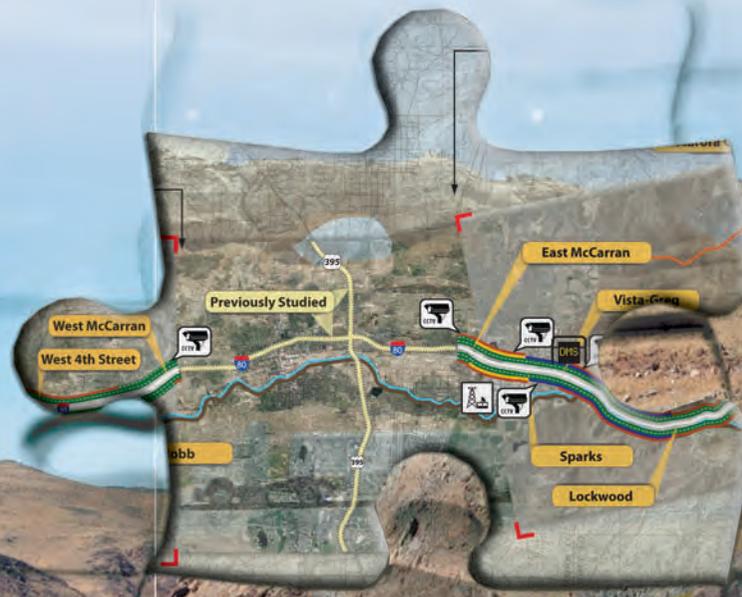


I-80 CORRIDOR STUDY TECHNICAL REPORT

Appendix K Potential
Alternative Solutions and
Estimated Cost of Alternatives

PREPARED FOR
NEVADA DEPARTMENT OF TRANSPORTATION



1. Introduction

The I-80 Corridor Study area encompasses I-80 west from the California state line to the West McCarran Boulevard (SR 651) Interchange, and I-80 east from the East McCarran Boulevard (SR650) Interchange in the City of Sparks to east of the Wadsworth-Pyramid (SR 427) Interchange. The study's intent is to provide decision-makers an action plan that will define future transportation needs along the corridor. It is also intended to provide participating agencies with a range of workable and cost-effective transportation alternatives that address current and future needs. These alternatives will be assessed for their socioeconomic, community, environmental, and fiscal impacts.

2. Purpose of the Memo

The study will address concerns related to the need for improving transportation along the I-80 corridor by evaluating the future land use demands while protecting and using existing resources. Analysis of existing and future conditions provides information regarding current deficiencies as well as growth areas and associated issues. The purpose of this memo is to identify major improvements and recommended alternative solutions to mitigate the deteriorating future conditions. These improvements are organized in three major categories:

- Improvements with travel demand management strategies
- Interchange improvements
- Mainline improvements

3. Travel Demand Management Strategies

Travel Demand Management (TDM) is a general term used for various strategies that seek to increase transportation system efficiency by emphasizing the movement of people and goods, and give priority to more efficient modes (such as walking, cycling, ridesharing, public transit, and telecommuting), particularly under congested conditions. These strategies prioritize travel based on the value and costs of each trip by giving higher-value trips and lower-cost modes priority over lower value and higher-cost options. TDM strategies improve the transportation options available to consumers; provide incentives to change trip scheduling, route, mode, or destination; and reduce the need for physical travel through more efficient land use (or transportation substitutes). Although most individual TDM strategies only affect a small portion of total travel, the cumulative impacts of a comprehensive TDM program can be significant.

The growth surrounding the I-80 corridor is expected to generate a variety of transportation problems that include traffic congestion; inadequate mobility for non-drivers; and increased economic, social, and environmental costs associated with high levels of automobile travel. The need to implement TDM becomes essential, considering these transportation problems as well as rising construction costs, increasing population age, increasing vehicle fuel costs, and ongoing environmental concerns.

To address the issues identified along the corridor, the following TDM strategies were explored:

- Alternative mode programs
 - Transit
 - Carpooling/vanpooling
 - Park-and-ride facilities
 - Bicycling
- Alternative work schedule
- Intelligent transportation systems (ITS)
- High-occupancy vehicle (HOV)/high-occupancy toll (HOT) priority
- Freight transport management
- Access management
- Incident detection and management

3.1 Alternative Mode Programs

Promoting the use of alternative modes is an efficient TDM strategy that can be used in reducing automobile travel along the I-80 corridor. Identified alternative modes included transit, carpooling/vanpooling, park-and-ride, and bicycling. The Washoe County Regional Transportation Commission (RTC) has established the “RTC Smart Trips” program, which assists local businesses to encourage employees to use alternative modes of transportation.

