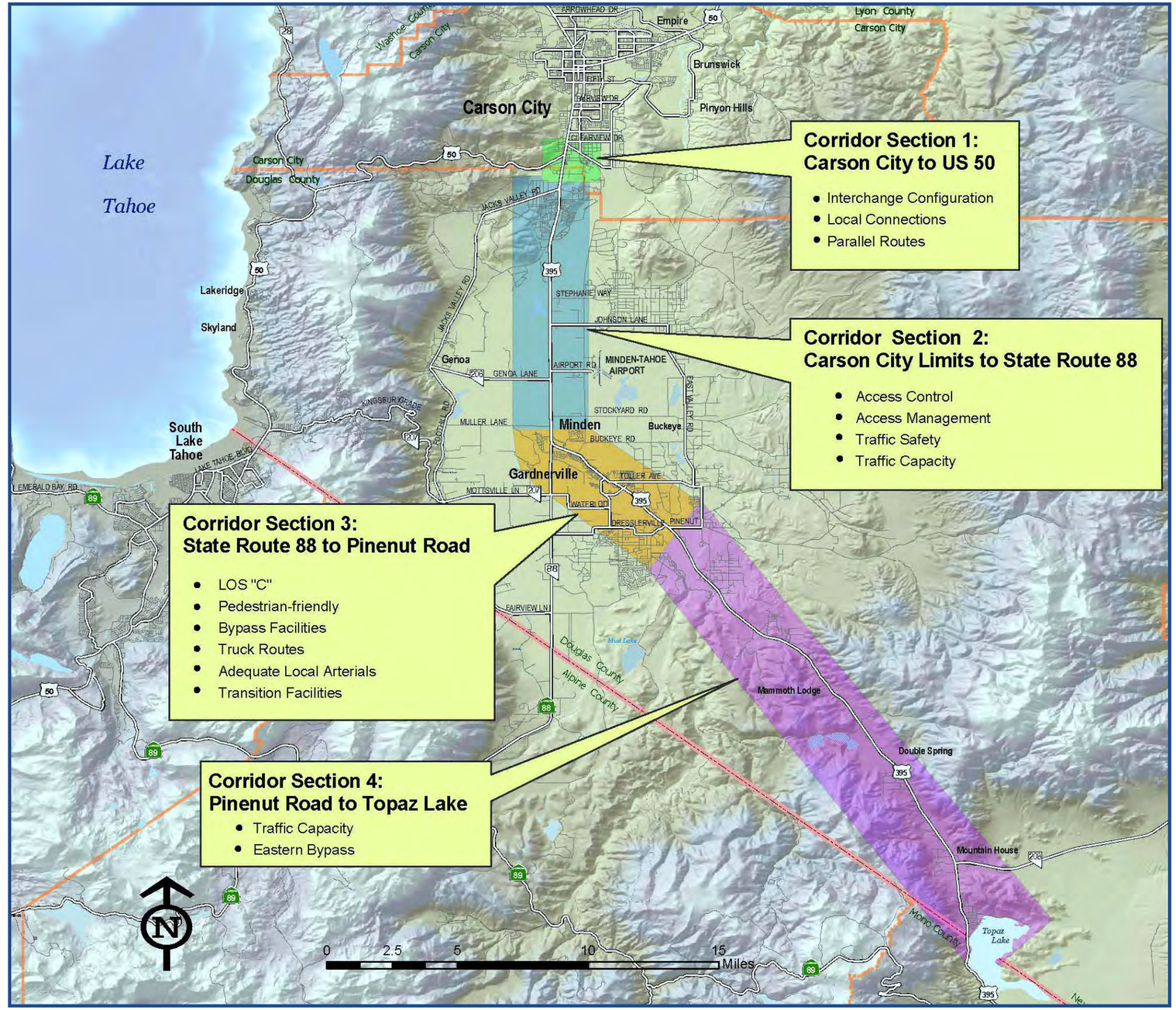


Figure 1-2 *U.S. 395 Corridor Issues Mapped According to Corridor Section*

2 Existing Conditions

The U.S. 395 Southern Sierra Corridor Study incorporates information about current land use development and the existing transportation network along with projections about future development and infrastructure improvements. To develop this information, Parsons collected data from the Carson City and Douglas County Community Development Departments, the Carson Area Metropolitan Planning Organization (CAMPO), the U.S. Census Bureau, the State of Nevada Department of Transportation, Department of Water Planning (NDWP), Department of Employment, Training and Rehabilitation and the State Demographer. Major documents reviewed for this study include:

- *2006 Douglas County Master Plan*
- *Draft 2007 Douglas County Transportation Plan*
- *Douglas County Land Use Master Plan Elements*
- *Douglas County Transit Needs Assessment*
- *Minden-Tahoe Airport System Plan*
- *Bicycle-Pedestrian Element of Douglas County Master Plan*
- *Carson City Land Use Master Plan*
- *Carson City 2004 Transportation Plan*
- Carson City Bypass EIS and Studies
- *Carson City Transit Needs Assessment*
- *PRIDE Service Characteristics*
- *Regional Transportation Air Quality Plan*
- Related NDOT planning documents

A complete bibliography of the land use and transportation planning documents consulted for this study appears in Appendix B.

2.1 DEMOGRAPHIC CONDITIONS AND TRAVEL DEMAND

2.1.1 Population Trends

Both Carson City and Douglas County experienced a significant amount of growth from 1990 to 2005. The Nevada State Demographer estimates that during this time, Douglas County population grew from 27,637 to 50,108; an increase of 81 percent. During the same time, Carson City grew from 40,443 to 57,104 residents; an increase of 41 percent.

Figure 2-1 illustrates the distribution of 2005 population by traffic analysis zone based on governmental property tax parcel records and U.S census data.

2.1.2 Employment Trends

As a part of the travel demand model development, Parsons used data from the Nevada Department of Employment, Training and Rehabilitation (DETR) to determine the existing number of employees in the Carson City/Douglas County study area. While the DETR reports an employment count of 22,227 full time equivalent jobs within Douglas County for 2005, only 19,563 jobs could be located geographically and assigned to a traffic analysis zone for travel modeling purposes. This difference is based on the way the jobs are counted and is not considered significant in traffic modeling. For Carson City, DETR reports a total of 26,050 jobs covered by unemployment insurance. The model locates and assigns all of these jobs.

Table 2-1 depicts employment by model category in the study area. In 2005, there were 37.7 jobs for every 100 people living in Douglas County. Carson City had 45 jobs per 100 residents for a combined rate of 41.5 jobs per 100 residents.

2.1.3 Vehicle Miles Traveled Trends

In addition to travel resulting from population and employment growth, transportation data indicates that people are traveling more than ever before due to the number of two-worker households and increased automobiles per household. For the base year 2005, NDOT estimates that the total number of vehicle miles traveled per year within Carson City is 400,625,770. In Douglas County, NDOT estimates the total number of vehicle miles traveled per year is 561,425,487. In the two-county study area the combined vehicle miles traveled (VMT) was 962,051,257 in 2005.

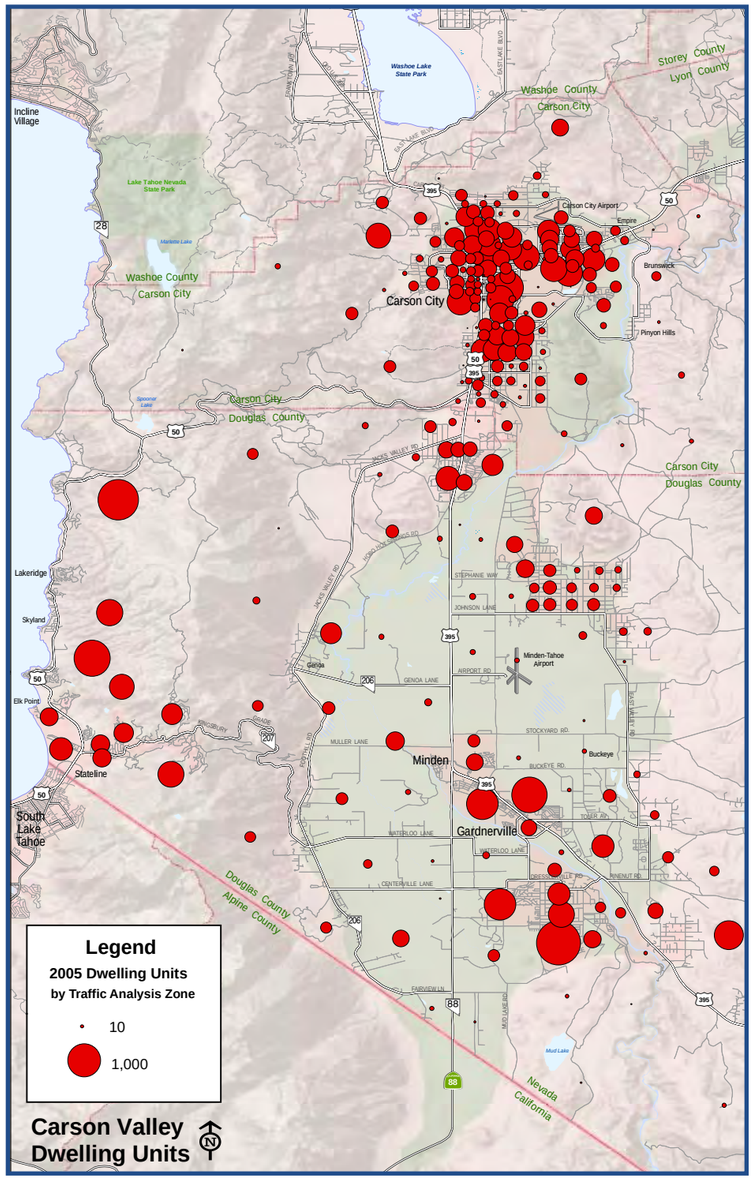


Figure 2-1 *2005 Population by Traffic Analysis Zone*

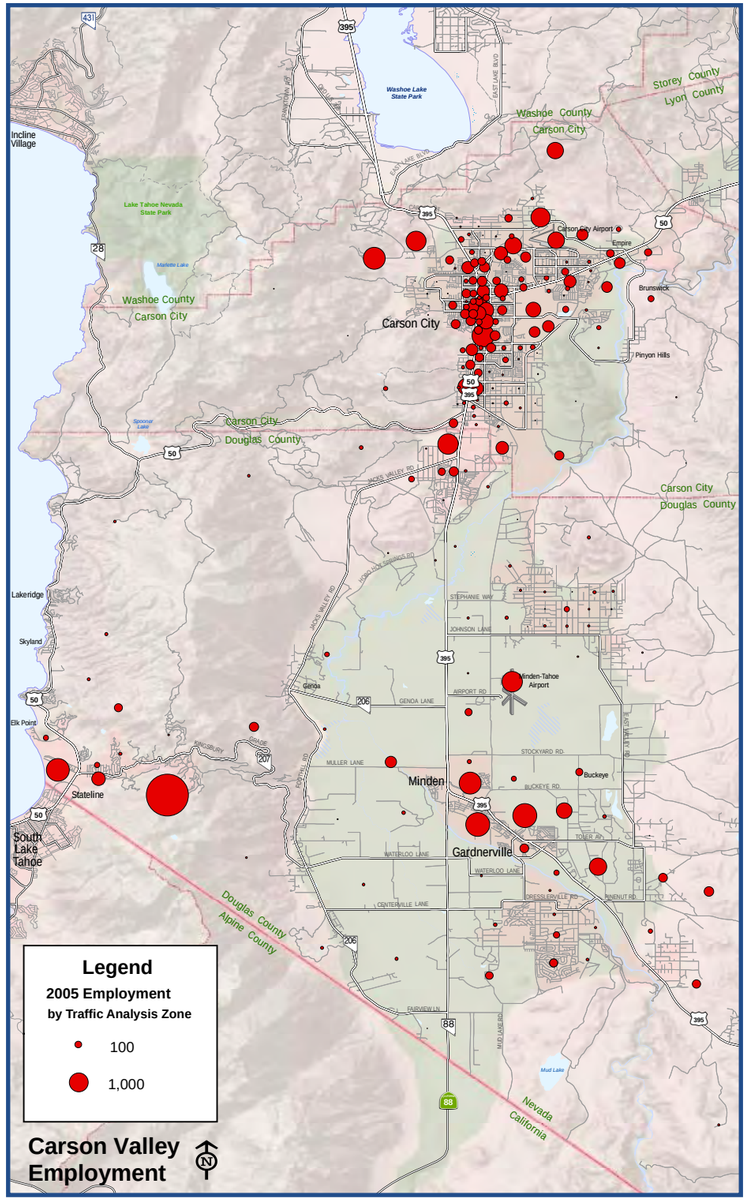


Figure 2-2 *2005 Employment by Traffic Analysis Zone*

Table 2-1 *2005 Travel Forecast Model Planning Variables*

	LAND USE DATA		
	COMBINED	DOUGLAS COUNTY	CARSON CITY
Population (POP)	109,964	51,948	58,016
Dwelling units (DU)	49,342	24,490	24,852
Occupied dwelling units (OCCDU)	44,100	20,610	23,490
Total employment (TOTEMP)*	45,622	19,563	26,059
Hotel employment (HOTEL)	9,167	6,954	2,213
Office employment (OFFICE)	17,493	4,857	12,636
Industrial employment (INDUST)	8,989	3,630	5,359
Retail shop employment (R_SHOP)	2,123	896	1,227
Commercial shop employment (C_SHOP)	6,552	2,873	3,679
Other retail employment (OTHER_RET)	611	178	433
Total retail employment (RETAIL)	9,286	3,947	5,339
Non-retail employment (OTHER_NON)	687	175	512
Elementary and middle school (F1-8)	10,839	5,144	5,695
High school enrollment (F9-12)	4,359	1,785	2,574
College enrollment (F13)	3,856	705	3,151

Source: Nevada Department of Employment, Training and Rehabilitation; Parsons
* Reflects jobs geo-coded to specific street addresses for 2005.

Using data provided by NDOT, the U.S. Environmental Protection Agency estimates that VMT in Douglas County increased about 46 percent over the past 10 years, slightly higher than the county's growth in population (39 percent) over the same time. VMT in Carson City increased about 45 percent over the past 10 years, while Carson City's population grew only 17 percent over the same period. The VMT in Carson City increased so much more than the population due to more trips between Carson City and adjacent developments in Lyon and Douglas County.

COMMUTE PATTERNS WITHIN THE CORRIDOR STUDY REGION

There is a fairly even balance between Douglas County in-commuting and out-commuting. The 2000 Census "Journey to Work" report data shows 6,498 commuters leaving Douglas County for work and 7,117 commuters coming into Douglas County for work. The largest numbers of out-commuters (3,415) travel to Carson City. The largest numbers of in-commuters (4,130) travel from El Dorado County, primarily to work for employers in the Lake Tahoe area.

Carson City had 10,624 commuters enter from other counties, most significantly Douglas County (3,415), Lyon County (2,949) and Washoe County (2,653). There were 5,615 Carson City residents who left the county for work. Of these, 3,106 commuters went to Washoe County and 1,415 residents traveled to Douglas County.

Tables 2-2 and 2-3 provide a detailed breakdown of the commute patterns within Carson City and Douglas County as taken from the U.S. Census data. These commute patterns indicate that a substantial amount of the employment related travel occurs between Douglas County, Carson City and Washoe County. Due to the land use patterns and the limited number of parallel routes, much of this traffic is funneled through the U.S. 395 corridor.

U.S. census data from 2000 within the two-county region provides information on the mode of travel to work. Table 2-4 provides separate totals of modes of travel to work for Nevada, Carson City, Douglas County and the two counties combined. The ratios of each transportation mode for the two counties are similar to the state averages in almost all categories. The main exception is the category of public transit, where Carson City and Douglas County average 0.8 percent use compared to the statewide average of 3.8 percent. The main users of the transit service in the study area are the elderly and persons with disabilities; and due to the rural nature of this area, transit service is not geared toward transporting working persons. Since the 2000 Census, Jump Around Carson (JAC) has provided regular transit service in Carson City, which should increase the percentage of public transit use in the area.

Two interesting statistics emerge from these tables: (1) 13 percent of the work trips involve a two-or-more person carpool and (2) 3.4 percent of the work trips are made by walking or bicycling. This data indicates that a significant number of commuters are already using alternatives to the single-occupant vehicle, with minimal marketing or external incentive.

Table 2-5 provides detailed information on travel times to work within Carson City, Douglas County and the state of Nevada. The greatest share of commuters (25 percent) in the study area travel between 10 and 14 minutes to work, with most commuters (89 percent) traveling between 5 and 44 minutes. Figure 2-3 illustrates that Carson City and Douglas County share a similar commute pattern, with a 5 to 10 minute shorter commute than the statewide average, which is heavily influenced by Clark County travel patterns.

Table 2-2 *Journey to Work, Sorted by Workplace County for Douglas County and Carson City*

RESIDENCE COUNTY	WORKPLACE COUNTY	COUNT
Total Douglas County Commuters		19,555
Douglas County, Nevada	Douglas County, Nevada	12,438
Commuters entering into Douglas County from other counties		7,117
*El Dorado County, California	Douglas County, Nevada	4,130
*Carson City, Nevada	Douglas County, Nevada	1,415
*Lyon County, Nevada	Douglas County, Nevada	560
*Washoe County, Nevada	Douglas County, Nevada	477
Commuters entering Douglas County from * areas		6,582
Commuters entering Douglas County from other areas		535
RESIDENCE COUNTY	**WORKPLACE COUNTY**	**COUNT**
Total Carson City Commuters		28,291
Carson City, Nevada	Carson City, Nevada	17,667
Commuters entering into Carson City from other counties		10,624
*Douglas County, Nevada	Carson City, Nevada	3,415
*Lyon County, Nevada	Carson City, Nevada	2,949
*Washoe County, Nevada	Carson City, Nevada	2,653
Commuters entering Carson City from * areas		9,017
Commuters entering Carson City from other areas		1,607

Source: 2000 U.S. Census

Table 2-3 *Journey to Work, Sorted by Residence County for Douglas County and Carson City*

RESIDENCE COUNTY	WORKPLACE COUNTY	COUNT
Total Douglas County commuters		18,936
Douglas County, Nevada	Douglas County, Nevada	12,438
Commuters leaving Douglas County to other counties		6,498
Douglas County, Nevada	*Carson City, Nevada	3,415
Douglas County, Nevada	*Washoe County, Nevada	1,365
Douglas County, Nevada	*El Dorado County, California	881
Commuters leaving Douglas County to other * areas		5,661
Commuters leaving Douglas County to other areas		837
RESIDENCE COUNTY	**WORKPLACE COUNTY**	**COUNT**
Total Carson City Commuters		23,282
Carson City, Nevada	Carson City, Nevada	17,667
Commuters leaving Carson City to other counties		
Carson City, Nevada	*Washoe County, Nevada	3,106
Carson City, Nevada	*Douglas County, Nevada	1,415
Carson City, Nevada	*Lyon County, Nevada	623
Commuters leaving Carson City to other * areas		5,144
Commuters leaving Carson City to other areas		471

Source: 2000 U.S. Census

Table 2-5 *Travel Time to Work (workers who did not work at home)*

	CARSON CITY		DOUGLAS COUNTY		STATE OF NEVADA	
	ESTIMATE	PERCENT	ESTIMATE	PERCENT	ESTIMATE	PERCENT
Less than 5	1,060	3.9	1,105	6.0	24,695	2.7
5 to 9	4,985	18.1	2,520	13.7	89,890	9.8
10 to 14	7,085	25.8	4,355	23.7	139,740	15.2
15 to 19	4,245	15.4	3,295	17.9	169,305	18.4
20 to 29	3,935	14.3	2,930	15.9	235,470	25.7
30 to 44	3,725	13.5	2,510	13.6	168,750	18.4
45 to 59	1,345	4.9	750	4.1	39,075	4.3
60 or more	1,135	4.1	935	5.1	50,790	5.5
Mean travel time (minutes)	19.5	(X)	20.7	(X)	23.4	(X)
Median travel time (minutes)	15.2	(X)	15.4	(X)	20.2	(X)

Source: 2000 U.S. Census

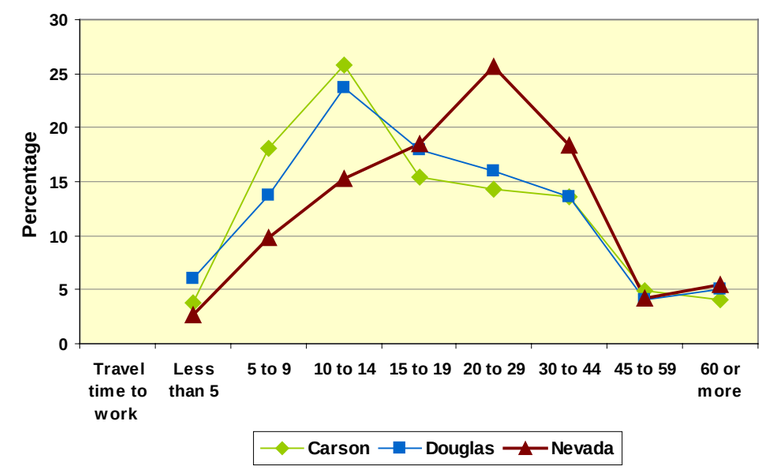


Figure 2-3 *Cumulative Frequency Distribution of Travel Time to Work*

Table 2-4 *Year 2000 Means of Transportation to Work, Workers 16 Years and Older*

TRANSPORTATION MODE	NEVADA		CARSON CITY		DOUGLAS COUNTY		COMBINED CARSON CITY AND DOUGLAS COUNTY	
	ESTIMATE	PERCENT	ESTIMATE	PERCENT	ESTIMATE	PERCENT	ESTIMATE	PERCENT
Drove alone	700,085	74.4%	22,410	79.2%	14,775	75.6%	37,185	77.7%
2-person carpool	111,620	11.9%	3,110	11.0%	2,125	10.9%	5,235	10.9%
3-or-more-person carpool	28,660	3.0%	670	2.4%	380	1.9%	1,050	2.2%
Bus or trolley bus	35,645	3.8%	125	0.4%	245	1.3%	370	0.8%
All other transit1	460	0.0%	0	0.0%	10	0.1%	10	0.0%
Bicycle or walked	30,205	3.2%	920	3.3%	690	3.5%	1,610	3.4%
Taxicab, motorcycle, or other mode	11,035	1.2%	275	1.0%	175	0.9%	450	0.9%
Worked at home	23,875	2.5%	780	2.8%	1,150	5.9%	1,930	4.0%
Totals	941,585	100%	28,290	100%	19,550	100%	47,840	100%

Source: 2000 U.S. Census

2.2 ROADWAY NETWORK

2.2.1 Highway 395

DESCRIPTION OF EXISTING CORRIDOR

U.S. 395 is the primary route for north-south travel between Douglas, Carson and Washoe counties. In the study corridor, the only parallel route is Jacks Valley Road/Foothill Road, which is a narrow and winding two-lane facility that runs along the west side of the valley. The other optional route for north-south travel is the narrow, winding, two-lane Kingsbury Grade (SR 207) connecting with the four-lane U.S. 50 at Lake Tahoe.

The following is a general description of the U.S. 395 corridor that includes land use, average right-of-way width, number of lanes per direction, median type, intersection traffic control, speed limits and truck climbing lanes. Appendix A, Aerial View of Intersections, provides an aerial view of each major intersection.

CLEARVIEW DRIVE TO U.S. 50

The Corridor Study area starts at Clearview Drive in Carson City and proceeds about 2,600 feet south to the intersection with U.S. 50, which joins U.S. 395 from the west. There are three lanes in both directions, with an average 200 foot right-of-way. A raised median divides the two sides of the highway. Traffic signals control access at the Clearview Drive and U.S. 50 intersections. Stop signs control traffic at all other side streets. There are extensive commercial/retail facilities on both sides of the highway, resulting in continuous ingress and egress on and off the highway. About one-quarter of the land fronting the highway is not yet developed.

U.S. 50 TO OLD CLEAR CREEK ROAD

This section has a similar configuration, except that the right-of-way expands to 300 feet in some areas. A traffic signal is located at the Old Clear Creek Road intersection; there are no additional intersections on this segment.

OLD CLEAR CREEK ROAD TO JACKS VALLEY ROAD (NORTH SUNRIDGE DRIVE)

Continuing south on U.S. 395 from Old Clear Creek Road, the west side of U.S. 395 is fronted by commercial and retail uses. There is a mobile home park on the east side of the highway, south of the Old Clear Creek Road intersection. The east side is undeveloped open space. The right-of-way varies from 275 to 400 feet in width. There are two northbound lanes throughout the section. Of the three southbound lanes, one lane becomes a right-turn-only lane at Jacks Valley Road. A raised median separates the traffic from the Old Clear Creek Road intersection to 800 feet south of Topsy Lane; from that point to Jacks Valley Road, the median is open and flat. Traffic signals are located at Topsy Lane and Jacks Valley Road, with stop signs controlling access to private roads and driveways. A private recreational vehicle park is located on the west side of U.S. 395.

JACKS VALLEY ROAD TO MICA DRIVE (SOUTH SUNRIDGE)

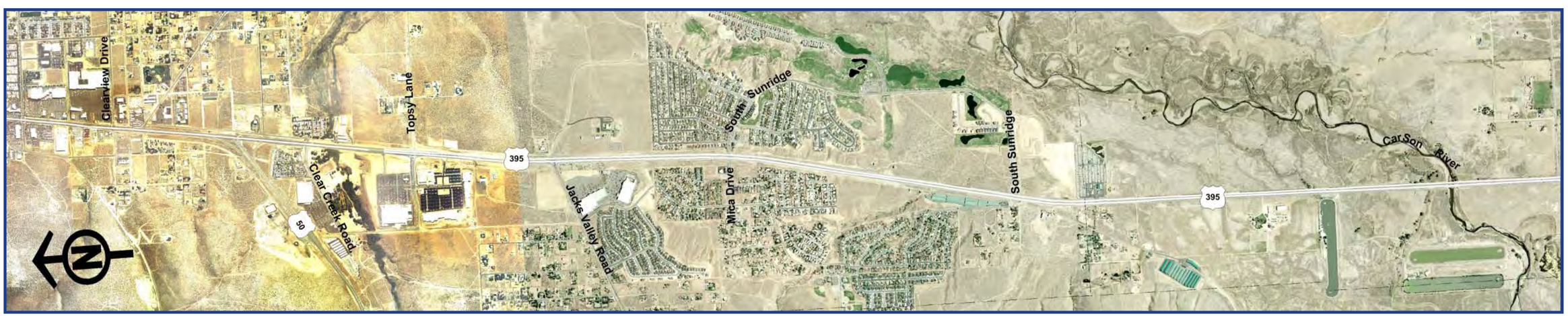
The commercial and retail land use continues on the west side of the highway for one-quarter mile, transitioning to residential development on both sides of U.S. 395. The right-of-way averages 400 feet wide in this section. There are two northbound lanes and two southbound lanes, separated by a raised median for 700 feet south of the Jacks Valley Road intersection. From that point, the median is open and flat up to Mica Drive. Traffic signals are located at Mica Drive. On the west side of the highway, south of Jacks Valley Road, a yield sign restricts merging traffic that is exiting from the shopping center.

MICA DRIVE TO STATE ROUTE 88

Land use in this section is primarily agricultural. There is a significant amount of mixed commercial and residential development south of Mica Drive and commercial/retail/medical just north of the intersection with SR 88. The right-of-way width varies from 170 feet to 400 feet. The two northbound and two southbound lanes are separated by an open median except for the sections of raised median for channelized movements or left turn lanes at Stephanie Way, Johnson Lane, Airport Road, Genoa Lane, Muller Lane, Ironwood Drive and SR 88. Stop signs control traffic at Plymouth Drive/South Sunridge Drive, Airport Road, Genoa Lane, Muller Lane and Ironwood Drive. Traffic signals control traffic at Johnson Lane (southbound lane free flow), Stephanie Way (southbound lane free flow) and SR 88.

STATE ROUTE 88 TO PINENUT ROAD/RIVERVIEW DRIVE

U.S. 395 begins a northwest-southeast orientation at the intersection with SR 88. Land use in this section is a mixture of commercial, retail and residential through the towns of Minden and Gardnerville. Land on the west side of U.S. 395 south of Waterloo Lane is open space. The right-of-way width varies from 80 feet through the towns of Minden and Gardnerville to 120 feet north of the Pinenut Road/Riverview Drive intersection. There are two northbound and two southbound lanes which are separated by a



two-way left turn lane in the middle of the roadway. Traffic signals control access at Buckeye Road, Gilman Avenue, Waterloo Lane and Pinenut Road/Riverview Drive. All other intersections with U.S. 395 through Minden and Gardnerville use stop signs to control side street access.

PINENUT ROAD/RIVERVIEW DRIVE TO NEVADA/ CALIFORNIA BORDER

The land use in this section is primarily open, federal-controlled land (Bureau of Land Management, Bureau of Indian Affairs and Forest Service) mixed with sparse residential development. There is a small amount of mixed commercial/retail and residential near the California border at the Topaz Ranch Estates development. The right-of-way varies from 120 feet to 200 feet. There is one northbound and one southbound lane in this section and several locations where the roadway has been widened to provide an additional lane for left turns into developments, for truck climbing lanes, or for northbound high speed merging at Holbrook Junction (SR 208). There is no median for a majority of the segment. A raised channelizing median exists at the Holbrook Junction intersection. All side street intersections in this segment are stop sign controlled.

STATE ROUTE 88 TO NEVADA/CALIFORNIA BORDER

SR 88 is a north-south road that begins at the intersection with U.S. 395 in Minden and goes to the California border, approximately eight miles. The road has one general-purpose lane in each direction and primarily serves the Gardnerville Ranchos area. There are several intersections with county roads in the vicinity of Douglas County at the north end. There are four main intersections to the south at Mottsville Lane/Waterloo Lane, Centerville Lane, Kimmerling Road and Fairview Lane. The Mottsville Lane/Waterloo Lane intersection is controlled by traffic signals and the other intersections are stop sign controlled.

SPEED LIMITS

Speed limits in the corridor vary as land use conditions change. Through the commercial area south of Carson City, the speed limit is generally 45 mph. Through the towns of Minden and Gardnerville. the speed limit is 25 mph. The divided four-lane section through Carson Valley has a speed limit of 65 mph between Plymouth Drive and Muller Lane. The rural section of U.S. 395 south of Gardnerville to the state line has a speed limit of 55 mph.

TRUCK CLIMBING LANES

There are two existing truck climbing lanes on U.S. 395 south of Gardnerville. The first climbing lane is on southbound U.S. 395 between Mileposts 14 and 16, south of Washoe Road, where the hill begins. The other truck climbing lane is on northbound U.S. 395 between Mileposts 11 and 12.

2.2.2 U.S. 50 Intersection

This is a T-intersection with U.S. 395 on the north and south legs and U.S. 50 on the west leg. U.S. 50 intersects at a near 45 degree angle to U.S. 395. The intersection is currently controlled by traffic signals and has a marked crosswalk on the south leg for pedestrian access between the east and west side of U.S. 395. There are three general purpose travel lanes in each direction on U.S. 395. The southbound direction has a large radius, free flow right-turn lane from U.S. 395 to U.S. 50 in the westerly direction. The northbound direction has a single left-turn lane. The eastbound direction on U.S. 50 has dual left-turn lanes. The eastbound direction also has a small radius, free flow right-turn lane. There are two general purpose travel lanes in each direction on U.S. 50.

2.2.3 SR 88 Intersection

This is a T-intersection with U.S. 395 on the north and south legs and SR 88 on the west leg. SR 88 is a north-south route that is curved at the intersection to tie into U.S. 395 at a near 90 degree angle. There are two general purpose lanes in each direction on both SR 88 and U.S. 395. Approaching the intersection southbound, there is a large radius, free flow right-turn lane. The radius of this turn was modified in 2006 to slow the right turning traffic before it reached the school zone in front of Douglas High School on SR 88. Northbound traffic on SR 88 is provided with dual left-turn lanes at the intersection and a large radius, free flow right-turn lane that merges into U.S. 395. There are left-turn lanes on both legs of U.S. 395 at the intersection.

2.2.4 Summary of Past Planning Studies

CARSON CITY FREEWAY PHASE 2 DESIGN ALTERNATIVES STUDY, LOUIS BERGER GROUP, INC (2003)

This study recommended a single-point urban intersection (SPUI) at the U.S. 50/U.S. 395 Bypass/Carson Street intersection. As part of this recommendation, U.S. 50 and the U.S. 395 Bypass would be four lanes in width, elevated above Carson Street with grade separations at Snyder Avenue and Clearview Drive. Carson Street and U.S. 395 to the south of the intersection would be six lanes wide. The eastbound entrance to the U.S.

395 Bypass from Carson Street would include two separate ramps; a two-lane free northbound to eastbound connection and a southbound to eastbound connection. It was also recommended that the westbound U.S. 395 exit ramp be a two-lane exit with three left-turn lanes at the intersection.

CARSON CITY FREEWAY PHASE 2 EVALUATION OF FUTURE CONNECTIVITY, LOUIS BERGER GROUP, INC (2003)

Several improvement options along U.S. 395 and the U.S. 395 Bypass were analyzed as part of this study. As part of the U.S. 395 Bypass Phase 2 improvements, East Fifth Street, Koontz Lane, Clearview Drive and Snyder Avenue would be grade separated, with an interchange constructed at Fairview Drive. A second potential interchange would be constructed if construction of the optional bypass roadway is considered, which extends from the U.S. 395 Bypass to south of Gardnerville. Several options were evaluated for U.S. 395 south of U.S. 50, including widening U.S. 395 to 10 lanes, and grade separating Old Clear Creek Road, Topsy Lane, and Jacks Valley Road, with one- or two-way frontage roads.

U.S. 395 CAPACITY IMPROVEMENT STUDY, PARSONS TRANSPORTATION GROUP (1998)

This study recommended several intersection capacity improvements along Carson Street north of the proposed U.S. 50/U.S. 395 Bypass/Carson Street interchange. At the Clearview Drive/Carson Street intersection, an exclusive westbound right-turn lane and elimination of the east-west split phasing was recommended. At the Koontz Lane/Carson Street intersection, an exclusive westbound right-turn lane was constructed in 2006, consistent with the report recommendation. At the Fairview Drive/Carson Street intersection, an additional westbound left-turn lane was recommended.

U.S. ROUTE 395 ALTERNATIVE ANALYSIS, NEVADA DEPARTMENT OF TRANSPORTATION (1997 AND 1998)

These studies recommended roadway improvements to U.S. 395 and SR 88, including widening U.S. 395 from four to six lanes between U.S. 50 and SR 88, and widening SR 88 to four lanes between U.S. 395 and Waterloo Lane. Several arterial widening and extensions in the area were also recommended, including consolidation and realignment of driveway and roadway access points in downtown Minden and downtown Gardnerville, extension of Drayton Boulevard, widening of Stephanie Lane (to four lanes east of U.S. 395), a Southern Ranchos connection, and widening Jacks Valley Road to four lanes.

An eastern bypass, from the U.S. 395 Bypass to a location on U.S. 395 at or south of Pinenut Road in Gardnerville, was also recommended. Several alternative alignments for this new roadway were analyzed, including using portions of Vicky Lane and East Valley Road, as well as following the right-of-way of the old Virginia & Truckee Railroad alignment.

This study also considered four additional bypass alternatives. One would begin at Johnson Lane, connect at Buckeye Road and East Valley Road, and utilize the existing East Valley Road until terminating at U.S. 395 south of Pinenut Road. The other bypass would begin at Genoa Lane, connect at Buckeye Road and East Valley Road, and utilize the existing East Valley Road until terminating at U.S. 395 south of Pinenut Road. A third bypass option would be located south of the Gardnerville core, connecting SR 88 to U.S. 395 by extending Waterloo Lane (terminating at the Waterloo Lane/Toler Avenue intersection). The final bypass would be located south of Gardnerville, connecting SR 88 to U.S. 395 by extending Dressler Lane (terminating south of Pinenut Road).

U.S. 395 WIDENING RIVERVIEW DRIVE TO GARDNERVILLE, FEDERAL HIGHWAY ADMINISTRATION (1992)

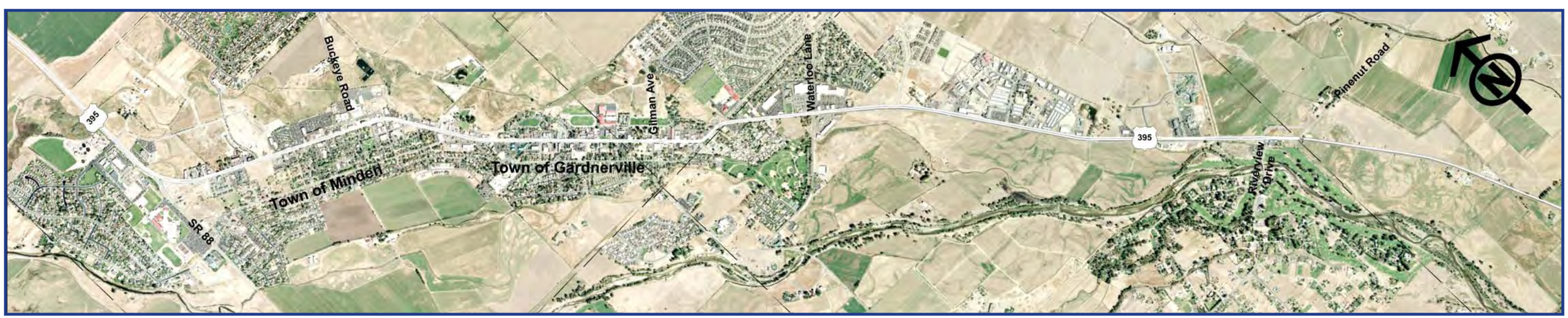
This project recommended widening U.S. 395 to four lanes with a center, two-way, left-turn lane from the Riverview Drive intersection to the existing four-lane section south of Gardnerville.

VALLEY PARKWAY ALIGNMENT STUDY, LUMOS & ASSOCIATES (1991)

This study recommended two components: (1) a Waterloo Lane extension and (2) a Muller Lane extension. The Waterloo extension would provide an east-west connector south of the core of Gardnerville, extending Waterloo Lane from the Mottsville Lane/SR 88 intersection east 2.4 miles to U.S. 395 (would intersect with the Muller Lane extension). The Muller extension would provide a north-south alternative to U.S. 395, extending Muller Lane south and east to just north of Elges Lane (with a potential extension to Riverview Drive). This roadway would initially be two lanes, but would be widened to four lanes after traffic volumes increase.

CARSON VALLEY 395 CORRIDOR ALTERNATIVES STATUS, NEVADA STATE HIGHWAY DEPARTMENT (1971)

This study analyzed several different alignments for a U.S. 395/U.S. 50 bypass, consisting of alignments west of U.S. 395, using portions of the existing U.S. 395, or east of U.S. 395.



Three alignments for the western bypass were analyzed: (1) beginning at U.S. 50, 1.5 miles west of U.S. 395/Carson Street (via an intersection or interchange), continuing south across Jacks Valley Road and parallel to Foothill Road, crossing SR 88 south of Gardnerville Ranchos, then east to U.S. 395; (2) beginning at the proposed U.S. 395 Bypass/U.S. 50 interchange, continuing south on U.S. 395, then turning west at a location south of Indian Hills and south of and parallel to Foothill Road, crossing SR 88 south of Gardnerville Ranchos, then east to U.S. 395; and (3) beginning at the U.S. 395 Bypass (approximately at the bend with an intersection or interchange), continuing southwest across U.S. 395 south of Indian Hills and south of and parallel to Foothill Road, crossing SR 88 south of Gardnerville Ranchos, then turning east to U.S. 395.

Four alignments for the bypass using portions of the existing alignment were analyzed: (1) beginning at the proposed U.S. 395 Bypass/U.S. 50 interchange, continuing south along U.S. 395 and SR 88, then east, south of Gardnerville Ranchos to U.S. 395; (2) beginning at the proposed U.S. 395 Bypass/U.S. 50 interchange, continuing south along U.S. 395 and SR 88, then east along Waterloo Lane extension to U.S. 395 (Elges Avenue); (3) beginning at the proposed U.S. 395 Bypass/U.S. 50 interchange, continuing south along U.S. 395 and SR 88, then southeast parallel to the Carson River to U.S. 395 (Elges Avenue); and (4) beginning at the proposed U.S. 395 Bypass/U.S. 50 interchange, south along U.S. 395, then southeast parallel to U.S. 395 (north of Minden and Gardnerville) to U.S. 395 (Riverview Drive).

Five alignments for the eastern bypass were analyzed: (1) beginning at the U.S. 395 Bypass (at the bend with an intersection or interchange), continuing south parallel to U.S. 395 (east of Vicki Lane and east of the airport) to U.S. 395 (Elges/Tolar Lane); (2) beginning at the U.S. 395 Bypass (at the bend with an intersection or interchange), continuing south parallel to U.S. 395 (east of Vicky Lane) and southeast just north of Stephanie Way (to Sunrise Pass Road), then south along the eastern edge of the valley to U.S. 395 (Palomino Lane); (3) beginning at the U.S. 395 Bypass (at the bend with an intersection or interchange), continuing southeast north of Hot Springs Mountain, then south parallel to U.S. 395 to U.S. 395 (Palomino Lane); (4) beginning at the U.S. 395 Bypass (at the bend with an intersection or interchange), continuing south parallel to U.S. 395 (east of Vicky Lane) and southeast just north of Stephanie Way (to Sunrise Pass Road), then south along the eastern edge of the valley to U.S. 395 (Bode Springs Flat); and (5) beginning at the U.S. 395 Bypass (at the bend with an intersection or interchange), continuing southeast north of Hot Springs Mountain, then south along the eastern edge of the valley to U.S. 395 (Bode Springs Flat).

2.2.5 Recent Planning Documents

IMPROVEMENTS FROM MASTER PLANS

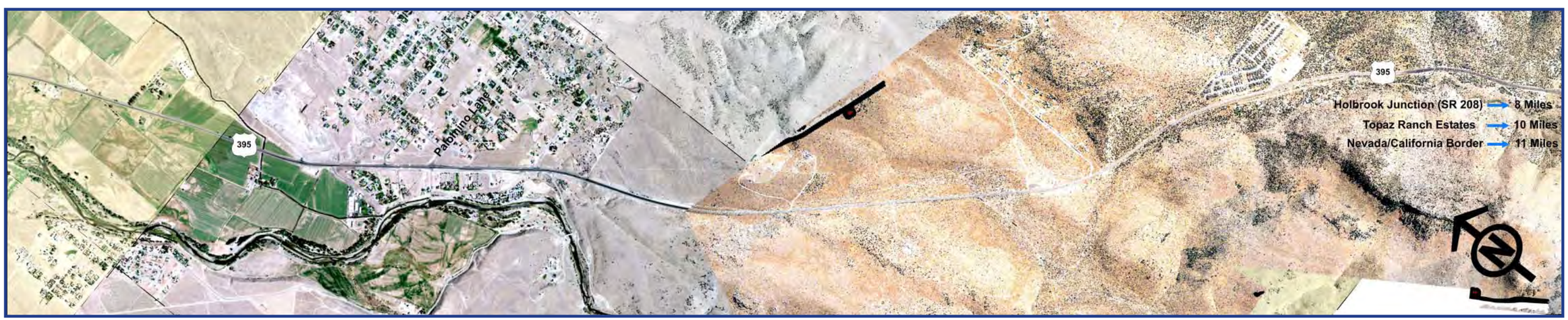
The 2006 Douglas County Master Plan recommends that as redevelopment occurs in the central areas of Minden and Gardnerville, opportunities should be identified to acquire right-of-way to realign intersections perpendicular to U.S. 395. These intersection realignments include Esmeralda Avenue, Mono Avenue, County Road, as well as opportunities to consolidate and organize driveway access locations to U.S. 395 at First Street, Third Street and Fourth Street. The Master Plans also identify several east-west and north-south street extensions (Drayton Boulevard, Ironwood Drive, East Valley Road, Waterloo Lane, Johnson Lane, County Road, Heybourne Road) and street widening projects (Stephanie Lane, Buckeye Road, East Valley Road, Jacks Valley Road) as development occurs and volumes warrant the improvements.

The *2006 Carson City Master Plan* recommends several east-west and north-south roadway extensions (Stewart Street–Carson Street to Curry Street, and Sonoma Street–Carson Street to Curry Street) and roadway widening projects (Roop Street, Fairview Drive, Fifth Street, Curry Street) when development and traffic volumes warrant the improvements. The Master Plan also recommends the U.S. 395 Bypass (from U.S. 50 east to U.S. 50 west) with interchanges at U.S. 395/Carson Street/U.S. 50 and Fairview Drive.

U.S. 395 TRUCK CLIMBING LANES

In the northbound direction, with the transition and intersection operations included, this NDOT highway widening project is proposed to begin just north of the intersection of U.S. 395 and Plymouth Drive and proceed through the intersection of Jacks Valley Road, connecting with the future northbound third lane.

