Cave Rock, Lake Tahoe

Planning Tools

In Section 2: the Nevada Statewide Travel Demand Model; Connecting Nevada website; the webmap; and, data compilation.

In the process of developing the Connecting Nevada plan, a number of planning tools were created to work with the data collected for, and generated by the project. The information provides some of the key deliverables of the Connecting Nevada process, and is described in this section.

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Nevada Statewide Travel Demand Model

Introduction

The Nevada Statewide Travel Demand Model (NVTDM) is one of the primary tools developed to support the Connecting Nevada planning effort. The model can test new major corridors and identify deficiencies on state highways and interstate facilities outside the coverage area of the current urban transportation models. The model also has the ability to run different scenarios.

Including Nevada, NVTDM covers 11 western states. The model is most detailed within Nevada, with resolution decreasing as distance from the state increases. This larger model area provides a context for forecasting long-distance truck and personal vehicle trips that cross state lines. Figure 21 shows the NVTDM model area. Figure 22 shows the model network which contains 3,766 individual Traffic Analysis Zones (TAZs), 3,633 of which are within Nevada.

Nevada's statewide travel demand is characterized by its unique economy and urban-rural dichotomy. To distinguish between underlying travel behaviors, NVTDM frames travel as five separate markets:

- Short-distance resident trips – Home-based or non-home-based trips, typically less than 50 miles and made for personal reasons in addition to work commute trips
- Short-distance visitor trips – Hotel-based or non-hotel-based trips, typically less than 50 miles and made for gaming, convention, or other social-recreational purposes
- Long-distance person trips – Home-based person trips, more than 50 miles in length and made for personal or business reasons
- Short-distance truck trips – Truck trips made for short distances within Nevada, including mining-related truck activity
- Long-distance truck trips – Regional truck trips carrying commodities between states and urban areas

Short-distance trips by residents are the largest travel market in NVTDM. Most of these trips are concentrated in the urban areas and are typically handled by urban travel demand models. Resident trips are also an important travel market in rural areas; however, rural travel behavior may be somewhat different than urban travel behavior. Longer distances between employment centers, and Nevada's dispersed rural population, means that some of these daily trips will be longer than seen in an urban area.

Some types of jobs require a longer commute; an example are jobs in the mining industry. In fact, due partially to this necessity several mining companies offer their employees transportation in buses to remote job sites. According to the U.S. Census Spring Creek, a rural community outside of Elko, Nevada, has average commute times of nearly 40 minutes, whereas, urbanized areas such as Reno have average travel times of less than half this.

Visitor trips are unique to Nevada's tourist economy. These are trips made by multiday visitors staying in hotels or resorts. One key difference between visitor and resident travel behavior is trip origin and destination. Typically starting from hotels, visitors travel to convention centers, casinos, and shopping, recreation, or dining sites.

Figure 21. Nevada's Statewide Travel Demand Model Area

The Nevada Statewide Travel Demand Model encompasses 11 states and includes 3,766 individual Traffic Analysis Zones (TAZs), 3,633 of which are within Nevada (shown here).

Figure 22. Nevada's Statewide Travel Demand Model Network

The Nevada Statewide Travel Demand Model roadway network extends beyond the state boundary to cover 11 western states. This extended network and traffic analysis zone geography is aimed at capturing long distance person and truck travel at a larger scale to understand total flows.

Travel behavior also varies by the purpose of the visit and the size and composition of the traveling party. Most visitor trips also occur in the urban areas.

Long-distance person trips are also a consideration of the Nevada statewide travel market. While a small portion of overall daily travel, long-distance trips over 50 miles account for up to 15 percent of daily VMT nationwide. In rural Nevada, the distinction between long-distance trips and short-distance trips is blurred, with many making daily trips of more than 50 miles each way for school, work, shopping, or medical care. Another distinction is that while urban travel behavior is well-studied, the data on long-distance travel behavior, by comparison, is sparse.

Short-distance truck trips are an important part of Nevada's warehousing and mining activity. These are trips that move raw materials, manufactured goods, and mining equipment within Nevada. Trucks move between mining and industrial sites, retail and office buildings, and households.

Long-distance truck trips are part of the national and global supply chain moving products from California's ports and agricultural areas to markets in the Midwest or East Coast. Trucks using I-80 and I-15 are predominantly completing trips involved in long-distance commodity movement. Nevada continues in many ways to function as a bridge state for the movement of goods.