Transit

Public transit along the corridor is currently limited to conventional bus transit that primarily covers the urban area from Robb Drive to Vista Boulevard. Due to the expected increase in population and density on both sides of the corridor, expanding existing service as well as evaluating express transit/bus rapid transit (BRT), light-rail, or commuter train service may offset the growing costs of freeway expansion and contribute to preserving the corridor’s interstate functionality. Establishing a public transportation service offers numerous benefits, including lower travel costs and better access to jobs, health care, and shopping. Local businesses would increase their level of activity and the communities would benefit by the best use of their unique environments. The RTC’s *Regional Transportation Plan* indicates that the primary transit network will be extended to the West Verdi area to serve the transit-oriented developments planned along the east side of the corridor. The primary transit network is not anticipated to serve the areas east of Vista Boulevard; however, an express transit line to Fernley is anticipated.

The *Draft West Fourth Street Transit-Oriented Development Corridor Plan*, prepared by the City of Reno, considers transit as a priority for this area, supported by the transit-oriented development and the planned tourist and commercial gateway facilities. The plan also recommends a future BRT system for the eastern part of Fourth Street that runs parallel to I-80 and emphasizes that “Expansion of regional road capacity should not come at the expense of transit or pedestrian improvements within the corridor and adequate right-of-way should be maintained to facilitate future rapid transit service within the eastern plan area.”

The I-80 Corridor Study Group recommends that an express transit service be established on the west side of the corridor by the 7-year horizon and the feasibility of a light-rail or commuter train service be explored for the 25-year horizon.

To coordinate these activities, it is recommended that the RTC and NDOT convene a task force to explore resources and funding for establishing an express transit route service along the I-80 corridor.

Carpooling/Vanpooling

Carpooling and vanpooling can be used in any geographic area; it tends to be more effective, however, in dispersed suburban areas that are not well served by public transit. The RTC currently offers a web-based service that uses advanced technology to make carpool matching easy, fast, convenient, and accurate within the Truckee Meadows.

The vanpool program offered free by RTC includes commuter vans driven by one of the members of the group, with passengers picked up and dropped off at agreed-upon locations and times. Expenses are shared by the riders and subsidized by RTC. When more riders participate, the cost for everyone decreases. Ridesharing is an extremely cost-effective alternate mode, particularly for areas not serviced by transit and for rural and suburban areas further than 10 miles from employment centers.

Targeted marketing with major employers or households in areas not covered by transit may be a strategy to encourage carpooling/vanpooling and facilitate transitioning to a full transit program.

Park-and-Ride Facilities

Park-and-ride facilities are locations where the travelers have the opportunity to transfer between the automobile and either transit or higher-occupancy vehicle modes. These facilities are usually located near transit stations, bus stops, and highway ramps that facilitate transit and rideshare. The primary purpose of park-and-ride is to facilitate access to public transportation and increase the availability of travel alternatives other than driving alone. It can encourage a shift to higher-occupancy modes, allowing agencies to reduce congestion and address air quality. Park-and-ride locations should not be designed alone but should be included in a comprehensive planning process, integrating multiple modes and defining their intended use by their anticipated function. Effective use of park-and-ride lots and other TDM efforts often require incentives to promote and encourage usage. Ridesharing programs and vanpooling are viable incentives to promote the use of park-and-ride facilities and increase rider density for the corridor.

The *Draft West Fourth Street Transit-Oriented Development Corridor Plan* envisions that a park-and-ride facility may be appropriate for I-80 commuters to access public transportation options. Transportation policies in the *Regional Transportation Plan* also promote park-and-ride facilities in outlying areas served by commuter express bus service, where warranted and feasible.

Bicycling

The combination of bicycle and pedestrian improvements that support the enhanced transit system is another TDM strategy that can be effective in promoting alternative modes of transportation. Currently, the Tahoe-Pyramid Bikeway, a non-profit organization, is pursuing a vision for a bikeway along Truckee River that links Lake Tahoe and Pyramid Lake. The route will descend more than 2,000 feet in 116 miles, using a combination of existing dirt and paved roads, plus some sections of new trail and bridges. The bikeway will increase recreational

opportunities and improve the efficiency of the transportation system in the Truckee Meadows area.

It is recommended that local governments incorporate the Tahoe-Pyramid bikeway in their transportation plans as an alternative mode that supports low-speed circulation and promotes pedestrian and bicycle commuter/recreational travel.