In the southbound direction, this NDOT highway widening would require the project to begin just south of Old Clear Creek Road and proceed through the intersection of Jacks Valley Road, ending 900 feet to the south. There are currently three southbound lanes in this section.



2.3 ROADWAY TRAFFIC OPERATIONS

2.3.1 Traffic Volumes

Figure 2-4 illustrates the average annual daily traffic volumes (AADT) for traffic count stations along U.S. 395 within the corridor study area. Table 2-6 provides historical count information for these same locations.

These traffic volumes show a significant difference in the level of activity on U.S. 395 between the north and south ends of Minden/Gardnerville. The low AADT volume at the Nevada/California state line indicates that the vast majority of traffic on U.S. 395 through the Carson Valley is generated within the valley area. Less than 15 percent of the vehicles could be considered "through" or interstate traffic.

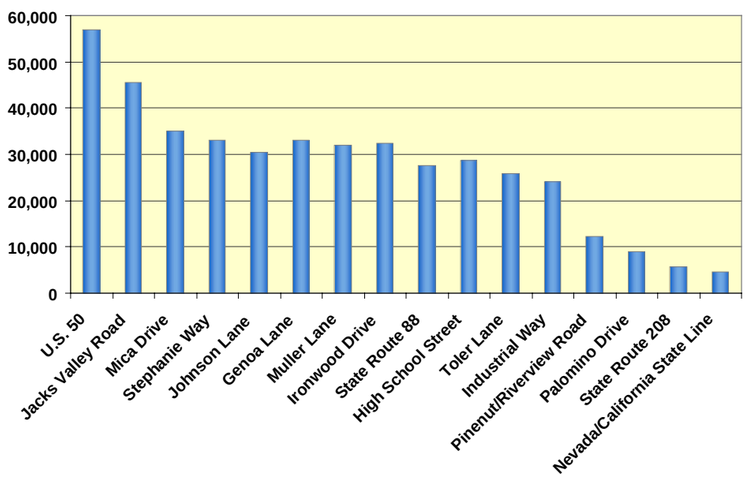


Figure 2-4 2005 *Annual Average Daily Traffic Volumes along U.S. 395*

2.3.2 Vehicle Occupancy Rates

The NDOT Vehicle Occupancy Monitoring Program showed that vehicle occupancy in Carson City and Douglas County is approximately 1.5 persons per vehicle in the urban areas and 1.7 persons per vehicle in the rural areas.

Table 2-6 *1996–2005 Historical Average Annual Daily Traffic*

COUNT STATION	LOCATION	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
25-0001	U.S. 395-Carson Street, 0.2 mile north of U.S. 50	36,400	38,100	39,800	38,900	43,500	43,500*	43,500*	46,500*	56,500	57,010
05-0045	U.S. 395, 0.4 mile north of Jacks Valley Road	30,600	29,800	32,200	33,600	37,600	37,600	39,600	36,500	44,000	45,500
05-0046	U.S. 395, 0.4 mile north of Mica Drive	N/A	N/A	N/A	N/A	N/A	N/A	31,500	34,000	34,000*	35,000
05-0033	U.S. 395, 0.3 mile north of Stephanie Way	23,100	23,500	25,100	26,400	27,700*	27,700*	29,900	30,500	31,000*	33,000
05-0030	U.S. 395, 0.1 mile south of SR 206 (Genoa Lane)	22,600	24,200	25,100	25,900	27,300	27,300*	29,000	30,000	31,500	32,000
05-0029	U.S. 395, 0.2 mile south of Muller Lane Parkway	23,300	23,800	24,100	25,200	26,600	26,600	29,200	30,500	30,500	32,500
05-0011	U.S. 395, 400 feet south of SR 88	21,700	22,200	22,300	23,000	24,300	24,300	24,900	26,200	26,200	27,700
05-0008	U.S. 395, 150 feet south of High School Street	24,200	23,700	24,300	25,300	26,500	25,000	25,000*	27,700	26,000	28,700
05-0007	U.S. 395, 30 feet south of Eddy Street	20,600	20,400	21,000	21,600	23,200	22,000	22,000*	22,500	23,000	24,200
05-0059	U.S. 395, 200 feet south of the north leg of Industrial Way	17,800	17,000	17,300*	17,800	20,000	19,000	20,100	21,900	23,000*	24,000*
05-0069	U.S. 395 0.6 mile south of Pinenut Road	—	9,900	10,100	10,100	10,000	11,000	10,800	11,500	11,800	12,300
05-0005	U.S. 395, 0.1 mile south of milepost 16 and south of Palomino Drive	7,000	6,900	7,050	6,700	6,800	7,600	8,050	8,900	8,900*	9,000
05-0002	U.S. 395, 0.3 mile south of SR 208	4,600	4,350	4,550	4,500	4,700	4,800*	4,950*	5,200	5,600	5,600
05-0001	U.S. 395 at Nevada/California state line (Topaz)	4,050	3,700	3,700	3,750	3,900	3,980	4,100	4,300	4,600	4,600

Source: Nevada Department of Transportation
*Count data estimated or extrapolated

2.3.3 Traffic Level of Service

Traffic level of service was measured at the major intersections along the corridor. These intersections are, or will soon be, controlled by traffic signals. The list of intersections analyzed along U.S. 395 includes the following:

- Clearview Drive
- U.S. 50 (Spooner Junction)
- Old Clear Creek Road
- Topsy Lane
- Jacks Valley Road
- Mica Drive
- Stephanie Way (no traffic signals in 2005)
- Johnson Lane
- State Route 88
- Buckeye Road/Sixth Street
- Gilman Avenue
- Waterloo Lane
- Pinenut Road/Riverview Drive

Aerial views of these intersections are provided in Appendix A, Aerial View of Intersections. These aerial views indicate the geometric layout of each intersection.

Figure 2-5 shows the 2005 AM and PM peak period traffic volumes for each movement at the study intersections. The intersections were analyzed using TRAFFIX, a computer software package developed to perform roadway capacity analysis. Current traffic signal timing data was obtained from Carson City and Douglas County Public Works. The TRAFFIX analysis results are shown in a separate document. To provide an accurate analysis, the peak hour factors were calculated using the 2005 turning movement counts from each intersection. The results of the existing (2005) conditions analyses are shown in Table 2-7. All intersections currently operate at LOS C or better, except at Clearview Drive and Waterloo Lane where the PM peak is at LOS D.

2.3.4 Highway Access Evaluation

The ability of the U.S. 395 corridor to carry traffic is largely dependent on the number and type of access points to the highway. The current access

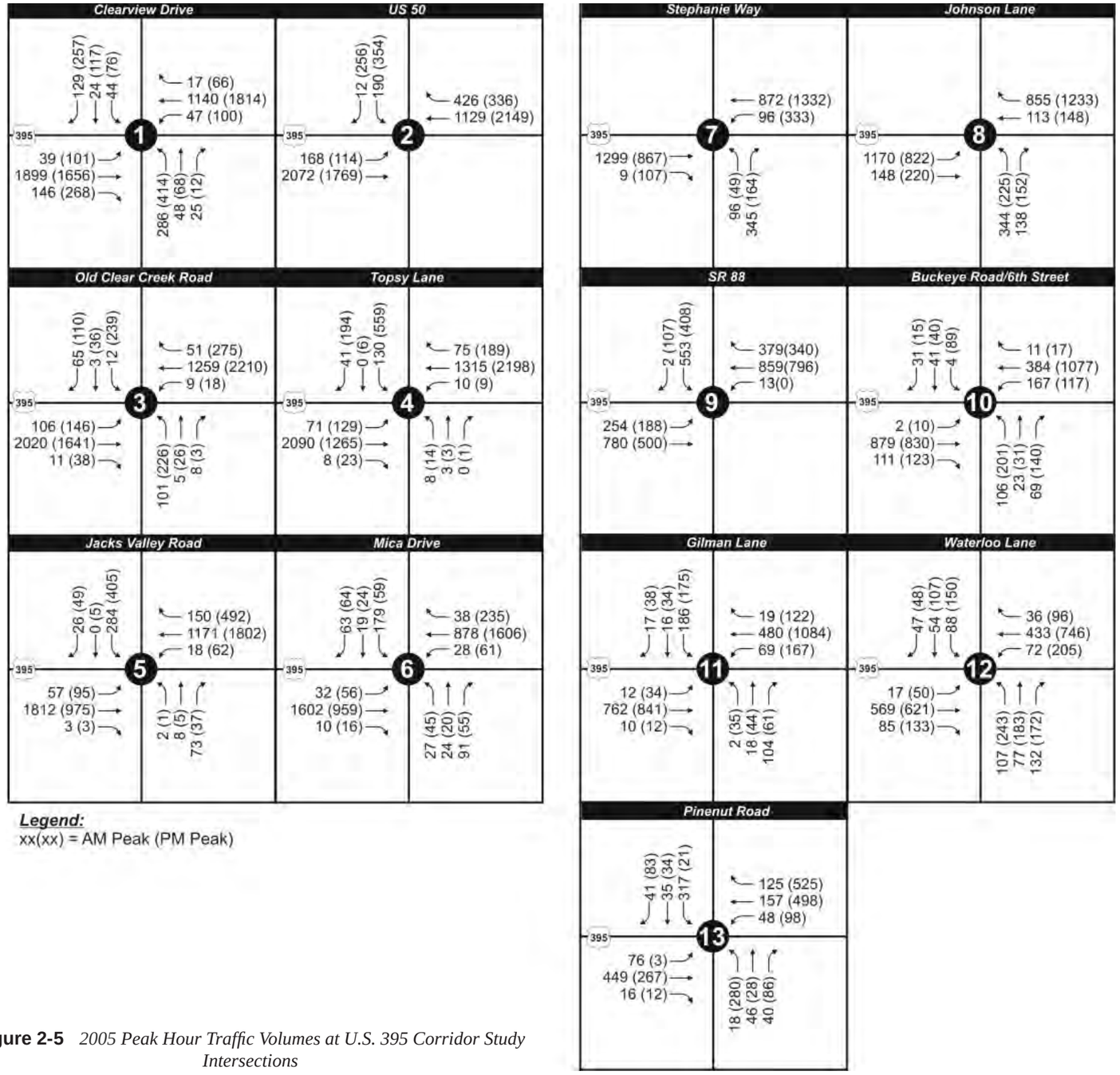


Figure 2-5 *2005 Peak Hour Traffic Volumes at U.S. 395 Corridor Study Intersections*

Table 2-7 *2005 Existing Conditions Analysis*

INTERSECTION	AM PEAK HOUR				PM PEAK HOUR			
	LOS	AVG DELAY (sec)	CRIT V/C	AVG CRIT DELAY (sec)	LOS	AVG DELAY (sec)	CRIT V/C	AV\G CRIT DELAY (sec)
U.S. 395 and								
Koonz	B	14.4	0.548	13	C	20.8	0.672	20.5
Clearview	C	33.1	0.897	38.9	D	45.6	0.946	55.7
U.S. 50	B	15	0.64	11.5	C	24.1	0.771	29.3
Clear Creek	C	21.6	0.8	25	C	34.8	0.939	44
Topsy	C	22	0.879	28.1	C	30.4	0.79	33.3
Jacks Valley	C	29.5	0.906	37.7	C	29.1	0.879	36.4
Mica	C	21.7	0.839	23.7	B	14.2	0.654	12.8
Stephanie	C	29.3	0.814	35.9	C	21.9	0.651	34
Johnson	C	29.6	0.803	37.2	C	23.4	0.587	19.3
Muller	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Ironwood	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
SR 88	C	33	0.818	42.2	C	26.7	0.65	33.5
Buckeye	C	24.4	0.551	28.5	C	27.9	0.571	32.5
Centerville/Gillman	C	33.4	0.549	35.2	C	28.6	0.482	24.5
Waterloo	C	33.2	0.419	33.6	D	37.3	0.619	40.9
Pinenut/Riverview	C	33	0.553	33.6	C	33.1	0.679	39

along the study corridor includes everything from single-family residential driveways to major intersections controlled by traffic signals. Within the corridor, the highway varies from a rural, multi-lane, high-speed facility with occasional low volume access points to an urban, low-speed facility with numerous access points serving small to large commercial establishments. This diversity creates different access needs, which in turn impact the traffic carrying capacity of the highway. A review of the access points along the study corridor was conducted in accordance with NDOT's Access Management System and Standards.

The following is a summary of the access points along the corridor and the current issues at those access points. It should be noted that NDOT does not have the authority to deny private property access to U.S. 395 unless NDOT acquires the control of access from that property owner. This can be very expensive in those instances where the private property has no other access available. Generally, the entire property would have to be purchased in those cases. Instead of purchasing control of access, NDOT could provide frontage roads on either side of a future freeway

section. Frontage roads provide private property access to a public street that allows access to a future freeway at select interchange locations along the freeway.

CLEARVIEW DRIVE TO OLD CLEAR CREEK ROAD

Full traffic movement access is allowed at the signalized intersections of Clearview Drive, U.S. 50 and Old Clear Creek Road and at the stop sign controlled intersection of Snyder Avenue/U.S. 395. During peak traffic periods the southbound to eastbound and westbound to southbound traffic at this intersection experiences some long delays; however, these are low volume movements and could be accommodated at the traffic signals to the north and south. There is an existing frontage road along the east side of U.S. 395 between Snyder Avenue and Old Clear Creek Road that keeps this portion of the highway free of local access points. The west side of the highway is also free of access points except for the U.S. 50 intersection.

Recommendation

NDOT should maintain the access status quo for this segment of U.S. 395 and not allow any additional access points. A future frontage road along the section of U.S. 395 south of Old Clear Creek Road would allow for local property access.

OLD CLEAR CREEK ROAD TO PLYMOUTH DRIVE/SOUTH SUNRIDGE DRIVE

This segment is relatively free of minor access points except for three right-turn-in, right-turn-out only driveways at the commercial areas north and south of Jacks Valley Road. The traffic signals at Old Clear Creek Road, Topsy Lane, Jacks Valley Road and Mica Drive provide full traffic movements.

The driveway for the two churches on the west side of U.S. 395 (between Topsy Lane and Jacks Valley Road) currently aligns with a median opening on U.S. 395. The movements exiting this driveway are currently restricted to right turns only. This driveway can also be accessed from the shopping center area near the Best Buy building. This driveway is used during the morning peak period by northbound motorists to access the shopping center facilities and allows them to avoid left turns at the Topsy Lane signal and the signal within the shopping center.

The commercial facility and mobile home park on the southwest corner of Old Clear Creek Road and U.S. 395 currently has no access control on its east property line along U.S. 395.

Recommendation

NDOT should consider limiting access to U.S. 395 across the east property line of the land parcel on the southwest corner of U.S. 395 and Old Clear Creek Road to only driveways that can be operated in a safe and efficient manner. Future property access can be accommodated with frontage roads if a freeway section is implemented on U.S. 395 south of U.S. 50.

PLYMOUTH DRIVE/SOUTH SUNRIDGE DRIVE TO MULLER LANE

This segment of the study corridor is a high-speed (posted at 65 mph) four-lane facility that has six public street access points and 30 private property access points. The six public streets are Plymouth Drive/South Sunridge Drive, Stephanie Way, Johnson Lane, Airport Road, Genoa Lane and Muller Lane. At present, Johnson Lane is controlled by a half traffic signal (southbound traffic is free flow). The other streets are controlled by stop signs. NDOT completed a half traffic signal (with southbound free flow) at Stephanie Way in December 2006. Muller Lane is currently a T-intersection at U.S. 395 and will eventually become a four-leg intersection as development occurs east of U.S. 395. The private property access points serve 16 homes and/or businesses (eight east side and eight west side) and 14 of the driveways provide access to agriculture fields (one east side and 13 west side).

In addition, there are 20 median openings along this segment. Six of those openings are for the six public street intersections. Ten of the remaining median openings are located at driveways for residents and/or businesses and the other four serve access points to agriculture fields.

Recommendation

The Safety Charrette Report recommended that NDOT conduct an access management assessment on this segment of U.S. 395 to determine if any of the median openings could be combined, modified or removed. It is recommended that NDOT move ahead with this assessment.

If NDOT determines that future improvements on this segment of U.S. 395 include the implementation of a freeway facility, it would likely prove to be cost-effective to provide frontage roads on either side of the highway to connect with interchanges. This would require the acquisition of right-of-way.

MULLER LANE TO PINENUT ROAD/RIVERVIEW ROAD

This segment of U.S. 395 serves the towns of Minden and Gardnerville and has numerous public and private access points. The major public street access points are controlled by traffic signals and can be found at SR 88, Buckeye Road, Gilman Avenue, Waterloo Lane and Pinenut Road/Riverview Road.

Recommendation

Requests to add new or modify existing access points should comply with the NDOT Access Management System and Standards. It is also recommended that NDOT coordinate with the towns of Minden and Gardnerville, and consult the Transportation Element of the *Douglas County Master Plan*, the *Douglas County Trails Plan*, and the *Douglas County Transportation Plan.*

PINENUT ROAD/RIVERVIEW ROAD TO CALIFORNIA STATE LINE

This segment of the study corridor is the most rural of the corridor and only has one travel lane in each direction. Most of the access points on this segment occur along the two miles south of Pinenut Road and consist of low volume streets and driveways. The highest traffic volume access point is the intersection of SR 208 near the south end of the corridor.

Recommendation

Requests to add new or modify existing access points should comply with the NDOT Access Management System and Standards.

2.3.5 Accident/Crash Data

TRAFFIC CRASH ANALYSIS

This section provides an overview of the study corridor traffic crash history for 2001 through 2005, taken from NDOT data.

- **Corridor sections 1 and 2 (Clearview Drive to north of Muller Lane)**—These sections represent the mixture of high-speed rural, four-lane roadway and medium- to low-speed urban, four-lane roadway controlled by traffic signals. Rear-end and angle are the most prevalent crash types in this area. Sections 1 and 2 also have the highest traffic volume of the four segments.
- **Corridor section 3 (Muller Lane to Pinenut Road)**—This section represents the urban, four-lane portion of the corridor through the towns of Minden and Gardnerville. The majority of those crashes are lower speed rear end and angle type crashes that most typically occur at intersections.
- **Corridor section 4 (Pinenut Road to the California state line)**—This section represents the rural, two-lane portion of the corridor and shows the majority of crashes are higher speed non-collision types, including run-off-the-road crashes.

Figure 2-6 shows the five-year (2001–2005) crash history by contributing factor in corridor sections 1, 2 and 3. Corridor section 4 experienced relatively few crashes during this time. The non-collision crashes, such as "animal in roadway" and "running off the road" constitute the majority of the incidents. The most frequently listed contributing factors to these crashes are "failure to maintain lane" and "driving too fast for conditions," indicating that drivers are not paying attention to the roadway. These factors and level of incidents are normal for a rural highway.

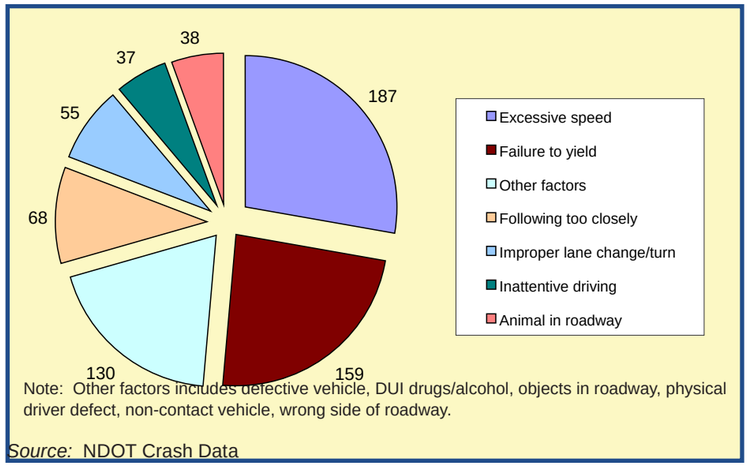


Figure 2-6 *2001–2005 Crashes by Contributing Factor—U.S. 395 Corridor, Pinenut Road to Carson City Line*

Corridor sections 1 and 2, Clearview Drive to Muller Lane, experience increased traffic congestion in a suburban and urban highway setting. Over 55 percent of the crashes are rear end collisions, with the primary contributing factor listed as "following too closely." This crash data indicates that this roadway is in transition from urban to rural conditions and that drivers are not fully accounting for increased traffic volumes, stopping, and turning maneuvers.

Corridor section 3, Muller Lane to Pinenut Road, runs through Gardnerville and Minden. A significant jump in the number of crashes is observed in this segment, with a high number of rear end and angle crashes. Generally, these crashes are the result on drivers not paying attention to the traffic in front of them, which is either entering or exiting the highway. The major contributing factors are "following too closely" and "failure to yield," typical of a roadway section with many ingress and egress points.

Crash rates can be a helpful way to understand the frequency of crashes relative to the vehicle miles traveled on a particular stretch of roadway. Table 2-8 provides crash summary data during the five-year period from 2001 to 2005. The higher crash rates in corridor section 3 indicate a relatively larger number of crashes through the more populous areas of Gardnerville and Minden. The statewide averages are significantly higher for urban principal arterials due to the higher crash frequency in the urbanized area of Clark County.

Table 2-8 *2001–2005 U.S. 395 5-Year Crash Summary and Crash Rates*

	PROPERTY DAMAGE ONLY CRASH	INJURY CRASH	FATAL CRASH	TOTAL CRASHES
Corridor Sections 1 and 2, Mile 24.1 to Mile 35.92 North of Muller Lane to Clearview Drive				
Total Crashes	455	335	11	801
Crash Rate	65.52	48.24	1.58	
Segment Length: 11.82 miles				
Segment AADT: 32,192				
Corridor Section 3, Mile 18.7 to Mile 24.09 North of Pinenut Road to North of Muller Lane				
Total Crashes	427	237	1	603
Crash Rate	235.72	130.83	0.55	
Segment Length: 5.39 miles				
Segment AADT: 18,415				
Corridor Section 4, Mile 0 to Mile 18.7 California State Line to North of Pinenut Road				
Total Crashes	100	80	7	187
Crash Rate	43.97	35.18	3.08	
Segment Length: 18.7 miles				
Segment AADT: 6,663				
Nevada Statewide Average for Principal Arterials				
Urban	420.5	224.73	2.18	
Rural	59.03	28.63	2.96	

Source: NDOT Crash Data

2.3.6 Truck Use/Truck Counts

NDOT conducted a vehicle classification survey on U.S. 395 (south of Gardnerville) in September 2002, for a seven-day period. This survey found that trucks and buses comprise approximately eight percent of the total traffic. A total of 25,320 vehicles were counted in the northbound direction. A total of 26,470 vehicles passed the count station in the southbound direction. The number of trucks and busses that passed the station was 2007 and 2216, respectively. The average daily traffic through this count station was 182 trucks northbound and 159 southbound.

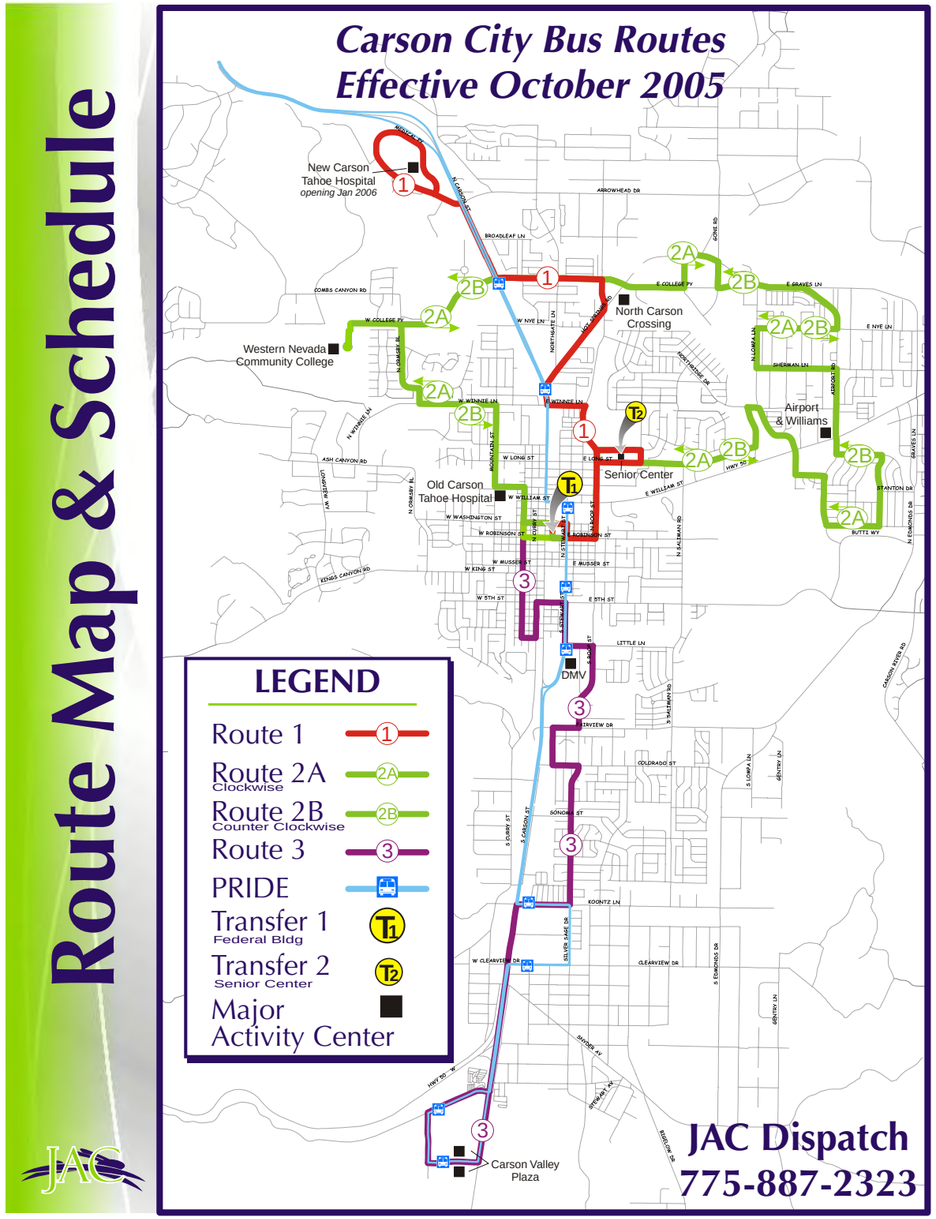
2.4 TRANSIT SERVICE

2.4.1 Jump Around Carson

Jump Around Carson (JAC) is the local transit service for Carson City. JAC provides three fixed routes from about 6:30 a.m. to 6:30 p.m. It serves the area from the Carson Tahoe Hospital in the north to the Carson Valley Plaza in the south. In calendar year 2006, the fixed route service logged 164,035 revenue miles and operated 13,812 revenue hours.

Carson City also operates a paratransit service (JAC Assist) for the elderly and persons with disabilities in compliance with the Americans with Disabilities Act (ADA) of 1990. JAC Assist logged 66,173 revenue miles in 6,088 revenue hours. Both services together collected $71,500 in fares in 2006 with 84,000 passenger trips.

The JAC transit service bus route and schedule are shown in Figure 2-7.



Route 1 - Northern Carson Area

Depart Transfer Point N. Plaza/ Fed. Bldg.	Community Center/ Library	Senior Center	North Carson Crossing	New Carson Tahoe Hospital	North Carson Crossing	Senior Center	Community Center/ Library	Arrive Transfer Point N. Plaza/ Fed. Bldg.	
6:30	6:33	6:35	6:46	6:51	7:03	7:10	7:13	7:15	
7:30	7:33	7:35	7:46	7:51	8:03	8:10	8:13	8:15	
8:30	8:33	8:35	8:46	8:51	9:03	9:10	9:13	9:15	
9:30	9:33	9:35	9:46	9:51	10:03	10:10	10:13	10:15	
10:30	10:33	10:35	10:46	10:51	11:03	11:10	11:13	11:15	
am 11:30	11:33	11:35	11:46	11:51	12:03	12:10	12:13	12:15	
pm 12:30	12:33	12:35	12:46	12:51	1:03	1:10	1:13	1:15	
1:30	1:33	1:35	1:46	1:51	2:03	2:10	2:13	2:15	
2:30	2:33	2:35	2:46	2:51	3:03	3:10	3:13	3:15	
3:30	3:33	3:35	3:46	3:51	4:03	4:10	4:13	4:15	SG
4:30	4:33	4:35	4:46	4:51	5:03	5:10	5:13	5:15	
5:30	5:33	5:35	5:46	5:51	6:03	6:10	6:13	6:15	G

Route 2A - North Town Clockwise - East/West Carson Area

Depart Transfer Point N. Plaza/ Fed. Bldg.	Old Carson Tahoe Hospital	Western Nev Community College	North Carson Crossing	Airport Rd./ E. Williams St. (US 50)	Senior Center	Library/ Community Center	Arrive Transfer Point N. Plaza/ Fed. Bldg.	
6:30	6:33	6:39	6:48	7:03	7:14	7:19	7:22	
7:30	7:33	7:39	7:48	8:03	8:14	8:19	8:22	
8:30	8:33	8:39	8:48	9:03	9:14	9:19	9:22	
9:30	9:33	9:39	9:48	10:03	10:14	10:19	10:22	
10:30	10:33	10:39	10:48	11:03	11:14	11:19	11:22	
am 11:30	11:33	11:39	11:48	12:03	12:14	12:19	12:22	
pm 12:30	12:33	12:39	12:48	1:03	1:14	1:19	1:22	
1:30	1:33	1:39	1:48	2:03	2:14	2:19	2:22	
2:30	2:33	2:39	2:48	3:03	3:14	3:19	3:22	
3:30	3:33	3:39	3:48	4:03	4:14	4:19	4:22	SG
4:30	4:33	4:39	4:48	5:03	5:14	5:19	5:22	
5:30	5:33	5:39	5:48	6:03	6:14	6:19	6:22	G

Route 2B - North Town Counter Clockwise - East/West Carson Area

Depart Transfer Point N. Plaza/ Fed. Bldg.	Library/ Community Center	Senior Center	Airport Rd./ E. Williams St. (US 50)	North Carson Crossing	Western Nev Community College	Old Carson Tahoe Hospital	Arrive Transfer Point N. Plaza/ Fed. Bldg.	
6:30	6:33	6:36	6:46	7:00	7:09	7:15	7:19	
7:30	7:33	7:36	7:46	8:00	8:09	8:15	8:19	
8:30	8:33	8:36	8:46	9:00	9:09	9:15	9:19	
9:30	9:33	9:36	9:46	10:00	10:09	10:15	10:19	
10:30	10:33	10:36	10:46	11:00	11:09	11:15	11:19	
am 11:30	11:33	11:36	11:46	12:00	12:09	12:15	12:19	
pm 12:30	12:33	12:36	12:46	1:00	1:09	1:15	1:19	
1:30	1:33	1:36	1:46	2:00	2:09	2:15	2:19	
2:30	2:33	2:36	2:46	3:00	3:09	3:15	3:19	
3:30	3:33	3:36	3:46	4:00	4:09	4:15	4:19	SG
4:30	4:33	4:36	4:46	5:00	5:09	5:15	5:19	
5:30	5:33	5:36	5:46	6:00	6:09	6:15	6:19	G

Route 3 - Southern Carson Area

Depart Transfer Point N. Plaza/ Fed. Bldg.	Division/ Washington Streets	Tenth/ Curry Streets	Nevada Dept of Transp.	Koontz/ S. Carson Streets	Carson Valley Plaza	Koontz/ S. Carson Streets	Nevada Dept of Transp.	Tenth/ Curry Streets	Division/ Washington Streets	Arrive Transfer Point N. Plaza/ Fed. Bldg.	
6:30	6:33	6:35	6:38	6:47	6:53	6:59	7:07	7:12	7:17	7:20	
7:30	7:33	7:35	7:38	7:47	7:53	7:59	8:07	8:12	8:17	8:20	
8:30	8:33	8:35	8:38	8:47	8:53	8:59	9:07	9:12	9:17	9:20	
9:30	9:33	9:35	9:38	9:47	9:53	9:59	10:07	10:12	10:17	10:20	
10:30	10:33	10:35	10:38	10:47	10:53	10:59	11:07	11:12	11:17	11:20	
am 11:30	11:33	11:35	11:38	11:47	11:53	11:59	12:07	12:12	12:17	12:20	
pm 12:30	12:33	12:35	12:38	12:47	12:53	12:59	1:07	1:12	1:17	1:20	
1:30	1:33	1:35	1:38	1:47	1:53	1:59	2:07	2:12	2:17	2:20	
2:30	2:33	2:35	2:38	2:47	2:53	2:59	3:07	3:12	3:17	3:20	
3:30	3:33	3:35	3:38	3:47	3:53	3:59	4:07	4:12	4:17	4:20	SG
4:30	4:33	4:35	4:38	4:47	4:53	4:59	5:07	5:12	5:17	5:20	
5:30	5:33	5:35	5:38	5:47	5:53	5:59	6:07	6:12	6:17	6:20	G

Yes, JAC runs on Saturday! Shorter Saturday hours are in the gray shaded area of the schedules.

SG = Saturday Garage
G = Garage

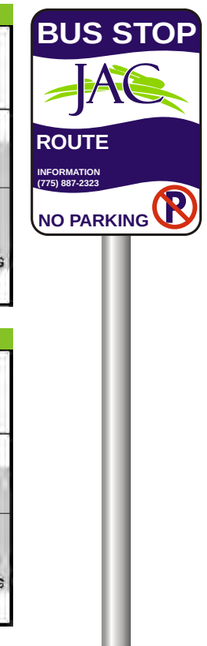
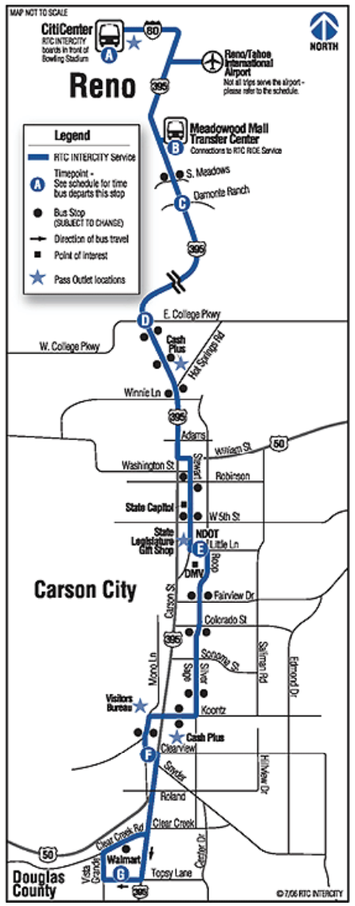


Figure 2-7 *JAC Transit Service Bus Route and Schedule*

2.4.2 RTC Intercity Transit Service

An intercity bus service operating between north Douglas County and the Meadowood Mall, the Reno/Tahoe Airport and downtown Reno is funded by the Regional Transportation Commissions of Washoe County (60.5 percent), Carson City (35 percent) and Douglas County (4.5 percent). Connecting bus service then provides access to the entire Reno/Sparks metropolitan area. The service operates six days a week from approximately 6:00 a.m. to 7:30 p.m., with no service on Sundays or major holidays. One-way fares range from $2.00 to $3.00 with discounts for seniors, students and persons with disabilities. Transit service funding comes from the Federal Transit Administration programs (Sections 5307 and 5309) for transit capital and operating costs. RTC Intercity Transit Service operated 6,600 revenue hours, with 43,000 passenger trips in calendar year 2006.

Figure 2-8 reproduces the public timetable and route map for this service.



Monday-Friday															
From Reno				Carson City			Douglas Co.		Carson City			To Reno			
A Depart 4th & Center	Reno/ Tahoe Airport	B Meadowood Mall	C Walmart Virginia/ Damonte	D N. Carson St. & College Parkway	E Nevada Dept. of Transport'n	F Clearview Drive	G Arrive Douglas Co. Walmart	G Depart Douglas Co. Walmart	F Clearview Drive	E Nevada Dept. of Transport'n	D N. Carson St &College Pkwy	C Walmart Virginia/ Damonte	B Meadowood Mall	Reno/ Tahoe Airport	A Arrive 4th & Center
-----	-----	5:20	5:25	5:53	6:02	6:13	6:18	6:23	6:28	6:38	6:48	7:10	7:20	-----	7:37
5:50	-----	6:04	6:09	6:37	6:46	6:57	7:02	7:23	7:28	7:38	7:48	8:10	8:20	-----	8:37
6:50	-----	7:04	7:09	7:37	7:46	7:57	8:02	8:14	8:19	8:29	8:39	9:01	9:11	9:23	9:37
7:50	8:02	8:14	8:19	8:47	8:56	9:07	9:12	9:17	9:22	9:32	9:42	10:04	10:14	-----	-----
2:20	**-----**	**2:34**	**2:39**	**3:07**	**3:16**	**3:27**	**3:32**	**3:53**	**3:58**	**4:08**	**4:18**	**4:40**	**4:50**	**-----**	**5:07**
-----	**-----**	**3:50**	**3:55**	**4:23**	**4:32**	**4:43**	**4:48**	**4:53**	**4:58**	**5:08**	**5:18**	**5:40**	**5:50**	**-----**	**6:07**
4:20	**4:32**	**4:44**	**4:49**	**5:17**	**5:26**	**5:37**	**5:42**	**5:47**	**5:52**	**6:02**	**6:12**	**6:34**	**6:44**	**6:56**	**7:10**
5:20	**-----**	**5:34**	**5:39**	**6:07**	**6:16**	**6:27**	**6:32**	**6:47**	**6:52**	**7:02**	**7:12**	**7:34**	**7:44**	**7:56**	**8:10**
6:20	**6:32**	**6:44**	**6:49**	**7:17**	**7:26**	**7:37**	**7:42**	**7:47**	**7:52**	**8:02**	**8:12**	**8:34**	**8:44**	**-----**	**-----**

Light Type = AM **Bold Type = PM**

Shaded times are in Carson City
NO WEEKEND SERVICE

Holidays with NO SERVICE: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Christmas Day

Figure 2-8 *Regional Transportation Commission Intercity Transit Service*

2.4.3 Douglas Area Rural Transit Service

Douglas County operates the Douglas Area Rural Transit (DART) service, which carries passengers between the southern- and northern-most points of the county along the U.S. 395 corridor. Most of this service occurs in the rural portions of Douglas County, allowing for use of funding from the Federal Transit Administration's Rural Transit Assistance Program.

The service extends from the Topaz Lodge (near Topaz Lake) in the south, to the new Wal-Mart at the intersection of U.S. 395 and Topsy Lane in the north. Service starts at 6:20 a.m. from the Topaz Lake/Topaz Ranch Estates area, with one bus making a continuous loop. The final drop-off is at 6:55 p.m. in the Topaz Lake/Topaz Ranch Estates area. A portion of the service in the northern part of Douglas County is within the Carson City metropolitan area. This northern transit stop allows an important connection to the RTC Intercity Regional Transit Service, which carries passengers to Carson City and the Reno/Sparks area.

Figure 2-9 is a map and schedule of the Douglas Area Rural Transit service in effect as of February 2007.

In addition to operating on a fixed route with a fixed schedule, DART deviates from the regular route to serve riders with disabilities. Buses serve riders within three-fourths mile of the fixed route, providing service as required by the Americans with Disabilities Act. This service requires that riders schedule their transportation at least one day in advance. The Douglas County Senior Center maintains Meals on Wheels, medical and

DART Northbound Service - Topaz Lodge to Wal-Mart
(no bus service on weekends or holidays)

Topaz Lodge	TRE	Holbrook	Ruhenstroth	Washoe	Tillman & Kimmerling	CVMC	Smith's	Senior Center	Bentley	CVI	Library	Westwood Park	Johnson Lane Store	Starbucks (Johnson Lane)	Vista Grande/ Plymouth	Vista Grande/ Mica	Target	Carson Valley Plaza	Wal-Mart	Old Wal-Mart
6:30 a.m.	6:20 a.m.	6:35 a.m.	–	–	7:00 a.m.	–	–	–	7:20 a.m.	7:25 a.m.	–	–	on call	on call	–	–	–	–	7:55 a.m.	–
–	–	–	–	–	10:10 a.m.	10:20 a.m.	10:30 a.m.	–	–	10:40 a.m.	10:45 a.m.	–	on call	on call	–	11:00 a.m.	11:10 a.m.	–	11:20 a.m.	–
10:30 a.m.	10:40 a.m.	11:30 a.m.	11:15 a.m.	11:25 a.m.	11:35 a.m.	11:45 a.m.	11:50 a.m.	11:55 a.m.	–	12:10 p.m.	12:15 p.m.	12:20 p.m.	on call	on call	12:45 p.m.	12:50 p.m.	12:55 p.m.	1:00 p.m.	1:10 p.m.	–
–	–	–	–	–	–	–	1:50 pm	2:00 pm	–	2:20 p.m.	2:25 p.m.	on call	on call	on call	–	on call	3:15 p.m.	3:20 p.m.	3:25 p.m.	–
–	–	–	–	–	3:10 p.m.	–	–	–	3:35 p.m.	3:40 p.m.	–	–	on call	on call	–	–	–	4:10 p.m.	4:15 p.m.	–
4:55 p.m.	5:05 p.m.	–	–	–	–	–	–	–	4:40 p.m.	–	–	–	on call	on call	–	–	–	–	–	5:25 p.m.
–	–	–	–	–	–	–	–	5:30 p.m.	–	–	–	–	on call	on call	–	–	–	–	–	–

DART Southbound Service - Wal-Mart to Topaz Lodge
(no bus service on weekends or holidays)

Old Wal-Mart	Wal-Mart	Carson Valley Plaza	Target	Vista Grande/ Mica	Vista Grande/ Plymouth	Johnson Lane Store	Starbucks (Johnson Lane)	Westwood Park	Library	CVI	Senior Center	Bentley	Smith's	CVMC	Tillman & Kimmerling	Washoe	Ruhenstroth	Holbrook	TRE	Topaz Lodge
–	–	–	–	–	–	on call	on call	–	–	–	–	–	–	–	–	–	–	–	6:20 a.m.	6:30 a.m.
–	8:15 a.m.	8:20 a.m.	8:25 a.m.	8:30 a.m.	8:35 a.m.	on call	on call	9:05 a.m.	9:10 a.m.	9:15 a.m.	9:20 a.m.	–	9:25 a.m.	9:30 a.m.	–	–	–	–	–	10:00 a.m.
–	11:45 a.m.	11:50 a.m.	11:55 a.m.	12:00 p.m.	–	on call	on call	12:20 p.m.	12:25 p.m.	12:30 p.m.	–	–	12:40 p.m.	–	–	–	–	–	–	–
–	1:40 p.m.	1:45 p.m.	1:50 p.m.	1:55 p.m.	2:00 p.m.	on call	on call	2:20 p.m.	2:25 p.m.	2:30 p.m.	–	–	2:40 p.m.	2:50 p.m.	3:00 p.m.	–	–	–	–	–
–	3:35 p.m.	3:40 p.m.	3:45 p.m.	–	–	on call	on call	–	–	4:10 p.m.	–	4:15 p.m.	4:20 p.m.	–	–	–	–	–	4:50 p.m.	–
–	4:15 p.m.	4:20 p.m.	–	–	–	on call	on call	–	–	–	–	4:40 p.m.	–	–	–	–	–	–	–	–
5:25 p.m.	5:30 p.m.	5:35 p.m.	5:40 p.m.	5:45 p.m.	–	on call	on call	–	–	6:10 p.m.	–	–	6:15 p.m.	–	6:25 p.m.	–	–	–	6:55 p.m.	–

Figure 2-9 *Douglas Area Rural Transit Map and Schedule*

dental transportation, transportation to congregate dining, personal care requests and recreational excursions.

The following groups oversee the operation of the DART service:

- Representatives from the Douglas County Senior Citizen's Community
- Douglas County Sheriff Department
- East Fork Fire and Paramedic District
- Douglas County Senior Services
- Soroptimist International
- Nevada Elderly Protective Services
- Douglas County Ministerial Board

Douglas Area Rural Transit is funded with the one percent room tax (tax on transient occupancy), Federal Transit Administration funds and Douglas County General Fund. The cost for fiscal year 2006–2007 was $478,175. For the period from July 2005 through June 2006, DART public transportation provided 28,577 passenger trips, 12, 927 passenger trips for the Division for Aging Service and 21,988 Meals on Wheels deliveries for a total of 63,492 passenger trips (5,291 per month). Vehicle revenue miles totaled 240,000, and vehicle revenue hours totaled 17,000, operating 13 hours per day for the entire year. Douglas County collected $20,000 in passenger fares during this time period.

2.5 SAFETY CHARRETTE SUMMARY

2.5.1 Overview

During the fall of 2005, a traffic safety charrette was held for the portion of the corridor between U.S. 50 and SR 88. Several fatal crashes had occurred on U.S. 395 between Carson City and Minden that resulted in public demands for additional traffic control and safety measures. The charrette was conducted to involve the public and other stakeholders in a process to identify concerns, priorities and suggestions aimed at traffic safety through the Carson Valley. The complete charrette process and results are discussed in the Public Involvement section of this study (Chapter 8) and are fully documented in Appendix J, Traffic Safety Charrette Report: U.S. 50 to SR 88.