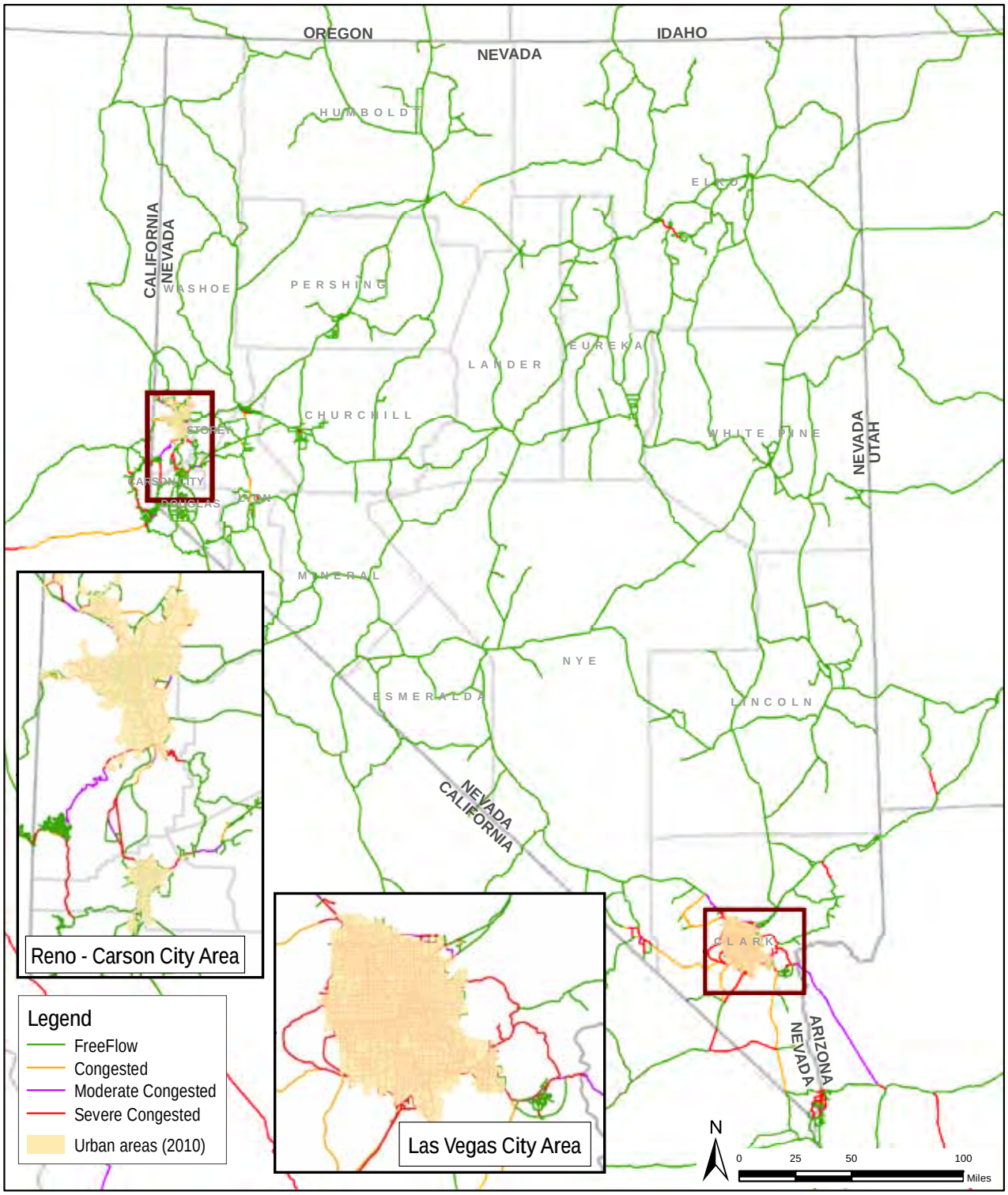
Traffic Forecasts

Socioeconomic projections prepared for the Connecting Nevada study are based on the MPOs models, State Demographer projections, and other data sources (refer to 'Data Compilation' later in this Section for a listing of the specific sources used). These projections show Nevada's population and employment more than doubling by 2060. Similar growth is expected in the surrounding western states. Most of the growth projected for Nevada will occur in existing urban areas. The 2060 NVTDM traffic forecasts reflect this trend, suggesting significant infrastructure needs to accommodate future travel demand within metropolitan areas. Figure 23 shows the 2060 forecast traffic congestion. On most highways outside of the metropolitan areas of Northern and Southern Nevada, daily traffic is forecast to double by 2060. While adequate capacity remains on most of Nevada's rural highway network to accommodate this traffic growth, the forecasts show capacity deficiencies emerging on several regional corridors by 2060, including:

- I-80 – Reno to Fernley
- US 50 – Carson City to Silver Springs
- US 95 – Silver Springs to Fernley
- State Route (SR) 160 – Pahrump to Las Vegas
- I-15 – Los Angeles to Las Vegas
- US 95 to Boulder City
- US 93 – Kingman to Boulder City

The NVTDM forecasts showed that portions of SR 789 near Winnemucca and SR 227 near Elko may also experience congestion by 2060.

Figure 23. 2060 Forecast Traffic Congestion



The above figure shows the 2060 forecast traffic congestion. Adequate capacity remains on most of Nevada's rural highway network to accommodate this traffic growth; however, the forecasts show capacity deficiencies emerging on several regional corridors by 2060.

Scenario modeling, also known as 'what if' scenarios, is an important example of the application of the Connecting Nevada Statewide Travel Demand Model (NVTDM) to a common question posed by development - how will future traffic affect roadways?

The NVTDM was used to estimate future traffic demand and roadway improvement needs for a large master-planned development in southern Nevada (Clark and Lincoln Counties). According to the Las Vegas Review Journal[1], Coyote Springs is planned for 159,000 homes on 43,000 acres. US 93 and State Route 168 (both operating as two-lane roadways today) provide direct access to this future community.

Detailed information on the build-out timeline, project phasing, and detailed development plans are not known at this time. For this planning level analysis, the development of Coyote Springs was patterned after the Summerlin develop in Las Vegas. Using this model, it was projected that by 2030 Coyote Springs would have approximately 40,000 households with employment of 19,800.

Using the NVTDM tool and the projected socioeconomic data for the proposed development, traffic forecasts were prepared. The congestion levels based on the estimated traffic volumes generated by this development without any roadway improvements are presented in Figure 24 at right. Level of congestion is expressed from free flow to severe congestion. With the projected development and no roadway improvements, modeled traffic operations on US 93 will be severely congested in 2030.

Based on the Coyote Springs development assumptions, roadway congestion forecast for 2030 illustrates a need to widen US 93 to meet the additional traffic demand projected from the development. A scenario assuming US 93 is built as a 4-lane roadway from Las Vegas to SR 168 was tested as well. When US 93 is modeled as a 4-lane roadway the NVTDM results show the congestion level will improve from severe congested to free flow.

1. http://www.lvrj.com/business/developers-reboot-159-00-home-coyote-springs-project-north-of-las-vegas-166980936.html

Figure 24. Coyote Springs Travel Demand Model Scenario

Policy Recommendations

The NVTDM is an important tool to assist NDOT policy makers because it identifies improvements and prioritizes intercity connections. On the regional level, the model can also inform the MPO regional travel demand models. While the NVTDM is not meant to supplant the MPO travel demand models, it can compliment these models with its regional analysis of long-distance personal travel and long-distance goods movement.

The model should be used to monitor the effects of growth and test what-if scenarios based alternative land use or transportation improvements outside of the MPO areas. The Coyote Springs development north of Las Vegas on US 93 is one example of how NVTDM can be used to evaluate growth scenarios. Growth in cross-border trade both with Canada and Mexico can generate goods movement scenarios with the potential for increased north-to-south commodity flows traveling through Nevada. The NVTDM can help identify transportation deficiencies related to increased truck traffic.

Maintenance and Update

The MPO areas will continue to generate the most demand for travel on Nevada's roads. Close coordination between NDOT and the MPOs is necessary to maintain the NVTDM socioeconomic data and transportation network for these regions. NDOT should also partner with MPOs where possible to help maintain a statewide travel survey database.