3.2 Alternative Work Schedule

Alternative work schedules (for example, “flextime”) is a TDM strategy that directly reduces peak-period congestion. The analysis of journey-to-work data indicated that the majority of workers leave home between 7:30 a.m. and 7:59 a.m. Implementing this strategy will help reduce peak-hour trips, create travel time peak spreading, and relieve peak-hour congestion. The *Regional Transportation Plan* identifies flextime as a TDM strategy, incorporated into the TDM policies, which encourage alternative work schedules for employees as a means to reduce peak-hour vehicle trips.

This study recommends that NDOT, in coordination with RTC and other local agencies, establish a comprehensive commute trip reduction program that will identify job categories suitable for alternative work schedules and provide guidance to the employers on how to implement these schedules.

3.3 Intelligent Transportation Systems

The use of information technologies such as computers, telecommunications, global positioning system (GPS), and the Internet in improving transportation system performance and efficiency is referred to as Intelligent Transportation Systems (ITS). Some ITS technologies improve automobile travel and may increase the vehicle miles traveled (VMT), while others support TDM by improving transportation options such as transit and ridesharing. All ITS improvements along the I-80 corridor must comply with the Northern Nevada Regional ITS Architecture and Strategic Deployment Plan developed by Iteris in September 2004 and updated in 2007. The ITS architecture represents a collaborative effort between regional agencies and provides a framework for current ITS deployment and strategies for future investments.

ITS elements that will help mitigate future congestion, enhance mobility, and improve safety along I-80 corridor are identified in Appendix J, ITS Alternatives Technical Memo.

3.4 HOV/HOT Priority

The *Regional Transportation Plan* has identified this strategy and incorporated it into the TDM policies, which require periodic review of HOV lanes as a congestion relief measure. Based on this policy, future corridor improvements need to consider this strategy.

3.5 Freight Transportation Management

Freight transport management is a TDM strategy that intends to increase the efficiency of freight and commercial transport, which is crucial within the I-80 corridor area. As one of three major transcontinental interstate corridors in the country, I-80 has understandably high truck volumes, which will significantly influence how current and future corridor needs are best met.

Corridor Truck Parking Needs

Analysis of current conditions indicates that truck traffic creates a challenge for freeway operations, especially during the winter months. The impact of truck traffic along the corridor has long been recognized by NDOT, and they have accordingly implemented a number of measures to improve safety and mobility for truckers and other motorists (for example, adding truck-climbing lanes and improving traveler information dissemination).

Within the study limits, specific concerns related to truck traffic, primarily during winter travel, need attention. California. Westbound traffic is often stopped at the Nevada-California border during Donner Pass winter storm event closures, leading to miles of traffic backups and a host of related safety and operational problems. Trucks are allowed to park in the shoulder due to insufficient truck parking space. A lack of equipment also contributes to a difficulty for NDOT in keeping the urban area clear of truck traffic during these closure events. The situation was exacerbated when in 2007, the Boomtown truck stop was closed, eliminating 200 parking spaces that were heavily used during these storm events.

In early 2008, NDOT submitted a request to the Federal Highway Administration (FHWA) for funding of a Truck Parking Initiative. In the request submittal, NDOT identified nine short- and long-term strategies to address the truck parking problem in the corridor:

1. Open non-traditional facilities to truck parking, including median parking, inspection and weigh stations, and park-and-ride facilities.
2. Facilitate the coordination between NDOT districts to use dynamic message signs (DMS) and highway advisory radio (HAR), when available, to advise truck drivers of state line closure conditions.
3. Upgrade the 511 system software to consider truck restrictions and closures on the roadway information systems.
4. Install flashing warning signs to advise westbound trucks when I-80 is closed to trucks in California.
5. Forecast truck parking availability based on past usage to equip adjacent truck parking areas in a corridor or region to better develop business plans for self-sustainability.
6. Divert trucks from over-filled to under-filled lots.
7. Convert temporary spaces to permanent installations.
8. Promote real-time dissemination of publicly or privately provided commercial motor vehicle parking availability using ITS and other means to facilitate a system that would allow truckers to make parking reservations and assign truck parking spaces based on departure.
9. Make safety and capital improvements to public parking facilities, including safety patrol and truck stop electrification systems.

The proposed Truck Parking Initiative also includes a list of activities to be funded. Table 1 summarizes these activities and identifies those applicable to the corridor area. The funding request was not granted as of the writing of this report. It is included in Appendix O of the

Technical Report as a reference document. The recommendations have been adopted as part of the I-80 Corridor Study as well.