2.5.2 Process

Public outreach included a presentation at the Good Government Committee, notices of meetings mailed to Douglas County residents within one-quarter mile of the corridor, notices placed in local newsletters and newspaper ads placed in the Record Courier. The NDOT Public Involvement web site included a posting for both meetings, and the project web site included a notice of the final meeting.

Two groups met at NDOT headquarters on October 6, 2005 to provide their input on driver behavior, traffic concerns, and potential improvements in the corridor. On Saturday, October 15, 2005, approximately 34 people attended a workshop at the Carson Valley Middle School. Participants voiced their concerns about the corridor, which were listed on large pieces of paper and affixed to the wall. Additional slides featuring crash data, prior improvements, current challenges and potential solutions were shown. Participants then voted for their top seven concerns.

On November 15, 2005 a Corridor Evaluation Field Review was conducted, including representatives from Parsons, NDOT, and FHWA. The group drove the corridor, stopping at selected locations to observe conditions. The corridor evaluation resulted in these objectives:

- Reduce the risk and severity of crashes that may be attributed to the existing road conditions by identifying potential safety improvements
- From a road user's viewpoint, identify confusing and/or misleading messages
- Improve awareness of safe maintenance practices
- Review the concerns and requests expressed at the Community Workshops held on 10/15/05

A follow-up community meeting was conducted on December 14, 2005, at Minden Elementary School, discussing how suggestions from the public were analyzed and developed into recommendations. The presentation included information on how recommendations are implemented through the normal transportation planning process and through the NDOT safety improvement program.

A project website for the corridor study is located at www.douglascounty395.com. Information regarding the traffic safety charrette meetings, input, and results were posted on the web site. Members of the public participated by submitting comments on the project through the use of a web log.

2.5.3 Recommendations

A number of recommendations emerged from the charrette process to improve safety on U.S. 395 in the study area. Some of those recommended improvements would qualify for NDOT Safety Improvement funding or could be addressed as District 2 maintenance projects. The other recommended improvements must go through a Project Development Process as required by the Nevada Legislature and will have to compete for funding with other projects throughout the state. Please see section 4.10, Implementation of Near-Term Improvements, for a complete list of these projects.

3 Future Conditions

Population and employment within the U.S. 395 Corridor Study area have grown significantly over the past 10 years. The transportation and land use plans for Carson City and the Douglas County forecast that this area will continue to grow; reaching a combined population of 161,500 persons by 2030. Forecasting future conditions provides the necessary information for planning adequate transportation facilities.

3.1 DOUGLAS COUNTY/CARSON CITY TRAVEL DEMAND MODEL

Transportation policy makers rely on travel analysis tools to evaluate the impacts of land use development and the need for infrastructure improvements. A travel demand model is one of the key technical analysis tools used for this evaluation. It uses a complex computer program to provide answers to "what if" questions about the effects of proposed development and land use policies. The model predicts travel behavior and travel demand within a specific area, over a specific time period.

3.1.1 How Travel Demand Modeling Works

A travel demand model uses a four-step process to create a simulation of current and future travel demands. These steps are:

1. Trip generation (how many trips will people make?)
2. Trip distribution (what places will people go?)
3. Mode choice (what different ways will people travel?)
4. Trip assignment (what routes will people take?)

To account for land use development, the study area is broken into individual transportation analysis zones (TAZ), which are assigned a specific number of origin and destination trips based on such factors as residential, employment and retail activities. Once the travel model is developed, transportation planners can create a simulation of existing travel patterns. The model is then checked or "validated" to ensure that the assumptions are correct. When the model is sufficiently calibrated to accurately account for current travel patterns, it can be used to forecast future travel based on proposed changes to the land use or transportation infrastructure.

For example, when a new residential development is proposed, the model can predict the number of people who will travel on local and regional streets to reach their school, shopping, recreation and/or employment destinations. If a new roadway is added to the existing network, or an existing road is widened, the model predicts how many trips will travel on the improved facility. In this way, transportation improvements can be designed and constructed to accommodate with the needs of the new development.

3.1.2 Overview of the Douglas County/ Carson City Travel Demand Model

The Douglas County/Carson City travel demand model is designed to operate with TransCAD software, which is used by the Nevada Department of Transportation for planning projects throughout the state. The detailed description of the modeling assumptions and analysis is available in Appendix D, allowing agencies that use the model to easily arrange for future model updates.

To provide a more accurate evaluation of travel patterns, the model encompasses transportation patterns in both Douglas County and Carson City. In addition to reflecting the regional nature of travel in these two counties, the shared model can assist policy makers with coordinating proposed land use and transportation improvements.

The travel demand model divides the two-county area into 324 internal traffic analysis zones and 7 external traffic analysis zones for travel forecasting purposes. Figure 3-1 illustrates these boundaries on a map of the two counties. To increase model accuracy, traffic analysis zones located in urban areas have a smaller geographical area than those located in rural areas.

The model identifies the streets and highways that people use for travel. Figure 3-2 shows the 2005 Base Highway Network, with the streets identified according to their functional classification. This network contains all major streets in the study area and their characteristics, such as the number of lanes and the historical traffic counts.

Some of the trips begin or end outside of the model area. These trips are assigned to locations where roads leave the county, called "external gateways." Table 3-1 lists the locations of the external gateways used in the model.

3.1.3 Forecasting for the U.S. 395 Southern Sierra Corridor Study

The Douglas County/Carson City Travel Demand Model is a new and improved version of the travel forecasting models and model components previously developed for Douglas County and Carson City. To develop an accurate database for the model development, residential data was obtained from the Douglas County Assessor's office and employment data from the Nevada Department of Employment, Training and Rehabilitation. Median income data was extracted from the 2000 Census at the block group level and appropriately distributed to the TAZ level. All data was adjusted for the model base year 2005.

Comparing the model results with actual traffic counts taken on the roadways in 2005 indicated that the model was operating very accurately. Model validation took place using traffic counts at 15 locations in Douglas County and 39 locations in Carson City. The comparison was made for the morning peak, evening peak, off-peak and daily traffic volumes.

The counts showed an overall total percent deviation between the travel model and the actual traffic counts of five percent for morning peak travel, four percent for evening peak travel, 8 percent for the off-peak travel and 6 percent for the daily travel. These variations are considered within allowable tolerances for planning purposes.

Nevada Department of Transportation officials decided to run the traffic model for the years 2020 and 2030 to determine the transportation system needs at those times. Please see Appendix D, *Douglas County/Carson City Travel Demand Model*, for complete documentation of the travel demand model.

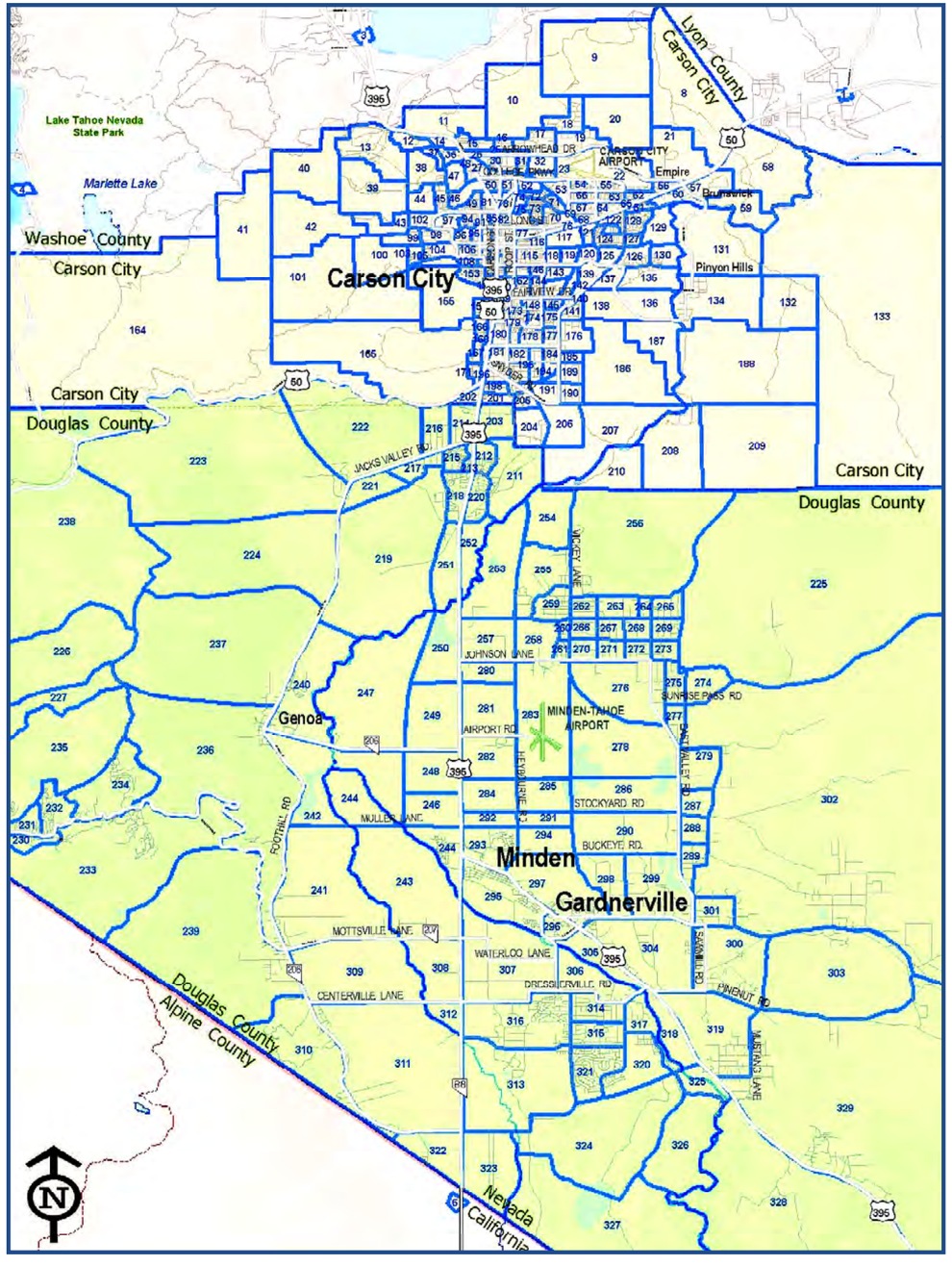


Figure 3-1 *Douglas County and Carson City Transportation Analysis Zone Map*

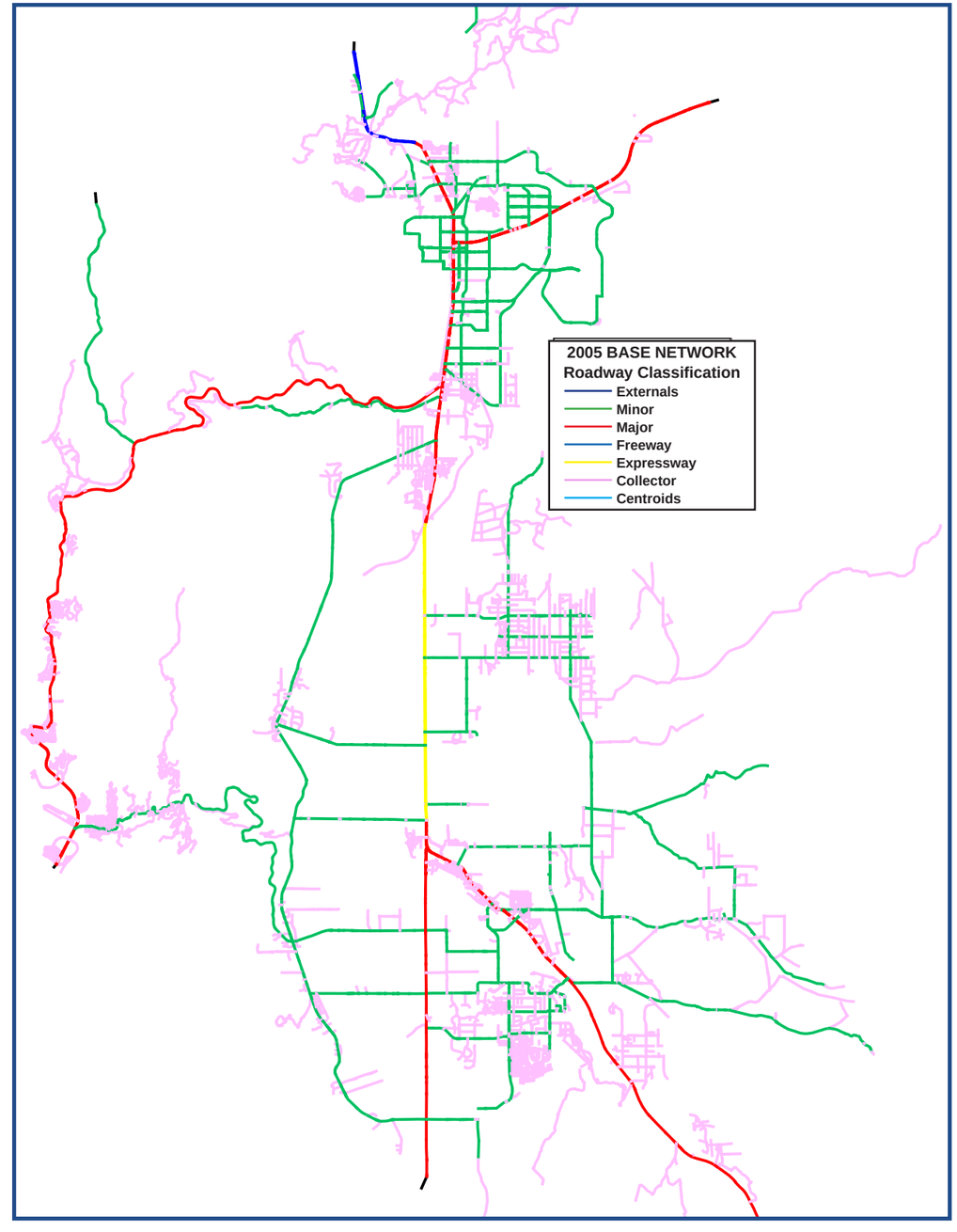


Figure 3-2 *Year 2005 Douglas County and Carson City Highway Network*

Table 3-1 *Locations of External Gateways*

GATEWAY/TAZ NUMBER	ROADWAY	LOCATION
1	U.S. 50	East end of Carson City
2	Goni Road	North end of Carson City
3	U.S. 395	North end of Carson City
4	Highway 28	North end of Carson City
5	U.S. 50	West end of Carson City
6	Highway 88	South end of Douglas County
7	U.S. 395	South end of Douglas County

3.1.4 Population Forecasts

The U.S. Census Bureau predicts that the state of Nevada will grow faster than any other state in the U.S. between 2000 and 2030. Nevada's population was 1,998,257 in 2000. The Census Bureau estimates that the state will gain 2,283,845 people by 2030, reaching a population of 4,282,102. This represents an increase of 114 percent during this 30-year period.

The State Demographer and the Nevada Department of Water Planning (NDWP) both develop growth projections for each county in Nevada, generally based on historical data and current trends. Using data from the State Demographer and NDWP projections in 1997 and 1998, Figure 3-3 shows population projections for Douglas County up to 2018 and 2020, respectively. A straight line extrapolation has been plotted for these two estimates to extend the projections to the year 2030. Selecting a midpoint between these two estimates would yield a Douglas County population forecast of 83,500 by 2030. For the purpose of the 2007 Douglas County Transportation Plan, a population control total of 83,689 has been assumed for travel demand forecasting.

Douglas County issued building permits for an average of 575 dwelling units over the past 17 years. Continuing along this same trend, with a 2 percent compound annual growth rate, Douglas County will issue 13,440 permits for new dwelling units over the next 23 years. This increase in dwelling units will result in approximately 34,000 new county residents by 2030; bringing the total Douglas County population to about 83,500.

Carson City also plans to continue to grow at a steady rate. In the 20-year period from 1982 to 2002, the number of housing units increased by 74 percent, which represents a 2.8 percent compounded annual rate of growth.

Carson City experienced its highest growth rate of 3.59 percent between 2000 and 2001. The State Demographer estimates that the growth rate will decline steadily from this rate to a 1.23 percent increase between 2019 and 2020. The Carson City Master Plan projects a build-out of 32,000 dwelling units with a population of about 78,000 persons in the year 2025. The traffic demand model assumes a 2030 population control total of 75,792.

Figure 3-4 provides an illustration of Carson City population projections similar to the graph used for Douglas County population projections. The

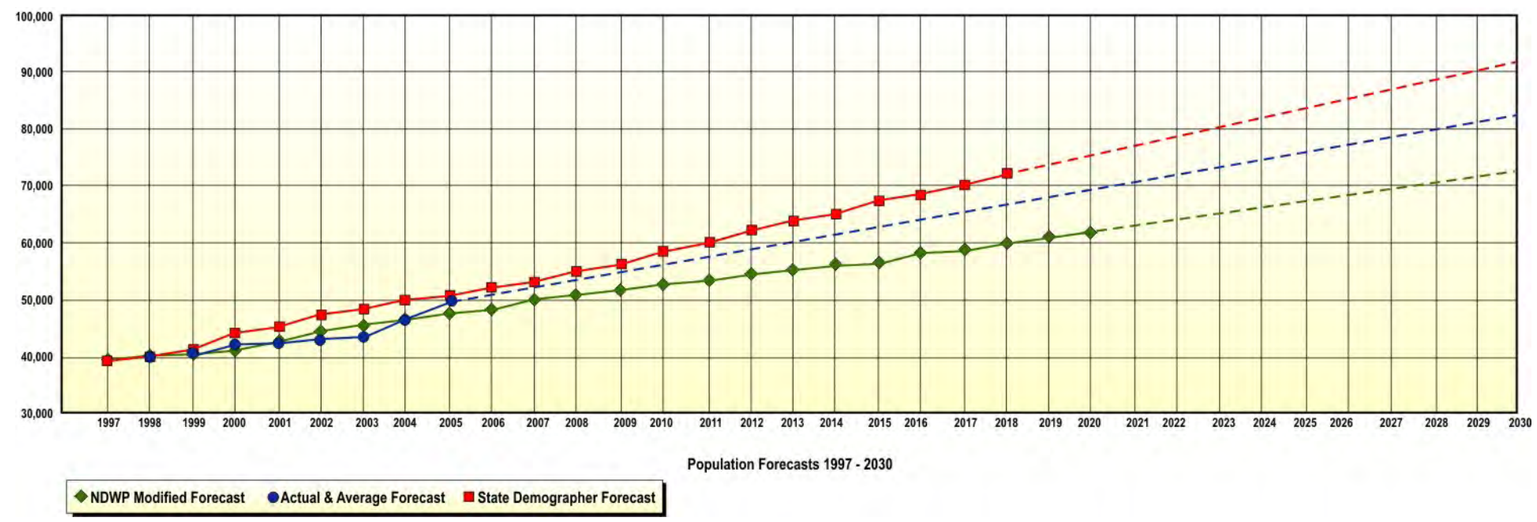


Figure 3-3 *Douglas County Population Forecasts*

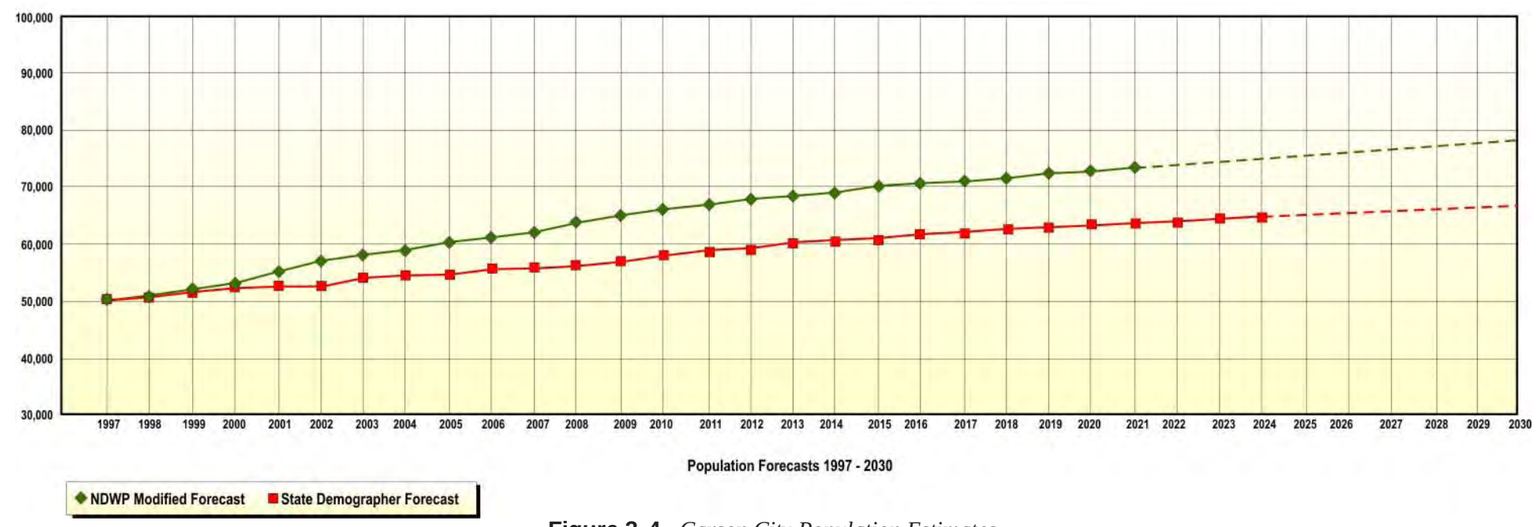


Figure 3-4 *Carson City Population Estimates*

NDWP projection and a straight-line projection based on the historical growth rate both place the 2030 population at approximately 75,000.

Figure 3-5 illustrates where population growth is projected to occur in Carson City and Douglas County between 2005 and 2030. The dark red circles indicate that substantial growth will take place along the U.S. 395 corridor in and around Gardnerville and Minden and in the northern Douglas County/south Carson City area.

3.1.5 Employment Forecasts

Figure 3-6 illustrates where employment growth is projected to occur in Carson City and Douglas County between 2005 and 2030. The red circles (new employment in 2030) on top of the yellow circles (existing employment in 2005) indicate projected employment growth along the U.S. 395 corridor in and around Minden and Gardnerville and northern Douglas County.

For Douglas County, the travel demand model reflects a 73 percent growth in employment from 2005 to 2030. Table 3-2 depicts employment by model category as the number of employees increases from 19,563 to 30,798.

For combined Carson City/Douglas County study area, the travel demand model reflects a 48 percent growth in employment as the number of employees increases from 45,622 to 67,668 between 2005 and 2030. Each county is assumed to add approximately 11,000 jobs over the 25-year period.

3.2 REGIONAL TRANSPORTATION PLANS

3.2.1 2007 Douglas County Transportation Plan

Douglas County is in the process of reviewing and finalizing the *2007 Douglas County Transportation Plan*, which includes a list of roadway improvement projects. In spite of the fact that these roadway capacity projects are identified in the draft Plan, many of these projects may not be built in the foreseeable future. As of March 2007, Douglas County officials were in the process of determining when, where, and how much the county will grow between now and the year 2030.

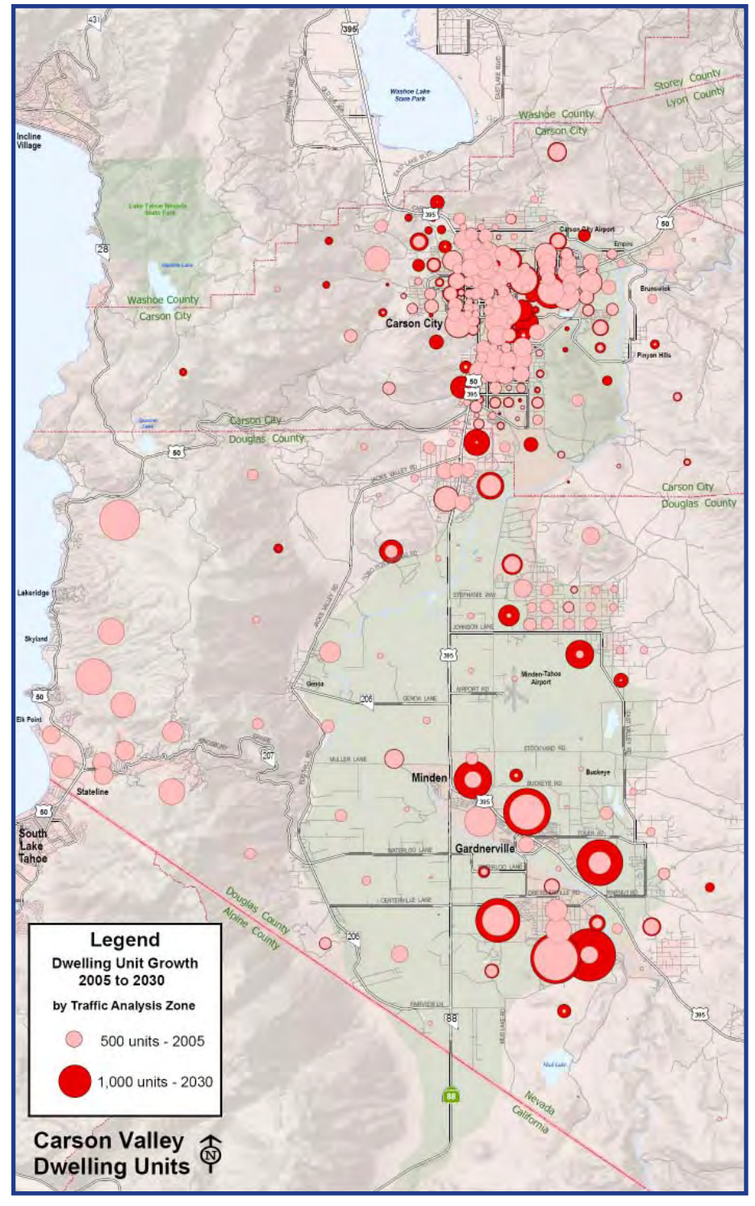


Figure 3-5 *2005–2030 Growth in Carson Valley Dwelling Units*

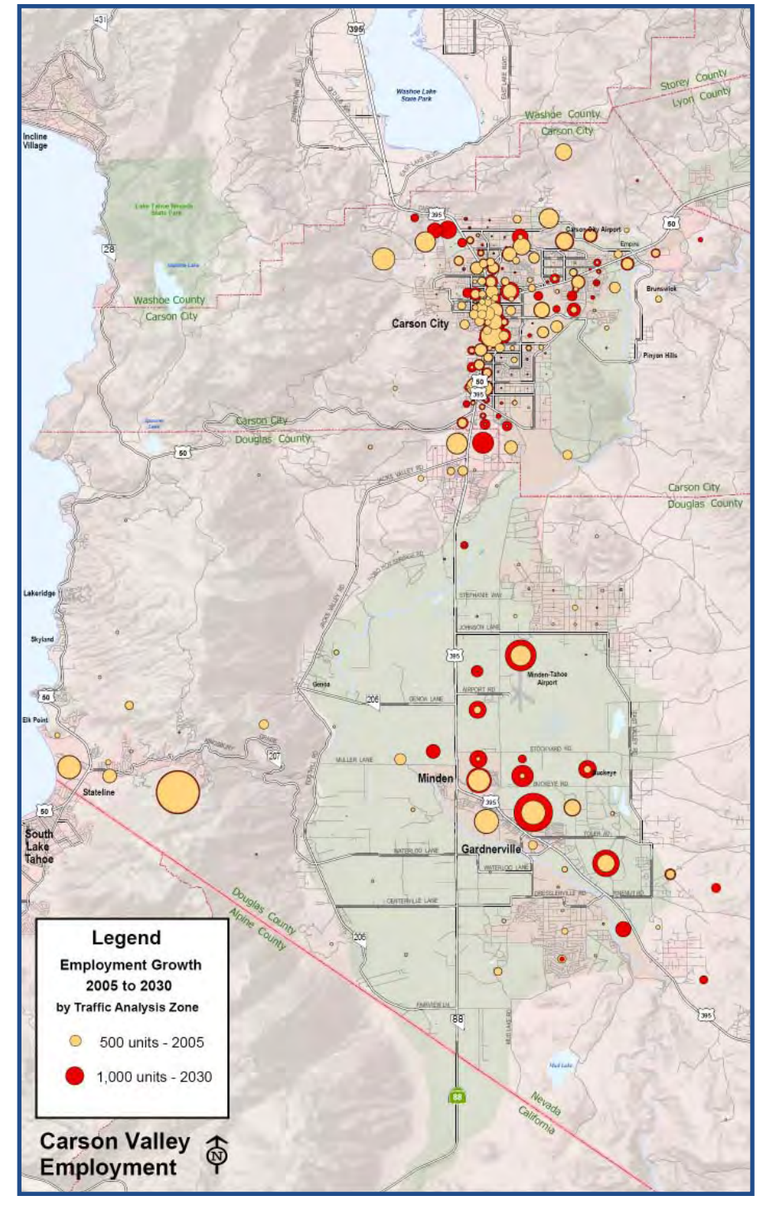


Figure 3-6 *2005–2030 Growth in Carson Valley Employment*

Table 3-2 *Douglas County/Carson City Land Use/Employment Data Traffic Forecast Model (2005–2030)*

	LAND USE DATA COMPARISON		DOUGLAS COUNTY LAND USE DATA COMPARISON		CARSON CITY LAND USE DATA COMPARISON	
	2005	2030	2005	2030	2005	2030
Population (POP)	109,964	159,481	51,948	83,689	58,016	75,792
Dwelling units (DU)	49,342	71,112	24,490	38,972	24,852	32,140
Occupied dwelling units (OCCDU)	44,100	64,541	20,610	34,198	23,490	30,343
Total employment (TOTEMP)*	45,622	67,668	19,563	30,798	26,059	36,849
Hotel employment (HOTEL)	9,167	9,167	6,954	6,954	2,213	2,213
Office employment (OFFICE)	17,493	28,370	4,857	8,279	12,636	20,091
Industrial employment (INDUST)	8,989	12,885	3,630	6,619	5,359	6,248
Retail shop employment (R_SHOP)	2,123	2,362	896	1,005	1,227	1,358
Commercial shop employment (C_SHOP)	6,552	8,611	2,873	4,144	3,679	4,467
Total retail employment (RETAIL)	9,286	14,357	3,947	7,721	5,339	6,635
Other retail employment (OTHER_RET)	611	3,384	178	2,573	433	810
Non-retail employment (OTHER_NON)	687	2,963	175	1,300	512	1,662
Elementary and middle school (F1-8)	10,839	10,839	5,144	5,144	5,695	5,695
High school enrollment (F9-12)	4,359	4,359	1,785	1,785	2,574	2,574
College enrollment (F13)	3,856	3,856	705	705	3,151	3,151

Source: Nevada Department of Employment, Training and Rehabilitation; Parsons
*Reflects jobs geocoded to specific street addresses for 2005.

In response to rapid growth in the 1990's and early 21st century, Douglas County voters approved the Sustainable Growth Initiative in 2002, which limited county growth to 280 permits for new dwellings each year. As of March 2007, the County had not implemented this initiative due to pending legal action. If the County acts to limit residential development to the level required by the initiative, the need for transportation infrastructure improvements will be postponed until some later date.

If the County decides to continue its current level of growth, it is uncertain how all of these infrastructure projects will be funded. Currently, Douglas County negotiates infrastructure improvements with developers on a case-by-case basis, who in turn construct or pay for transportation facilities to access their land developments. Therefore, if a transportation facility is adjacent to a development, it will likely be constructed or improved as a condition of development approval.

Douglas County is planning for construction of the center segment of Muller Parkway in 2010, as shown in the *2007 Transportation Capital Improvement Program*. Muller Parkway is an important part of the local arterial network because it provides additional roadway capacity parallel to U.S. 395. In addition, there are numerous developments planned for construction that will use this facility for access at the northern and southern intersections with U.S. 395. However, according to Douglt County budget figures, this project cannot be built using the currently available revenues. If the center section of Muller Parkway is not completed, local residents will not be able to use this facility as an alternative route to U.S. 395. This situation will have a negative impact on the level of service on U.S. 395, causing this facility to drop below traffic level of service "C" in the sections through Gardnerville and Minden.

3.2.2 *Minden Plan for Prosperity* (2002) and *Gardnerville Plan for Prosperity* (2005)

The US 395/Main Street corridor is important to the vitality and the sense of community in Douglas County. As the largest towns in the county, Minden and Gardnerville have a strong desire to preserve their identity and character. Occasionally these goals may be in conflict with the goals of moving traffic quickly through this area to other locations. Local residents recently developed and approved the *Minden Plan for Prosperity* (2002) and the *Gardnerville Plan for Prosperity* (2005) along with the *Gardnerville Design Guidelines* to address their most significant concerns. The plans made numerous recommendations, including the following pertaining to transportation facilities:

- Provide traffic signals at selected intersections to allow pedestrian crossings of U.S. 395
- Provide medians and crosswalks to facilitate pedestrian and bicycle connections
- Use traffic calming devices to slow traffic through towns to allow for safe access to local businesses
- Improve the image of U.S. 395 by creating walkable streetscapes
- Preserve local historic structures

The towns of Minden and Gardnerville have expessed interest in working with the Nevada Department of Transportation to improve the appearance and the functionality of U.S. 395 in this section of the corridor. By coordinating any improvements with local residents and governmental agencies, NDOT can accomplish goals that are mutually compatible with the desires of local residents.

3.2.3 *Carson Area 2004 Transportation Plan*

The *Carson Area 2004 Transportation Plan* provides a list of proposed projects to meet the needs of a growing community for the next 20 years. Using a Carson City travel demand model to forecast infrastructure needs required by population and employment growth, the plan recommends where local roadway capacity needs improvement.

The completion of U.S. 395 Carson City Bypass remains Carson City's most critical transportation project. Without the bypass, new employment and population would push the traffic level of service to "F" along most of U.S. 395 through downtown Carson City (Carson Street) for two or more hours in the morning and evening peak commuting periods. In addition, without the bypass, traffic would seek out parallel routes, causing level of service conditions of "E" and "F" on Roop Street, Stewart Street, Silver Sage Drive and Edmonds Drive. Carson City Board of Supervisors approved an increased fuel tax to fund the bypass construction and the project is scheduled to advertise for bids in May 2007.

3.2.4 NDOT Area Plans

The Nevada Department of Transportation developed the *US 395, West US 50, SR 28, SR 207 and SR 431 Landscape and Aesthetics Corridor Plan* in 2006 to assist state and local agencies with designing and constructing consistent highway facilities along these routes. Figure 3-7 is the cover page of this document.

This highway corridor planning effort provides design direction and sets priorities for future projects. The *Landscape and Aesthetics Corridor Plan* is the first step toward establishing landscape and aesthetic guidelines; however, it is not a promise of future implementation. This process included the development of three intermediate reports which were then combined to create the final Corridor Plan. These reports include:

Figure 3-7 *NDOT U.S. 395, West U.S. 50, SR 28, SR 207 and SR 431 Landscape and Aesthetics Corridor Plan Cover*

1. Opportunities and Constraints – defines the challenges inherent in the planning and design of each corridor.
2. Design Synthesis – establishes a design theme and the visual interpretation of that theme, and determined the level of landscape treatment for specific segments of the highway.
3. Design Guidelines – defines the guiding principles, determined priority projects, and estimated broad based planning-level costs.

Each report was reviewed by the Technical Review Committee and revised in accordance with its input. The final step synthesized the information presented in these reports into the Corridor Plan. The Plan will then be used as a tool for all future planning efforts along the highway corridor.

The corridor locations are shown in Figure 3-8. They include U.S. 395, from Topaz Lake to the California state line near Bordertown, U.S. 50 from Stateline to the Six Mile Canyon Road intersection east of Dayton, and State Routes 28, 207, and 431 around Lake Tahoe. As a whole, the corridor is one of the most visually stunning settings in Nevada.

This plan is a useful management tool for designing highway projects because it provides specific recommendations, programs, and a description of the intended result.

The Corridor Plan establishes a theme or central design idea. Projects within each Landscape Design Segment are guided by a theme, associated design objectives, examples that illustrate interpretation of the theme, and a program of facilities with common definitions. Design guidelines, estimated costs, and project priorities establish the viability of the final corridor plan. NDOT will use the Corridor Plan to manage the design of highway projects. And, prior to designing specific highway projects, NDOT and the design consultant will review the Corridor Plan to understand how the project level design fits within a particular Landscape Design Segment.

The U.S. 395 Southern Sierra Corridor study area is included in the Landscape Plan area and some of the design objectives and guidelines apply to projects in the corridor. Figure 3-9 is a page from the *US 395, West US 50, SR 28, SR 207 and SR 431 Preliminary Corridor Plan*, which provides specific features for Carson Valley, Carson City, and Dayton.

For a complete copy of the plan, please see http://www.ndothighways.org/northern_project-details.html.

Figure 3-8 *U.S. 395, West U.S. 50, SR 28, SR 207 and SR 431 Corridor*

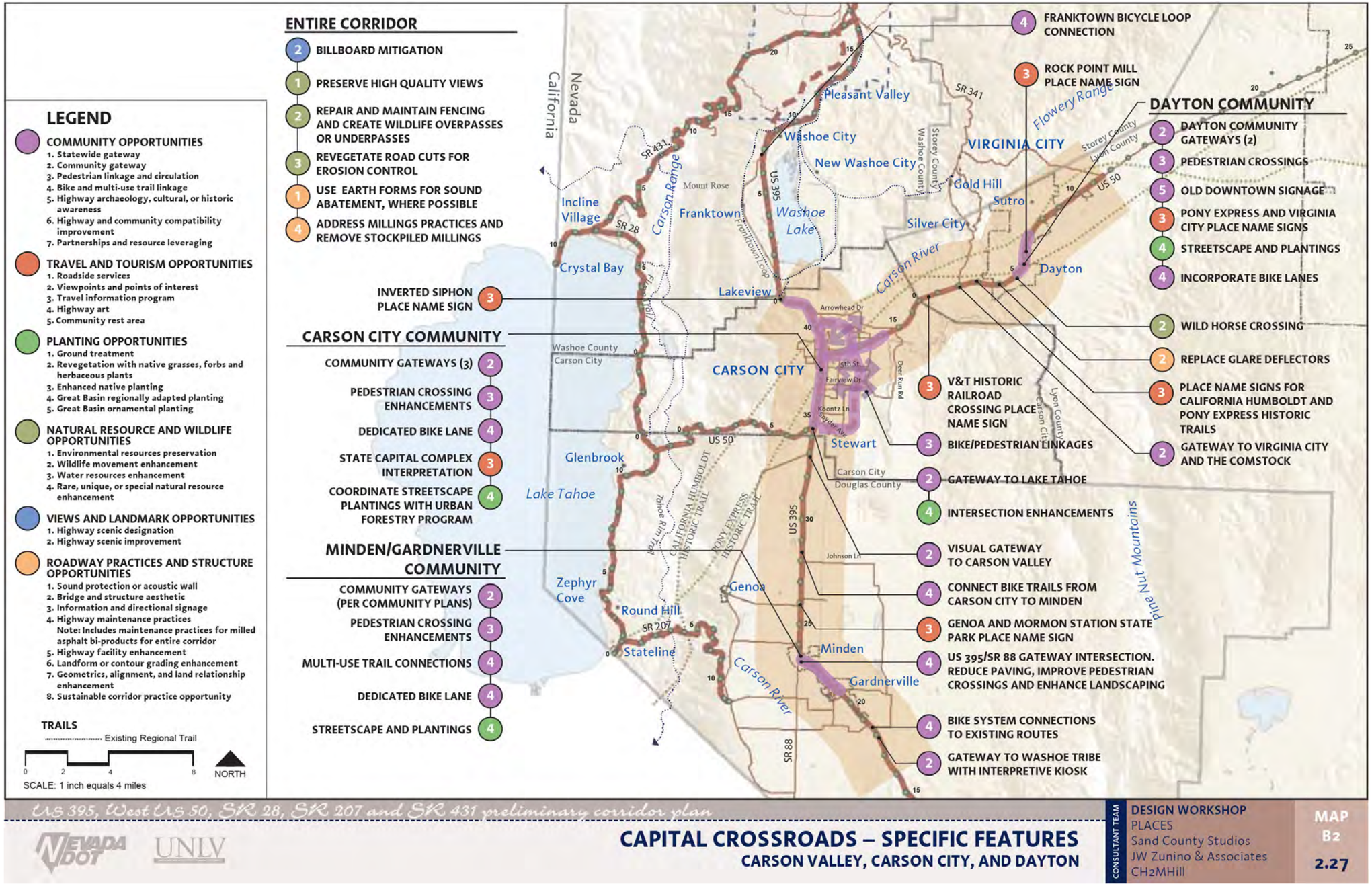


Figure 3-9 *Page 2.27 from the US 395, West US 50, SR 28, SR 207 and SR431 Preliminary Corridor Plan*

Source: NDOT *US 395, West US 50, SR 28, SR 207 and SR 431 Preliminary Corridor Plan*

3.3 NON-ROADWAY TRANSPORTATION SYSTEM IMPROVEMENTS

3.3.1 Transportation Demand Management/ Transportation System Management

Transportation Demand Management (TDM) and Transportation System Management (TSM) measures are different techniques for managing travel demand on a roadway system. TDM/TSM measures are designed to improve operation of area streets and make transit, bicycling, and pedestrian circulation safer and more efficient without costly development of new infrastructure. TDM/TSM measures or programs address both supply and demand issues. While TDM measures focus more on demand issues by providing information and incentives to influence human behavior, TSM measures are a by-product of work performed by traffic engineers and focus on managing supply rather than on traffic demand.

TDM programs are intended to minimize automobile travel by increasing the number of persons in a vehicle, or by influencing the time of, or need to travel. These measures can help alleviate traffic congestion, reduce lost worker productivity, and improve local air quality. Specific TDM measures can include alternatives to single occupant vehicle travel such as carpools and vanpools, public and private transit, bicycling, and walking. Management strategies may include financial or time incentives and parking management programs.

Research suggests that an effective TDM program at individual high-density employment sites can potentially reduce vehicle trips by as much as 30 to 40 percent in relation to ambient conditions. However, in areas where there is medium to low density office or commercial development, the results will be more modest (5 to 10 percent). It has also been documented that effective TDM programs usually employ a wide variety of TDM measures, each mutually supporting the overall objective of trip reduction. The research shows that when a TDM program is designed to provide time or financial advantages to a commuter, fewer people will drive alone during the peak hours. When such advantages are not provided, the program is unlikely to accomplish its objective of reducing vehicle trips.

TSM measures are defined as operating, regulatory, and service policies that can achieve maximum efficiency and productivity of a transportation system. Since traffic congestion is an ongoing problem, the operation of a transportation system must continuously be managed and improved. As a result, it is important to continuously monitor, adjust, and revise transportation programs in order to provide relief from congestion and improve the overall system. Many TSM measures consist of traffic control improvements as well as traffic engineering improvements, which do not involve large-scale construction. Traffic engineering improvements may consist of left- and right-turn lanes, one-way streets, reversible traffic lanes, intersection widening, high occupancy vehicle (HOV) lanes on freeways and major arterials, ramp metering, and pavement markings. Traffic control improvements are designed to reduce travel times, delays, and stops, while also improving average travel speeds. Measures such as coordinated traffic signals and traffic signal priority for buses are typical traffic control improvements.

Research indicates that the greatest potential for applying TDM/TSM measures is in the strategic grouping of measures into “programs” of reinforcing actions. This is true for three reasons. First, most TDM/TSM measures have relatively small impacts when applied by themselves, particularly when applied only at a small geographic scale. Second, many TDM/TSM programs complement the effectiveness of each other, suggesting that the whole is frequently greater than the sum of its parts. For example, limiting parking in a high-density commercial development served by convenient, reliable transit service can do more to reduce vehicle trips rather than just limiting parking. Third, balance in a TDM/TSM program is necessary to achieve acceptance and desired impact. Generally, it would be unacceptable to encourage travel through disincentive measures to change behavior without providing acceptable alternatives to driving alone. For example, the likelihood for success would be limited if a jurisdiction were to restrict parking in an area where transit service was limited or nonexistent.

Table 3-3 provides a summary of the TDM/TSM measures along with their potential effectiveness within the study area. The remainder of this section describes individual TDM/TSM measures that may have potential application in the U.S. 395 South Sierra Corridor.

3.3.2 TDM Measures

AREAWIDE RIDESHARING PROGRAMS

Potential Effectiveness: HIGH

An areawide ridesharing program involves organizational efforts to implement and support the use of HOV lanes for carpooling, vanpooling, and buspooling. Operation and implementation of a ridesharing program involves matching of potential ridesharers, promotion of alternatives to driving alone, and support of transportation management associations.

This program could be operated by one full-time person coordinating a ridesharing program for both Douglas County and Carson City. By working with local employers and community groups, the ridesharing coordinator could increase awareness of the program in the area. The presence of a relatively large number of commuters traveling within the study area raises the likelihood that a ridesharing program would be successful.

TRANSPORTATION MANAGEMENT ASSOCIATIONS (TMA)

Potential Effectiveness: HIGH

TMAs are comprised of several local business organizations that act in partnership with local governments to solve transportation problems. TMAs provide ride-sharing and transit services to their employees, but are also involved in transportation planning, financing, and implementation.

THIRD PARTY VANPOOLING PROGRAM

Potential Effectiveness: HIGH

A third-party organization administers the vanpool program and assumes certain financial liabilities for operations, thus reducing the employer’s risks involved in setting up a vanpool program. They may also provide administrative, ride matching, and insurance services at no cost to the employer. The Carson City and the Douglas County Regional Transportation Commissions could also chose to subsidize third-party vanpool programs within the U.S. 395 Corridor area.

Table 3-3 *Summary of TDM/TSM Measures and Their Potential Effectiveness*

TDM MEASURES	
Areawide Ridesharing Programs	HIGH
Transportation Management Associations (TMA)	HIGH
Third Party Vanpooling Program	HIGH
Employer-based Ridesharing Program	HIGH
Alternate Work Schedules	HIGH
Telecommuting and Teleconferencing	MEDIUM
Transit Oriented Development/Planned Unit Development	MEDIUM
Limits on Parking Supply	LOW
TSM MEASURES	
Signal Coordination	HIGH
Transit Financial Incentives	HIGH
Investment in Public Transit	HIGH
Bus Shelters and Support Services	MEDIUM
Incident Management	MEDIUM
Real-Time Travel Information	MEDIUM
Sidewalks and Bike Lanes with Different Materials, Color and/or Texture, and Separated from Automobiles	MEDIUM
Signal Pre-emption and/or Extension for Buses	LOW
Ramp Metering	LOW
High Occupancy Vehicle (HOV) Lanes	LOW

EMPLOYER-BASED RIDESHARING PROGRAM
Potential Effectiveness: HIGH

Employer-based ridesharing programs involve matching employees who make similar commutes, providing information about commute choices, operating supporting services (possibly including a Guaranteed Ride Home Program), and may involve the use on an 8- to 15-passenger van, which is driven by an employee. The employer may use a regional ride-share matching service or an in-house service.

ALTERNATE WORK SCHEDULES
Potential Effectiveness: HIGH

In general, trip congestion occurs during peak periods. Alternative work schedules allow travel demand to be spread out throughout the day. Alternative work schedules include three types of programs: (1) staggered hours, (2) flextime, and (3) compressed work week.

TELECOMMUTING AND TELECONFERENCING
Potential Effectiveness: MEDIUM

Telecommuting allows an employee to perform work at a remote worksite; i.e. home, regional worksite or satellite center, by using telecommunications technology. Teleconferencing allows a meeting to be held at multiple locations and linked by audio, video, or data equipment.

TRANSIT ORIENTED DEVELOPMENT/PLANNED UNIT DEVELOPMENT
Potential Effectiveness: LOW

Transit oriented or planned unit development is a land use concept that promotes a mix of pedestrian scale, higher density development centered around the use of public transit and/or bicycle and pedestrian travel modes.

LIMITS ON PARKING SUPPLY
Potential Effectiveness: LOW

Parking supply is the number and location of all parking spaces in the study area. Parking supply is a fixed number while parking demand can vary. A limited parking supply would consist of less than 100 percent of the parking demand at peak hour, thus creating a shortage of supply to accommodate parking demand.

3.3.3 TSM Measures

SIGNAL COORDINATION
Potential Effectiveness: HIGH

Signal coordination can optimize intersection operation as well as decrease travel times and vehicle stops and delays. Computer applications can adjust phasing, timing patterns, and cycle length to reach an optimum condition, which yields the best level of service.

TRANSIT FINANCIAL INCENTIVES
Potential Effectiveness: HIGH

In order to encourage commuters to use alternate travel modes they must be attractive to the consumer. Incentives may be used for this purpose. Transit pass subsidies may be provided in order to encourage public transit ridership.

INVESTMENT IN PUBLIC TRANSIT
Potential Effectiveness: HIGH

Investment in public transit is a long-range planning process and a major financial investment. Planning studies should include goals and objectives, a survey of travel patterns, identification of the existing needs and problems, forecast of future ridership, alternative routes, and financial analysis.

BUS SHELTERS AND SUPPORT SERVICES
Potential Effectiveness: MEDIUM

The addition of bus shelters and benches increases the safety and comfort of passengers by providing seating while protecting them from the elements. Bus shelters are desirable where service headways exceed a few minutes. Shelter walls also provide space for posting maps, schedules, and advertising. At bus and rail stations, some transit operators are also now implementing technology improvements that can provide real-time arrival and departure scheduling information for transit riders.

INCIDENT MANAGEMENT
Potential Effectiveness: MEDIUM

Used on freeways and major arterials, measures that include the pre-positioning of incident response personnel and equipment and/or use of advanced technology to detect and verify traffic incidents. These measures improve response time and allow for quicker implementation of traffic management to restore traffic flow.

REAL-TIME TRAVEL INFORMATION
Potential Effectiveness: MEDIUM

Real-time travel information on roadway conditions which can be provided to the traveling public via telephone, radio, kiosks, changeable message signs, or the Internet.

SIDEWALKS AND BIKE LANES ON THE SAME LEVEL, BUT WITH DIFFERENT MATERIALS, COLOR AND/OR TEXTURE, AND SEPARATED FROM AUTOMOBILES
Potential Effectiveness: MEDIUM

Bike lanes and sidewalks that are separated from automobiles and are differentiated by color, texture, or material provide an extra level of safety and security. If the public is confident that safety and security are provided, bicycle use is likely to increase.

SIGNAL PRE-EMPTION AND/OR EXTENSION FOR BUSES
Potential Effectiveness: LOW

Actively providing traffic signal priority to buses can reduce the delay time for transit riders.

RAMP METERING
Potential Effectiveness: LOW

Ramp metering can reduce congestion on freeway corridors by allowing one car at a time to enter the freeway from a vehicle queue. HOV lanes may be used in conjunction with ramp metering. Priority treatment is provided to the HOV, which can enter the freeway with minimal delay through the use of a ramp meter bypass lane.

HIGH OCCUPANCY VEHICLE (HOV) LANES
Potential Effectiveness: LOW

Priority treatment is offered to buses, vanpools, and cars carrying two or more people on freeways and arterials where a lane is provided for the exclusive use of HOV vehicles. HOV lanes reduce congestion and are usually constructed on congested roadways where the construction of additional traffic lanes may not be possible.

3.3.4 Transit System Improvements

Public transit in Douglas County is expected to maintain generally the same level of service for the next five years due to funding constraints. The current funding plan allows an increase of 3 percent per year to cover the cost of inflation. Unless additional transit funding is obtained, transit services are not likely to improve.

Carson City and Douglas County could provide additional services within the study corridor by increasing the frequency and vehicle revenue hours of the RTC Intercity transit service, Jump Around Carson transit service (Carson City), and the Douglas Area Rural Transit (Douglas County). Improving the quality of these services could have the result of increasing ridership, thereby reducing some of the traffic in the U.S. 395 Corridor.

Both Douglas County and Carson City anticipate completion of short-range transit plans within the next three years. By increasing service and inter-county communication in the plan development process, there will be several opportunities to coordinate the transit service between both counties, resulting in a more popular public transit system.

3.3.5 Intelligent Transportation Systems Alternatives

Intelligent tranpsortation systems (ITS) improve transportation safety and mobility and enhance productivity through the use of advanced communications technologies. The types of systems that can be implemented will depend on the final roadway improvements in the corridor, although most can be implemented on either arterials or freeways.

Intelligent transportation systems encompass a broad range of wireless and wire line communications-based information and electronics technologies. When integrated into the transportation system's infrastructure, and in vehicles themselves, these technologies relieve congestion, improve safety and enhance productivity.

Intelligent transportation systems are made up of 16 types of technology based systems. These systems are divided into intelligent infrastructure systems and intelligent vehicle systems. The highlighted systems are recommended for consideration in the U.S. 395 Corridor by NDOT staff.

- Arterial Management
- Traveler Information
- Crash Prevention and Safety
- Roadway Operations and Maintenance
- Road Weather Management
- Freeway Management
- Transit Management
- Incident Management
- Emergency Management
- Electronic Payment
- Information Management
- Commercial Vehicle Operations
- Intermodal Freight

In-Vehicle (Intelligent Vehicle) Systems

- Collision Avoidance Systems
- Collision Notification Systems
- Driver Assistance Systems

With the exception of the Intelligent Vehicle Systems, the other systems are available for implementation. NDOT representatives have indicated a willingness to coordinate the regional development of the Intelligent Transportation Systems program.

3.4 ROADWAY SYSTEM IMPROVEMENT NEEDS

As population and employment in Douglas County and Carson City grows from approximately 110,000 residents in 2005 to the projected population of 161,500 in 2030, various transportation projects will need to be completed to supplement TDM/TSM measures and transit service improvements. In developing the list of Corridor Study projects listed in the next chapter, NDOT and Project Development Team representatives sought to define a roadway network that would provide the best traffic level of service over the entire system. The resulting model runs provide detailed analysis of the best locations for capacity improvements.

Table 3-4 depicts the traffic volume projections in 2030 at the various segments of the roadway network: the traffic level of service in 2030 if none of the projects are built (2030 No Build) and the traffic level of service if the proposed projects are complete by 2030 (2030 Build).

3.4.1 2030 Planned Improvements (No Build) Analysis

The Planned Improvements scenario assumes the current Transportation Master Plans for Carson City (2004) and *2007 Douglas County Transportation Plan* will be implemented by 2030; however, no other improvements will be made. This scenario is also considered to be a No Build alternative, meaning that no right-of-way improvements are considered beyond the current Carson City and Douglas County Master Plans.

This includes the completion of the Carson Freeway from U.S. 50 (east of downtown Carson City) to U.S. 50 at the south end of Carson City, the widening of Fairview Drive to four lanes in Carson City from the new freeway to U.S. 395, the addition of a third northbound lane on U.S. 395 from Jacks Valley Road to U.S. 50 and the improvements in Douglas County described in Section 5.5.1.

Before completion of the travel demand model for Carson City and Douglas County, NDOT Traffic Information Division provided future traffic volumes for the corridor, including the 2030 traffic volumes developed for the future Carson Freeway analysis done in 2002. These traffic volumes were for U.S. 395 from the future U.S. 50 interchange to Jacks Valley Road and for the Carson Freeway interchange at Fairview Drive. This included AM and PM peak period volumes for 2010 and 2030 and are shown in Appendix E. South of Jacks Valley Road the 2030 traffic volumes were calculated from a combination of NDOT's derived volumes, the historical NDOT traffic volume data on U.S. 395 and the anticipated growth in Douglas County.

Table 3-4 *Projected 2030 Average Annual Daily Traffic for Select Intersections on U.S. 395 for the No Build and Build Scenarios*

COUNT STATION	LOCATION	2005	2030 NO BUILD	2030 BUILD
25-0001	0.2 mile north of U.S. 50	57,010	50,927	52,420
05-0045	0.4 mile north of Jacks Valley Road	45,500	65,827	91,095
05-0046	0.4 mile north of Mica Drive	35,000	54,790	81,038
05-0033	0.3 mile north of Stephanie Way	33,000	64,236	81,401
05-0030	0.1 mile south of SR 206 (Genoa Lane)	32,000	46,279	59,285
05-0029	0.2 mile south of Muller Parkway	32,500	37,044	41,155
05-0011	400 feet south of SR 88	27,700	13,080	13,732
05-0008	150 feet south of High School Street	28,700	21,122	22,247
05-0007	30 feet south of Eddy Street	24,200	16,390	17,640
05-0059	200 feet south of the north leg of Industrial Way	24,000*	18,842	18,591
05-0069	0.6 mile south of Pinenut Road	12,300	25,547	20,425
05-0005	0.1 mile south of MP 16 and south of Palomino Drive	9,000	14,996	13,713
05-0002	0.3 mile south of SR 208	5,600	—	—
05-0001	Nevada/California state line (Topaz)	4,600	8,200	8,200

Source: Nevada Department of Transportation, Parsons

The future turning movement volumes were estimated based on current turning movement percentages. A Peak Hour Factor of 0.94 was used for the analysis. The 2030 No Build analysis was performed for those intersections listed in the Existing (2005) Conditions section and also included the following intersections:

- U.S. 395 at Muller Lane
- U.S. 395 at Ironwood Drive

Figure 3-10 is a bandwidth map illustrating the daily traffic volumes in the corridor study area for the year 2005. Figure 3-11 shows traffic volumes in 2030 if the proposed projects are completed by 2030. These maps show increased traffic volumes throughout the U.S. 395 corridor, especially north of Jacks Valley Road and in the towns of Gardnerville and Minden. In that area, the proposed Muller Parkway absorbs traffic equal to the amount of traffic on U.S. 395.

The 2030 No Build condition includes U.S. 395 with all improvement projects shown in the NDOT long range plan and those Douglas County projects expected to be completed by 2030. The following is a listing of those future projects:

U.S. 395

- Carson Freeway and the interchange at U.S. 50 (single point urban interchange)

DOUGLAS COUNTY

- Muller Lane Extension (from existing Muller Lane/U.S. 395 intersection to the Pinenut Road/Riverview Road intersection at U.S. 395)
- Ironwood Extension to Gilman Avenue
- Heybourne Road Extension from Airport Road to Buckeye Road
- Vicky Lane Extension from Johnson Lane to East Valley Road

The Douglas County improvements will be a major factor in diverting trips from U.S. 395 through the towns of Minden and Gardnerville. It was assumed these improvements would add traffic signals on U.S. 395 at the Muller Lane and Ironwood Drive intersections. The Heybourne Road and Vicky Lane extension improvements will also reduce the traffic on U.S. 395 between the Johnson Lane area and Minden/Gardnerville. These improvements will serve the areas that the Douglas County Land Use Master Plan identifies for future development, also known as "receiving areas." The current Master Plan shows receiving areas along the east side of Minden and Gardnerville (see Figure 3-12); as well as areas east of the Minden-Tahoe Airport.

As was discussed earlier, the draft 2007 Douglas County Transportation Plan contains these projects, but they may not be built in the foreseeable future. Douglas County officials are currently in the process of determining where, how much and when the county will grow between now and the year 2030. In addition, there is no funding for additional highway capacity projects.

Under the 2030 No Build scenario the County's roadway extension improvements on Muller Lane and Ironwood Drive will divert traffic from U.S. 395 that currently must pass through Minden and Gardnerville. Muller Lane will especially be attractive as a "defacto" by-pass around both towns since it is planned as a four-lane facility. Douglas County will not allow large trucks on the future Muller Lane. The analysis results in Table 3-5 shows the amount of traffic diverted to Muller Lane and Ironwood Drive east of U.S. 395 would allow the signalized intersections through the towns of Minden and Gardnerville to operate at LOS D or better during both the AM and PM peak periods.

Figure 3-13 shows the 2030 No Build schematic layout of intersections, traffic movement volumes and peak period levels of service. Table 3-4

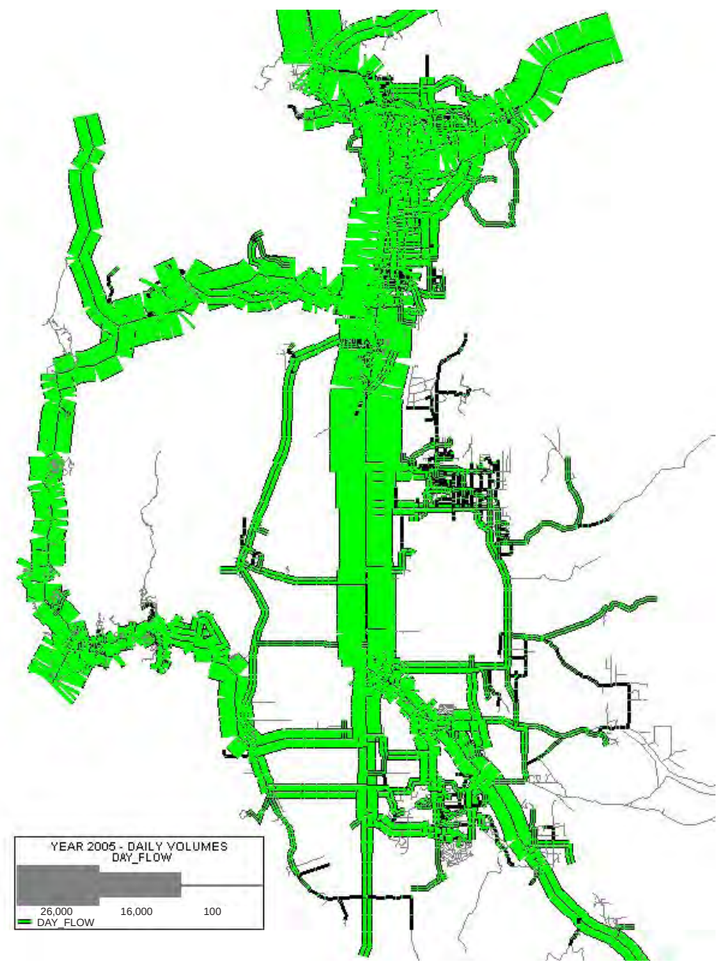


Figure 3-10 *2005 Daily Traffic Volumes*

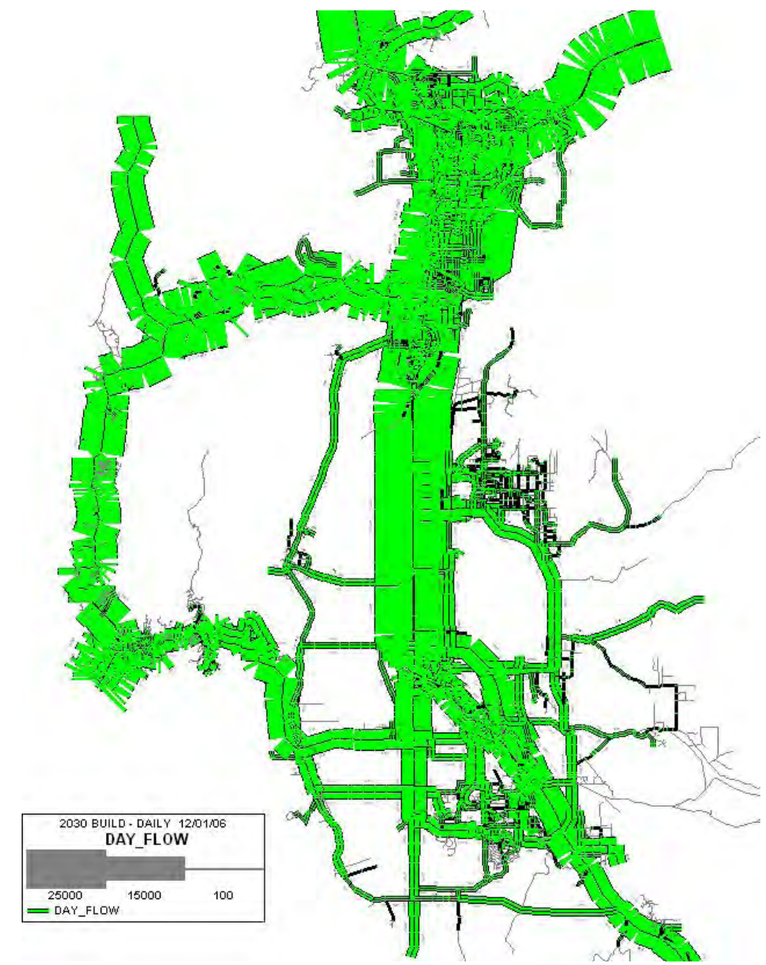


Figure 3-11 *2030 Build Daily Traffic Volumes*

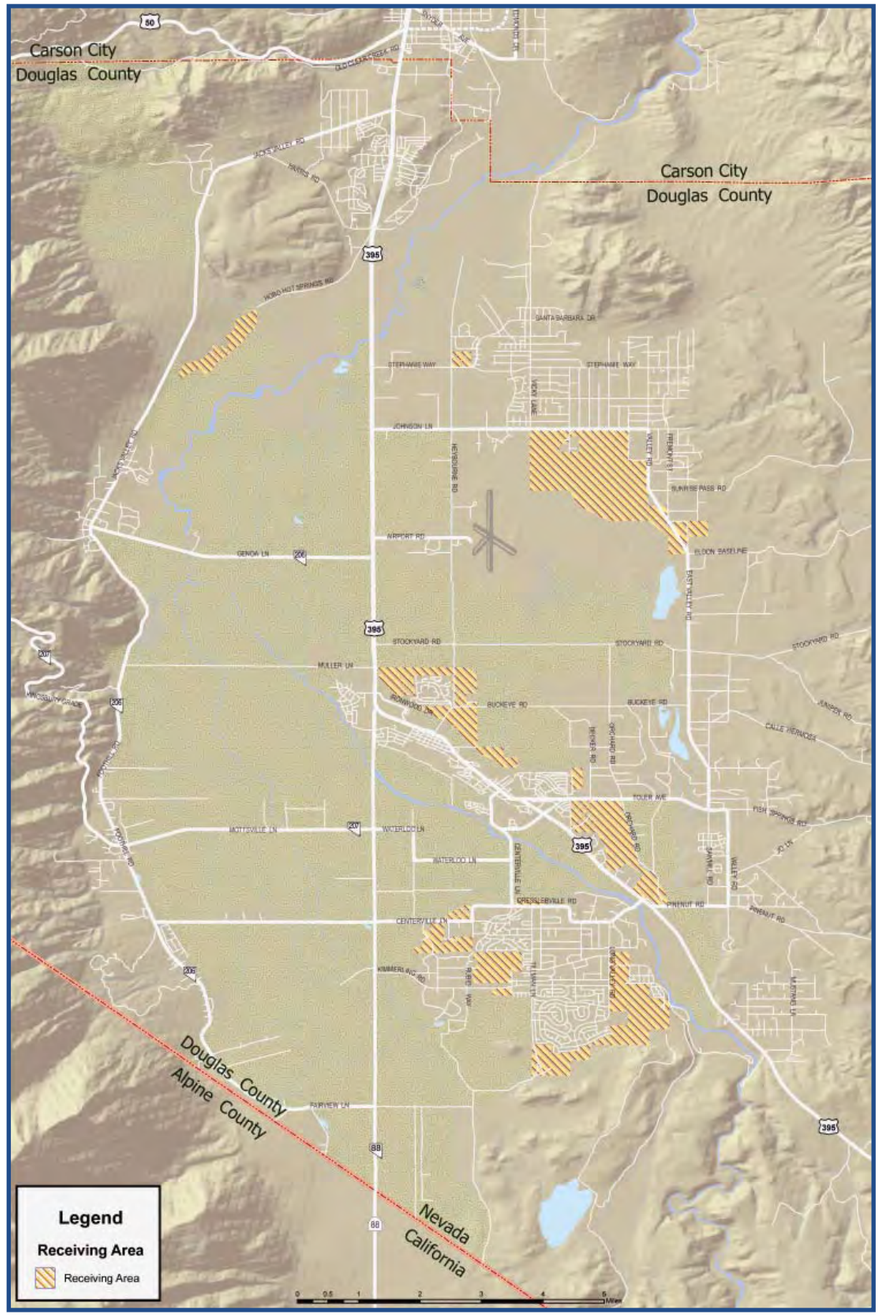


Figure 3-12 *Douglas County Receiving Areas Proposed for New Development*

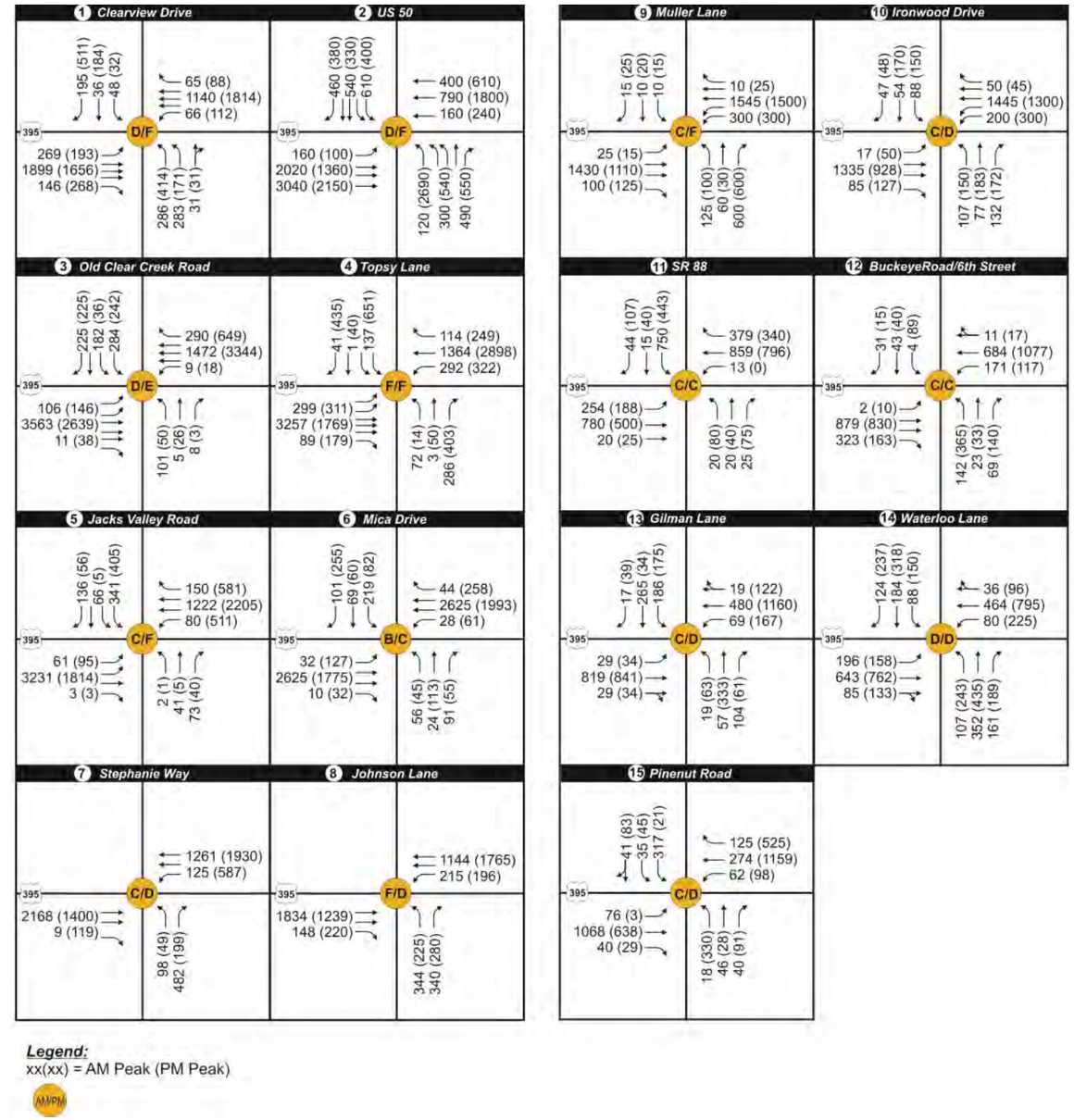


Figure 3-13 *2030 No Build Schematic Layout of Intersections, Traffic Movement Volumes and Peak Period Levels of Services*

shows the traffic analysis results for Existing (2005) Conditions, the 2030 No Build and the 2030 Build projections. These results show the major U.S. 395 intersections will fail (LOS F) in both the AM and PM peak periods under their current geometrics.

3.4.2 Truck Movements

The volume of traffic on U.S. 395 is expected to be 80 percent greater in 2030 than it was in 2005; growing from 4,600 to 8,200 vehicles per day. Regional truck traffic constitutes eight percent of the 2005 total, as measured at the Nevada/California state line. Using this same ratio, the number of trucks is projected to increase from 368 to 656 trucks per day in 2030.

A significant increase in truck traffic in the U.S. 395 corridor is unlikely due to the fact that the California Department of Transportation has no plans to widen the winding, narrow, two-lane section of U.S. 395 between Lee Vining and Topaz. As a result, the majority of interstate truckers will not find it cost effective to use this route between Los Angeles and Reno and points north of Reno.

Table 3-5 *2005, 2030 No Build, and 2030 Build Traffic Analysis Results*

INTERSECTION	EXISTING (YEAR 2005) AM PEAK				EXISTING (YEAR 2005) PM PEAK				NO BUILD 2030 AM PEAK				NO BUILD 2030 PM PEAK			
	LOS	AVERAGE DELAY (sec)	CRITICAL V/C	AVERAGE CRITICAL DELAY (sec)	LOS	AVERAGE DELAY (sec)	CRITICAL V/C	AVERAGE CRITICAL DELAY (sec)	LOS	AVERAGE DELAY (sec)	CRITICAL V/C	AVERAGE CRITICAL DELAY (sec)	LOS	AVERAGE DELAY (sec)	CRITICAL V/C	AVERAGE CRITICAL DE-LAY (sec)
U.S. 395 and																
Koontz	B	14.4	0.548	13	C	20.8	0.672	20.5	B	17.3	0.852	17.4	C	21	0.643	20.5
Clearview	C	33.1	0.897	38.9	D	45.6	0.946	55.7	C	34	0.747	31.7	E	59.5	0.98	66.7
US 50	B	15	0.64	11.5	C	24.1	0.771	29.3	F	203.8	1.529	284.5	F	609.9	2.599	761.4
Clear Creek	C	21.6	0.8	25	C	34.8	0.939	44	E	78	1.117	110.7	D	54.6	1.08	83.5
Topsy	C	22	0.879	28.1	C	30.4	0.79	33.3	F	212.3	1.597	306.3	F	184.5	1.377	221.4
Jacks Valley	C	29.5	0.906	37.7	C	29.1	0.879	36.4	F	96	1.225	134.8	E	69.9	1.132	117.3
Mica	C	21.7	0.839	23.7	B	14.2	0.654	12.8	C	24.6	0.891	29.6	C	26.3	0.851	31.6
Stephanie	C	29.3	0.814	35.9	C	21.9	0.651	34	C	25.6	0.891	25.7	D	40.1	0.894	41.4
Johnson	C	29.6	0.803	37.2	C	23.4	0.587	19.3	E	70.4	1.043	73.4	C	33.7	0.756	34.1
Mueller	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	C	33.2	0.876	39.7	F	179.7	1.464	241.8
Ironwood	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	B	16.1	0.562	11.7	C	24.8	0.803	20
SR 88	C	33	0.818	42.2	C	26.7	0.65	33.5	C	34.5	0.751	41.4	D	36.8	0.668	40.8
Buckeye	C	24.4	0.551	28.5	C	27.9	0.571	32.5	C	25	0.536	29.7	C	30.7	0.602	34
Centerville/Gillman	C	33.4	0.549	35.2	C	28.6	0.482	24.5	C	30.7	0.457	32.1	D	36.7	0.669	34.9
Waterloo	C	33.2	0.419	33.6	D	37.3	0.619	40.9	D	39.3	0.61	40.5	D	44.2	0.765	46.7
Pinenut/Riverview	C	33	0.553	33.6	C	33.1	0.679	39	C	29.7	0.586	31	D	41.9	0.865	53.5

4 Recommended Near-Term U.S. 395 Safety Improvements

Analyses of community input and technical data resulted in recommendations for specific projects within the corridor and at selected intersections. At the December 14, 2005 Community Meeting, NDOT representatives presented the results and explained the next steps to implement the proposed projects. This Corridor Study recommends implementing these safety improvements within the next three to five years. NDOT representatives provided these cost and schedule estimates in 2006. All schedule estimates are effective from the date of NDOT approval and funding.

4.1 MEDIAN BARRIER

Members of the public suggested a median barrier as a solution to crossover crashes. Cable barrier, shown in Figure 4-1, is recommended for installation from Mica Drive to Muller Lane. Installation will require existing median side slopes to be flattened and existing median openings should be reviewed for possible closure or relocation. The cost of installation is estimated at $1.2 million and NDOT implementation by June 2008.

Figure 4-1 *Cable Median Barriers are Effective Devices to Prevent Crossover Crashes*

Table 4-1 summarizes the limit, schedule and cost of the median barrier project, as well as the remaining projects recommended for near-term safety improvements. See Figure 4-2 for the locations of the proposed near-term safety improvements described in Table 4-1.

Table 4-1 *Summary of Recommended U.S. 395 Near-Term Improvements*

PROJECT	LIMITS		SCHEDULE	COST
CORRIDOR IMPROVEMENTS				
1. Rumble strips	Topsy Lane to Plymouth Drive		6 months	$ 25,000
2. Median barrier	Mica Drive to Muller Lane		June 2008	$1.2 million
Widen roadway markings	Entire corridor		6 months	$ 3,000
ACCELERATION/DECELERATION LANES				
3. Old Clear Creek Road	—	Add	18-36 months	$150,000
4. Jacks Valley Road	Extend three lanes through intersection*		—	—
5. Mica Drive	Add truck climbing lane to Sunridge Drive		18-36 months	$600,000
6. South Sunridge Drive	Add	Add	18-36 months	$400,000
7. Silver City RV Resort	Add	Extend	18-36 months	$475,000
8. Johnson Lane	Add	Existing	18-36 months	$650,000
9. Genoa Lane	Add*	Existing	18-36 months	$640,000
OTHER INTERSECTION IMPROVEMENTS				
10. U.S. 50 High-T			18-36 months	N/A
11. Muller Lane			18-36 months	N/A
12. Ironwood Drive	Remove southbound left-turn		18-36 months	N/A
13. State Route 88	Remove slower right-turn lane		18-36 months	N/A
14. Washoe Tribal Headquarters			18-36 months	N/A
ROUNDABOUTS				
15. Ironwood Drive			24-48 months	N/A
16. State Route 88			24-48 months	N/A
PROJECT EVALUATIONS/STUDIES				
17. Speed Limit Evaluation	Muller Lane to SR 88		6 months	$ 1,000
18. U.S. 50 High-T Feasibility Evaluation			18-36 months	$ 30,000
Roadway Access Management Study			6-18 months	$ 2,000
Traffic Signal Installation and Coordination Study			18 months	$350,000

4.2 ACCELERATION OR DECELERATION LANES

The public discussed the difficulty of entering and exiting the highway in the presence of high-speed traffic. They suggested adding or extending acceleration or deceleration lanes at many intersections and some driveways. During the field review, additional sites and lane changes were added to the list. The resulting recommendations were summarized for the Community Meeting as shown in Table 4-1 and are discussed in more detail below.

4.2.1 Old Clear Creek Road

A northbound deceleration lane at Old Clear Creek Road would help reduce rear-end crashes occurring due to the increased delay on U.S. 395. Cost is estimated at $150,000. It would take 18 to 36 months to develop the project and install the lanes from the time of NDOT approval and funding. The cost and implementation schedule would be greater if additional right-of-way is required. It may be feasible to include this project when future development occurs.

4.2.2 Jacks Valley Road

Currently, the right travel lane on southbound U.S. 395 becomes a right-turn only lane at the intersection of Jacks Valley Road. The safety team recommended continuation of this lane through the intersection and ending it south of the shopping center driveways. No cost was calculated for this improvement. It may be feasible to include this project when future development occurs.

4.2.3 Mica Drive

Northbound trucks must come to a complete stop for the traffic signal at Mica Drive/Sunridge Drive, and their slow start-up speeds cause traffic to back up. It was recommended that Douglas County pursue a project with NDOT to construct a truck climbing lane from Mica Drive to Sunridge Drive. The lane would allow for a right-turn lane to serve the residential area access from Sunridge Drive. Cost is estimated at $600,000 and implementation would take between 18 and 36 months from the time of NDOT approval and funding.

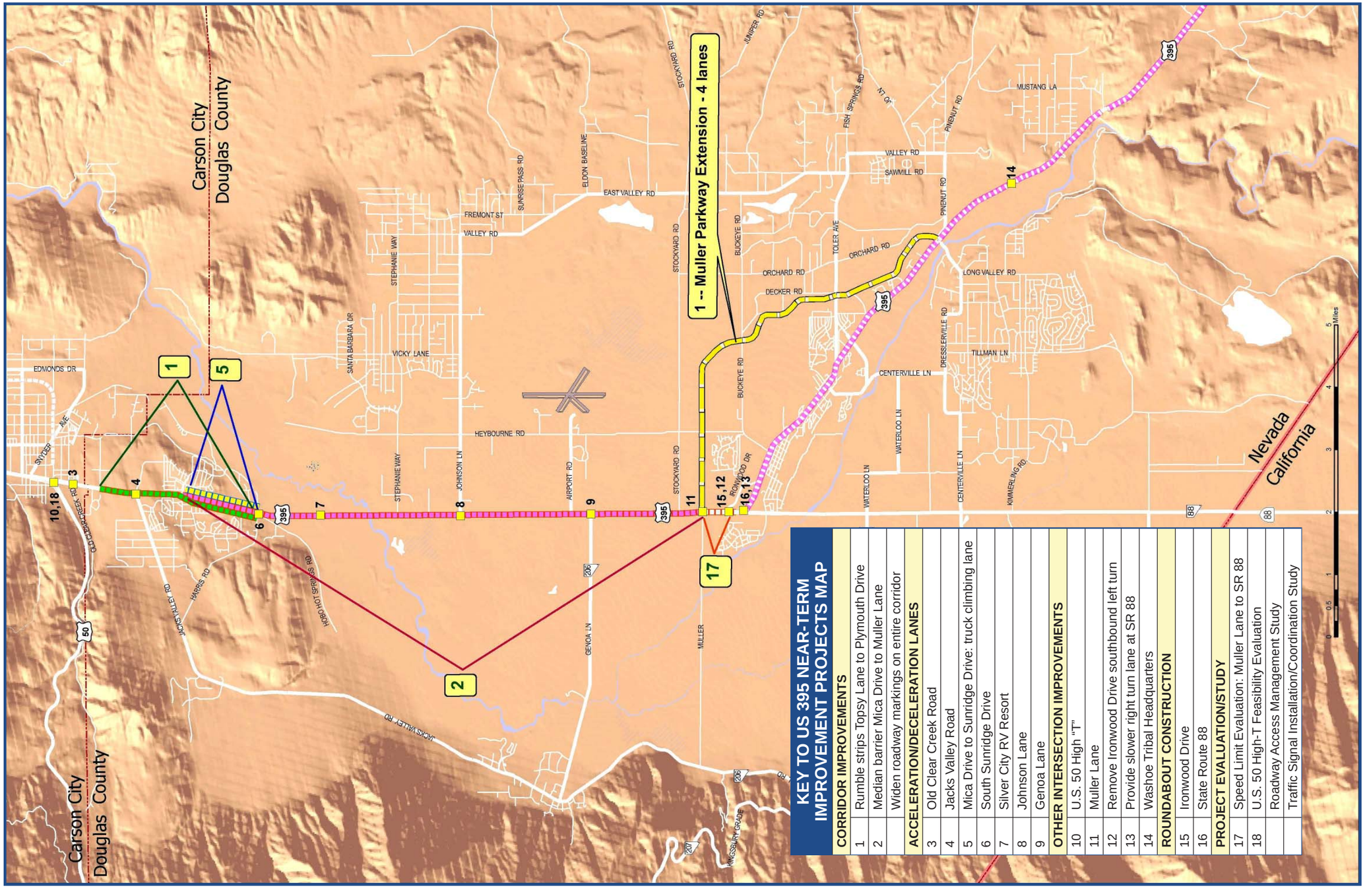


Figure 4-2 *Map of Proposed U.S. 395 Near-Term Safety Improvements*

4.2.4 South Sunridge Drive

New home construction in this area has increased the number of vehicles turning into and out of this street. Currently, vehicles must enter the outside travel lane (posted for speeds of 55 mph) to travel northbound. Northbound traffic must reduce its speed within the northbound outside travel lane to make a right-turn onto South Sunridge Drive. Community workshop participants recommended that Douglas County pursue a project with NDOT to add northbound acceleration and decelerations lanes to serve this traffic. Cost is estimated at $400,000 and the project would take between 18 and 36 months to complete from the time of NDOT approval and funding.

4.2.5 Recreational Vehicle Park

Large recreational vehicles (RVs) access a commercial site via a private driveway on U.S. 395 near South Sunridge Drive. Due to the size of the vehicles and the distance needed to decelerate for the approach or accelerate into traffic, longer deceleration and acceleration lanes are needed. Participants recommended that Douglas County pursue a project with NDOT to lengthen the deceleration lane, add an acceleration lane, and lengthen the southbound left-turn lane into the RV park. Cost is estimated at $475,000 and the project would take between 18 and 36 months to complete from the time of NDOT approval and funding.

Figure 4-3 *Modifications are Recommended to Better Accommodate Slow-moving Traffic at the Silver City RV Resort*

4.2.6 Johnson Lane

There is a need for an acceleration lane to facilitate traffic turning right from Johnson Lane onto U.S. 395. To widen U.S. 395 at this point, right-of-way is needed to relocate irrigation ditches and head gates. In addition, Johnson Lane should also be widened 14 feet to the north to allow for a right-turn lane. It was recommended that Douglas County pursue a project with NDOT to make these changes, estimated to cost $650,000. It would take an estimated 18-36 months to complete the project from the time of NDOT approval and funding, not including right-of-way acquisition.

4.2.7 Genoa Lane

Suggestions made during the Community Workshop included improving conditions for vehicles turning at Genoa Lane. Douglas County could pursue a project with NDOT to lengthen the southbound deceleration and acceleration lane, and to lengthen the northbound left-turn lane. Cost is estimated at $640,000 and implementation would take 18 to 36 months from the time of NDOT approval and funding.

4.2.8 Muller Lane and Ironwood Lane

Roadway safety would be improved by lengthening and/or adding acceleration and deceleration lanes at these two intersections and to lower speeds in this suburbanized area. It is recommended that Douglas County pursue a project with NDOT to make these changes. Acceleration and deceleration lanes facilitate high speeds and were therefore not recommended at these sites.

4.3 MANAGE ACCESS

It is necessary to manage the points where traffic enters and exits U.S. 395, which would be accomplished by eliminating or consolidating openings and moving traffic to grade-separated interchanges or newly constructed parallel routes. An Access Management Assessment is recommended. This detailed study would determine the number of approaches with median openings that should be combined, modified, or removed, and would allow time for staff to work with property owners to ensure their access needs are met. The study could be completed by NDOT staff at a cost of about $2,000 in 6 to 18 months from the time of NDOT approval and funding.

4.4 ALTERNATE ROUTES

Many suggestions for frontage roads and connections within existing county road systems were expressed during the charrette process. Some suggested a new freeway alignment, while others envisioned new routes for local traffic that would preserve U.S. 395 for regional traffic. The Traffic Safety Charrette resulted in recommended improvements over the next three to four years. Longer terms improvements, including the alternatives from the charrette, are addressed in Chapter 5, Alternatives Development, of this document.

4.5 CORRIDOR SPEEDS

During the workshop, many people spoke of the need for reduced speeds in the corridor. Discussions included an acknowledgement of limited enforcement resources that can be dedicated to this specific corridor. An NDOT speed study conducted between Plymouth Drive and Muller Lane showed that 85 percent of vehicles were traveling at 68 mph, which is 3 mph over the 65 mph posted speed limit. Many people would prefer lower speeds, but research shows that reducing posted speed limits is not likely to change the travel speeds of many drivers unless the reduction is accompanied by heavy enforcement. A reduction in the speed limit between Plymouth Drive and Muller Lane is not recommended, because it could result in wider speed variance, which could increase crashes.

A speed study from Muller Lane to SR 88 is recommended. The study would assess current travel speeds, access, visibility, design speed, and crashes to determine if the speed limit in this segment should be reduced.

Completion of the study is expected within 6 months from the time of NDOT approval and funding and will cost approximately $1,000.

4.6 FLASHING WARNING LIGHTS

Charette participants suggested that the warning lights at Johnson Lane should begin flashing sooner, in advance of the traffic signal changing from green to amber. The timing of the lights is intended to alert the driver to the need to begin braking when the lights are flashing. Drivers should know they do not have time to clear the intersection. No changes are recommended because a longer time could result in red-light running.

There were also suggestions for additional flashing warning lights at Stephanie Way and Johnson Lane to alert drivers to traffic merging into the left lane. The field review group observed that drivers at these locations are moving into the right lane to allow turning traffic to merge except during congested times of the day. This indicates any reluctance to move over is not because the driver is unaware of the condition. No change was recommended.

Some participants also suggested the use of flashing lights south of Muller Lane to alert drivers to reduced speeds. Research shows warning lights yield little change in speeds unless accompanied by ample enforcement. Other strategies to slow traffic in this area may be useful and were considered by the corridor study.

4.7 RUMBLE STRIPS/WIDER MARKINGS

NDOT will initiate a project to install rumble strips on the inside and outside of shoulders from Topsy Lane south to Plymouth Drive. Rumble strips help avert roadway departure crashes and are already in place in the remainder of the corridor study area (U.S. 50 to SR 88). The project is expected to be complete in six months at a cost of about $25,000. In addition, NDOT will replace faded markings with 8-inch lines to improve visibility. Estimated cost is $3,000 and the project would be complete within 6 months after NDOT approval and funding.