Update on Corridor Activities since the Truck Parking Initiative Funding Request. The economic downturn and resultant growth slowdown in the corridor has not diminished the need to implement strategies identified in the Truck Parking Initiative. NDOT had been through two winters since the Boomtown closure, and due primarily to proactive measures taken, they have been able to handle winter storm events without major incident. Measures taken include:

- *Flyers.* In advance of and during the winter months, NDOT prepared and distributed flyers to advise the freight industry of parking limitations in Reno during ice and snow events. These flyers were posted on the NDOT Website; every truck stop between Reno and Evanston, Wyoming; Caltrans rest stops; and Utah ports of entry.
- *Consistent and updated closure information.* Accessing a variety of available media, travelers can obtain the latest storm and road closure information. NDOT makes effective use of their Website, the 511 traveler information system, and HAR to disseminate information. They have also taken steps to provide free Internet access at several rest stops.
- *Signing.* Advanced information is provided through a combination of permanent and portable DMS and solar-powered, flashing warning signs indicating road closures. These signs are placed as far east as Elko, Nevada.

Although these steps have met with success, additional measures as outlined in the Truck Parking Initiative are still needed to help reduce the impact of I-80 road closures. Since completion of the Truck Parking Initiative report in February 2008, development within the corridor has slowed dramatically.

Table 1: Freight Transportation Management Activities

Description	Quantity	Location	Proposed for Study Area
Truck Oriented HAR	1	Lovelock to California Sateline	
ATIS to disseminate information regarding traffic, truck routing, fueling locations, and truck stops.	1	Corridor	Yes
Test Reservation Systems	1	Demonstration Project	If applicable
Identify with local government parking space locations		Corridor	Yes
Acquire ROW		At identified locations	If applicable
Construct Pavement Oasis and Buildings for Truck Resting Area		East of Urban Area	No

Description	Quantity	Location	Proposed for Study Area
Rest Area Assessment		Corridor	Yes
Pave winter parking Areas			
DMS Signs	1 4 2	Imlay Trinity Wadsworth	2 DMS signs at Wadsworth, 1 at Mogul, 1 at Mustang, 1 at Cemetary are being installed.
Truck Stop Electrification System	2	between Imlay and Lovelock between Lovelock and Trinity	No
Solar Flashers to Support new HAR	8	between Imlay and Lovelock between Lovelock and Trinity	No
Mobile DMS	20	20, Corridor	To be used as needed

Virtually all new residential development has been placed on hold and limited commercial and industrial development has occurred. Other issues affecting truck parking:

- *Reno City Ordinance*. Passage of this ordinance prohibits new truck stops being built in those areas not zoned for industrial development.
- *Washoe County Fuel Tax*. Washoe County sought voter approval and recently enacted increases in fuel taxes, including diesel fuel that may impact the attractiveness of locating truck stops in Washoe County. Nevada counties to the east of Washoe along I-80 may be able to offer lower fuel prices and thus be more attractive for new truck stop development.

Below are several updates in truck stop development along the study corridor:

- *Big Wheel Truck Stop in Fernley (exit 48)*. This truck stop is under construction with a scheduled opening in spring 2010. Located near the property occupied by the former Truck Inn, it appears this development could add a significant number of truck parking spaces during future storm events.
- *TRCC Truck Stop at the Patrick Interchange*. The Truck Parking Initiative indicated that the world's largest truck stop was planned at a reconstructed Patrick Interchange as part of the planned development of the Tahoe Reno Commercial Center. With the I-80 Corridor Study results indicating that this interchange upgrade is not essential to maintaining I-80 operational functionality, approval and funding for the interchange is called into question. There is no current information about the planned truck stop online.
- *Flying J at Robb Drive Interchange*. This proposed truck stop has not gained the necessary approvals to move forward. The property does not meet the industrial zoning criteria as required by the City of Reno. Flying J was recently purchased by Pilot.

- *Boomtown Truck Stop at Garson Road Interchange.* There has been no recent announcement from Boomtown about moving forward with a replacement facility.
- *Golden Gate Truck Stop at USA Parkway.* This is a new truck stop facility, located approximately 1 mile from I-80 on USA Parkway. Currently the facility has minimal parking, but there are plans to expand this facility in the future.

Future truck traffic growth is expected to be significant along the I-80 corridor, with a major portion occurring in Reno and its surrounding communities. Plans for the Port of Oakland development upgrade may cause truck traffic to increase further. Also, plans for expanding the Reno-Tahoe Industrial Park will contribute to this growth. Future growth plans include the development of major warehouse and distribution facilities, industrial and residential development, and supporting commercial development.

Planning for the future of the I-80 corridor through Reno will be a key component of any set of solutions. Given the wide range of factors contributing to this growth and the future challenges facing freight transportation management, gathering a region-wide inventory of existing and potential future truck parking is recommended. This inventory will establish parking needs in detail and assist in developing a comprehensive operational strategy for incident response.