4.8 ADDITIONAL RECOMMENDATIONS AT INTERSECTIONS

4.8.1 U.S. 50 “High-T”

There is a potential for converting the full traffic signal controlled intersection at U.S. 50 to a high-T, which could improve traffic flow and reduce crashes. Detailed evaluation of the feasibility of this treatment would cost an estimated $30,000 and would take 6 to 18 months from the time of NDOT approval and funding to complete the work.

4.8.2 Stephanie Way

At the time of the safety charrette, Stephanie Way was an unsignalized, high-T intersection. Participant suggestions for this location included a full-signal, a half-signal (high-T), leaving it unsignalized, installing a dual-lane roundabout, restricting movements, and providing grade-separated access.

NDOT analyzed these suggestions and provided the technical data to the Douglas County Commissioners. Analyses indicated that although the intersection did not meet normal minimum traffic volume requirements (warrants), it did meet a warrant for left-turn movements. Because a fatality involving a left-turn occurred at the intersection, this warrant was used to qualify the intersection for a half traffic signal. Analyses showed that a fully signalized intersection would increase crashes. A dual-lane roundabout may be feasible, but would have required a much longer time period for evaluation, design, and implementation. The Douglas County Commission supported provision of a half traffic signal at Stephanie Way. A project for installation of the signal was initiated by NDOT, with Douglas County participating in the funding. The signal became operational in December 2006.

Grade-separated treatments such as overpasses or interchanges are long-term solutions that are addressed in Chapter 5, Alternatives Development, of this document.

4.8.3 Johnson Lane

Johnson Lane is a high-T intersection with a half traffic signal. This study will consider installing a full traffic signal, extending the existing raised median, or providing a grade separated interchange.

A full traffic signal is likely to increase crash frequency and was not recommended. Engineers could not identify any benefits to extending the median, so this change was not recommended. Grade-separated treatments such as overpasses or interchanges are long-term solutions that were evaluated as the Corridor Study explored how to meet future transportation needs.

4.8.4 Genoa Lane

Traffic safety could be improved at this location by realigning it with Airport Road and installing a traffic signal, or by a grade-separated overpass. These two long-term options were considered as part of the alternative evaluation process described in Chapter 5. The suggestion for lengthening the northbound left-turn lane was included in recommendations and costs in section 4.2, Acceleration or Deceleration Lanes, of this chapter.

4.8.5 Muller Lane

The characteristics of the U.S. 395 corridor become more suburban south of Muller Lane. Members of the public expressed the need for a gateway, or entrance, into the Minden area that would alert motorists of the need to slow down, using signs or a traffic signal. The consultant team suggested consideration of a roundabout at this site.

4.8.6 Washoe Tribal Headquarters

The Washoe Tribe of Nevada and California has requested the installation of a center turn lane on U.S. 395 at the entrance to the Tribal Headquarters office, approximately one mile south of Pinenut Road/Riverview Drive.

Figure 4-4 *Washoe Tribal Headquarters*

In addition, the Washoe Tribe has requested speed reductions in the corridor from the current speed limit of 55 mph to 45 and 35 mph. NDOT is reviewing this proposed safety improvement.

4.9 ROUNDABOUTS

Figures 4-5 through 4-8 explain some of the characteristics and benefits of roundabouts. Roundabouts are circular intersections with channelized approaches. In Figure 4-5, a green circle in the center shows where a roundabout is being built to replace a traffic circle. In a roundabout, entering traffic yields to circulating traffic. Speeds are controlled by the design, and generally range from 15 to 27 mph. Roundabouts can be single or multiple lane.

The primary benefit of roundabouts is improved safety. Single and multiple lane roundabouts have fewer crashes than signalized intersections with less severe injuries, and provide greater traffic capacity. Roundabouts are aesthetically pleasing and are sometimes used to create a gateway, or entrance, to communities.

Roundabouts and other intersection possibilities for Muller Lane were considered as alternatives for addressing long-term transportation needs in the entire corridor.

Figure 4-6 *Signalized Intersection in Olathe, Kansas before Roundabout is Installed*

4.9.1 Ironwood Drive

Participants perceived Ironwood Drive as another site for reduced speeds and a possible gateway. A suggestion to eliminate the left turn from the Ironwood Center onto U.S. 395 was made during the Field Review and was recommended for implementation. This change would likely reduce conflicts. NDOT will partner with Douglas County to work with affected parties to ensure access needs are met.

4.9.2 SR 88

A project was implemented in 2006 to modify the free-flow right-turn lane at this junction. This new design forces drivers to enter SR88 at reduced speeds. Long-term alternatives to enhance traffic flow and maximize capacity at this intersection were considered along with a roundabout.

4.9.3 Lucerne Street

Although this street is outside the study area, some charette participants suggested a traffic signal at this location. This suggestion was considered during the development of long-term alternatives.

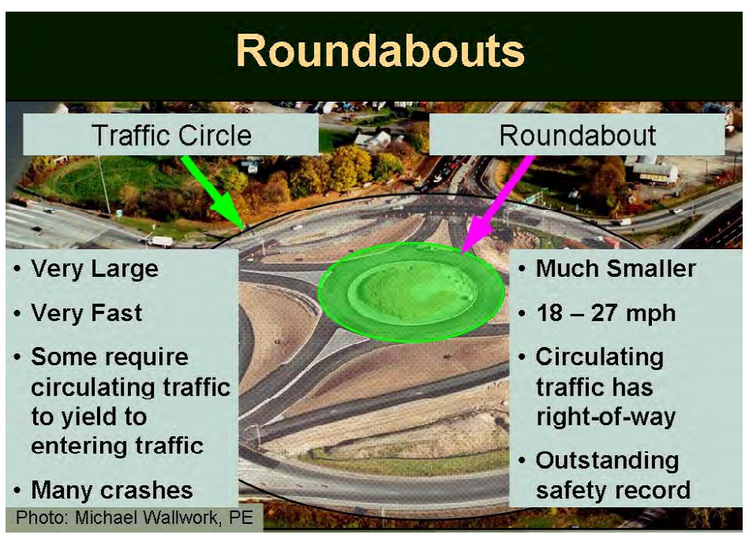


Figure 4-5 *Roundabout and Traffic Circle Features Compared*

Figure 4-7 *This Roundabout Replaces the Intersection Shown in Figure 4-6*

Figure 4-8 *Roundabout in Kings County, Washington*

4.10 IMPLEMENTATION OF NEAR-TERM IMPROVEMENTS

The Traffic Safety Charrette resulted in numerous recommendations to improve safety on U.S. 395 between U.S. 50 and the Nevada/California state line over the next three to four years. Strategies for implementation are dependent upon the type of process and available funding applicable to each recommendation.

According to NDOT procedures, Douglas County must submit an application for each individual project to NDOT. Once NDOT determines that the project application is complete, they will rank the project against other projects in the state. NDOT implements these projects as funding becomes complete. Project steps include securing funding, working with Douglas County and property owners, and scheduling the work.

Some recommended improvements qualify for the NDOT Safety Improvement program or as District II maintenance projects.

- Install median barrier from Mica Drive to Muller Lane
- Install rumble strips from Topsy Lane to Plymouth Drive
- Restripe shoulders and lanes with 8-inch wide markings
- Conduct Access Management Assessment
- Conduct U.S. 50 High-T Feasibility Evaluation
- Conduct speed limit evaluation from Muller Lane to SR 88
- Eliminate left-turn lane at Ironwood Drive
- Install slower right-turn lane at SR 88 intersection

The projects listed below must go through a Project Development Process as required by the Nevada Legislature.

- Install acceleration/deceleration lanes
- Install access improvements at Washoe Tribal Headquarters
- Install truck climbing lane from Mica Drive to Sunridge Drive
- Extend third lane past Jacks Valley Road
- Install half traffic signal at Stephanie Way (complete)
- Lengthen right-turn pocket on Johnson Lane
- Lengthen left-turn pocket at Genoa Lane
- Install third lane on northbound U.S. 395 between Jacks Valley Road and Old Clear Creek Road

5 Alternatives Development

As an important part of the corridor study, NDOT requested analysis of alternative alignments other than the existing U.S. 395 highway through Douglas County, especially an option that bypassed the towns of Minden and Gardnerville.

5.1 METHODOLOGY

The first step was to look at the traffic volume history along U.S. 395 between the south end of Carson City and the California state line at Topaz Lake. The highest traffic volume on the study corridor existed at the north end of the county in the vicinity of the commercial development, i.e., between U.S. 50 and Jacks Valley Road. The traffic volume history also showed there is a significant reduction in traffic volumes south of Gardnerville, indicating that the majority of traffic on U.S. 395 is generated by the population in the Gardnerville Ranchos area and the general population of Minden and Gardnerville. The other major sources of traffic are from the developments located in the Johnson Lane and Stephanie Way areas.

It was also noted there is a substantial flow of traffic between South Lake Tahoe and the Carson Valley. Much of this traffic is from employees working in the hotel/casino and commercial areas along the south end of Lake Tahoe.

At the California state line (Topaz Lake) the average daily traffic on U.S. 395 is only a fraction of traffic flow between Carson City and the south end of Gardnerville. The 10-year history of traffic flow at the state line shows a minimal amount of growth (3,940 ADT (average daily traffic) in 1995 and 4,600 ADT in 2005). The 2030 projected traffic at the state line is only 8,200 ADT and would indicate the existing two lanes on U.S. 395 will be adequate to accommodate this level of traffic. This data led to the conclusion that a bypass facility around Minden and Gardnerville to accommodate only the interstate traffic, including trucks, would likely not be justified within the 2030 timeframe of this study.

Following the review of the traffic volume history and the knowledge of the 2030 projected traffic, Parsons reviewed the existing U.S. 395 alignment and a number of potential alternative alignments. The analyses showed the existing U.S. 395 corridor would not operate at an acceptable level of service in 2030. The NDOT standard is LOS D or better on state highways. These findings indicated the existing corridor would have to be widened to provide additional capacity or alternative alignments would have to be provided to reduce the traffic demand on U.S. 395 or both would have to occur.

When the travel demand model runs were done for 2030, Parsons made a number of assumptions about the future road network in Carson City and Douglas County. These assumptions included the completion of the Carson freeway and the implementation of the *2007 Douglas County Transportation Plan* by 2030. With these assumptions the travel demand model results revealed the following information:

- The majority of traffic into and out of the north end of Douglas County would go through the future Carson Freeway interchange at U.S. 50. Analyses showed the interchange would fail due to the heavy traffic movements
- U.S. 395 would operate at LOS E and F in 2030 between U.S. 50 and SR 88
- U.S. 395 between SR 88 and Pinenut Road would operate at LOS A in 2030
- U.S. 395 between Pinenut Road and Palomino Lane would operate at LOS E
- U.S. 395 south of Palomino Lane would operate at LOS D or better

The next step was to explore potential alternative alignments that could absorb enough of the 2030 traffic demand to avoid or minimize improvements to the existing U.S. 395 corridor. This involved an assessment of potential alignments that included terrain, impact on developed property, tribal property (Washoe Indian Reservation) or protected environments, impact on wetlands or other waterways and other environmental considerations. The following possible alignments were evaluated and are covered in further detail in the Improvement Scenarios section in Chapter 4, Recommended Near-Term U.S. 395 Safety Improvements.

5.2 West of U.S. 395

The area west of U.S. 395 did not offer any acceptable alignment due to:

- Steep terrain south of U.S. 50 where Clear Creek Canyon would cut across any north-south alignment options
- A combination of tribal land, developed land and the Jacks Valley Wildlife Management Area that occupies the majority of the land west of U.S. 395 from U.S. 50 to the Carson River
- The Carson River flood zone covers most of the area west of U.S. 395 to Jacks Valley Road and south of the tribal land

The only feasible option would be to widen Jacks Valley Road; however, this runs along the west side of Carson Valley and is not in close proximity to the majority of existing and future development.

The disadvantages of a west side alignment outweigh any advantages and were not carried forward for further analysis.

5.3 East of U.S. 395

The research of past transportation planning studies revealed that several alignments have been studied east of U.S. 395 to provide additional connectivity between Carson City and Douglas County. In fact, one of these alignments, an extension of Heybourne Road, was used by the original Virginia & Truckee Railroad between Carson City and Minden. This alignment has been designated by Douglas County as a future transit and bicycle/pedestrian corridor. The following alignments were considered and analyzed:

- Connection between the future Carson Freeway and U.S. 395 (south of South Sunridge Drive)
- Extension of Heybourne Road from Buckeye Road to the Carson Freeway
- Extension of Vicky Lane from North Santa Barbara Drive to the Carson Freeway

Another alignment that was studied in the past was a road that bypassed Gardnerville and Minden, utilized BLM land along the foothills east of Carson Valley and connected to U.S. 395 somewhere south of Gardnerville. Although it may have merit for planning horizons beyond 2030, this alignment was not analyzed due to the low volume of traffic projected to use the facility by 2030.

No other alignments were considered due to the location of tribal land, Nature Conservancy land and existing developments.

The initial review of alternatives east of U.S. 395 focused on a roadway that would connect to the future Carson freeway near the north end of the Edmonds Sports Complex. It would then follow the existing Bigelow Drive alignment south along the Northern Nevada Correctional Center property and then along the east and south sides of the Sunridge Golf Club. South of the golf club, the proposed roadway would swing west and tie into U.S. 395 in the vicinity of the existing South Sunridge Drive/ U.S. 395 intersection. This alignment became less feasible when it was discovered that the Nature Conservancy had purchased the land between the golf club and the Carson River. In fact, the Nature Conservancy owns land on both sides of the Carson River from the north end of the golf club to a point just north of Stephanie Way. Moving the alignment further east to go around the Nature Conservancy property would put it on top of the Heybourne Road alignment, thus reducing its attractiveness as an alternative to U.S. 395.

Figure 5-1 illustrates the boundaries of the Nature Conservancy, Washoe Tribal and Jacks Valley Wildlife Management properties. It should be noted that a majority of the Nature Conservancy property lies within the Carson River flood zone area.

The Heybourne Road extension was analyzed as a two-lane and four-lane road and showed promise as an alternate connection between Douglas County and Carson City. It did not, however, absorb enough traffic to show significant improvement to U.S. 395. The Vicky Lane extension showed similar promise as a connection, but not to the benefit of U.S. 395. The extension of Heybourne Road would have to cross the Carson River including a wide swath of flood plain, as well as a portion of the Northern Nevada Correctional Center property. The Vicky Lane crossing of the Carson River could occur in an area with a narrower flood zone; however, it would also have to cross the correctional center property to connect to the Carson Freeway or a local city street.

In order for Heybourne Road or Vicky Lane to attract enough traffic to be beneficial to U.S. 395, they would have to connect to the Carson Freeway at a new interchange. The only possible location for a new interchange

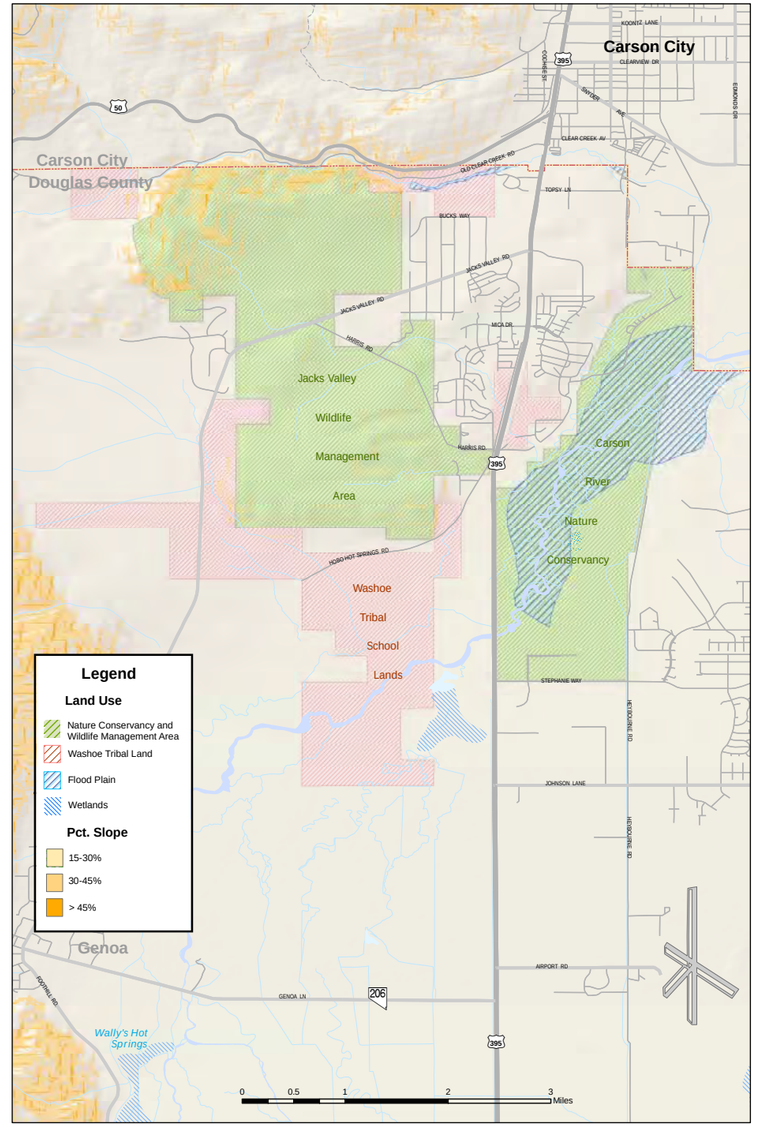


Figure 5-1 *Land Use Constraints, including Nature Conservancy Property Boundaries*

that did not impact Washoe Tribal Land or the Edmonds Sports Complex would be south of Clearview Drive where it crosses the future freeway alignment. This approach would impact approximately 20 private properties along the west side of South Edmonds Drive.

While the extension of Heybourne Road or Vicky Lane would not provide enough traffic relief to avoid capacity improvements to U.S. 395, these roads do offer additional connectivity between Carson City and Douglas County.

5.4 Improvement Scenarios for 2030

After exploring possible alternative alignments, it was determined the majority of the 2030 traffic would need to be served on an improved U.S. 395 Corridor. Corridor improvements were identified based on the following objectives:

- Be responsive to public suggestions and concerns
- Provide a safe highway environment
- Minimize congestion and delay
- Provide user benefits for a reasonable investment
- Minimize impacts to the environment, quality of life, right-of-way requirements, floodplain/drainage, etc.

Responding to these objectives resulted in the identification of potential improvements throughout the corridor. Figure 5-2 identifies the potential corridor improvements, grouped into 12 geographic segments.

5.4.1 Segment 1 – U.S. 395 – U.S. 50 to Jacks Valley Road

U.S. 395 south of U.S. 50 to Jacks Valley Road would be developed to a four-lane freeway with frontage roads (two lanes per direction). Two-lane direct connector ramps would be used to connect the new freeway section to the Carson Freeway. The new freeway would be elevated and have overpasses at Old Clear Creek Road and Topsy Lane and an interchange with Jacks Valley Road over the freeway. Two-lane, one-way frontage roads would intersect the cross streets and be controlled by traffic signals or roundabouts.

Figure 5-3 illustrates the preliminary design for the recommended alternative of the U.S. 395/U.S. 50 interchange with ramps connecting the future U.S. 395 bypass to the improved U.S. 395 south of U.S. 50. Figure 5-4 illustrates the profile of the existing and proposed facilities. Figure 5-5 illustrates another alternative which provides direct connectors between the U.S. 395 bypass and the new U.S. 395 south of U.S. 50.

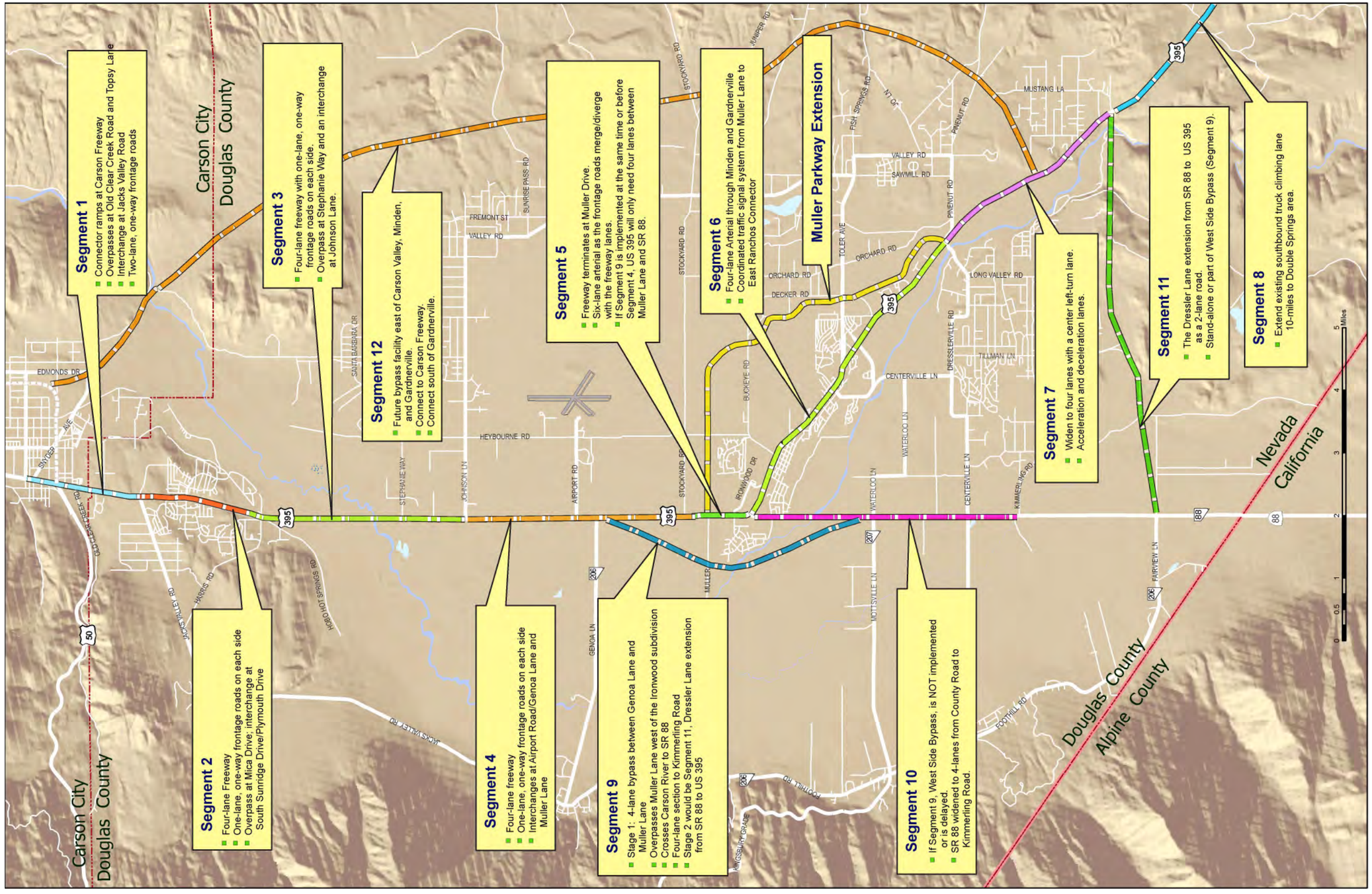


Figure 5-2 *U.S. 395 Corridor Segment Improvements Needed by 2030*

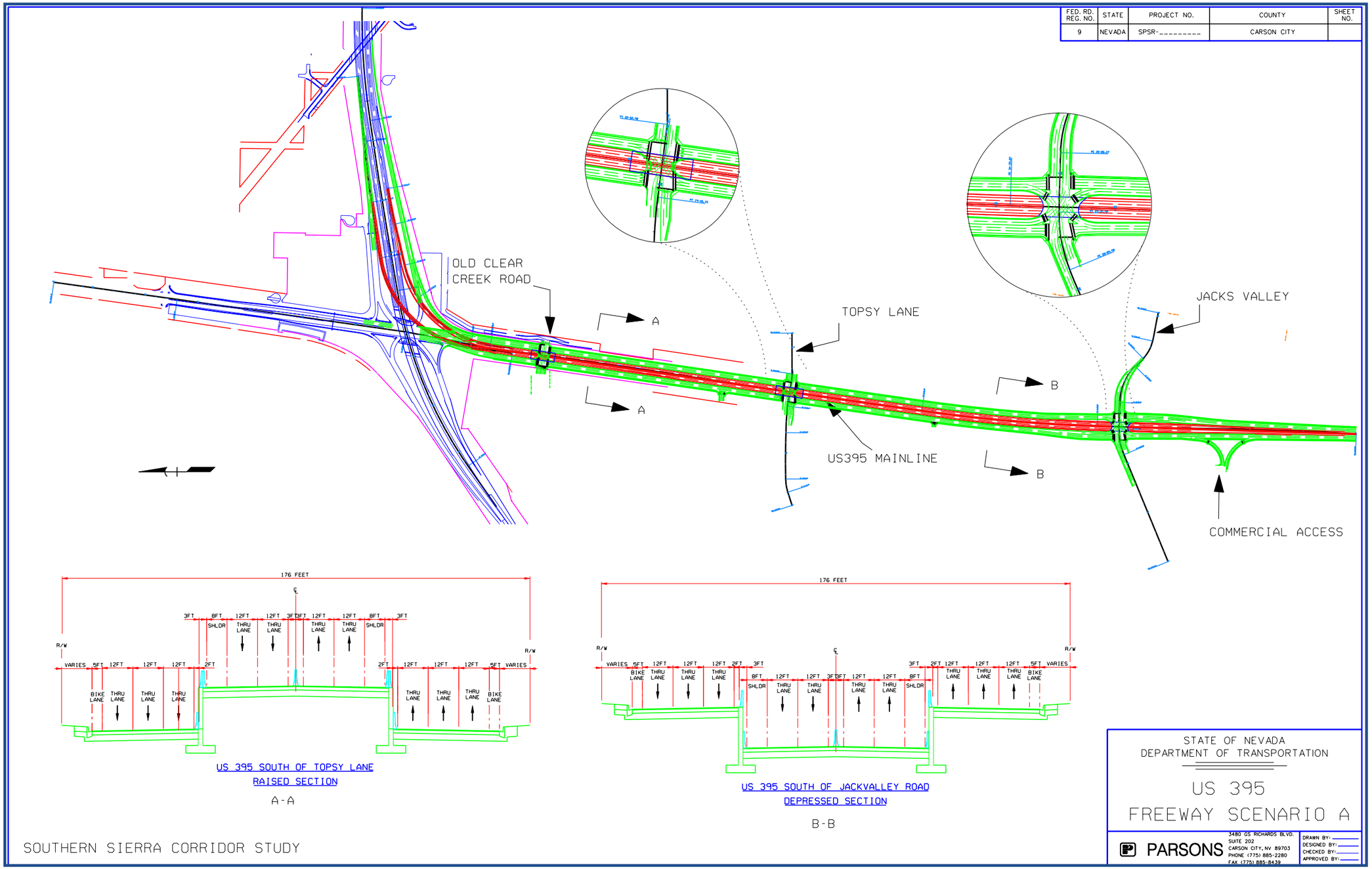


Figure 5-3 *U.S. 395/U.S. 50 Interchange Recommended Alternative*

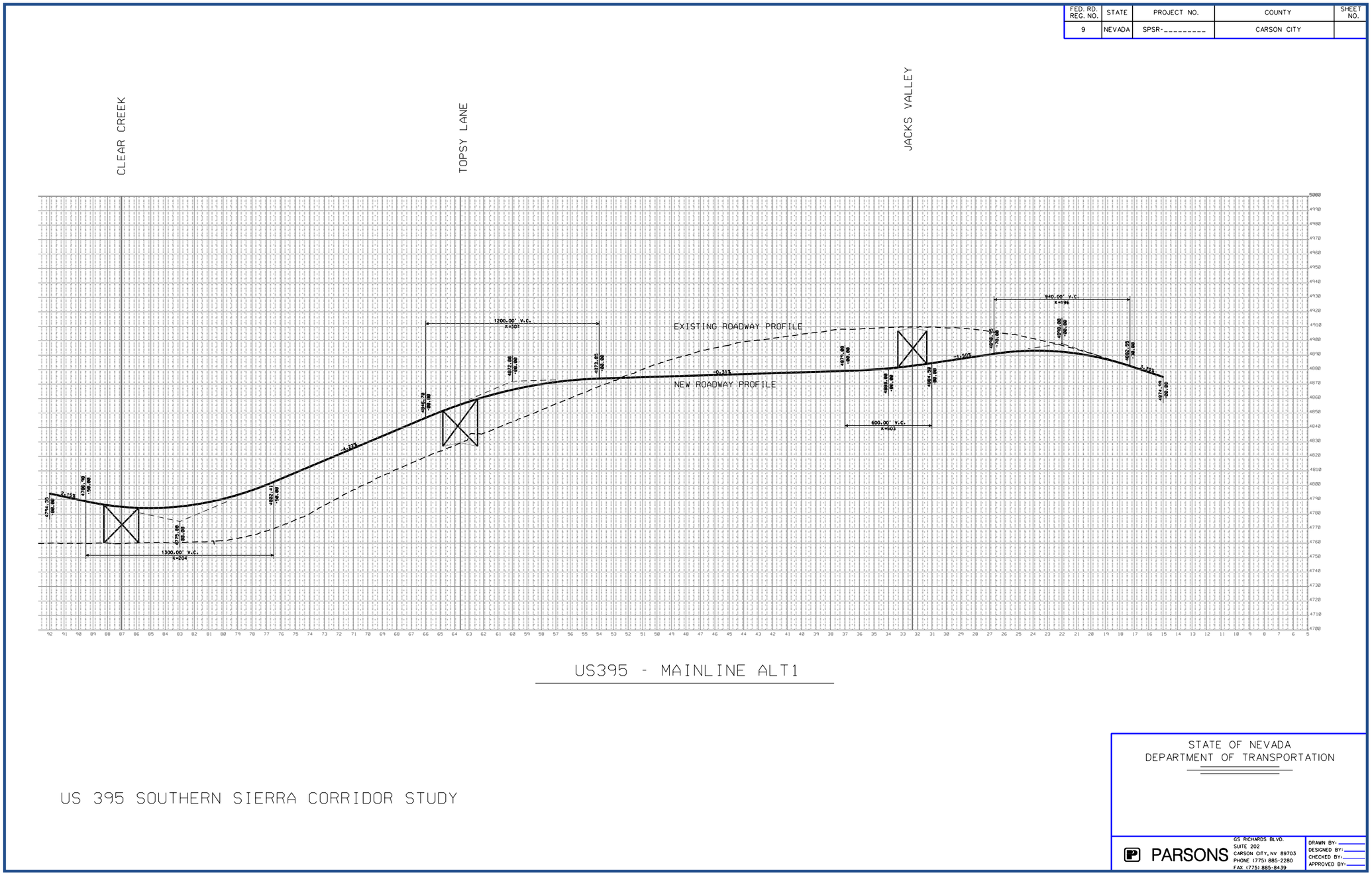


Figure 5-4 *U.S. 395 Mainline Existing and Proposed Facilities*

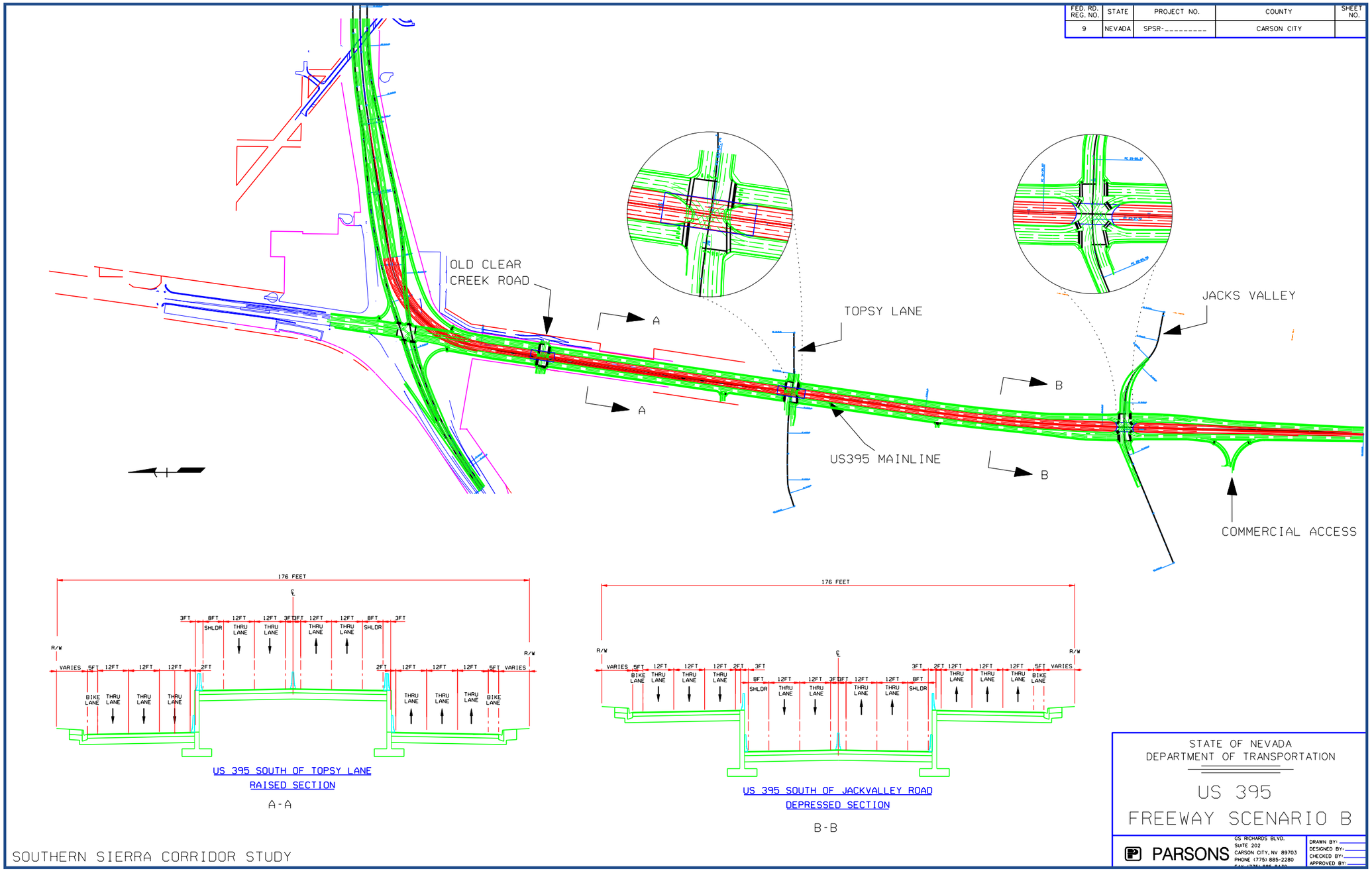


Figure 5-5 *U.S. 395 Scenario B*

5.4.2 Segment 2 – U.S. 395 – Jacks Valley Road to South of Plymouth Drive/South Sunridge Drive

U.S. 395 would be a four-lane freeway with one-lane, one-way frontage roads on each side. The freeway would have an overpass at Mica Drive and a potential interchange at South Sunridge Drive/Plymouth Drive. The frontage roads would intersect the cross streets and be controlled by traffic signals or roundabouts.

5.4.3 Segment 3 – U.S. 395 – South of Plymouth Drive/South Sunridge Drive to South of Johnson Lane

U.S. 395 would be a four-lane freeway with one-lane, one-way frontage roads on each side. The freeway would have an overpass at Stephanie Way and an interchange at Johnson Lane. The frontage roads would intersect the cross streets and be controlled by traffic signals or roundabouts.

5.4.4 Segment 4 – U.S. 395 – South of Johnson Lane to Muller Lane

U.S. 395 would be a four-lane freeway with one-lane, one-way frontage roads on each side. The freeway would have interchanges at Airport Road/Genoa Lane and Muller Lane. The frontage roads would intersect the cross streets and be controlled by traffic signals or roundabouts.

5.4.5 Segment 5 – U.S. 395 - Muller Lane to Junction of SR 88

U.S. 395 freeway would terminate at Muller Lane and become a six-lane arterial where the frontage roads merge/diverge with the freeway lanes. If Segment 9 is implemented at the same time or before Segment 4, U.S. 395 will only need four lanes between Muller Lane and SR 88.

5.4.6 Segment 6 – U.S. 395 – Junction of SR 88 to Pinenut Road

U.S. 395 would remain as a four-lane arterial through the towns of Minden and Gardnerville. A coordinated traffic signal system would be implemented to include the existing and future traffic signals between Muller Lane and a future connection from the East Ranchos area at U.S. 395.

5.4.7 Segment 7 – U.S. 395 – Pinenut Road to South of Palomino Lane

U.S. 395 would be widened to four lanes with a center left-turn lane. Acceleration and deceleration lanes for private property access may be implemented at selected locations.

5.4.8 Segment 8 – U.S. 395 – Extend Truck Climbing Lane to Double Springs

The existing southbound truck climbing lane would be extended to the Double Springs area.

5.4.9 Segment 9 – U.S. 395 – West Side Bypass (2 Stages)

Stage 1 would develop a four-lane bypass facility that intersects as a half-interchange with U.S. 395 between Airport Road/Genoa Lane and Muller Lane, overpasses Muller Lane with an alignment west of the Ironwood subdivision, crosses the Carson River and connects to SR 88 as a free flow facility continuing the four-lane section to Kimmerling Road. Stage 2 would be Segment 11, Dressler Lane extension from SR 88 to U.S. 395.

5.4.10 Segment 10 – SR 88 – County Road to Kimmerling Road

If Segment 9, West Side Bypass, is not implemented or is delayed, SR 88 will need to be widened to four lanes from County Road to Kimmerling Road.

5.4.11 Segment 11 – Dressler Lane Extension – SR 88 to U.S. 395

The Dressler Lane extension from SR 88 to U.S. 395 as a two-lane road could be implemented as a stand alone project or as part of the west side bypass described as Segment 9.

5.4.12 Segment 12 – East Side Bypass (Future Project)

An alignment corridor has been identified that would create a future bypass facility east of Carson Valley and the towns of Minden and Gardnerville. The proposed bypass would connect to a future interchange on the Carson Freeway (same location mentioned above for the Heybourne Road and Vicky Lane extensions into Carson City). The bypass alignment would primarily utilize the BLM land along the foothills east of Carson Valley and tie into U.S. 395 at a point south of Gardnerville.

5.5 Development and Evaluation of Improvement Scenarios

A number of improvement scenarios were developed and analyzed using the segments described above. The U.S. 395/Douglas County travel demand model was used to generate the future traffic volumes and a roadway segment level of service was determined from traffic volume threshold table. The following is a description of each scenario along with the positive and negative aspects of the scenario.

5.5.1 Planned Improvements (No Build)

This scenario assumes the current Transportation Master Plan for Carson City (2004) and Douglas County Transportation Plan will be implemented by 2030; however, no other improvements will be made. Figure 5-6 shows the planned improvements according to the draft *2007 Douglas County Transportation Plan.* Figure 5-7 shows the planned improvements according to the *Carson City Area 2004 Transportation Plan.*

This scenario is also considered to be a No Build Alternative, meaning that no new improvements are considered beyond the current Carson City and Douglas County Transportation Plans.

This includes the completion of the Carson Freeway from U.S. 50 (east of downtown Carson City) to U.S. 50 at the south end of Carson City, the widening of Fairview Drive to four lanes in Carson City from the new freeway to U.S. 395, the addition of a third northbound lane on U.S. 395 from Jacks Valley Road to U.S. 50 and the following improvements in Douglas County.

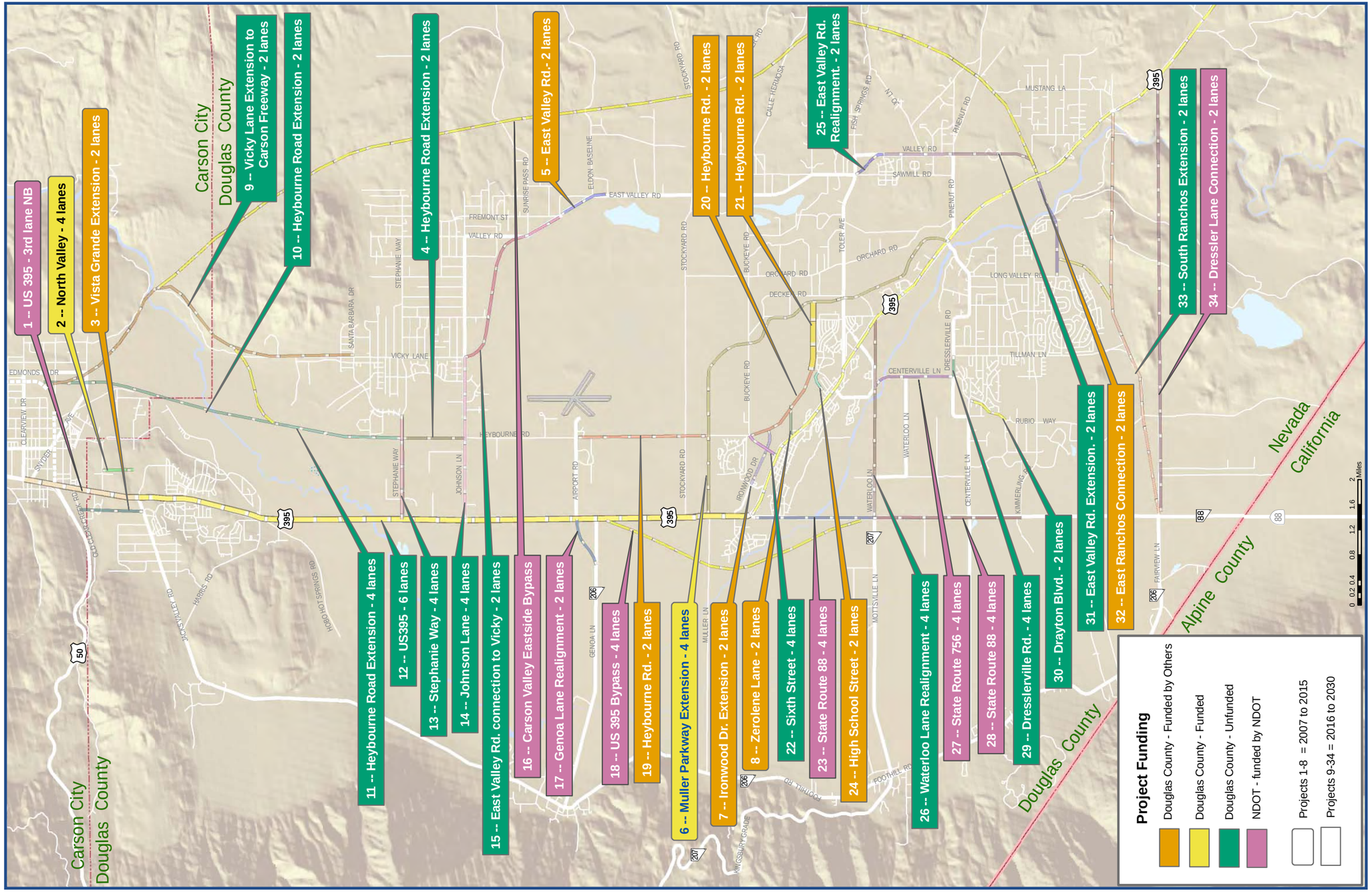


Figure 5-6 *Planned Improvements from the Draft 2007 Douglas County Transportation Plan*

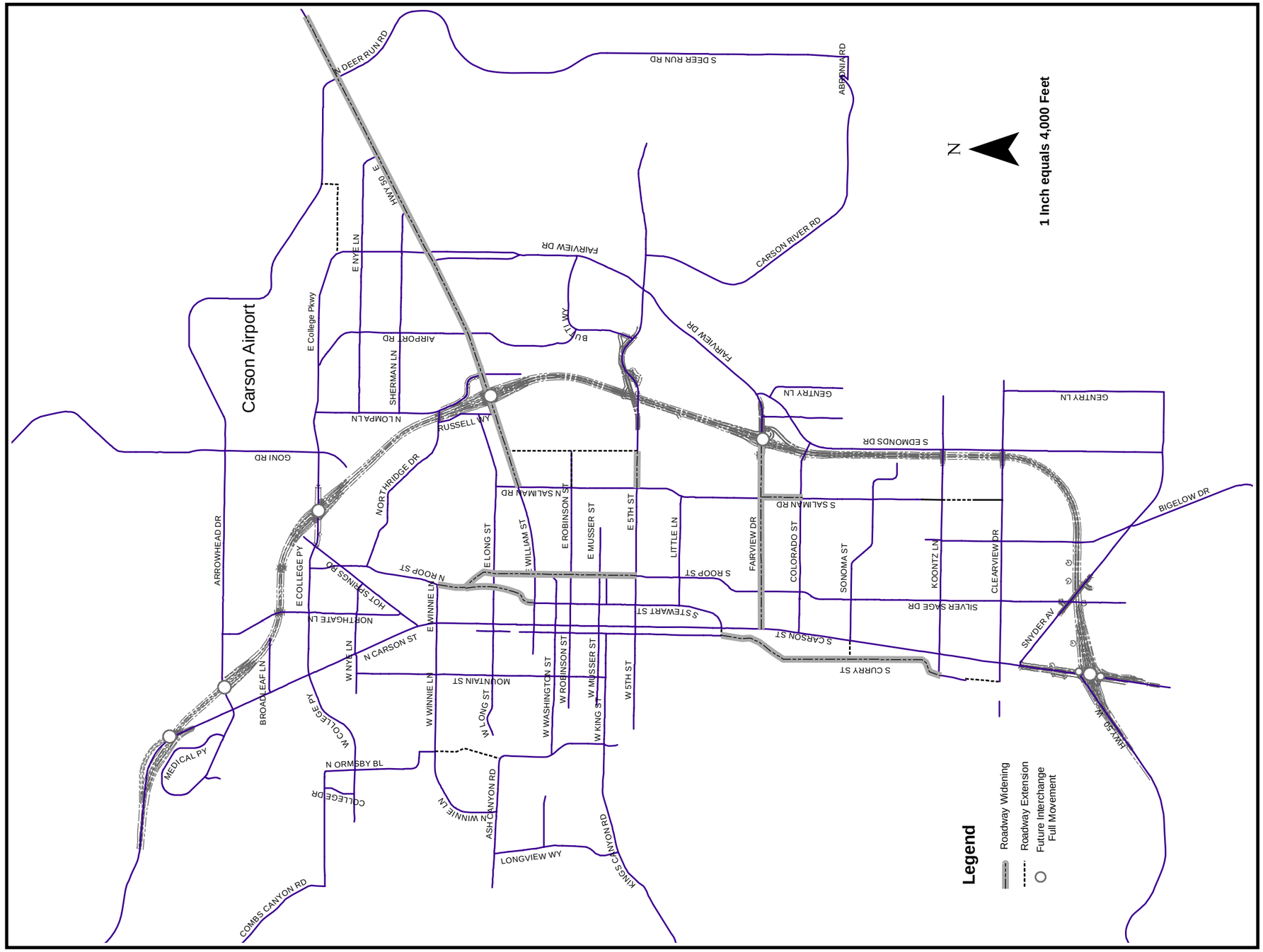


Figure 5-7 *Carson City Area 2004 Transportation Plan Planned Improvements*

- Heybourne Road would be extended from Airport Road to Buckeye Road
- Muller Lane would be extended from U.S. 395 north of Minden to U.S. 395 south of Gardnerville
- Waterloo Lane (four-lane) connection between SR 88 and U.S. 395
- Ironwood Drive connection between Lucerne Street and Muller Lane
- Zerolene Road connection between U.S. 395 and Ironwood Drive
- Vicky Lane connection between Johnson Lane and East Valley Road
- East Valley Road would be realigned south of Fish Springs Road
- Vista Grande Boulevard connection between Old Clear Creek Road and Jacks Valley Road
- Lucerne Street connection between Muller Lane and U.S. 395
- Stephanie Lane would be widened to four lanes between U.S. 395 and Santa Barbara Drive
- Johnson Lane would be widened to four lanes between U.S. 395 and Vicky Lane
- Jacks Valley Road would be widened to four lanes between U.S. 395 and Shawnee Drive
- Sixth Street would be widened to four lanes between Ironwood Drive and Heybourne Road
- East Valley Road would be upgraded to a two-lane major collector between Johnson Lane and Toler Lane
- SR 756 (Centerville Lane/Gilman Lane) would be upgraded to a three-lane minor arterial
- Drayton Boulevard would be extended between Centerville Road and Kimmerling Road
- SR 88 would be widened to four lanes from U.S. 395 to Waterloo Lane
- Various intersection improvements would be completed, i.e., widening, traffic signals, as needed

ADVANTAGES

- Carson Freeway would be completed to U.S. 50 (Spooner Junction)
- 2030 traffic volumes on U.S. 395 would be lower than 2005 levels through Minden and Gardnerville

DISADVANTAGES

- U.S. 395 would operate at LOS E and F from U.S. 50 to Ironwood Drive and LOS D and E south of Pinenut Road/Riverview Drive.
- Douglas County roads would operate at LOS C or better except for Riverview Drive between U.S. 395 and Dresslerville Road which is LOS F and D
- Vista Grande Bouelvard would operate at LOS F between Old Clear Creek Road and Jacks Valley Road

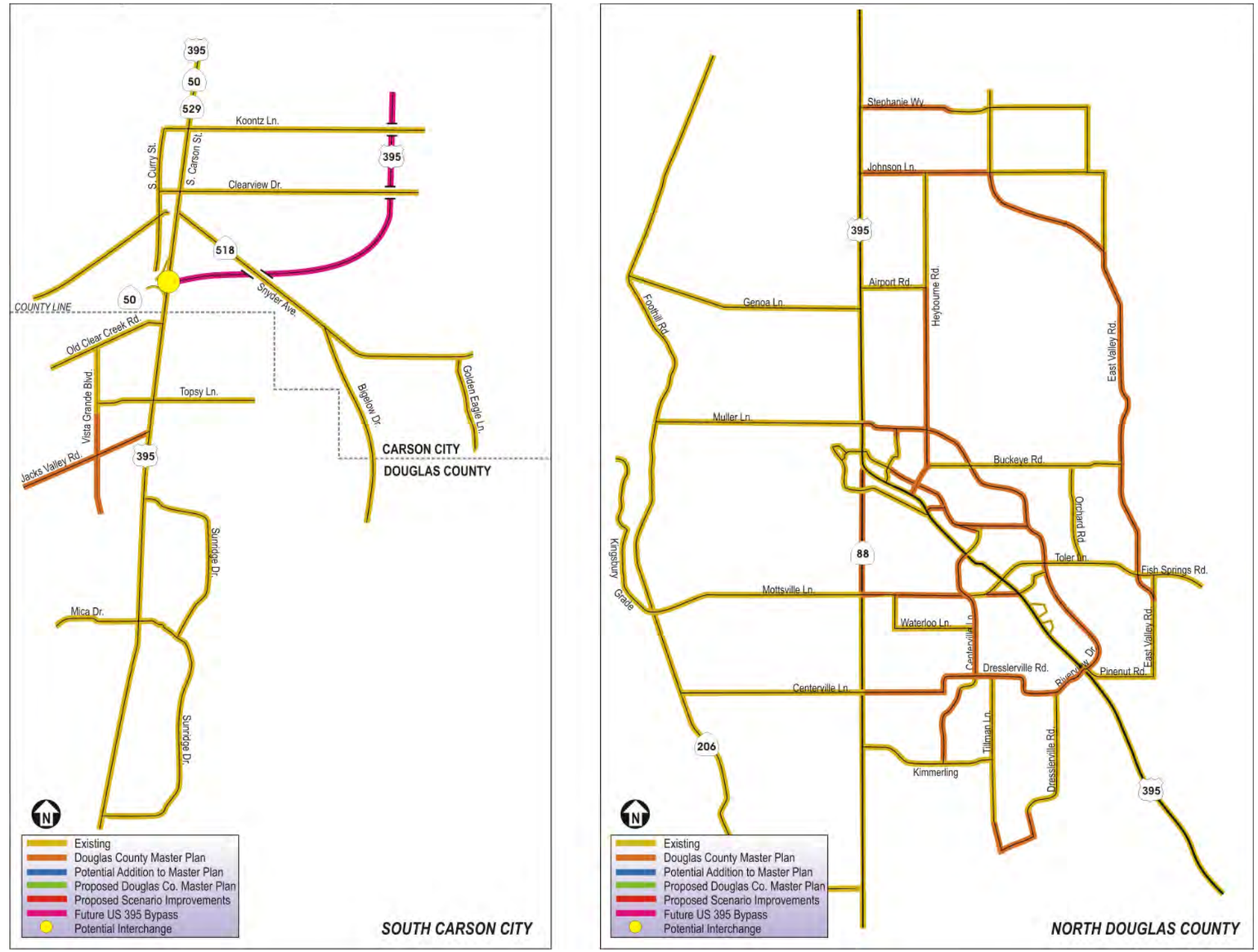


Figure 5-8 *Current Douglas County/Carson City Master Planned Improvements*

- Topsy Lane would operate at LOS F between U.S. 395 and Lyla Lane

5.5.2 Heybourne Road Extension – Two Lanes

Scenario 1 assumes all the improvements from the Planned Improvements scenario will be in place plus the extension of Heybourne Road as a two-lane road from Johnson Lane to a new interchange on the Carson Freeway. The extension would roughly follow the old Virginia & Truckee Railroad alignment (privately owned), require a new bridge over the Carson River, tie into Bigelow Drive for a short distance before deviating to an alignment west of the state prison, and connect to the Carson Freeway at a future interchange. This includes proposed additions from the *2007 Douglas County Transportation Plan* as shown in the Advantages section below:

ADVANTAGES

- Heybourne Road extension (two lanes) would provide additional access into and out of Douglas County parallel to U.S. 395 and between Johnson Lane and Stephanie Way
- Carson Freeway would be completed to U.S. 50 (Spooner Junction)
- 2030 traffic volumes on U.S. 395 would be lower than 2005 levels through Minden and Gardnerville
- Access to the Ranchos area via East Ranchos connection to U.S. 395 and SR 88 widening would be improved
- East Valley Road south of Pinenut Road would be extended to U.S. 395 where the East Ranchos connector intersects U.S. 395
- Genoa Lane and Airport Road would be realigned
- Dressler Lane extension between SR 88 and U.S. 395 would provide an alternate route allowing large trucks and through traffic to bypass the Gardnerville/Minden downtown areas
- Majority of county roads would operate at LOS C or better

DISADVANTAGES

- U.S. 395 would operate at LOS E and F between U.S. 50 and Ironwood Drive
- U.S. 395 would operate at LOS E south of Riverview Drive
- Heybourne Road extension (two lanes) would operate at LOS F for most of the alignment north of Stephanie Way
- Heybourne Road extension would require right-of-way across privately owned land, a new bridge across the Carson River, a new interchange on the Carson Freeway and will traverse environmentally sensitive wetlands in the Carson River basin area
- Vista Grande Boulevard would operate at LOS F between Old Clear Creek Road and Jacks Valley Road
- Topsy Lane would operate at LOS F between U.S. 395 and Lyla Lane

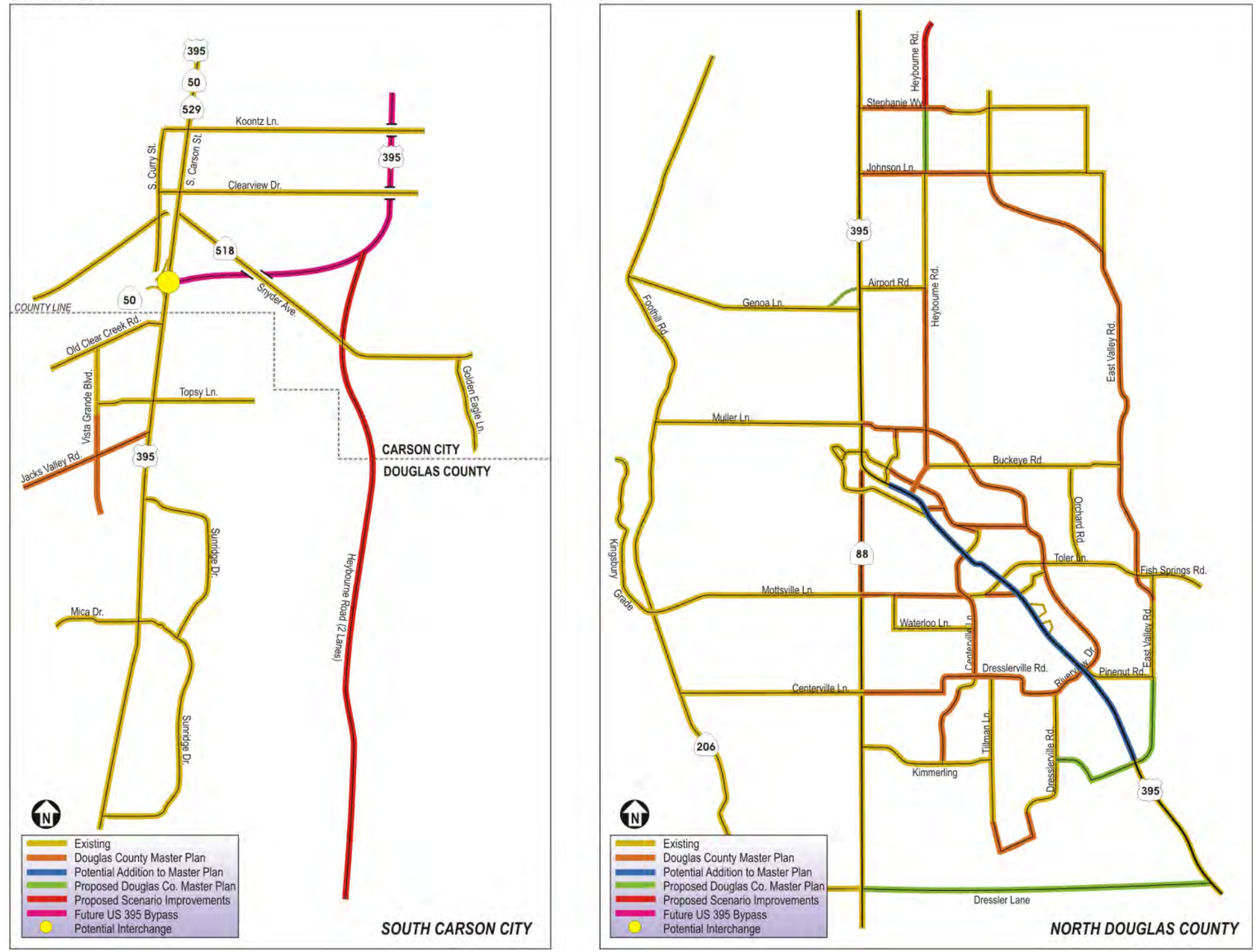


Figure 5-9 *Scenario 1—Heybourne Road Extension—2 Lanes*

5.5.3 Heybourne Road Extension – Four Lanes

Scenario 1A is the same as the Heybourne Road two-lane scenario but with Heybourne Road as a four-lane road. This scenario also includes the proposed additions to the *2007 Douglas County Transportation Plan*, as well as those roadway improvements shown in the Advantages section below.

ADVANTAGES

- Heybourne Road Extension would provide additional access into and out of Douglas County parallel to U.S. 395 at LOS D or better and between Johnson Lane and Stephanie Way
- Carson Freeway would be completed to U.S. 50 (Spooner Junction)
- 2030 traffic volumes on U.S. 395 would be lower than 2005 levels through Minden and Gardnerville
- Genoa Lane and Airport Road would be realigned
- Access to the Ranchos area via East Ranchos connection to U.S. 395 and SR 88 widening would be improved
- Dressler Lane extension between SR 88 and U.S. 395 would provide an alternate route allowing large trucks and through traffic to bypass the Gardnerville/Minden downtown areas
- East Valley south of Pinenut Road would be extended to U.S. 395 where the East Ranchos connector intersects U.S. 395
- Majority of county roads would operate at LOS C or better

DISADVANTAGES

- U.S. 395 would operate at LOS E and F between U.S. 50 and Ironwood Drive
- U.S. 395 would operate at LOS E south of Riverview Drive
- Heybourne Road extension would require right-of-way across privately owned land, a new bridge across the Carson River, a new interchange on the Carson Freeway and will traverse environmentally sensitive wetlands in the Carson River basin area
- Heybourne Road would operate at LOS D between the Carson Freeway and north of Stephanie Way
- Vista Grande Boulevard would operate at LOS F between Old Clear Creek Road and Jacks Valley Road
- Topsy Lane would operate at LOS E between U.S. 395 and Lyla Lane
- Riverview Drive would operate at LOS D west of U.S. 395

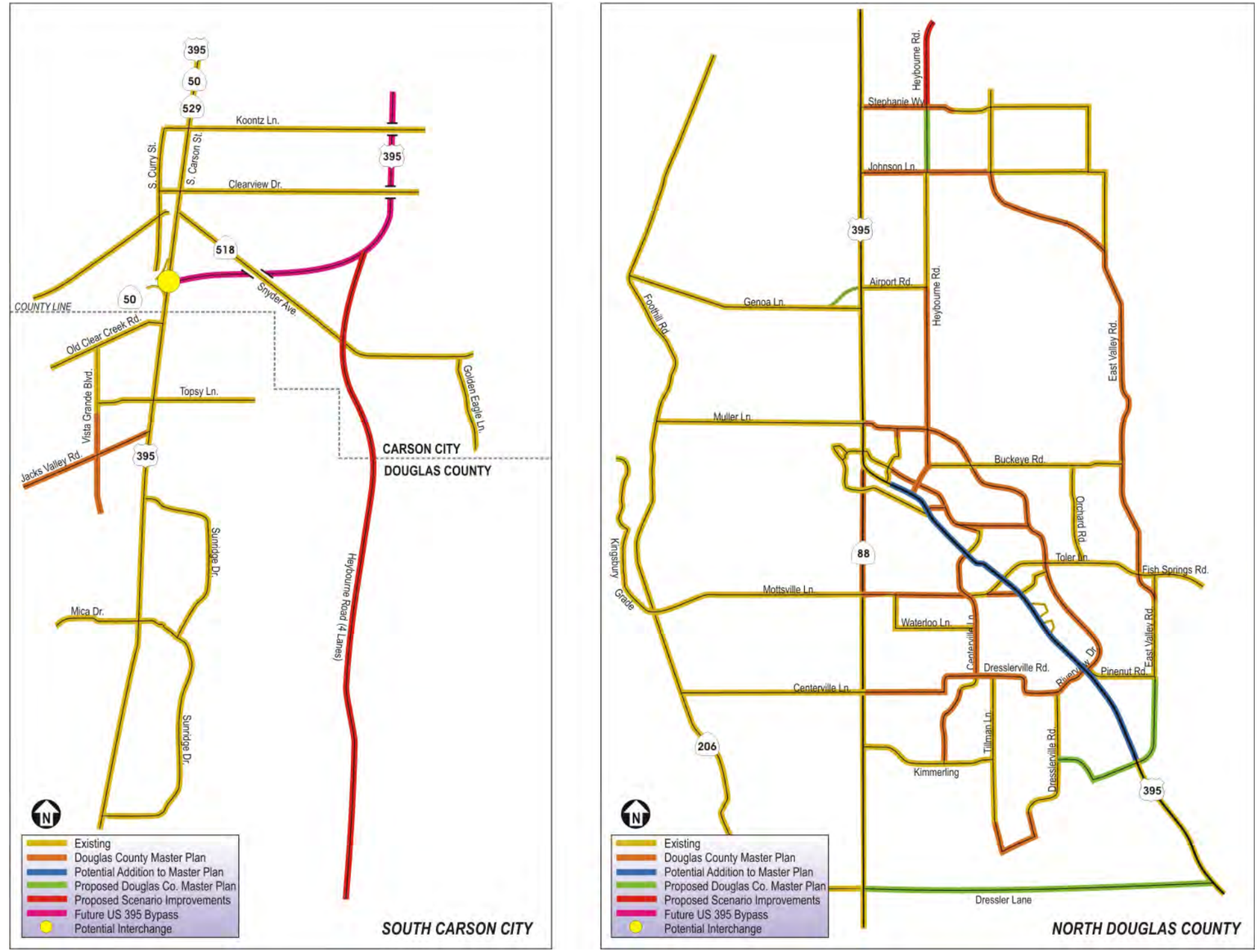


Figure 5-10 *Scenario 1A—Heybourne Road Extension—4 Lanes*

5.5.4 Vicky Lane Extension – Two Lanes

Scenario 2 assumes all the improvements from the Planned Improvements scenario will be in place plus the extension of Vicky Lane, as a two-lane road, north of Santa Cruz Drive to a new interchange on the Carson Freeway. This alignment could follow the existing dirt road that provides access to several residential properties near the south side of the Carson River. It would require a new bridge across the Carson River and would cross a portion of the state prison property to access a new interchange on the Carson Freeway. This scenario also includes the proposed additions to the *2007 Douglas County Transportation Plan*.

ADVANTAGES

- Vicky Lane extension (two lanes) would provide additional access into and out of Douglas County parallel to U.S. 395
- Carson Freeway would be completed to U.S. 50 (Spooner Junction)
- 2030 traffic volumes on U.S. 395 would be lower than 2005 levels through Minden and Gardnerville
- Heybourne Road extension between Johnson Lane and Stephanie Way
- Access to the Ranchos area via East Ranchos connection to U.S. 395 and SR 88 widening would be improved
- Dressler Lane extension between SR 88 and U.S. 395 would provide an alternate route allowing large trucks and through traffic to bypass the Gardnerville/Minden downtown areas
- Extension of East Valley south of Pinenut Road to U.S. 395 where the East Ranchos connector intersects U.S. 395
- Genoa Lane and Airport Road connector
- Majority of county roads would operate at LOS C or better

DISADVANTAGES

- U.S. 395 would operate at LOS E and F between U.S. 50 and Ironwood Drive
- U.S. 395 would operate at LOS E south of Riverview Drive
- Vicky Lane extension (two lanes) would operate at LOS E and F for most of the alignment north of Stephanie Way
- Vicky Lane extension would require right-of-way across privately owned land, a new bridge across the Carson River, a new interchange on the Carson Freeway and will traverse environmentally sensitive wetlands in the Carson River basin area
- Vista Grande Boulevard would operate at LOS F between Old Clear Creek Road and Jacks Valley Road
- Topsy Lane would operate at LOS E between U.S. 395 and Lyla Lane
- Riverview Drive would operate at LOS D west of U.S. 395

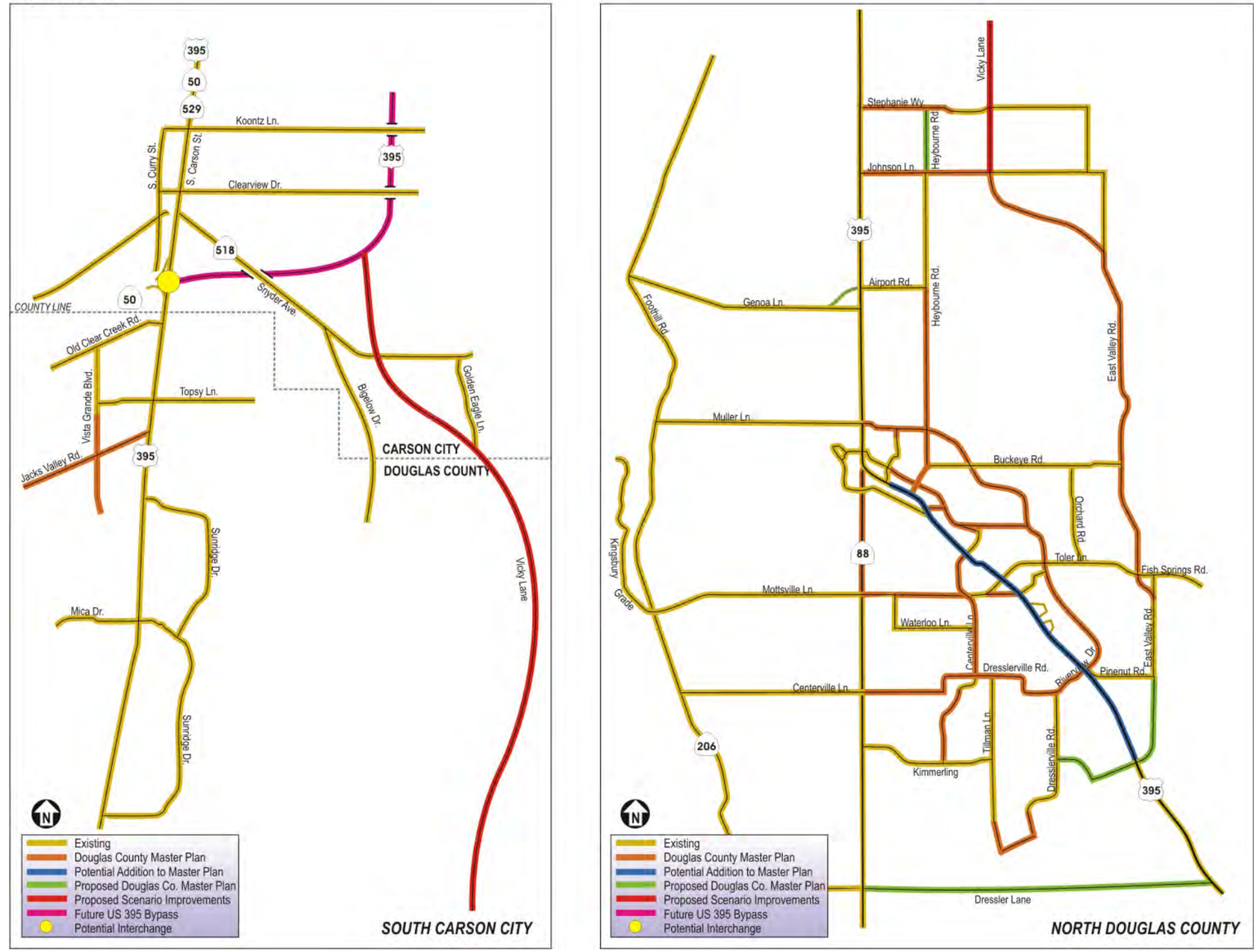


Figure 5-11 *Scenario 2—Vicky Lane Extension—2 Lanes*

5.5.5 Partial Planned Improvements

Scenario 3 includes only select improvements from the 2030 Planned Improvement scenario. It also includes U.S. 395 as a four-lane freeway with frontage roads between U.S. 50 and Mica Drive and a four-lane freeway (no frontage roads) between Mica Drive and Muller Lane. The following improvements **were *not* included** in this scenario:

1. Waterloo Lane extension – four lanes between SR 88 and U.S. 395
2. SR 88 – four lanes between County Road and Waterloo Lane
3. Muller Lane – four lanes between Heybourne Road and Buckeye Road

ADVANTAGES AND DISADVANTAGES

- U.S. 395 would operate at LOS D or better between U.S. 50 and Muller Lane
- U.S. 395 would operate at LOS F between Muller Lane and Ironwood Drive
- U.S. 395 would operate at LOS E between Pinenut Road and Palomino Lane
- SR 88 would operate at LOS D between U.S. 395 and Waterloo Lane and between Centerville Lane and Kimmerling Road
- Vista Grande Boulevard would operate at LOS F between Old Clear Creek Road and Topsy Lane
- Topsy Lane would operate at LOS F between U.S. 395 and Lyla Lane
- Johnson Lane would operate at LOS D between Heybourne Road and Nowlin Road
- Buckeye Road would operate at LOS D east of Heybourne Road
- Heybourne Road would operate at LOS D between Sixth Street and Zerolene Road
- Riverview Drive would operate at LOS D between U.S. 395 and Dresslerville Road
- Lantana Drive would operate at LOS E north of Bougainvillea Drive
- Frontage roads would allow for bicycle travel adjacent to the freeway and serve as parallel routes when incidents close the freeway

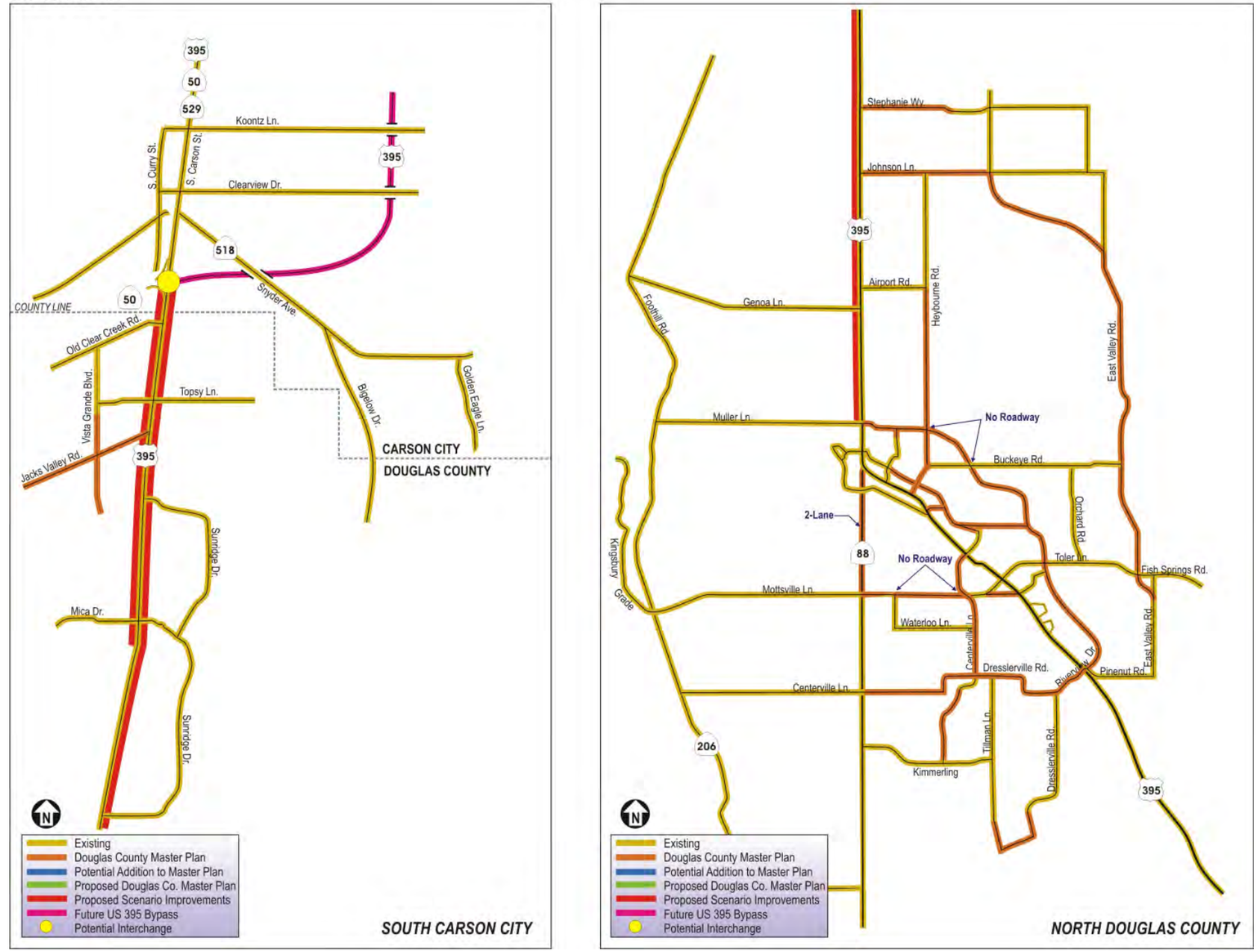


Figure 5-12 *Scenario 3—Partial Planned Improvements*

5.5.6 South Ranchos Connector to U.S. 395

Scenario 4 assumes all the improvements from the Planned Improvements scenario will be in place. U.S. 395 will be a freeway facility with frontage roads and interchanges from U.S. 50 to Muller Lane. This scenario also includes the proposed additions to the Transportation Element of the Douglas County Master Plan; however, the Dressler Lane extension is replaced with the South Ranchos connector. This road would connect SR 88 to the East Ranchos connector road.

ADVANTAGES

- U.S. 395 could be upgraded to a freeway-level facility with minimal right-of-way and environmental impacts
- U.S. 395 would operate at LOS D or better between U.S. 50 and south of Mica Drive
- South Ranchos connector and SR 88 would provide an alternate route allowing large trucks and through traffic to bypass the Gardnerville/Minden downtown areas
- Carson Freeway would be completed to U.S. 50 (Spooner Junction)
- 2030 traffic volumes on U.S. 395 would be lower than 2005 levels through Minden and Gardnerville
- Access to the Ranchos area via East Ranchos connection to U.S. 395 and SR 88 widening would be improved
- Frontage roads would allow for bicycle travel adjacent to the freeway and serve as parallel routes when incidents close the freeway

DISADVANTAGES

- U.S. 395 would operate at LOS E and F between Mica Drive and Johnson Lane
- U.S. 395 would operate at LOS F between Muller Lane and Ironwood Drive
- U.S. 395 would operate at LOS E south of Riverview Drive
- Riverview Drive would operate at LOS D west of U.S. 395
- SR 88 and U.S. 395 intersection would need improvement to avoid severe congestion

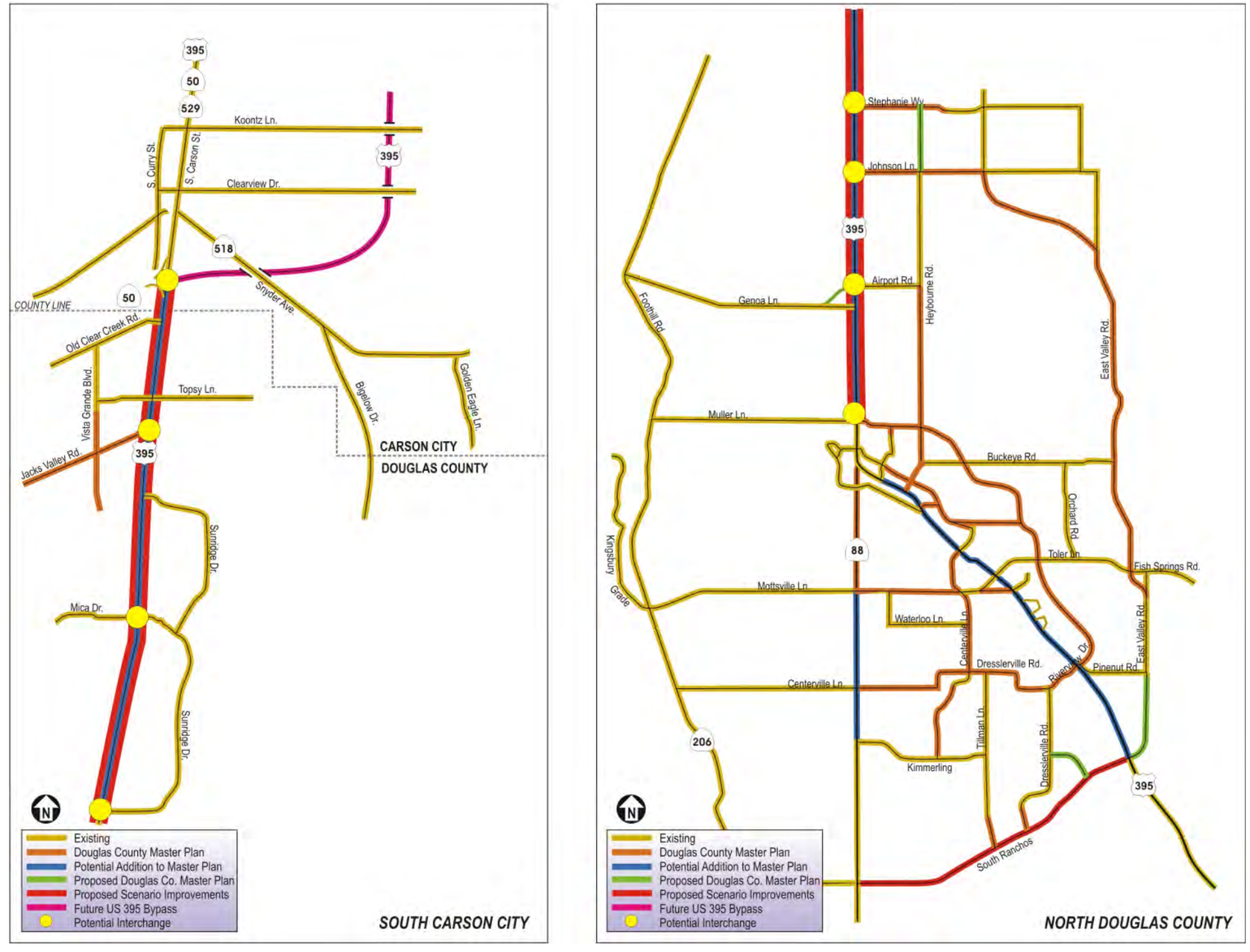


Figure 5-13 *Scenario 4—South Ranchos Connector to U.S. 395*

5.5.7 U.S. 395 Freeway with Dressler Lane Connector to U.S. 395

Scenario 5 assumes all the improvements from the Planned Improvement scenario will be in place plus U.S. 395 would be constructed as a freeway facility with frontage roads and interchanges between U.S. 50 and Muller Lane. This scenario also includes the proposed additions to the *2007 Douglas County Transportation Plan*.

ADVANTAGES

- U.S. 395 could be upgraded to a freeway-level facility with minimal right-of-way and environmental impacts
- U.S. 395 would operate at LOS D or better between U.S. 50 and Muller Lane
- Dressler Lane connector and SR 88 would provide an alternate route allowing large trucks and through traffic to bypass the Gardnerville/Minden downtown areas
- Carson Freeway would be completed to U.S. 50 (Spooner Junction)
- 2030 traffic volumes on U.S. 395 would be lower than 2005 levels through Minden and Gardnerville
- Access to the Ranchos area via East Ranchos connection to U.S. 395 and SR 88 widening would be improved
- Frontage roads would allow for bicycle travel adjacent to the freeway and serve as parallel routes when incidents close the freeway

DISADVANTAGES

- U.S. 396 would operate at LOS E and F between Mica Drive and Johnson Lane
- U.S. 395 would operate at LOS F between Muller Lane and Ironwood Drive
- U.S. 395 would operate at LOS E south of Riverview Drive
- SR 88 and U.S. 395 intersection would need improvement to avoid severe congestion

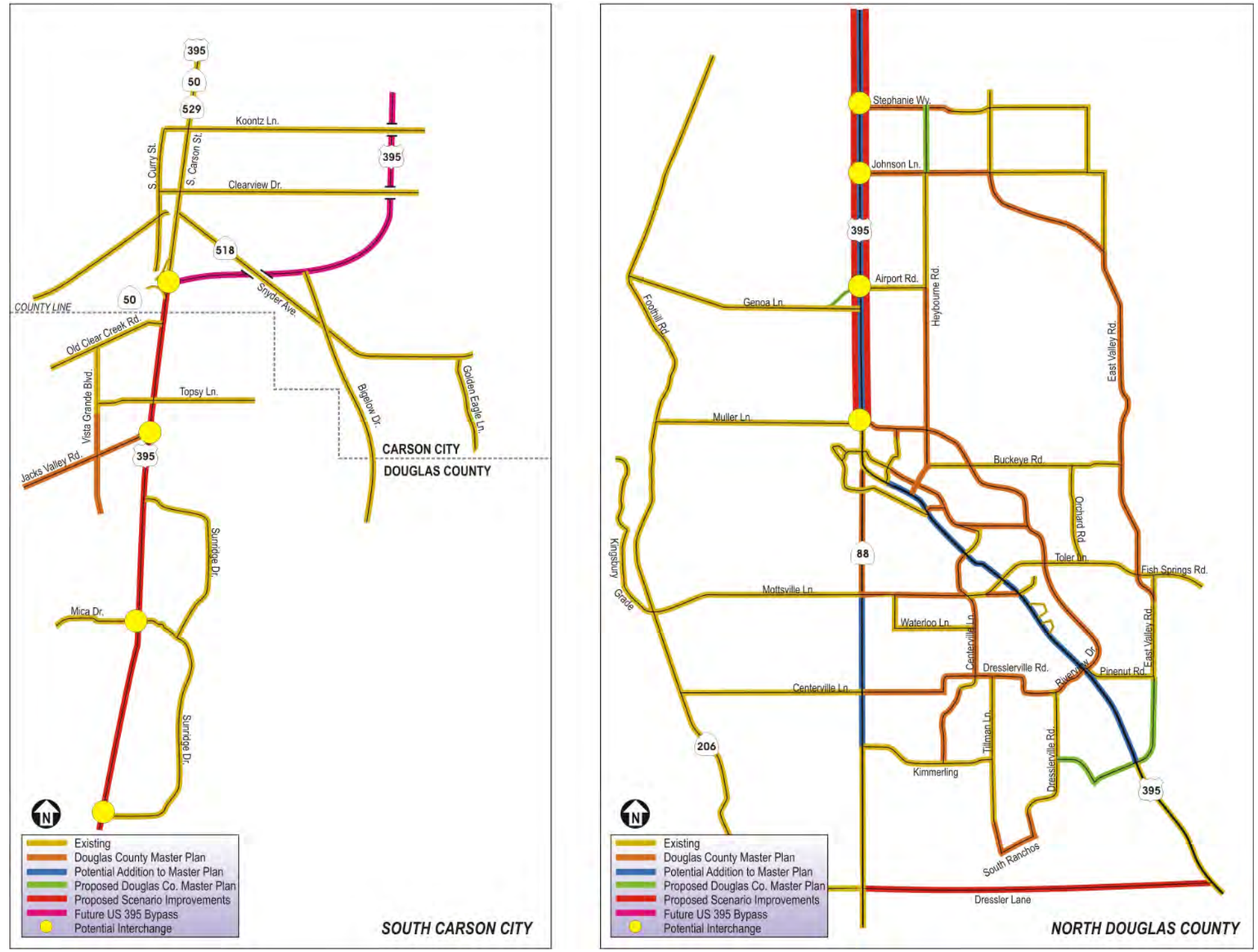


Figure 5-14 *Scenario 5—U.S. 395 Freeway with Dressler Lane Connector to U.S. 395*

5.5.8 U.S. 395 Freeway with Dressler Lane Connector and Heybourne Extension with Four Lanes

Scenario 6 includes the improvements in Scenario 5, plus the following:

- Heybourne Road extension – four-lane extension from Johnson Lane to a new interchange on the Carson Freeway

ADVANTAGES

- U.S. 395 would operate at LOS B between Jacks Valley Road and Stephanie Way versus LOS C on the same section in the 2030 Scenario 5 due to Heybourne Road four-lane extension to the Carson Freeway
- Frontage roads would allow for bicycle travel adjacent to the freeway and serve as parallel routes when incidents close the freeway

DISADVANTAGES

- Johnson Lane would operate at LOS D between Heybourne Road and Nowlin Road
- Topsy Lane would operate at LOS F between U.S. 395 and Lyla Lane
- Vista Grande Boulevard would operate at LOS E between Old Clear Creek Road and Topsy Lane

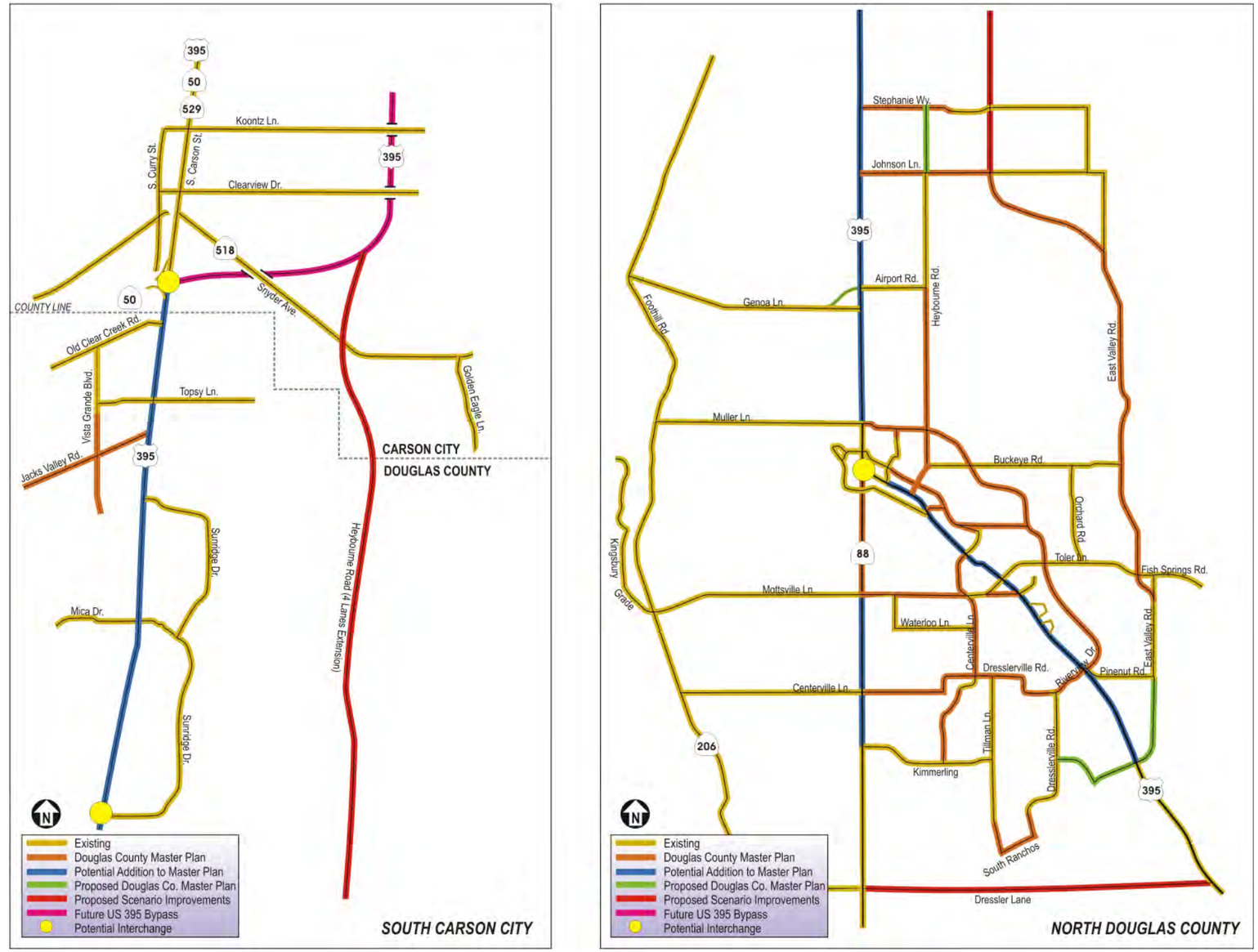


Figure 5-15 *Scenario 6—U.S. 395 Freeway with Dressler Lane Connector and Heybourne Extension with 4 Lanes*

5.5.9 U.S. 395 Freeway with West Side Bypass

Scenario 7 includes the improvements in Scenario 5 plus the following:

- New West Side Bypass would operate as four-lane facility from U.S. 395 between Muller and Genoa Lanes with an alignment west of the Ironwood area that ties into SR 88 south of the Carson River. It would continue as a four-lane facility along SR 88 to Dressler Lane (or at some point north of Dressler) and continue as a four-lane facility between SR 88 and U.S. 395.