3.6 Access Management

Local entities have currently incorporated access management in their comprehensive plans as a tool to improve access and safety and create more transit-oriented development. NDOT has also adopted the Access Management System and Standards (AMSS) as its official guidance for access management in Nevada. The purpose of these standards is to regulate access onto state highways to protect the health, safety, and welfare of the public; to maintain the highway rights-of-way; and to preserve the functional level of state highways while meeting the needs of the motoring public. The opportunity exists for the local agencies and NDOT to use access management as a tool that supports TDM by integrating transportation and land use planning and creating accessible land use patterns that are better suited to walking, bicycling, and public transit. A detailed discussion on access management is provided in Appendix I, Access Evaluation Technical Memo.

3.7 Incident Management

A traffic safety and accident analysis of three years of data (January 1, 2004 through December 31, 2006) was conducted for the east and west segments of I-80. A total of 1,791 crashes were reported. While 14 crashes were fatal, there were 458 injury crashes and 1,319 property damage only (PDO) crashes.

In their 1999 *Urban Mobility Report*, Texas Transportation Institute estimated that 57% of the nation's traffic congestion is due to crashes and other incidents, amounting to 2.45 billion vehicle-hours of delay in 1997 in the 68 areas studied. To mitigate the impact of these incidents on I-80, NDOT uses its own maintenance crews and relies on Nevada Highway Patrol and private towing companies in clearing the accident zone. During construction, contractors are

required to provide an incident management plan. Formalizing a Regional Traffic Incident Management Program is the primary tool in mitigating impact and transitioning incident management from reliance on relationships with responders to official recognition as a core activity at executive levels of participating agencies.

Considering the importance of incident management in increasing safety and improving traffic flow, it is recommended that NDOT and other agencies finalize the process of creating the Traffic Incident Management Coalition for establishing a Regional Traffic Incident Management Program. To smooth the incident management progress, installing flow detectors and video surveillance cameras is also recommended.

Additionally, the I-80 Corridor Study Stakeholder Working Group identified that an emergency response plan needs to be developed for the east side of the corridor due to the absence of parallel alternative routes.

4. Interchange and Mainline Improvements

Latent capacity analysis provided an estimate of future volumes for 2-, 7-, 15- and 25-year horizons as well as recommendations regarding the most likely mainline improvements by horizon year. Using estimated future traffic volumes, an analysis of interchange terminal operations was performed for each horizon year. Deficiencies were identified, and mitigation measures were recommended. Additionally, the existing conditions review and site observations identified safety deficiencies and connectivity issues. A summary of all identified deficiencies and recommended mitigation for the mainline and interchange terminals is provided in Appendix G of the Latent Capacity Analysis Technical Memo.

An important component of the physical improvements on the mainline and ramp terminals that requires specific attention is the bridge and structure rehabilitation/reconstruction along the corridor. Tables 2 and 3 were obtained from the Bridge Inventory Records and indicate the year the structures were built, their remaining life, and their sufficiency rating.

Table 2: I-80 West Corridor Bridge Inventory Record

Bridge #	Intersecting Feature	Facility	Year Built	Sufficiency Rating	Remaining Life
I 763	I 80	SR425 THIRD ST	1962	83.4	10
B 764E	TRUCKEE RIVER	I 80	1962	74.4	10
B 764W	TRUCKEE RIVER	I 80	1962	74.4	10
G 765E	SPRR AND POWER CANAL	I 80 EB	1962	88.6	10
G 765W	SPRR AND POWER CANAL	I 80	1962	88.6	10
B 820	DITCH	I 80	1964	78.7	10
I 770	I 80	GARSON RD	1964	65.7	10
G 772E	TRUCKEE RIVER & SPRR	I 80	1964	82.8	9
G 772W	TRUCKEE RIVER & SPRR	I 80	1964	82.8	9
I 773E	SR425 THIRD ST	I 80E	1964	88.9	10
I 773W	SR425 THIRD ST	I 80W	1964	88.9	10
B 127	DITCH	I 80	1938	79	10

Bridge #	Intersecting Feature	Facility	Year Built	Sufficiency Rating	Remaining Life
I 774E	FRONTAGE ROAD	I 80E	1964	92.6	10
I 774W	FRONTAGE ROAD	I 80W	1964	93.6	10
I 775E	SR647 W 4TH ST	I 80E	1964	89.4	10
I 775W	SR647 W 4TH ST	I 80W	1964	89.4	10
H 767E	MAE ANN AV	I 80E	1966	91.7	10
H 767W	MAE ANN AV	I 80W	1966	91.7	10
I1922	I 80	ROBB DR	1993	97.5	36
I1301E	SR 651 W McCARRAN	I 80E	1977	83.7	20
I1301W	SR 651 McCARRAN BL	I 80W	1977	83.7	20