ADVANTAGES

- U.S. 395 would operate at LOS D or better between U.S. 50 and Ironwood Drive
- West Side Bypass would accommodate large trucks and other interstate traffic that could bypass Minden and Gardnerville. The bypass would also provide alternate routing if U.S. 395 closed due to incidents between Muller Lane and Pinenut Road
- Frontage roads would allow for bicycle travel adjacent to the freeway and serve as parallel routes when incidents close the freeway

DISADVANTAGES

- Johnson Lane would operate at LOS D between Heybourne Road and Nowlin Road
- Topsy Lane would operate at LOS F between U.S. 395 and Lyla Lane
- Vista Grande would operate at LOS F between Old Clear Creek Road and Topsy Lane

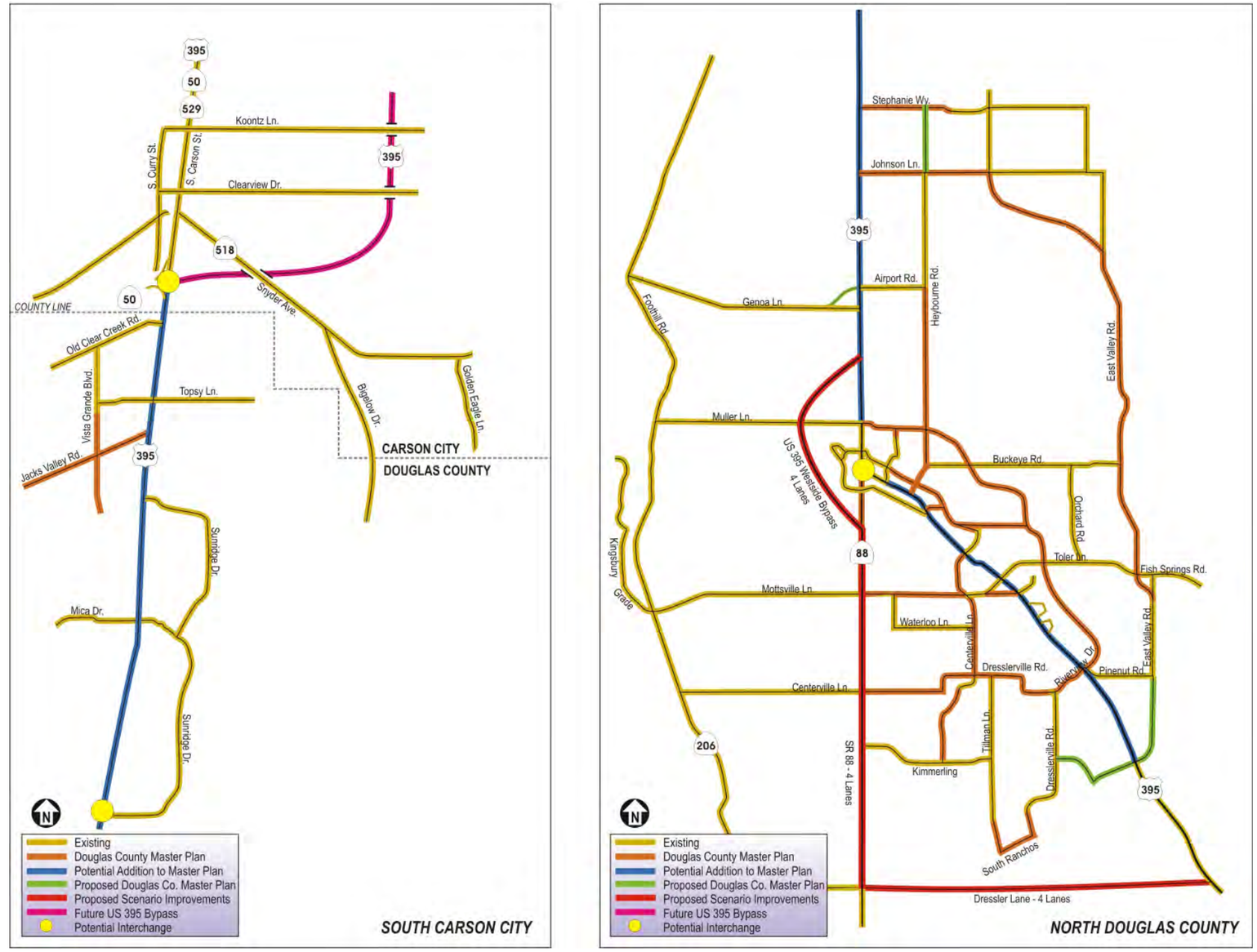


Figure 5-16 *Scenario 7—U.S. 395 Freeway with West Side Bypass*

6 Costs and Benefits

The Build Alternative includes eleven major highway improvement segments:

1. U.S. 395 improvements from U.S. 50 to Jacks Valley Road
2. U.S. 395 improvements from Jacks Valley Road to south of Plymouth/South Sunridge
3. U.S. 395 improvements from south of Plymouth/South Sunridge to south of Johnson Lane
4. U.S. 395 improvements from south of Johnson Lane to Muller Lane
5. U.S. 395 improvements from Muller Lane to SR 88
6. U.S. 395 improvements from SR 88 to Pinenut Road
7. U.S. 395 improvements from Pinenut Road to south of Palomino Drive
8. Extend the truck climbing lane on U.S. 395 to Double Springs
9. Construct a west side bypass of Minden around the Douglas High School and the Ironwood development
10. Widen SR 88 from County Road to Kimmerling Road
11. Extend Dressler Lane from SR 88 to U.S. 395

In addition to these eleven major highway improvements, a twelfth project, constructing an East Side Bypass approximately seven miles east of U.S. 395 at Minden, has been identified as a potential future project. A description of this alternative is provided in Chapter 5.

Section 6 identifies the costs and estimated benefits associated with implementing the Build Alternative.

6.1 COST ESTIMATES

Cost estimates have been developed for each element of the Build Alternative. These costs include the capital cost of construction, right-of-way acquisition, and project engineering expenses. A map of these segments is provided in Figure 5-2. These costs, expressed in 2006 dollars, are reported in Table 6-1. Excluding segment 12, these costs total $641.4 million.

6.2 BENEFITS ESTIMATES

The Build Alternative services more vehicles on U.S. 395 than the No-Build Alternative, meaning that vehicles traverse fewer miles on arterial streets and more miles on U.S. 395. Under the No-build Alternative, traffic cascades across the highway network seeking available capacity. Hence, traffic volume impacts are regional in addition to the U.S. 395 Corridor.

To provide a regional comparison of U.S. 395 build versus no-build traffic-related impacts, Parsons calculated regional benefits using the Douglas County/Carson City Travel Demand Model and STEAM 2.0, a system-wide analysis tool.

The Federal Highway Administration (FHWA) introduced the first version of the Surface Transportation Efficiency Analysis Module (STEAM) in 1997. STEAM was the first FHWA impact analysis product to use input directly from the four-step travel demand modeling process for detailed, system wide analysis of alternative transportation investments. STEAM 2.0 was released in 2000 to expand the scope of the program to address environmental justice measures.

"Like STEAM, STEAM 2.0 is based on the principles of economic analysis, and allows development of monetized impact estimates for a wide range of transportation and investments and policies, including major capital projects, pricing and travel demand management (TDM). Impact measures are monetized to the extent feasible, but quantitative estimates of natural resources usage (i.e., energy consumption) and environmental impacts (i.e., emissions) are also provided. Net monetary benefits (or costs) of alternatives can then be used to evaluate trade-offs against non-monetizable benefits, including sustainability and community livability."[1]

An important feature of STEAM 2.0 is that the software program post-processes the traffic assignment volumes generated from conventional four-step travel forecasting models. The purpose of this feature is to compute benefits based on more accurate highway travel speeds, and to provide FHWA with a more consistent basis of comparison between urban areas.

The STEAM 2.0 speed models account for delays due to incidents, using data on the frequency, severity, and duration of incidents. Incidents account for a large share of total travel delays due to congestion, especially on freeways. The models also account for peak spreading that occurs when facilities become more congested. The traffic temporal distributions used in developing the models were based on data collected from 579 urban automatic traffic recorders across the nation. Separate temporal distributions were developed for freeways and arterials with low, moderate, and high ratios of average daily traffic to capacity. The models further account for day-to-day variations in traffic. The relationship between delays due to congestion and traffic volumes are highly non-linear in nature, especially when the ratio of demand volume to capacity is close to 1.0. Lastly, the STEAM 2.0 speed models account for the decrease in highway capacity that occurs after demand volumes exceed capacity. The 1994 Highway Capacity Manual notes that observations of freeway queue departure rates range from 1,500 to 2,000 passenger cars per hour per lane. In contrast, freeway capacities for 12-foot lanes with no lateral obstructions are 2,200 to 2,300 passenger cars per hour per lane. Not accounting for the fact that queue departure rates are generally lower than freeway capacities can result in a large understatement of the delays due to queuing.[2]

Table 6-2 reports measures of effectiveness computed with STEAM 2.0, based on travel demand forecast input from the Douglas County/Carson City travel model. Monetized benefits and costs follow Table 6-2 along with assumptions used in the STEAM 2.0 computations.

The data reported in Table 6-2 indicate that vehicle miles traveled (VMT) decrease slightly with the Build Alternative as improvements attract higher speed, and more direct travel between trip origins and destinations. Hydrocarbon (HC) emissions decrease with increasing speed to 55–60 mph, and then rise. Fewer HC emissions result due to higher speeds on U.S. 395 compared with parallel arterial streets. Like hydrocarbons, carbon monoxide (CO) emissions decrease with increasing speeds to 45–50 miles per hour, and then increase thereafter. Build Alternatives benefits are most noticeable in reduced crashes, reduced fuel consumption, and reduced greenhouse gas emissions; in addition to travel time savings.

[1] Surface Transportation Efficiency Analysis Model (STEAM 2.0): User Manual, Cambridge Systematics, Inc., December 2000.

[2] Ibid.

Table 6-1 *Estimated Build Alternative Costs*

	PROJECT	LENGTH (miles)	NUMBER OF LANES	RURAL COST/ MILE	ROADWAY COST	SIGNALS		INTERCHANGES		GRADE SEPARATIONS		HYDRAULIC BRIDGES		RIGHT-OF-WAY	TOTAL COST
						#	COST	#	COST	#	COST	#	COST		
SEGMENT 1 (US 395 - Spooner Juncion to Jacks Valley Road)															
1	Carson Freeway Direct Connectors	0.3	4		$72,500,000										$72,500,000
2	Frontage Roads with Bikelanes, Sidewalks	1.3	4	$13,185,250	$17,140,825									$22,308,000	$39,448,825
3	Freeway Section (total reconstruction)	1.3	4	$21,356,400	$27,763,320										$27,763,320
4	Clear Creek Grade Separation										$12,000,000				$12,000,000
5	Topsy Grade Separation										$12,000,000				$12,000,000
6	Jacks Valley Interchange								$51,000,000						$51,000,000
														Segment Total	**$214,712,145**
SEGMENT 2 (US 395 - Jacks Valley Road to South of Plymouth/South Sunridge)															
7	Mica Grade Seperation										$12,000,000				$12,000,000
8	Plymouth/S. Sunridge Interchange								$30,000,000					$1,660,600	$31,660,600
9	Frontage Roads (1 lane, 1 way per side)	2	2	$6,014,450	$12,028,900									$2,845,600	$14,874,500
10	Freeway Section (Use Existing Roadway)	2	4	$1,653,125	$3,306,250										$3,306,250
														Segment Total	**$61,841,350**
SEGMENT 3 (US 395 - South of Plymouth/South Sunridge to South of Johnson Lane)															
11	Freeway Section (Use Existing Roadway)	3.2	4	$1,653,125	$5,290,000										$5,290,000
12	Frontage Roads (1 lane, 1 way per side)	3.2	2	$6,014,450	$19,246,240									$4,931,000	$24,177,240
13	Stephanie Way Grade Separation				$0						$12,000,000				$12,000,000
14	Johnson Lane Interchange				$0				$30,000,000					$1,660,600	$31,660,600
														Segment Total	**$73,127,840**
SEGMENT 4 (US 395 - South of Johnson Lane to Muller Lane)															
15	Freeway Section (Use Existing Roadway)	3.8	4	$1,653,125	$6,281,875								$4,500,000		$10,781,875
16	Frontage Roads (1 lane, 1 way per side)	3.8	2	$6,014,450	$22,854,910								$9,000,000	$5,331,700	$37,186,610
17	Muller Interchange				$0				$30,000,000					$1,660,600	$31,660,600
18	Airport/Genoa Interchange				$0				$30,000,000					$1,660,600	$31,660,600
19	West Side Ramps		4		$0						$12,000,000				$12,000,000
20	Genoa Lane Re-Alignment with Airport	0.5	2	$6,014,450	$3,007,225										$3,007,225
														Segment Total	**$126,296,910**
SEGMENT 5 (US 395 - Muller Lane to Junction of SR 88)															
21	Add 3rd lane both directions	0.7	4 to 6	$10,967,190	$5,000,000									$4,000,000	$9,000,000
22	Improve Intersection with SR 88			$0	$1,000,000		$446,063								$1,446,063
														Segment Total	**$10,446,063**
SEGMENT 6 (US 395 - Junction of SR 88 to Pinenut Road)															
23	Signal Implementation Project	4.75				4	$346,938								$346,938
SEGMENT 7 (US 395 - Pinenut Road to South of Palamino Drive)															
24	Widen to a 5 Lane Section	3	2 to 5	$9,700,000	$29,100,000										$29,100,000
SEGMENT 8 (US 395 - Extend Truck Climbing Lane to Double Springs Flat)															
25	Add Southbound Truck Climbing Lane	2	1 to 2	$4,266,340	$8,532,680										$8,532,680

Table 6-1 *Estimated Build Alternative Costs* (continued)

		LENGTH (miles)	NUMBER OF LANES	RURAL COST/ MILE	ROADWAY COST	SIGNALS		INTERCHANGES		GRADE SEPARA-TIONS		HYDRAULIC BRIDGES		RIGHT-OF-WAY	TOTAL COST
						#	COST	#	COST	#	COST	#	COST		
SEGMENT 9 (US 395 - West Side Bypass)															
26	4 Lane West Side Bypass	3	4	$8,571,150	$25,713,450							1	$15,000,000	$4,752,000	$45,465,450
SEGMENT 10 (SR 88 - County Road to Kimmerling Road)															
27	Widen to a 4 Lane Section to Waterloo	1.67	2 to 4	$6,264,700	$10,462,049	1	$346,938					1	$1,060,000		$11,868,987
28	Widen to a 4 Lane Section to Kimmerling	2	2 to 4	$6,264,700	$12,529,400	2	$693,875								$13,223,275
											Segment Total				$25,092,262
SEGMENT 11 (Dressler Lane Extension - SR 88 to US 395)															
29	New 2 Lane Roadway	5.1	2	$6,014,450	$30,673,695	1	$346,938					1	$10,000,000	$5,385,600	$46,406,233
SEGMENT 12 (East Side Bypass- FUTURE PROJECT)															
30	New 2 Lane Roadway	20	2	$8,014,450	$160,289,000			1	$51,600,000			11	$53,900,000	$2,000,000	$267,789,000
													GRAND TOTAL		**$909,156,869**

* A 10% factor was used for both Maintenance of Traffic (MOT) and Mobilization Factor. MOT For new construction consist of MOT at tie-in points only.
** Total cost shown is derived from a standard typical section. Total cost of project must account for signals, bridges, or any additional item not deemed typical.

Notes:
1. Costs shown are present day costs.
2. These figures exclude costs for Environmental Impact Analysis, improvements to cross streets, landscaping, and ITS.
3. Estimates were derived from recent NDOT projects.
4. The costs developed for this chart should be used for preliminary estimating purposes only.
5. These estimated costs include design and construction engineering.

Table 6-2 *U.S. 395 Network Measures of Effectiveness*

	NO-BUILD	BUILD	CHANGE
Travel Demand			
VMT (million VMT/year)	299.9	292.1	–7.8
Travel time (million person hours/year)	15.8	13.1	–2.7
Tons of Emissions (tons/year)			
VMT Related Emissions			
HC	239.3	213.5	–25.8
CO	758.0	644.6	–113.4
NO_X	76.9	70.0	–6.8
PM_{10}	6.6	6.4	–0.2
Cold start emissions	No change		
Greenhouse Gas Emissions			
Btu energy consumption (100 billion Btu/year)	22.5	18.7	–3.8
CO_2 emissions (1,000 tons/year)	175.5	145.6	–29.9
Accidents			
Fatalities	6.1	5.7	–0.4
Injuries	575.0	541.0	–34.0
Property damage only	1,043.8	987.6	–56.3
Fuel Consumption			
Gallons (1,000 gallons/year)	18,003.0	14,931.3	–3,071.7

Source: Parsons (based on STEAM 2.0)

6.2.1 Travel Time Savings

Vehicle hours of travel were computed for each link in the highway system. Highway link travel speeds and volumes were output directly from the Douglas County/Carson City Travel Demand Model TransCAD 4.8 software to STEAM 2.0 using a custom design interface. This program interface is publicly available for use with any Douglas County/Carson City Travel Model/STEAM 2.0 application.

Consistent with U.S. Department of Transportation guidance for the valuation of travel time in economic analysis, Parsons assumed local personal travel to be valued at 50 percent of the local median wage rate. Business travel by truck was valued at 100 percent of the mean wage for these occupations, plus fringe benefits. Douglas County's mean wage for all occupations was reported by the Nevada Department of Employment, Training and Rehabilitation to be $15.10 per hour for 2006, while the mean wage in Carson City was $18.25 per hour. Averaging these two wage rates and multiplying by 50 percent produced a value of time equal to $8.34 per hour was used for local personal travel. The state reported that heavy and tractor trailer truck drivers residing in Douglas County earned $16.42 per hour on average in 2006, while truck drivers residing in Carson City earned $18.09 per hour. A fringe benefit rate of 50 percent of the mean wage was assumed by Parsons for truck drivers, based on an equal mix of employees covered by teamsters (55.5 percent) and other (44.5 percent) labor agreements. The corresponding value of time for these business travelers was thus estimated to be $25.88 per hour (mean average of two counties).

Computation of benefits also took vehicle occupancy into account for local personal travel. The average daily vehicle occupancy for all trip purposes in the Douglas County/Carson City model area is estimated to be 1.43 persons per vehicle. While this average occupancy may be lower or higher during peak periods, the average rate was assumed for the benefits calculation for lack of better data.

Overall, the Build Alternative provides $23 million of travel time savings annually, assuming current year dollars and Year 2030 traffic volumes. Assuming a linear year-to-year increase in traffic volumes and the delivery of capacity enhancements as needed, the Build Alternative would produce nearly $255 million of travel time savings over a 20-year improvement time period.

6.2.2 Crash Benefits

The frequency of accident occurrence is typically lower on freeways and expressways when compared to other types of regional roads and city streets. To compute benefits associated with the Build Alternatives versus the No-build Alternative, the number of vehicle miles traveled over the highway system was computed for each alternative, using the Douglas County/Carson City Travel Model and STEAM 2.0.

Rates of crash occurrences resulting in fatalities, personal injuries, and property damage only were obtained from NDOT for Year 2002. Statewide rates listed for urban roadways were used in the calculation of benefits. These rates are listed in Table 6-3.

The values of loss associated with accidents were obtained from the National Safety Council and a 1991 Urban Institute/FHWA study. Periodically, the National Safety Council estimates the average cost of fatal and non-fatal injuries due to motor vehicle crashes. These estimates are made using a comprehensive or willingness to pay method.

Table 6-3 *Nevada Crash Rates by Functional Roadway Classification (2002)**

FUNCTIONAL CLASSIFICATION	PDO CRASH RATE	INJURY CRASH RATE	FATAL CRASH RATE
Interstate urban	220.34	85.51	0.66
Other urban freeways and expressways	159.61	63.00	0.62
Urban principal arterials	420.15	224.73	2.18
Urban minor arterials	354.48	200.83	2.27
Urban collector streets	228.71	123.64	1.16
Urban local streets	261.85	93.37	0.83

*Crash rates per 100 million vehicle miles.
Source: Nevada Department of Transportation

These costs include economic costs such as wage and productivity losses, medical expenses, motor vehicle damage, etc.; and a value reflecting lost quality of life.

In 2001, the National Safety Council estimated the following average comprehensive costs on a per injured person basis:

Death	$3,340,000
Incapacitating injury	$ 165,000
Non-incapacitating evident injury	$ 42,500
Possible injury	$ 20,200

These per injured person costs were converted to per vehicle crash costs using formulas published in FHWA Technical Advisory T 7570 (June 30, 1988). The resulting costs per vehicle crash were computed to be the following, expressed in Year 2005 dollars:

Fatal accident	$4,250,901
Injury accident	$ 95,803

Property damage only (PDO) accident costs were computed using a cost value obtained from the California Life-Cycle Benefit/Cost Analysis Model. This model uses a value for PDO accidents estimated by the 1991 Urban Institute/FHWA study. The Urban Institute/ FHWA calculated its estimate taking two primary factors into account:

1. Unreported accidents—Automobile accident surveys indicate that roughly 40 to 50 percent of all PDO accidents are not reported.
2. Combined property value—PDO accidents frequently involve more than one vehicle.

The value of an average non-fatal, non-injury accident was calculated primarily using records of vehicle and property damage payments made by insurance companies. Some additional cost categories, such as travel delay and lost wages, were included to make minor contributions to the final estimate.

After adjusting the Urban Institute/FHWA estimate to Year 2005 using the gross domestic product deflator, a value of $7,948 per reported PDO accident was derived.

Taking inflation into account, these estimates of accident costs compare favorably with values used in four computerized benefit-cost models, as reported in Table 6-4.

Table 6-4 *Accident Cost Estimates*

ACCIDENT TYPE	CSI[1] ($ 1993)	StratBENCOST[2] ($ 1996)	STEAM[3] ($ 1997)	RAILDEC[4] ($ 1997)	U.S. 395[5] ($ 2005)
Fatality	$3,325,095	$3,521,359	$2,726,350	$3,613,137	$4,250,901
Injury	$ 7,890	$ 83,848	$ 59,718	$ 86,033	$ 95,803
PDO	$ 5,651	$ 5,806	$ 3,322	$ 5,957	$ 7,948

[1]Cambridge Systematics, Inc. (CSI), Approaches for Developing Nationwide Estimates of Congestion Delay, Accidents, Emissions, and Noise Impacts: Interim Report, 1995.
[2]NCHRP Project 2-18(3), Development of an Innovative Highway User Cost Estimation Procedure. Midrange of cossts reported.
[3]FHWA, Surface Transportation Efficiency Analysis Model, 1997. Total of internal and external costs.
[4]Companion to StratBENCOST which estimates the reduction in accident costs as the change in highway accidents between the base and alternative (rail) case. StratBENCOST values inflated by 2.6 percent for all accident types.
[5]Parsons, based on California Life-Cycle Benefit/Cost Analysis Model, Technical Supplement to User's Guide.

STEAM 2.0 calculates separate internal and external accident costs. Internal accident costs are defined as costs inflicted upon and perceived by transportation facility users. External costs are defined as costs inflicted on users, but not perceived by users. Table 6-5 identifies the breakdown of these accident cost assumptions.

Table 6-5 *Accident Cost Assumptions for STEAM (2005 dollars)*

ACCIDENT TYPE	INTERNAL COST	EXTERNAL COST	TOTAL COST
Fatality	$3,613,266	$637,635	$4,250,901
Injury	$ 81,433	$ 14,370	$ 95,803
PDO	$ 6,756	$ 1,192	$ 7,948

Source: Parsons

Overall, the Build Alternatives provide $6.2 million of accident cost savings annually, assuming current year dollars and Year 2030 traffic volumes.

Assuming a linear, year-to-year increase in traffic volumes, and the delivery of capacity enhancements when needed to address traffic demands, the Build Alternatives would produce $68.5 million of crash benefits over a 20-year U.S. 395 improvement timeframe.

6.2.3 Motor Vehicle Emissions and Costs

Motor vehicle emissions were calculated for the emissions listed in Table 6-6. Rates of motor vehicle emissions were obtained from the California Life-Cycle Benefit/Cost Analysis Model for carbon monoxide, nitrogen oxides, and fine particulates assuming a vehicle model year of 2020—the midpoint of the benefit/cost comparison. The source of these emission rates is the California Air Resources Board model, EMF 2002 version 2.2. STEAM 2.0's default values for hydrocarbon emissions were also used in the analysis. These rates assume a Year 2010 vehicle model year and are based on the EPA's Mobil 5a model results.

Table 6-6 *Vehicle Pollution Emissions*

EMISSION	DESCRIPTION	SOURCE	HARMFUL EFFECTS	SCALE
Carbon monoxide (CO)	A toxic gas that undermines blood's ability to carry oxygen	Engine	Human health, climate change	Very local
Nitrogen oxides (NO_X)	Various compounds; some are toxic, all contribute to ozone.	Engine	Human health, ozone precursor	Regional
Fine particulates (PM_{10})	Inhalable particles consisting of bits of fuel and carbon	Diesel engines and other sources	Human health, aesthetics	Local and regional
Hydrocarbons (HC)	Unburned fuel; forms ozone	Fuel production and engines	Human health, ozone precursor	Regional

Monetary values for CO, PM_{10} and NO_X emissions were obtained from research by Donald McCubbin and Mark Delucchi reported in "The Social Cost of Health Effects of Motor-Vehicle Use in the United States," as updated for use in the California Life-Cycle Benefit/Cost Analysis Model. Values reported for the Los Angeles/South Coast air basin (see Table 6-7) were used for the U.S. 395 evaluation of benefits and costs.

Table 6-7 *Health Cost of Motor Vehicle Emissions ($/ton)*

EMISSION		VALUE
Carbon monoxide	CO	$ 127
Fine particulates	PM_{10}	$422,985
Nitrogen oxides	NO_X	$ 51,635
Hydrocarbons	HC	$ 7,407

Source: Parsons, the based on California Life-Cycle Benefit/Cost Analysis Model, Technical Supplement to User's Guide.

The health cost of HC emissions was taken from a second source that also valued NO_X.[3] These values were indexed to the Cal B/C values to estimate the per ton cost of HC.

The resulting motor vehicle benefits of the Build Alternative improvements, computed for Year 2030 traffic volumes, are estimated to be $632,000 per year.

6.2.4 Vehicle Operating Costs

Vehicle operating costs were calculated for the No-Build Alternative and Build Alternative using estimates of vehicle miles traveled produced by the Douglas County/Carson City Travel Demand Model and STEAM 2.0.

STEAM 2.0 calculates fuel consumption per gallon based on average link speeds and vehicle miles traveled per link.

Default values for the fuel consumption rates used in STEAM come from the ITE "Transportation Planning Handbook," 1992. However, these rates were derived from a study published by Caltrans in 1983. Non-fuel volatile organic compounds (VOC) are taken from a USDOT publication, "Characteristics of Urban Transportation Supply," 1992, and are converted to 1997 dollars. These costs originated in the American Automobile Association publication, "Your Driving Costs."

[3]Gunnar Linberg, Benefit-Cost Analysis in a Multimodal Planning Process, "Exploring the Application of Benefit-Cost Methodologies to Transportation Decision Making," May 1995, Tampa, Florida.

For evaluation of benefits and costs for U.S. 395, fuel consumption was based on estimates of average fuel consumption for the Year 2000 obtained from the California Air Resources Board's Motor Vehicle Emission Inventory models. These rates, used in the California Life-Cycle Benefit/Cost Analysis Model, are reported in Table 6-8.

Table 6-8 *Fuel Consumption Rates (gallons/mile)*

SPEED	AUTO	TRUCK
5	0.182	0.310
10	0.123	0.181
15	0.089	0.135
20	0.068	0.118
25	0.054	0.120
30	0.044	0.133
35	0.037	0.156
40	0.034	0.185
45	0.033	0.223
50	0.033	0.264
55	0.034	0.316
60	0.037	0.374
65	0.043	0.439
70	0.052	0.511

Source: Cal-B/C, California Air Resources Board

The price-per-gallon of regular grade gasoline was assumed to be $2.81 per gallon based on prices prevailing in Reno, Nevada in April 2006. STEAM 2.0 separates fuel costs into tax and non-tax components, using the tax portion to compute "revenue transfers." The tax rate per gallon of gasoline was assumed to be 18.4 cents Federal, 18.455 cents State, 6.35 cents County mandatory, and 9.0 cents County optional for Douglas County and Carson City. These taxes total 52.2 cents per gallon. Truck fuel costs were assumed to be $2.22 per gallon for the non-tax portion and $0.61 for the tax component.

Non-fuel costs for vehicle maintenance and tire expense were assumed to be $0.061 per mile for automobiles based on Center for Transportation Analysis, Department of Energy Statistics for calendar year 2004, and $0.121 for trucks. The STEAM 2.0 model does not include mileage-based depreciation.

The resulting vehicle operating cost benefits of the U.S. 395 Build Alternative improvements, computed for Year 2030 traffic volumes, are estimated to be $7.5 million annually. Revenue transfers and fuel taxes not collected as a result of these benefits amount to $1.6 million annually in 2030.

6.3 SUMMARY OF BENEFITS

The Build Alternative will produce net savings in travel time, crashes, emissions and vehicle operating expense. Collectively, these will amount to $36.4 million annually based on Year 2030 traffic volumes. These findings are summarized in Table 6-9 and sorted by benefit type.

Table 6-9 *Summary of Build Alternative Benefits*

BENEFIT TYPE	$/YEAR IN YEAR 2030
User Benefits	
In-vehicle travel time	$23,030,800
Fuel costs	7,028,100
Non-fuel operating costs	477,200
Internal accident costs	5,365,900
Revenue transfers	(1,603,400)
Reduction in External Costs	
Emissions	631,900
Global warming	106,600
Noise	7,800
Accident	836,700
Other mileage based	477,200
TOTAL BENEFITS	**$36,358,800**

Source: Parsons

6.4 U.S. 395 PHASING ASSUMPTIONS

The U.S. 395 Build Alternative improvements are assumed to be implemented over time so that NDOT's standards for freeway and primary arterial operational performance may be maintained at level of service D or better. Benefits will likewise accrue over time as traffic demand volumes increase from present day levels to those forecast for Year 2030. A measurement of life-cycle benefits, assuming a straight-line projection of traffic growth, is reported in Table 6-10. This table assumes that U.S. 395 improvements will be implemented in phases as funding becomes available. Components included in each phase are identified in Table 6-11.

Table 6-10 *Life-Cycle Benefits and Costs*

YEAR	TOTAL BENEFITS	TOTAL COSTS	NET PRESENT VALUE	NET PRESENT VALUE BENEFITS	NET PRESENT VALUE COSTS
2007	—	—	1.000	—	—
2008	—	$ 8,157,900	0.935	—	$ 7,627,600
2009	—	30,465,900	0.873	—	26,596,700
2010	—	62,544,100	0.816	—	51,036,000
2011	—	62,544,200	0.763	—	47,721,200
2012	$ 1,913,600	8,358,000	0.713	1,364,400	5,959,300
2013	3,827,200	17,795,200	0.666	2,548,900	11,851,600
2014	5,740,900	64,077,700	0.623	3,576,600	39,920,400
2015	7,654,500	64,077,800	0.582	4,454,900	37,293,300
2016	9,568,100	8,517,900	0.544	5,205,000	4,633,700
2017	11,481,700	18,831,400	0.508	5,832,700	9,566,400
2018	13,395,300	65,304,100	0.475	6,362,800	31,019,400
2019	15,309,000	65,304,100	0.444	6,797,200	28,995,000
2020	17,222,600	8,726,100	0.415	7,147,400	3,621,300
2021	19,136,200	22,863,700	0.388	7,424,800	8,871,100
2022	21,049,800	66,899,900	0.362	7,620,000	24,217,800
2023	22,963,500	66,899,900	0.339	7,784,600	22,679,100
2024	24,877,100	—	0.317	7,886,000	—
2025	26,790,700	—	0.296	7,930,000	—
2026	28,704,300	—	0.277	7,951,100	—
2027	30,617,900	—	0.258	7,899,400	—
2028	32,531,600	—	0.242	7,872,600	—
2029	34,445,200	—	0.226	7,784,600	—
2030	36,358,800	—	0.211	7,671,700	—
2031	38,272,400	—	0.197	7,539,700	—
	$401,560,400	$641,367,900		$128,654,400	$361,609,900

Source: Parsons

Table 6-11 *Project Phasing Assumptions*

PHASE	TIMEFRAME AND COST	PROJECT ELEMENTS
1	2008–2011 $163.7 M	**U.S. 395–Spooner Junction to Jacks Valley Road** 1. Carson Freeway Direct Connectors 2. Frontage Roads with Bike Lanes, Sidewalks 3. Freeway Section (Total Reconstruction) 4. Clear Creek Grade Separation 5. Topsy Grade Separation
2	2012–2015 $154.3 M	6. Jacks Valley Interchange **U.S. 395–Jacks Valley Road to South of Plymouth/ South Sunridge** 7. Mica Grade Separation 8. Plymouth/S. Sunridge Interchange 9. Frontage Roads (1 lane, 1 way per side) 10. Freeway Section (Use Existing Roadway) **U.S. 395–South of Plymouth/South Sunridge to South of Johnson Lane** 11. Freeway Section (Use Existing Roadway) 12. Frontage Roads (1 lane, 1 way per side) 13. Stephanie Way Grade Separation
3	2016–2019 $158.0 M	14. Johnson Lane Interchange **U.S. 395–South of Johnson Lane to Muller Lane** 15. Freeway Section (Use Existing Roadway 16. Frontage Roads (1 lane, 1 way per side) 17. Muller Interchange 18. Airport Genoa Interchange 19. West Side Ramps 20. Genoa Lane Re-Alignment with Airport
4	2020–2023 $165.4 M	**U.S. 395–Muller Lane to Junction of SR 88** 21. Add 3rd Lane Both Directions 22. Improve Intersection with SR 88 **U.S. 395–Junction of SR 88 to Pinenut Road** 23. Signal Implementation Project **U.S. 395–Pinenut Road to South of Palamino Drive** 24. Widen to a 5-Lane Section **U.S. 395–Extend Truck Climbing Lane to Double Springs Flat** 25. Add Southbound Truck Climbing Lane **U.S. 395–West Side Bypass** 26. 4-Lane West Side Bypass **SR 88 County Road to Kimmerling Road** 27. Widen to a 4-Lane Section to Waterloo 28. Widen to a 4-Lane Section to Kimberling **Dressler Lane Extension–SR 88 to U.S. 395** 29. New 2-Lane Roadway

Source: Parsons

6.5 BENEFIT/COST COMPARISONS

A comparison of life-cycle benefits with costs is reported in Table 6-12. This table lists benefits and costs for the Build Alternative as compared to the No-Build Alternative. Total benefits and costs and the net present values of the overall system improvements assume a discount rate of 7 percent.

These findings indicate the following:

1. Total benefits ($401,560,400) are less than total costs ($641,367,900) by $239.8 million (year 2006 dollars). This benefit/cost (B/C) ratio is 0.626.
2. The net present value of these benefits, assuming a discount rate of 7 percent is $128,654,400. The net present value of implementation costs, excluding maintenance and repair, is $361,609,900. This B/C ratio is 0.356.

The payback period, at a discount rate of 7 percent, exceeds 50 years.

Table 6-12 *Summary of Benefit Cost Analysis Results*

LIFE-CYCLE BENEFITS/ TOTAL COSTS RATIO (excludes Transit and O&M)	NET PRESENT VALUE OF BENEFITS COSTS AT 7% DISCOUNT RATE (excludes Transit and O&M)	PAYBACK PERIOD AT 7% DISCOUNT RATE
$401.6 M/641.4 M = 0.626	$128.7 M/$361.6 M = 0.356	>50 years

Source: Parsons

7 Implementation Plan

7.1 LONG-TERM IMPROVEMENTS

The U.S. 395 Corridor Study Build Alternative proposed in Chapter 5, Alternatives Development, includes 11 major highway improvement components which are defined to accommodate Year 2030 traffic volumes:

1. U.S. 395 improvements from U.S. 50 to Jacks Valley Road
2. U.S. 395 improvements from Jacks Valley Road to south of Plymouth Drive/South Sunridge Drive
3. U.S. 395 improvements from south of Plymouth Drive/South Sunridge Drive to south of Johnson Lane
4. U.S. 395 improvements from south of Johnson Lane to Muller Lane
5. U.S. 395 improvements from Muller Lane to SR 88
6. U.S. 395 improvements from SR 88 to Pinenut Road
7. U.S. 395 improvements from Pinenut Road to south of Palomino Drive
8. Extend the truck climbing lane on U.S. 395 to Double Springs
9. Construct a west side bypass around the Douglas High School and the Ironwood Drive subdivision
10. Widen SR 88 from County Road to Kimmerling Road
11. Extend Dressler Lane from SR 88 to U.S. 395

Chapter 5 provides a detailed description of the improvements recommended for each segment. Chapter 5 also identifies 29 projects that could be constructed as individual elements. Completion of any of these projects will provide a benefit to the entire corridor.

The highest current and projected future traffic volumes are located in the northern section of the corridor study area. Project construction in this area would therefore provide the most cost/benefit to the overall system. This study recommends construction of Projects 1 through 5 in Segment 1 as the highest priority package of projects in this corridor (see Table 7-1). Appendix E, U.S. 395/U.S. 50 Intersection Preliminary Drawings, contains the preliminary design drawings of the improvements identified in Segment 1, including two alternatives for the interchange at U.S. 395 and U.S. 50.

With an estimated cost of $163.7 million, this segment package will require significant partnership between NDOT, Douglas County, and Carson City. These projects will be especially important to the roadway network when the U.S. 395 Carson City Bypass completes the connection to U.S. 50, estimated to occur by 2012. If this package of projects is not completed, the traffic level of service is projected to fall below the NDOT standard of LOS D.

The total cost of the 29 individual long-term projects is estimated at $641 million. The highway projects listed in Table 7-1 will require a large investment of time and money by the local partners. Considering the current state of highway funding in Nevada, Carson City and Douglas County, implementation of these projects will take a long time to accomplish. Both entities are evaluating methods to acquire additional funding from transportation projects in the future, as discussed later in this chapter.

In the meantime, implementation of the near-term improvement projects listed in section 7.2 will provide a noticeable improvement in traffic safety within the U.S. 395 corridor. Construction of most of these projects will take less than five years from the time of NDOT approval and funding and will cost less than $5 million to complete. In addition to improving safety in the corridor, these projects will respond positively to the input that NDOT and Douglas County received from the public outreach effort performed during the corridor study.

See Table 4-1 for a summary of these near-term safety improvements.

7.2 NEAR-TERM SAFETY IMPROVEMENTS

7.2.1 Median Barrier

A cable median barrier is recommended for installation from Mica Drive to Muller Lane. Installation will require existing median side slopes to be flattened and existing median openings should be reviewed for possible closure or relocation. Cost of the installation is estimated at $1.2 million and implementation is expected to take 18 to 36 months.

Table 7-1 *Summary of Recommended U.S. 395 Long-Term Improvements*

PROJECT PHASE	IMPLEMENTATION YEAR/COST	PROJECT DESCRIPTION
1	2008–2011 $163.7 M	**U.S. 395–Spooner Junction to Jacks Valley Road** 1. Carson Freeway direct connectors 2. Frontage roads with bike lanes, sidewalks 3. Freeway section (total reconstruction) 4. Clear Creek Road grade separation 5. Topsy Lane grade separation
2	2012–2015 $154.3 M	6. Jacks Valley Road interchange **U.S. 395–Jacks Valley Road to South of Plymouth Drive/South Sunridge** 7. Mica Drive grade separation 8. Plymouth Drive/S. Sunridge Drive interchange 9. Frontage roads (1 lane, 1 way per side) 10. Freeway section (use existing roadway) **U.S. 395–South of Plymouth Drive/South Sunridge Drive to South of Johnson Lane** 11. Freeway section (use existing roadway) 12. Frontage roads (1 lane, 1 way per side) 13. Stephanie Way grade separation
3	2016–2019 $158.0 M	14. Johnson Lane interchange **U.S. 395–South of Johnson Lane to Muller Lane** 15. Freeway section (use existing roadway 16. Frontage roads (1 lane, 1 way per side) 17. Muller Lane interchange 18. Airport Genoa Lane interchange 19. West Side ramps 20. Genoa Lane re-alignment with airport
4	2020–2023 $165.4 M	**U.S. 395–Muller Lane to Junction of SR 88** 21. Add third lane both directions 22. Improve intersection with SR 88 **U.S. 395–Junction of SR 88 to Pinenut Road** 23. Signal implementation project **U.S. 395–Pinenut Road to South of Palomino Drive** 24. Widen to a 5-lane section **U.S. 395–Extend Truck Climbing Lane to Double Springs Flat** 25. Add southbound truck climbing lane **U.S. 395–West Side Bypass** 26. 4-lane West Side bypass **SR 88 County Road to Kimmerling Road** 27. Widen to a 4-lane section to Waterloo Lane 28. Widen to a 4-lane section to Kimmerling Road **Dressler Lane Extension–SR 88 to U.S. 395** 29. New 2-lane roadway

7.2.2 Traffic Signal Installation and Coordination

Signal coordination is the process of timing traffic signals along a corridor to allow multiple signals to operate together as a group. It provides a means by which the sequence of green lights is established along a series of traffic signals to provide a consistent flow of traffic through a corridor.

Figure 7-1 shows the locations of existing signalized intersections, as well as the potential locations for future signalized intersections. The estimated cost for completing the signal coordination project is $350,000. The project could be completed within 18 months of being initiated.

7.2.3 Acceleration or Deceleration Lanes

Adding or extending acceleration and deceleration lanes at intersections and driveways would be beneficial in reducing crashes.

OLD CLEAR CREEK ROAD

A northbound deceleration lane at Old Clear Creek Road is recommended to reduce rear-end crashes occurring due to the increased delay on U.S. 395. The cost of this improvement is estimated to be $150,000. It would take 18 to 36 months to develop the project and install the lanes from the time of NDOT approval and funding. The cost and implementation schedule would be greater if additional right-of-way is required.

JACKS VALLEY ROAD

Currently, the right-hand travel lane on southbound U.S. 395 becomes a right-turn only lane at the intersection of Jacks Valley Road. It is recommended to continue this lane through the intersection, ending south of the shopping center driveways. No cost was calculated for this improvement. It may be feasible to include this project as a condition of approval for future development of the adjacent land parcel(s).

MICA DRIVE

This improvement entails constructing a truck climbing lane project from Mica Drive to Sunridge Drive. The lane would also provide a right-turn lane to serve the residential area access from Sunridge Drive. Cost is estimated at $600,000 and implementation would take between 18 and 36 months from the time of NDOT approval and funding. It is proposed that NDOT partner with Douglas County to implement this project.