Table 3: I-80 East Corridor Bridge Inventory Record

Bridge #	Intersecting Feature	Facility	Year Built	Sufficiency Rating	Remaining Life
I1007E	SR650 E McCARRAN	I 80E	1964	89.7	10
I1007W	SR650 E McCARRAN	I 80W	1964	89.7	10
I1556	I 80	SPARKS BL	1989	94.6	32
G1474	I 80	SPRR	1977	0	11
B 12	TRUCKEE DRAIN	IRR I 80	1953	76.3	10
I1008	I 80	VISTA BL	1985	91.5	29
I 750	I 80	LOCKWOOD DR	1962	84	10
I 753E	CROSS ROAD	I 80E	1962	94.7	10
I 753W	CROSS ROAD	I 80W	1962	94.7	10
I 660	COUNTY ROAD	I 80	1957	94	10
I2796	I 80	USA PARKWAY	2008	93.4	50
I 681	I 80	CROSS RD-THISBE	1958	96	10
I 670	CROSS ROAD	I 80	1958	94	10
I 671	CROSS ROAD	I 80	1958	93	10
H 842E	GILPIN RD	I-80E	1963	93.4	10
H 842W	GILPIN RD	I-80W	1963	93.4	10
I 700E	SR427 OLD US 40	I 80E	1963	96	10
I 700W	SR427 OLD US 40	I 80W	1963	96	10

With the majority of structures approaching the design life limit, a detailed bridge intervention plan may be needed. Publicly owned highway bridge rehabilitation/replacement is usually done through funds provided by the Highway Bridge Replacement and Rehabilitation Program (HBRRP). Bridge funding eligibility is based on a rating used by FHWA as a numerical indicator of a bridge's sufficiency to remain in service. It is based on a 0-to-100 scale. Bridges with a sufficiency rating between 50 and 80 are eligible for rehabilitation, and bridges with sufficiency rating below 50 are considered eligible for replacement.

NDOT has a program in place that monitors bridge conditions. Based on the sufficiency rating provided by NDOT, none of the current bridges require early action intervention. This study will

not provide a detailed rehabilitation/replacement timeframe. Considering the life of these structures, however, it is recommended that NDOT budget to replace a majority of the bridges before the 25-year horizon. Many of the roadway improvements recommended by the study already include a replacement cost for these structures.

5. Summary of Alternative Potential Solutions

Table 5 summarizes the recommended alternative potential solutions that will provide participating agencies with a range of workable and cost-effective transportation options that address current and future corridor needs. The analysis was performed at a level that allows the identification of need as a placeholder for future projects. A detailed analysis would be required for each specific project, to further explore improvement needs. A cost estimate is also provided for physical improvements.

The NDOT Estimate Tool was used to create the cost estimates for this study, which are in 2009 dollars and not inflated to the estimated construction year. The estimate tool allows default percentages for various project types for such things as additional items, erosion control, traffic control, roadside safety, and landscaping/aesthetics. The estimates also include percentages for mobilization, time-related overhead, construction engineering and inspection, and contingency, which was set at 25%. The tool's guidelines were used for all percentages assumed. Lengths of improvements, general terrain, and existing conditions were interpreted from the Washoe County Online Mapping Warehouse and Google Earth Maps.

Table 5: Alternative Potential Solutions

Option	Potential Solution	Additional Description	Estimated Cost
	West Verdi Interchange		
	2-7 years reconstruct WB ramp terminals to improve operations and connectivity -- roundabouts recommended	Ramp terminal reconstructed with a roundabout.	\$1,500,000
	15-25 years Interchange reconstruction or modification	Diamond Interchange. Includes cross road, bridge, and two roundabouts at ramp terminals.	\$30,000,000
I	Garson Interchange		
	7-15 years improve eastbound ramp terminal intersection.	Reconstruct portion of ramps and portion of cross road at terminal.	\$1,200,000
	15-25 years Interchange reconstruction or modification.	Diamond Interchange. Includes cross road and bridge.	\$25,000,000
II	*Garson Interchange		
	2-7 years Interchange reconstruction or modification.	Diamond Interchange. Includes cross road and bridge.	\$25,000,000
	Mogul Interchange		
	2-7 years reconfigure to accommodate storage and improve connectivity.	Includes two new bridges at the Mogul Interchange (west and east) to provide space under. Reconstruct eastbound off ramp.	\$12,000,000
	7-15 years Interchange reconstruction or modification.	Diamond Interchange. Includes cross road and bridge.	\$25,000,000
	Robb Dr. Interchange		
	2-7 years reconstruct ramp terminals to	Option #1: Includes adding an additional lane	Option #1:

Option	Potential Solution	Additional Description	Estimated Cost
	improve operations, connectivity, and safety	northbound from exit ramp to next intersection. Option #2: Includes adding an additional lane northbound from exit ramp to next intersection and improvements to south terminal relative to potential improvements needed by developer.	\$300,000 Option #2: \$1,400,000
I	West McCarran Interchange		
	2-7 years reconfigure WB ramp terminal	Option #1: Ramp reconstruction only. Option #2: Diamond Interchange including crossroad and bridge	Option #1: \$10,000,000 Option #2: \$24,900,000
	7-15 years reconfigure EB ramp terminal		\$1,300,000
	15-25 years reconstruct bridge structure	Replace bridges in both westbound and eastbound directions.	\$25,000,000
II	West McCarran Interchange		
	2-7 years reconstruct Interchange	Diamond Interchange.	\$25,000,000
	West Verdi, Garson, East Verdi, Mogul, and Robb Interchanges		
	2-7 years start implementing travel demand management strategies -- differential start times and work schedules, incentives, park-and-ride, and ride share.		-
	CA Stateline to West McCarran Interchange		

Option	Potential Solution	Additional Description	Estimated Cost
	2-7 years establish an express transit service		-
	2-7 years establish a bicycle facilities network		-
	15-25 years establish a light rail service		-
	East McCarran Interchange		
	0-2 years evaluate modern roundabouts for ramp terminal intersections	Roundabout Alternative Analysis only, no design or construction included.	\$150,000
	2-7 years reconstruct east and westbound ramp terminals	Ramp terminals reconstructed with roundabouts.	\$3,000,000
I	Sparks Interchange		
	0-2 years construct east to north triple left	Option #1: Reconstruct Sparks off ramp to accommodate enough lanes. Restriping and median shift on Sparks Structure to accept three turning lanes. No structure replacement or widening included. Option #2: Reconstruct Sparks off ramp to accommodate enough lanes. Widen Sparks Structure to accommodate new width needed for additional lane.	Option #1: \$6,800,000 Option #2: \$16,200,000
	2-7 years construct northbound double left and a separate storage lanes to accommodate southbound right turn movement.		\$12,400,000
	15-25 years reconstruct eastbound ramp terminal intersection	Widen Sparks Structure to accommodate new width needed for additional lane.	\$16,200,000
II	Sparks Interchange		

Option	Potential Solution	Additional Description	Estimated Cost
	2-7 years reconstruct interchange		\$41,000,000
	Vista Interchange		
	0-2 years construct southbound free right turn lane and provide storage for the westbound left and right turn movement on the ramp		\$1,300,000
	0-2 years construct eastbound to north triple left	Option #1: Reconstruct Vista off ramp to accommodate enough lanes. Restriping and median shift on Vista Structure to accept three turning lanes. No structure replacement or widening included. Option #2: Reconstruct Vista off ramp to accommodate enough lanes. Widen Sparks Structure to accommodate new width needed for additional lane.	\$3,200,000 14,000,000
	2-7 years construct southbound to east dual left turn	Option #1: Reconstruct Vista on Ramp to accept two turning lanes. Restriping (lane and shoulder width reductions) to accommodate additional left turn lane. No structure replacement or widening included. Option #2: Reconstruct Vista on Ramp to accept two turning lanes. Widen Vista Structure to accommodate new width needed for additional lane.	Option #1: \$1,800,000 Option #2: \$14,000,000
	15-25 years terminal improvements. Provide additional lane on the EB on-ramp and WB off-ramp		\$1,000,000
	East McCarran, Sparks, and Vista Interchanges		
	2-7 years start implementing travel demand management strategies -- differential start times and work schedules, incentives, park-		-

Option	Potential Solution	Additional Description	Estimated Cost
	and-ride, and ride share		
	East McCarran Interchange to Wadsworth Interchange		
	2-7 years establish an express transit service		-
	2-7 years establish a bicycle facilities network		-
	15-25 years establish a light rail service		-
I	Lockwood and Patrick Interchanges		
	7 years or upon development install roundabouts at slip ramp terminals	Ramp terminals reconstructed with roundabouts.	\$3,000,000
II	Lockwood and Patrick Interchanges		
	Upon development reconstruct ramp terminals	Diamond Interchange. Includes cross road and bridge.	\$25,000,000
	Upon development reconstruct Interchanges	Diamond Interchange. Includes cross road and bridge.	\$25,000,000
	Mainline		
	CA Stateline to West McCarran Interchange		
	15-25 years eastbound Garson to Robb Drive add general purpose lane	Includes widening of 5 major bridges (Truckee River Crossing, East Verdi, Mogul, West 4 th Street, and MaeAnne).	\$68,000,000
	15-25 years eastbound Verdi to Garson add a full auxiliary lane	Includes widening of 2 major bridges (West Verdi, and Verdi).	\$30,000,000
	15-25 years eastbound McCarran off to the		\$1,100,000

Option	Potential Solution	Additional Description	Estimated Cost
	project limits add one through lane		
	West McCarran Interchange to CA Stateline		
	15-25 years westbound McCarran to Garson add one general purpose lane	Includes widening of 5 major bridges (Truckee River Crossing, East Verdi, Mogul, West 4 th Street, and MaeAnne).	\$72,000,000
	15-25 years westbound Garson to Verdi add one full auxiliary lane	Includes widening of 2 major bridges (West Verdi, and Verdi).	\$30,000,000
	East McCarran Interchange to Wadsworth Interchange		
	2-7 years eastbound McCarran to Sparks add on full auxiliary lane		\$14,000,000
	7-15 years eastbound McCarran to Vista add one general purpose lane	Includes replacement of 2 major bridge (Sparks and RR flyover) due to widening needs.	\$62,000,000
	7-15 years eastbound Vista to Lockwood add one full auxiliary lane	Includes extreme earthwork on the south side of roadway.	\$34,000,000
	15-25 years eastbound Vista to Patrick add one general purpose lane	Includes widening of 1 major bridge (Mustang). Also includes extreme earthwork on south side of roadway.	\$96,000,000
	15-25 years eastbound McCarran to Sparks add one full auxiliary lane		\$14,000,000
	15-25 years eastbound 4 general purpose lanes entering this section		-
I	Wadsworth Interchange to East McCarran Interchange		

Option	Potential Solution	Additional Description	Estimated Cost
	0-2 years westbound Sparks on ramp extend	Includes extending the acceleration lane associated with the westbound Sparks on ramp +/- 1000'.	\$2,100,000
	2-7 years westbound Sparks to McCarran add 1 full auxiliary lane		\$14,000,000
	2-7 years westbound between McCarran on-ramps add 1 general purpose lane	Includes widening of 1 major bridge (East McCarran).	\$7,500,000
	7-15 years westbound Vista to McCarran add 1 general purpose lane	Includes replacement of 2 major bridges (Sparks and RR Flyover) widening needs.	\$62,000,000
	7-15 years westbound Lockwood to Vista add 1 full auxiliary lane	Includes extreme earthwork on the north side of roadway.	\$171,000,000
	15-25 years westbound Patrick to Vista add 1 general purpose lane	Includes widening of 1 major bridge (Mustang. Also includes extreme earthwork on the north side of roadway.	\$127,000,000
	15-25 years westbound Sparks to McCarran add 1 full auxiliary lane		\$14,000,000
II	Wadsworth Interchange to East McCarran Interchange		
	0-2 years westbound Sparks to McCarran add 1 full auxiliary lane		\$14,000,000
	2-7 years westbound between McCarran on-ramps add 1 general purpose lane	Includes widening of 1 major bridge (East McCarran) due to widening needs.	\$7,500,000
	7-15 years westbound Vista to McCarran add 1 general purpose lane	Includes replacement of 2 major bridges (Sparks and RR Flyover) due to widening needs.	\$62,000,000
	7-15 years westbound Lockwood to Vista add	Includes extreme earthwork on the north side of	\$171,000,000

Option	Potential Solution	Additional Description	Estimated Cost
	1 full auxiliary lane	roadway.	
	15-25 years westbound Patrick to Vista add 1 general purpose lane	Includes widening of 1 major bridge (Mustang). Also includes extreme earthwork on the north side of roadway.	\$127,000,000
	15-25 years westbound Sparks to McCarran add 1 full auxiliary lane		\$14,000,000

(*) This improvement will occur earlier if sufficiency rating of Garson Road Bridge will fall below the threshold level and the bridge becomes eligible for replacement.

6. References

- 2008 – 2030 Regional Transportation Plan of Washoe County, Nevada*, November 21, 2008
- RTC Short Range Transit Plan – Final Report* – Nelson\Nygaard Consulting Associates, 2005
- Victoria Transport Policy Institute – Online TDM Encyclopedia*
- Northern Nevada Updated Architecture*, Iteris 2008.
- Truck Parking Initiative*, Nevada DOT, February 14, 2008
- Tahoe-Pyramid Bikeway*, <http://www.tpbikeway.org/>
- Nevada Department of Transportation Structures Manual*, 2008