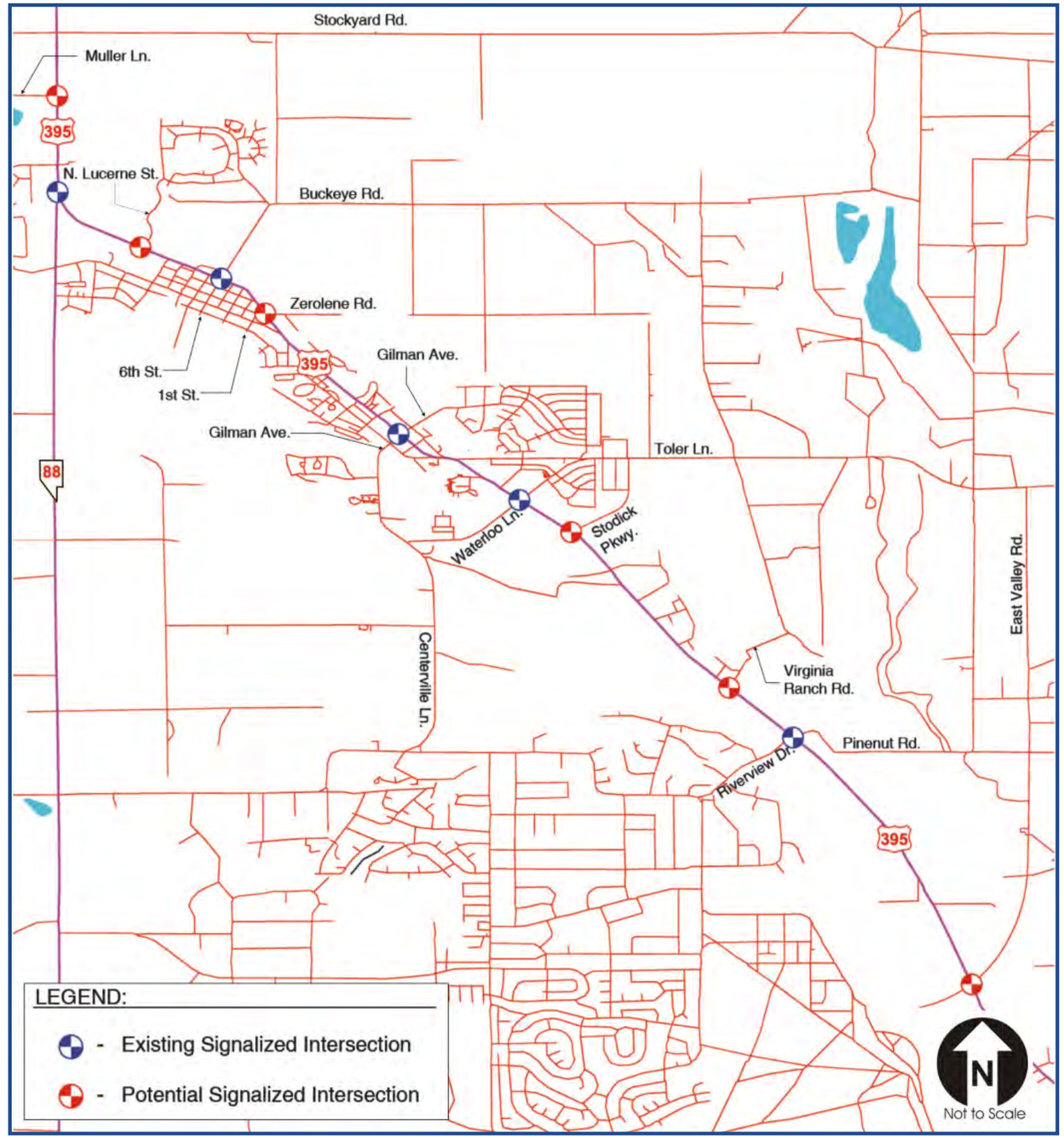


Figure 7-1 *Locations of Existing and Proposed Signalized Intersections*

SOUTH SUNRIDGE DRIVE

Northbound acceleration and decelerations lanes are recommended at South Sunridge Drive. The cost is estimated at $400,000 and the project would take between 18 and 36 months to complete from the time of NDOT approval and funding. It is proposed that NDOT partner with Douglas County to implement this project.

RECREATIONAL VEHICLE PARK

Lengthening the existing northbound deceleration lane, adding a northbound acceleration lane, and lengthening the southbound left-turn lane into the Silver City RV Resort is recommended. To implement this project, a partnership between NDOT and Douglas County is proposed. The cost is estimated to be $475,000 and the project would take between 18 and 36 months to complete from the time of NDOT approval and funding.

JOHNSON LANE

There is a need for an acceleration lane to facilitate traffic turning right from Johnson Lane onto U.S. 395. To widen U.S. 395 at this point, right-of-way is needed to relocate irrigation ditches and head gates. In addition, Johnson Lane should be widened 14 feet to the north to allow for a right-turn lane. To implement this project, it is proposed that NDOT partner with Douglas County to make these changes which are estimated to cost $650,000. It would take an estimated 18 to 36 months to complete the project, not including right-of-way acquisition, from the time of NDOT approval and funding.

GENOA LANE

To improve conditions for vehicles turning at Genoa Lane, NDOT could partner with Douglas County to lengthen the southbound deceleration and acceleration lane, and to lengthen the northbound left-turn lane. The cost is estimated at $640,000 and implementation would take 18 to 36 months from the time of NDOT approval and funding.

7.3 ROADWAY ACCESS MANAGEMENT

Because vehicles are constantly entering and leaving the U.S. 395 divided highway, there is a need to manage these points by eliminating or consolidating openings and moving traffic to grade-separated interchanges or newly constructed parallel routes. An Access Management Assessment would determine the number of approaches with median openings that should be combined, modified, or removed, and would allow time for NDOT staff to work with property owners to ensure their access needs are met. The study could be completed by NDOT staff at a cost of about $2,000 in 6 to 18 months from the time of NDOT approval and funding.

A speed study from Muller Lane to SR 88 is also recommended. The study would assess current travel speeds, access, visibility, design speed, and crashes to determine if the speed limit in this segment should be reduced. Completion of the study could occur within 6 months from the time of NDOT approval and funding and would cost approximately $1,000.

7.4 INSTALL RUMBLE STRIPS/ WIDEN ROADWAY MARKINGS

As a result of the corridor study, NDOT will initiate a project to install rumble strips on the inside and outside shoulders of U.S. 395 from Topsy Lane south to Plymouth Drive. Rumble strips help avert roadway departure crashes and are already in place in the remainder of the corridor study area (U.S. 50 to SR 88). The project is expected to be completed within 6 months at a cost of about $25,000. In addition, NDOT will replace faded markings with 8-inch-wide lines to improve visibility. The estimated cost is $3,000 and the project is scheduled for completion by January 2008.

7.5 ADDITIONAL INTERSECTION RECOMMENDATIONS

7.5.1 U.S. 50 “High-T”

There is potential for converting the full traffic signal controlled intersection at U.S. 50 to a high-T intersection. This treatment could improve traffic flow and reduce crashes. Detailed evaluation of the feasibility of this treatment is recommended, estimated to cost $30,000 and requiring 6 to 18 months to complete this evaluation from the time of NDOT approval and funding.

7.5.2 Stephanie Way

Stephanie Way has been converted to a signalized high-T intersection as one of the first projects completed as a result of the public outreach and preliminary recommendations of this corridor study. In December 2006, NDOT installed a traffic signal with Douglas County participating in the project funding. A dual-lane roundabout may be feasible at this location and may be considered in the future.

7.5.3 Muller Lane

The characteristics of the U.S. 395 corridor become more suburban south of Muller Lane. There is a need for a gateway, or entrance, into the Minden area that would alert motorists of the need to slow down. A roundabout should be considered for this site.

7.5.4 Washoe Tribal Headquarters

The Washoe Tribe of Nevada and California has requested the installation of a center-turn lane on U.S. 395 at the entrance to the Tribal Headquarters office, approximately one mile south of Pinenut Road/Riverview Drive. In addition, the Washoe Tribe has requested speed reductions in the corridor from the current speed limit of 55 mph to 45 and 35 mph. NDOT is reviewing this proposed safety improvement.

7.6 ROUNDABOUTS

Roundabouts at Muller Lane and other locations may be a viable alternative for addressing long-term transportation needs in the entire corridor, especially at the locations listed below.

7.6.1 Ironwood Drive

Ironwood Drive is a site where a roundabout could provide a community gateway and reduce traffic speeds. Eliminating the left turn from the Ironwood Center onto U.S. 395 would likely reduce conflicts. NDOT will partner with Douglas County to work with affected parties to ensure access needs are met.

7.6.2 State Route 88

NDOT recently modified the free flow right-turn lane at this junction to reduce the speed of drivers entering SR 88. Long-term alternatives to enhance traffic flow and maximize capacity at this intersection include a roundabout.

7.7 FUNDING PLAN

The U.S. 395 Southern Sierra Corridor Study identifies many possible projects on the existing highway network. Some of these projects are large, capacity-improving projects which will reduce traffic congestion

and improve traffic level of service. Other projects are smaller operational and safety improvements designed to reduce crashes, injuries and fatalities, such as acceleration and deceleration lanes. Given the current lack of funding for transportation projects in the state of Nevada, Douglas County and Carson City, this study recommends that the Nevada Department of Transportation work closely with local representatives to identify the highest priority safety and operations projects for immediate implementation. Other projects can be designed and built if and when funding becomes available.

7.7.1 Potential Funding Sources

The State of Nevada Blue Ribbon Task Force to Evaluate Nevada Department of Transportation Long-Range Projects, 2008-2015 released its report in 2006. The report stated:

> "Nevada faces many challenges in the coming years. Growth of unprecedented proportions in population, housing, economic development, and virtually every other facet of life in the state is predicted to continue into the foreseeable future. Travel demand is growing even faster than the population, and highway revenue sources have not kept up with inflation. From 1990 to 2003 Nevada's population grew by 92 percent, the fastest rate of growth in the nation. During the same time period, the vehicle miles of travel on all of Nevada's streets and highways more than doubled from 9 billion to 19.46 billion, also the fastest rate of growth in the nation. Nevada's population is expected to grow to 2.8 million people by 2010, and vehicle travel in Nevada is expected to increase by 80 percent by 2010, to 35 billion miles of travel annually."

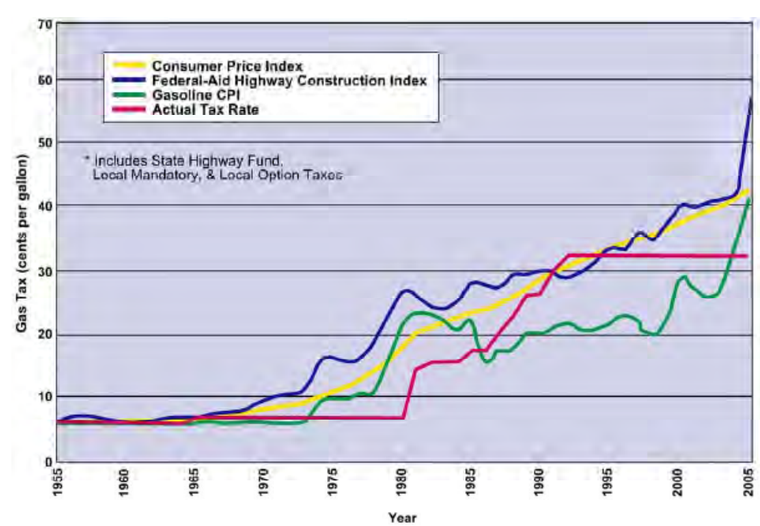
The rate of inflation in the highway construction industry has greatly exceeded general inflation, as shown in Figure 7-2. Asphalt, concrete and steel, the three main ingredients of highway construction projects, have increased more than 20 percent during the past 12 months. The cost of fuel to operate vehicles and equipment has also risen sharply.

The Task Force Report supports construction of the Nevada Department of Transportation's 10 "Super and Mega Projects," pavement and bridge preservation projects, two-lane highway widening projects, and intelligent transportation system projects which would require, at a minimum, an additional $4.8 billion in revenue. The 10 Super and Mega Projects include eight projects in the Las Vegas area and two projects in the Reno/Sparks area. The report also expresses concern regarding funding shortfalls that would prevent NDOT from carrying out its current program of projects, including pavement preservation and bridge replacement.

In lieu of such an increase in motor vehicle fuel taxes, the Task Force recommended redirecting existing general fund revenues and adjusting depreciation schedules for the valuation of vehicles, both of which have a strong nexus to highways and a strong relationship to inflation. In addition, the Task Force recommended indexing the State gasoline and diesel tax to inflation, along with innovative financing tools, such as increased vehicle driver's license fees.

In response to the Blue Ribbon Task Force recommendations, the 2007 Nevada State Legislature is considering State Bill 324, which would provide an estimated $118 million in new transportation funds for 2007–2008, $213 million in 2008–2009, and $237 million in subsequent years. As of April 2007, the Nevada State Legislature was considering the bill in committee and legislative analysts predicted that the bill would come to the floor for a vote in 2007 or 2008.

The Task Force report recommends including $80 million for U.S. 395 early action and safety improvements, pending acquisition of new funding sources. Given the priority placed on these large projects in the major metropolitan areas of the state, no other new state funding sources are available for U.S. 395 projects within the foreseeable future.



Source: Nevada Blue Ribbon Task Force Report (2006)

Figure 7-2 *Nevada* Gasoline Tax versus Inflation-Adjusted Tax*

7.7.2 Likely Fund Sources

Douglas County is also struggling with projected transportation funding shortfalls. The *2007 Douglas County Transportation Plan* estimates a $17.5 million deficit for transportation funds by 2030, which includes $6.3 million in capacity improvement projects on the future Muller Parkway. Douglas County currently requires developers to make site-specific improvements in the vicinity of their projects. However, developers are not currently required to make contributions to regional roadway improvements.

Douglas County representatives have expressed an interest in partnering with the State of Nevada to complete projects on the state roadway system. In order to accomplish this task, Douglas County will need to develop new revenues sources. There are a limited number of financing options for Douglas County to increase transportation funding. Below is a list of the possible financing mechanisms and an assessment of the likelihood of implementation in Douglas County.

SALES TAX

The current sales tax level in Douglas County is 6.75 percent. The Washoe County Board of Supervisors approved a 1/4 percent sales tax increase and in 2002, Washoe County voters approved WC-2, providing an additional 1/16 percent of sales tax funds for local streets and highways. Douglas County voters have indicated their displeasure with using sales taxes to pay for local transportation, most recently rejecting a proposed 1/4 cent sales tax increase in 2002. While it may be possible put together another campaign for a transportation sales tax measure, local policy makers would need to have a specific list of projects and clear community agreement that these projects are vital for the common good of the community.

LOCAL FUEL TAX FUNDS

The local fuel tax has two sources: a 4 cent per gallon Regional Transportation Commission (RTC) fuel tax and a 6.35 cent per gallon local fuel tax. Other regions in Nevada have been successful with indexing this tax to the rate of inflation, allowing for small annual increases. Douglas County voters have indicated their displeasure with using fuel taxes to pay for local transportation, most recently rejecting a proposed 5 cent per gallon fuel tax increase in 2002. The County should also consider revisiting an increase in the local fuel tax to fund street maintenance, rehabilitation and transit services.

REGIONAL TRAFFIC IMPACT FEES

Regional impact fees could be assessed on new local residential and commercial development to pay for specific capacity improvements on the regional street and highway network. This approach to providing local transportation infrastructure is popular throughout the country where new growth is occurring. Many developers are supportive of these programs because they see that adequate infrastructure development ensures that the area remains a desirable place to live. Developers also like the certainty of paying a fee based on a set cost formula instead of discretionary negotiation of off-site improvements to receive project approvals.

SOURCES FOR ADDITIONAL FUNDING

Additional funding options are somewhat limited at this time, given that Douglas County residents recently rejected a sales tax increase. Concerned about the impacts of population growth in Douglas County, in 2002, local voters approved the Sustainable Growth Initiative, which limited residential building permits to 280 dwelling units per year. This measure has been not been placed into law due to ongoing legal proceedings in the Nevada court system. However, with a prevailing attitude toward limiting growth, county residents are not likely to approve across the board increases to the local tax structure to mitigate impacts created by new development.

Based on careful consideration of these funding options and its infrastructure needs, Douglas County is investigating the creation of a traffic impact fee program as part of the Financial Element of the *2007 Douglas County Transportation Plan*.

7.7.3 Recommended Action

The Carson City Board of Supervisors has already approved an increased fuel tax to pay for the local portion of the U.S. 395 Bypass of the downtown area. Since most of the newly proposed U.S. 395 improvements are located in Douglas County, NDOT will rely on Douglas County to provide most of the local funding match for projects under consideration in this study.

7.8 PROJECT DELIVERY

A number of projects are recommended for implementation during the next three to five years to improve safety on U.S. 395 between U.S. 50 and the Nevada/California state line. Strategies for implementation depend on the type of funding applicable to each recommendation. Figure 7-3 illustrates the Nevada Department of Transportation project development process.

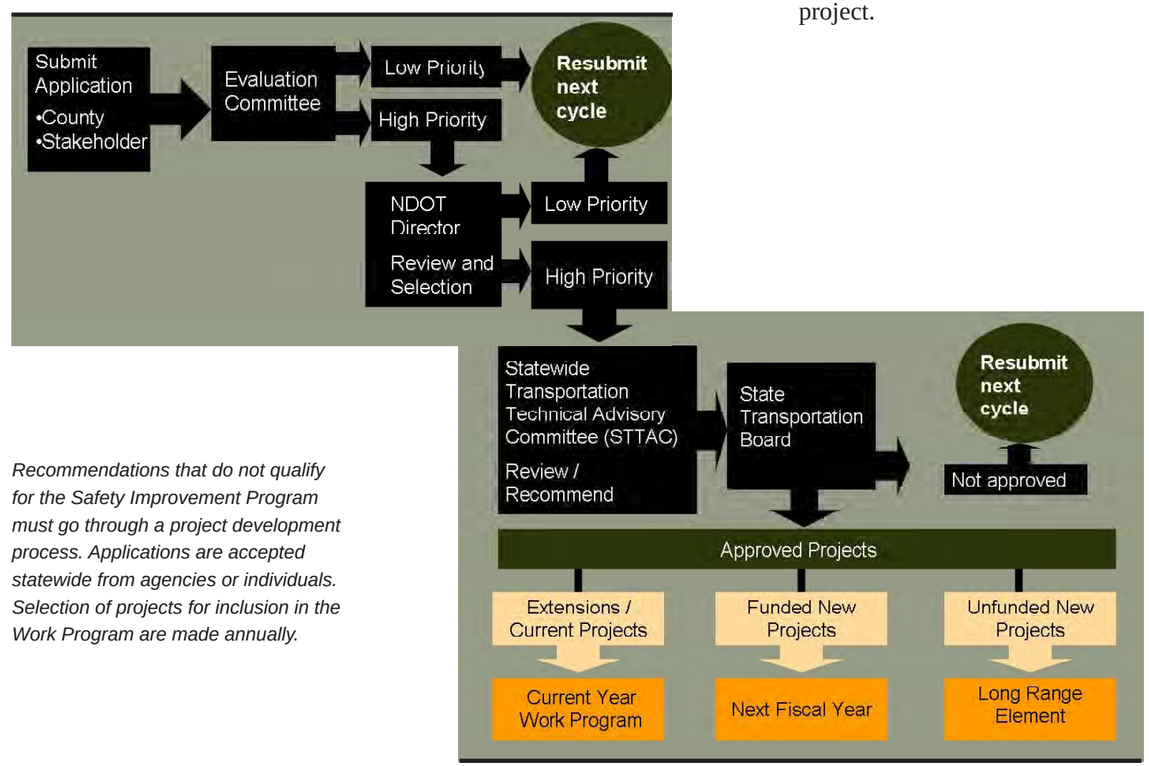
This group of projects should be prioritized and implemented by NDOT as funds are available. Project steps include securing funding, working with Douglas County and property owners and scheduling the work. Some recommended improvements qualify for the NDOT Safety Improvement program or as District II maintenance projects. These include:

- Install median barrier from Mica Drive to Muller Lane
- Install rumble strips from Topsy Lane to Plymouth Drive
- Restripe shoulders and lanes with 8-inch wide markings
- Conduct Access Management Assessment
- Conduct U.S. 50 High-T Feasibility Evaluation
- Conduct speed limit evaluation from Muller Lane to SR 88
- Eliminate left-turn lane at Ironwood Drive
- Install slower right-turn lane at SR 88 intersection

The projects listed below must go through a Project Development Process as required by the Nevada Legislature.

- Install acceleration/deceleration lanes
- Install access improvements to the Washoe Tribal Headquarters
- Install truck climbing lane from Mica Drive to Sunridge Drive
- Extend third lane past Jacks Valley Road
- Install half signal at Stephanie Way
- Lengthen right turn pocket on Johnson Lane
- Lengthen left turn pocket at Genoa Lane
- Install third lane on northbound U.S. 395 between Jacks Valley Road and Clear Creek Road

The half signal project at Stephanie Way has been completed. Local funding participation assured that this project received a high priority for implementation. The other projects will require Douglas County and/or individuals to submit an application to NDOT for a transportation system project.



Recommendations that do not qualify for the Safety Improvement Program must go through a project development process. Applications are accepted statewide from agencies or individuals. Selection of projects for inclusion in the Work Program are made annually.

Figure 7-3 *NDOT Project Development Process*

8 Public Involvement

Community involvement in the *U.S. 395 Southern Sierra Corridor Study* has been an important part of the project from its inception. Shortly after the project began, a number of serious crashes occurred on U.S. 395 between the intersection with U.S. 50 in Carson City and the intersection with SR 88 in Gardnerville. These crashes made public participation even more crucial and resulted in community requests to address safety issues in this section of the corridor. In response, NDOT representatives decided to conduct a traffic safety charrette for the entire study corridor to obtain public input on traffic safety and planning issues. The term *charrette* is used to describe a series of events including meetings, in which citizens and staff work together to define concerns, establish priorities and develop solutions.

Figure 8-1 *Workshop Participants Discuss Safety Concerns on U.S. 395*

In addition to the traffic safety charrette, the public outreach effort included four basic components:

- Meetings with city and county representatives
- Meetings with local key stakeholders
- Preparation of public materials, coordination and response to comments
- Public scoping meetings

The public involvement plan and outcomes of these efforts are summarized in this chapter.

Figure 8-2 *Charrette Participants Engage in Small Group Discussions*

8.1 PUBLIC INVOLVEMENT PLAN

The Public Involvement Plan defined the goal of the public outreach as follows:

> ***"Build project support by involving stakeholders in an interactive process that results in outcomes reflective of community standards."***

The plan also describes how and when public outreach efforts, involvement activities, and informational materials will be used to achieve the goal. The plan for the *U.S. 395 Southern Sierra Corridor Study* was designed to reach as many people in the study area as possible within budget constraints, involve them in the process, understand their concerns and priorities, and share information and ideas that would result in project recommendations being supported by the community. Developing a Public Involvement Plan allowed NDOT and its partners to provide a coordinated outreach effort that increased the plan's likelihood of success. Appendix I provides the complete Public Involvement Plan.

The outreach effort was designed to inform the public regarding the project and to invite participation. Materials were developed to be visually appealing, concise, and easy to understand. To distinguish information materials for this project from other NDOT efforts, a project "look" was developed for use on the web site, mailings, newsletters, posters, presentations and handouts. In addition, a logo and "tag line" succinctly described the project location and purpose (see Figure 8-3).

Figure 8-3 *U.S. 395 Southern Sierra Corridor Study Traffic Safety Charrette Logo*

Printed materials included display boards for public meetings and handouts. Presentations were created for each of the workshops. A two-sided, full-color, tri-fold brochure explaining single-lane roundabouts was developed and distributed at meetings. The brochure addressed concerns that had been expressed regarding the proposed SR 88 roundabout near Douglas High School.

8.2 STAKEHOLDER WORKING GROUP

Representatives of the following agencies were identified to participate in the Stakeholder Working Group (SWG):

- Carson City Engineering
- Carson Area Metropolitan Planning Organization (CAMPO)
- Douglas County: Planning, Engineering, Community Development
- Tahoe Regional Planning Agency
- Federal Department of Transportation, Carson City Office
- Washoe Tribe
- Nevada Department of Transportation, Headquarters: Design, Planning
- Town of Gardnerville
- Town of Minden

Each entity appointed a representative and an alternate to serve on the SWG. The SWG met seven times between August 2005 and May 2007. Roles include:

- Assisting with stakeholder identification and outreach
- Collaborating to develop a purpose and need statement
- Providing project background information, suggestions, and review/comment

8.2.1 Key Public Stakeholder Contacts

All interested and affected parties are public stakeholders. A database of key stakeholders, such as community leaders, agency staff, and SWG members was established during September 2005. Participants of subsequent events and those requesting to be on the mailing list were added to the database. Database e-mail addresses served as the distribution method for a series of electronic newsletters and were integrated into all printed material mailing.

8.2.2 Technical Input/Comment

Members of the SWG reviewed and commented on all technical material developed as part of the corridor study. They discussed travel forecast model results, project alternatives, alternatives cost/benefit methodology and draft public outreach materials. The group's comments provided substantial assistance to the project staff in developing the best possible collection of projects to serve this corridor.

8.3 OUTREACH INFORMATION MATERIALS

Outreach includes all efforts to inform the public about the project and public involvement opportunities. In addition to acquiring materials at meetings, the public received information via the following methods.

8.3.1 Project Web Site

The project web site was a valuable tool for disseminating current information. Project background, objectives, status, and schedules were provided on a public web site, linked to the Nevada Department of Transportation web site. Updates included meeting schedules, summaries of public process, newsletters and project status. Figure 7-4 shows the web site home page. The address of the web site is *www.douglascounty395.com*.

Figure 8-4 *U.S. 395 Southern Sierra Corridor Study Website*

8.3.2 Direct Mail

All residents and property owners within one-quarter mile of the corridor between Carson City and SR 88 and residents of Genoa and the Johnson Lane area received an informational card with details on the Traffic Safety Charrette workshops. The project database was integrated into the mailings to ensure that all those on the database received meeting notices.

8.3.3 Notices in Public Places

NDOT staff prepared public notices of the workshops in accordance with Nevada's Open Meeting Law. Additional postings of eye-catching event flyers were provided in at least five locations, such as community bulletin boards.

8.3.4 Media Outreach

Talking points related to the traffic safety charrette were developed and distributed to key staff who might come in contact with the media. Press kits were distributed to local media organizations to obtain proactive and informed media coverage of the project and opportunities for involvement.

8.3.5 Electronic Notification

Electronic notices were sent to all those on the project database, along with an invitation to distribute the notices to other mailing lists.

Figure 8-5 *Charrette Participants Consider Possible Safety Improvement Projects*

8.4 PUBLIC MEETINGS AND ACTIVITIES

8.4.1 Focus Groups

Two groups convened to discuss corridor growth and safety issues at NDOT headquarters on October 6, 2005. Each group was engaged in a facilitated discussion that invited their input on driver behavior, traffic concerns, and potential improvements in the corridor. Participants included Douglas County Sheriff and Planning Department representatives, members of various Conservation Districts, representatives from Carson City, the Town of Minden, Indian Hills General Improvement District, and the Federal Highway Administration (FHWA). Detailed notes and comments are provided in Appendix J.

8.4.2 Community Workshop

On Saturday, October 15, 2005, approximately 34 people attended a workshop at the Carson Valley Middle School. Following introductions, the audience viewed several background slides which explained the corridor study, the workshop agenda, and how the public input would be used. Participants voiced their concerns about the corridor, which were listed on large pieces of paper and affixed to the wall. Additional slides featuring crash data, prior improvements, current challenges, and potential solutions were then shown. Participants then "voted" for their top seven concerns using sticky dots. A traffic signal at Stephanie Way was the top concern. A detailed list of concerns and the number of votes received are listed in Appendix J.

The audience gathered in groups to discuss possible solutions. Afterwards, each group presented their ideas to the larger group. Appendix J contains the Potential Solutions handout, a list of suggestions, written comments, and responses.

8.4.3 U.S. 395 Corridor Evaluation Field Review

On November 15, 2005 a Corridor Evaluation Field Review was conducted. Participants included representatives from NDOT and the FHWA. The group traveled the corridor, stopping at selected locations to observe conditions. Objectives of the corridor evaluation were:

- Reduce the risk and severity of crashes that may be attributed to the existing road conditions by identifying potential safety improvements.
- From a road user's viewpoint, identify confusing and/or misleading messages.
- Improve awareness of safe maintenance practices.
- Review the concerns and requests expressed at the Community Workshops held on October 15, 2005.

8.4.4 Follow-up to the October 15, 2005 Meeting

A follow-up community meeting was conducted on December 14, 2005, at the Minden Elementary School. A slide presentation explained how suggestions from the Community Workshop, focus groups, and the field review were analyzed and developed into recommendations. The presentation included information on how recommendations are implemented through the normal transportation planning process and through the NDOT safety improvement program.

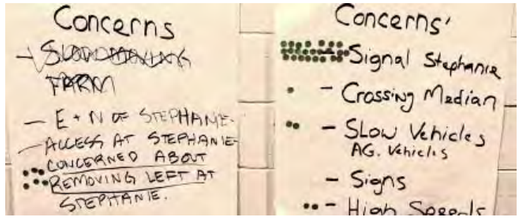
8.4.5 Public Workshops to Report Recommendations, January 2007

JACKS VALLEY ELEMENTARY SCHOOL
CVIC BUILDING, MINDEN

Approximately 75 people attended a public meeting on the evening of January 23, 2007 in the northern area of Douglas County. Over 100 people attended a similar meeting on January 31 at the CVIC Building in Minden. Representatives from the Nevada Department of Transportation, the Nevada Highway Patrol and Douglas County were present. The purpose of the meeting was to inform the public of the draft results of the corridor study. Participants completed a questionnaire to indicate their preferences for various projects, with the combined results from both community meetings provided in Table 8-1.

Members expressed their concerns regarding corridor issues and the seven different concepts for roadway network development by the year 2030. A number of people requested a study of an eastern bypass of Minden/Gardnerville. Participants also commented on increasing traffic congestion, especially in the Topsy Lane area of northern Douglas County. Some people requested construction of interchanges at Stephanie Way, Johnson Lane and Airport Road. All of these comments are included as a part of Appendix K.

After developing a list of concerns, participants viewed a series of slides.



People voted for their top seven concerns.

The audience gathered in groups to develop suggestions.

Each table presented their suggestions.

Figure 8-6 *Community Workshop Process*

Table 8-1 *Summary of Questionnaire Responses from January 2007 Public Meetings*

SCENARIO/ CONCEPT	STRONGLY FAVOR	FAVOR	NEUTRAL	OPPOSE	STRONGLY OPPOSE
1. Carson City and Douglas County planned improvements	10	14	3	0	0
2. Heybourne Connection to Carson Freeway	13	16	3	2	2
3. Freeway with frontage Roads from U.S. 50 to Mica; 6-lane freeway with interchange(s) to Muller	10	7	5	6	3
4. Freeway with frontage roads as described in #3, plus Heybourne Road connection to Carson City Freeway	11	8	6	3	1
5. Vicky Lane Connection to Carson Freeway	4	6	5	2	9
6. U.S. 395 at Muller and SR 88: Widen Intersection	4	9	8	7	3
7. U.S. 395 at Muller and SR 88: Bypass	0	7	12	1	1
8. U.S. 395 at SR 88: Roundabout	9	3	7	6	5

8.4.6 Presentation to Carson Area Metropolitan Planning Organization

NDOT presented the preliminary results of the Corridor Study to the Carson Area Metropolitan Planning Organization (CAMPO) Board of Directors on March 14, 2007. Staff explained the purpose of the study and the various options for roadway development in the U.S. 395 Corridor. The board members expressed particular interest in the options for diverting traffic around the towns of Minden and Gardnerville with some type of bypass facility. Several bypass facility options are explored in this report. Additional CAMPO board comments on the project are included in the draft meeting minutes, located in Appendix L.

8.5 SUMMARY

The traffic safety charrette focused on a segment of a corridor that extends from the southern end of Carson City to the California border. The study resulted in a list of projects that will be pursued by NDOT, and a list of projects that will require further action by a local agency to be considered for state programming and funding. It also resulted in some suggestions for long-term improvements in the corridor. These suggestions will receive additional consideration as NDOT considers implementing the recommendations of the U.S. 395 Southern Sierra Corridor Study.

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1 Study Introduction

2 Existing Conditions

3 Future Conditions

4 Recommended Near-Term U.S. 395 Safety Improvements

5 Alternatives Development

6 Costs and Benefits

7 Implementation Plan

8 Public Involvement

9 Appendices

10 Glossary of Terms

10 Glossary

This glossary of terms is intended to provide a common definition and form a mutual understanding for all users of this report:

A

Acceleration lane – Drivers entering a roadway use this lane to increase speed so that they may safely merge with traffic.

Air quality conformity – The link between air quality planning and transportation planning.

Americans with Disabilities Act of 1990 (ADA) – The legislation defining the responsibilities of and requirements for transportation providers to make transportation accessible to individuals with disabilities.

Arterial – A class of roads serving major traffic movements (high-speed, high volume) for travel between major points.

At-grade intersection – An intersection where all roadways join or cross at the same level.

Average annual daily traffic (AADT) – The annual average two-way traffic volume on a roadway during a normal day in a specified year.

Average daily traffic (ADT) – The total volume of traffic during a given time period divided by the number of days in that time period, representative of average traffic in a 24-hour period of time.

B

Bureau of Land Management of the U.S. Department of the Interior (BLM) – Federally-owned land areas (67% of Nevada is managed by the BLM).

Bypass – A highway that allows traffic to avoid driving through an urban area.

C

Calendar year – The period of time between January 1 and December 31 of any given year.

Capacity – The maximum number of vehicles that can safely pass a given point in one hour, on a specific road, under ideal driving conditions.

Capital costs – The costs of designing, acquiring rights-of-way, constructing, purchasing equipment (e.g., vehicles), and implementing a transit or highway project or system, etc.

Carbon dioxide (CO_2) – 1) A fluid consisting of more than 90 percent carbon dioxide molecules compressed to a supercritical state. (49CFR195) 2) A colorless, odorless gas. It is not a liquid under standard temperature and pressure.

Carbon monoxide (CO) – A colorless, odorless, highly toxic gas that is a normal by-product of incomplete fossil fuel combustion. Carbon monoxide, one of the major air pollutants, can be harmful in small amounts if breathed over a certain period of time.

Channelization – The use of traffic markings or islands to direct traffic into certain paths, for instance, a “channelized” intersection directs portions of traffic into a left turn lane through the use of roadway islands or striping that separates the turn lane from traffic going straight.

Collector-distributor roads (C-D) – These roadways penetrate neighborhoods, connecting arterial streets (see arterial street system) to residential, or local streets.

Congestion – This term relates to how the current traffic on a road compares to the amount of traffic a road was designed to handle; a road is considered “congested” if its peak period traffic volume (see peak period) exceeds 80 percent of the intended capacity of the roadway. Consensus – Broad agreement among stakeholders.

Controlled access – A roadway where access is limited to interchanges only.

Corridor – A broad geographical band that follows a general directional flow connecting major sources of trips that may contain a number of streets, highways and transit route alignments.

Corridor study – Evaluating a strip or area of land to determine specific traffic, topography, local environment, and other characteristics in order to identify potential ways to improve or enhance the area’s transportation system and roadway network.

Cost-benefit analysis – Appraisal of the economic efficiency of a strategy, by weighing the costs of a strategy against the benefits it might bring, over a number of years into the future.

D

Deceleration lane – A lane designed to allow traffic to safely decrease speed.

Delineator – A retro-reflective device mounted on the roadway surface or at the side of the roadway, typically in a series, to indicate alignment of the roadway and to channelize vehicles to form queues and/or prevent crossing into an adjacent lane or accessway.

Design capacity – The maximum number of passenger vehicles per lane that is intended to pass a certain point during one hour on an average day.

Design life – The projected life (in years) of a new structure or structural component under normal loading and environmental conditions before replacement or major rehabilitation is expected.

Divided highway – A highway where the two travel directions are separated by a barrier.

F

Federal Highway Administration (FHWA) – The branch of the federal Department of Transportation that works with state departments to oversee highways in the United States.

Freeway – A principal, divided arterial highway designed for the unimpeded flow of large traffic volumes. Access to a freeway is rigorously controlled and intersection grade separations are required.

Frontage road – A road adjacent and typically running parallel to a highway, allowing access to nearby properties.

Functional classification – The system by which roadways are categorized; a road is grouped into general classes based on its function (see principal arterials, minor arterials, collectors, and local streets).

G

Geographic information system (GIS) – 1) Computerized data management system designed to capture, store, retrieve, analyze, and display geographically referenced information. 2) A system of hardware, software, and data for collecting, storing, analyzing, and disseminating information about areas of the Earth.

Goals – Generalized statements which broadly relate to the physical environment to values.

Grade separation – An intersection with an underpass or overpass that allows traffic to cross over or under another roadway.

H

High occupancy vehicle (HOV) – Vehicles carrying two or more people. The number that constitutes an HOV for the purposes of HOV highway lanes may be designated differently by different transportation agencies.

High occupancy vehicle lane – Exclusive road or traffic lane limited to buses, vanpools, carpools, and emergency vehicles.

Highway – Any road, street, parkway, or freeway/expressway that includes rights-of-way, bridges, railroad-highway crossings, tunnels, drainage structures, signs, guardrail, and protective structures in connection with highways. The highway further includes that portion of any interstate or international bridge or tunnel and the approaches thereto.

Highway-rail grade crossing – A location where one or more railroad tracks are crossed by a public highway, road, street, or a private roadway at grade, including sidewalks and pathways at or associated with the crossing.

Horizon year – The future year to which a planning activity is directed.

Hydrocarbons (HC) – Colorless gaseous compounds originating from evaporation and the incomplete combustion of fossil fuels.

I

Indian lands – Indian reservation or Indian trust land or restricted Indian land which is not subject to fee title alienation without the approval of the Federal Government, or Indian and Alaska Native villages, group, or communities in which Indians and Alaskan Natives reside, whom the Secretary of the Interior has determined are eligible for services generally available to Indians under Federal laws specifically applicable to Indians.

Infrastructure – All the relevant elements of the environment in which a transportation system operates. The physical underpinnings of society at large, including, but not limited to, roads, bridges, transit, waste systems, public housing, sidewalks, utility installations, parks, public buildings, and communications networks.

Interchange – The system of interconnecting ramps between two or more grade-separated intersecting roadways or guideways.

Intermodal – A transportation system connecting or including different modes of transportation.

Intersection – The area at which two or more roadways cross each other.

L

Land use – The function of a given area of land. Examples of types of land use include: residential, industrial, commercial, agricultural and recreational.

Land use plan – A plan which establishes strategies for the use of land to meet identified community needs.

Level of service (LOS) – A traffic “report card” that rates the flow of traffic on a particular roadway from A (best) to F (worst), by comparing the volume of traffic on the road with its intended maximum capacity.

M

Major arterials – High-volume roadways that provide significant regional access. Also called principal arterials.

Minor arterials – High-volume roadways that act as secondary routes or that link to major arterials.

Model – A representation of the relationships which occur between supply and demand within the land use / transport system. Usually expressed in mathematical form, models are widely used to predict the outcomes of transport strategies.

Measures of effectiveness – Measures or tests which reflect the degree of attainment of particular objectives.

N

Nitrogen oxide emissions – Nitrogen oxides (NO_x), the term used to describe the sum of nitric oxide (NO), nitrogen dioxide (NO_2) and other oxides of nitrogen, play a major role in the formation of ozone. The major sources of man-made NO_x emissions are high-temperature combustion processes, such as those occurring in automobiles and power plants.

Nitrogen oxides – A product of combustion of fossil fuels whose production increases with the temperature of the process. It can become an air pollutant if concentrations are excessive.

O

Origin/destination (O-D) – Counts of people (or households) as a combination of two addresses: a home (usually resident) address and an address at work or study

Ozone (O_3) – Ozone is a colorless gas with a sweet odor. Ozone is not a direct emission from transportation sources. It is a secondary pollutant formed when VOCs and NO_X combine in the presence of sunlight. Ozone is associated with smog or haze conditions. Although the ozone in the upper atmosphere protects us from harmful ultraviolet rays, ground-level ozone produces an unhealthy environment in which to live. Ozone is created by human and natural sources.

P

Particulate matter (PM_{10} and $PM_{2.5}$) – Particulate matter consists of airborne solid particles and liquid droplets. Particulate matter may be in the form of fly ash, soot, dust, fog, fumes, etc. These particles are classified as "coarse" if they are smaller than 10 microns, or "fine" if they are smaller than 2.5 microns. Exposure to these particles may aggravate medical conditions such as asthma, chronic bronchitis, aggravated coughing, heart disease and emphysema and may cause premature death.

Parts per million (PPM) – A measure of air pollutant concentrations.
Passenger Car A motor vehicle designed primarily for carrying passengers on ordinary roads, includes convertibles, sedans, and stations wagons.

Peak period – The time during which the maximum amount of travel occurs, usually specified as the morning (a.m.) or evening (p.m.) peak.

Performance measures – Indicators of how well the transportation system is performing with regard to such things as average speed, reliability of travel, and accident rates. Used as feedback in the decision-making process.

Person trip – A trip taken by an individual. For example, if three persons from the same household travel together, the trip is counted as one household trip and three person trips.

Person-miles – An estimate of the aggregate distances traveled by all persons on a given trip based on the estimated transportation-network-miles traveled on that trip.

Problem identification – An element in the planning process which represents the gap between the desired vision, goals and objectives and the current or projected performance of the system

Projected land use – The anticipated way a specific area will be utilized in the future (e.g., residential, commercial property, industrial use).

Public participation – The active and meaningful involvement of the public in the development of transportation plans and programs.

Public transit – Passenger transportation services, usually local in scope, that is available to any person who pays a prescribed fare. It operates on established schedules along designated routes or lines with specific stops and is designed to move relatively large numbers of people at one time.

Public transit agencies – A public entity responsible for administering and managing transit activities and services. Public transit agencies can directly operate transit service or contract out for all or part of the total transit service provided.

Q

Queue – A stacking of vehicles waiting to be serviced and/or processed.

R

Right-of-way (ROW) – The land (usually a strip) acquired for or devoted to highway transportation purposes.

Roundabout – A type of road junction (or traffic calming device) at which traffic enters a stream around a central island after first yielding (giving way) to the circulating traffic.

Rural highway – Any highway, road, or street that is not an urban highway.

S

Safety – Minimizing the number of all types of road traffic accidents. ally expressed through total traffic accident costs or by accident risk per vehicle kilometre.

Scenario – Possible future situation in terms of a range of factors such as economic growth, changes in population and household size, income and car ownership.

Sensitivity – The susceptibility to change of one thing in relation to a change in another. Sensitivity analysis is a programme of tests of a strategy to find out how its performance changes with changes in the assumptions.

Service life – The projected remaining life (in years) of an existing structure or structural component under normal loading and environmental conditions before replacement or major rehabilitation is expected.

Shoulder – The area to the side of a roadway, which may or may not be paved or improved.

Single-point urban interchange (SPUI) – An interchange where all movements of traffic entering and exiting the freeway are controlled by one traffic signal.

Stakeholder – Person or group affected by a transportation plan, program or project. These include federal/state/local officials, MPOs, transit operators, freight companies, shippers, and the general public.

Study area – The geographic area addressed by the analysis in a plan or study.

Sustainable/sustainability – Meeting the needs of the present without compromising the ability of future generations to meet their own needs.

Synergy – A condition where the component instruments of a strategy have a greater beneficial effect than the sum of their parts.

T

Threshold – The value of an indicator which should not be exceeded.

Traffic analysis zone (TAZ) – The smallest geographically designated area for analysis of transportation activity. A zone can be from one to ten square miles in area. Average zone size depends on the total size of study area.

Total benefit/cost ratio – The sum of quantifiable project benefits divided by the anualized cost of the project.

Traffic management – Installation of signals, signs or pavement markings to control traffic flow.

Traffic modeling – Using a computer program to analyze the prominent ways people travel

Traffic volume – The number of vehicles traveling on a specified roadway during a specific time period, typically reported as vehicles per hour (vph) or vehicles per day (vpd).

Transportation infrastructure – A federal credit program under which the USDOT may provide three forms of credit assistance - secured (direct) loans, loan guarantees, and standby lines of credit - for surface transportation projects of national or regional significance. The fundamental goal is to leverage federal funds by attracting substantial private and non-federal co-investment in critical improvements to the nation's surface transportation system.

Travel demand modeling (TDM) – Analysis of spatial and temporal dimensions related to travel patterns, in order to effectively plan the distribution and management of travel demand; an important initial step in the creation of transportation plans such as TIP (see transportation improvement programs).

Tribal lands – Land held in trust for Indian people, restricted Indian land which is not subject to fee title alienation without the approval of the Federal Government, and fee lands owned by tribal governments.

Turn bay – An additional lane added to a roadway to permit turning traffic to pull aside prior to turning.

Two-way left turn – A designated lane located in the center of a roadway from which left turns may be made from either direction.

V

Vehicle hours of delay (VHD) – A measure of delay that indicates the number of hours the traffic stream is delayed, measured in vehicle-hours.

Vehicle hours of travel (VHT) – The total number of hours of vehicle travel on the designated set of roadways.

Vehicle miles traveled (VMT) – The amount of vehicle travel on a designated set of roadways, multiplied by the total mileage of those roadways.

Volatile organic compounds (VOC) – VOCs come from vehicle exhaust, paint thinners, solvents, and other petroleum-based products. A number of exhaust VOCs are also toxic, with the potential to cause cancer.

W

Workshop - An educational seminar or series of meetings emphasizing interaction and exchange of information among a usually small number of participants

Z

Zone – The smallest geographically designated area for analysis of transportation activity. A zone can be from one to ten square miles in area. Average zone size depends on the total size of study area.