Limitations

NVTDM is a three-step model that includes trip generation, trip distribution, and highway assignment. As Nevada continues to grow, intercity public transit between urban areas may become part of the overall transportation solution. To support intercity transit planning, NDOT should consider adding a mode choice step.

NVTDM covers 11 western states. The model should be expanded to cover all of North America. This would improve estimation of long-distance commodity flows and personal travel by reducing the number of user inputs at the perimeter of the model area.

The trip production, attraction, and distribution models behind NVTDM are based on the RTC of Southern Nevada's travel demand model (see Figure 25 to right showing the NVTDM user interface). While Clark County represents most of the state's travel activity, travel behavior varies across the state. A statewide travel survey should be conducted and used to estimate more universal statewide models.

The long-distance truck forecasts are based on FHWA's Freight Analysis Framework (FAF) database. These forecasts should be updated when new FAF data become available and be evaluated based on emerging trends in commodity flows.

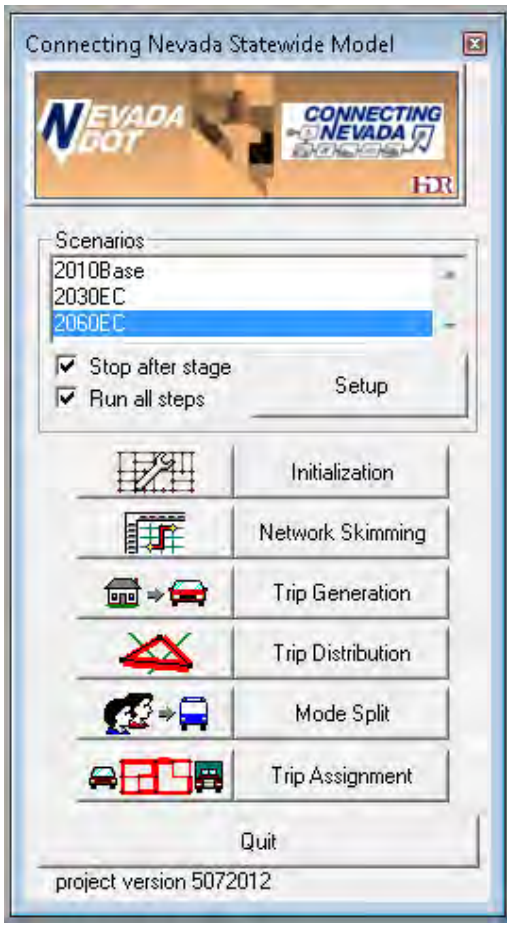


Figure 25. NVTDM User Interface

While the short-distance truck forecasts based on the FHWA's Quick Response Freight Manual II approach provided a good fit in the Reno-Tahoe region, this approach did not accurately simulate local truck activity in Clark County. Enhancements to NVTDM's short-distance truck model are needed to better simulate local truck activity statewide.

More information on travel behavior is needed for rural areas, especially regarding long-distance travel. As noted previously, trip production, attraction, and distribution models behind NVTDM are based on the RTC of Southern Nevada's travel demand model. Understanding the rural areas travel behavior will improve the performance of the NVTDM.

One scenario suggested for evaluation using the NVTDM was the expansion of intermodal facilities, such as the Sparks Intermodal Rail Facility, located in Sparks, Nevada (refer to Figure 26 for an aerial view of this facility). Limitations of NVTDM include evaluating the traffic impact of a potential development such as the Sparks facility, which generates a significant number of long distance trips. The model uses constant trip length by trip purposes. The actual distribution of long distance trips and activities associated with this type of development will not reflect well with current NVTDM algorithm. The trip interaction could be captured partially using the long distance freight model used in NVTDM, however, a comprehensive traffic study would be more appropriate in this case. NVTDM can be used as an effective tool to measure traffic impacts from a future development generating a number of short-distance local trips with defined trip purposes (such as residential and commercial developments.

Figure 26. Sparks Intermodal Rail Facility

Image Source: Google Maps (2012).

Connecting Nevada Website

The Connecting Nevada website (www.connectingnevada.org) was set up at the project start as a portal for public and project team access to important information on the project (see Figure 27). The website included links to the following Connecting Nevada webpages:

Home. The launch page for the study including links for the webmap, videos, bulletins, meeting, info, and the latest updates.

Project Background. Project summary and stakeholder priorities.

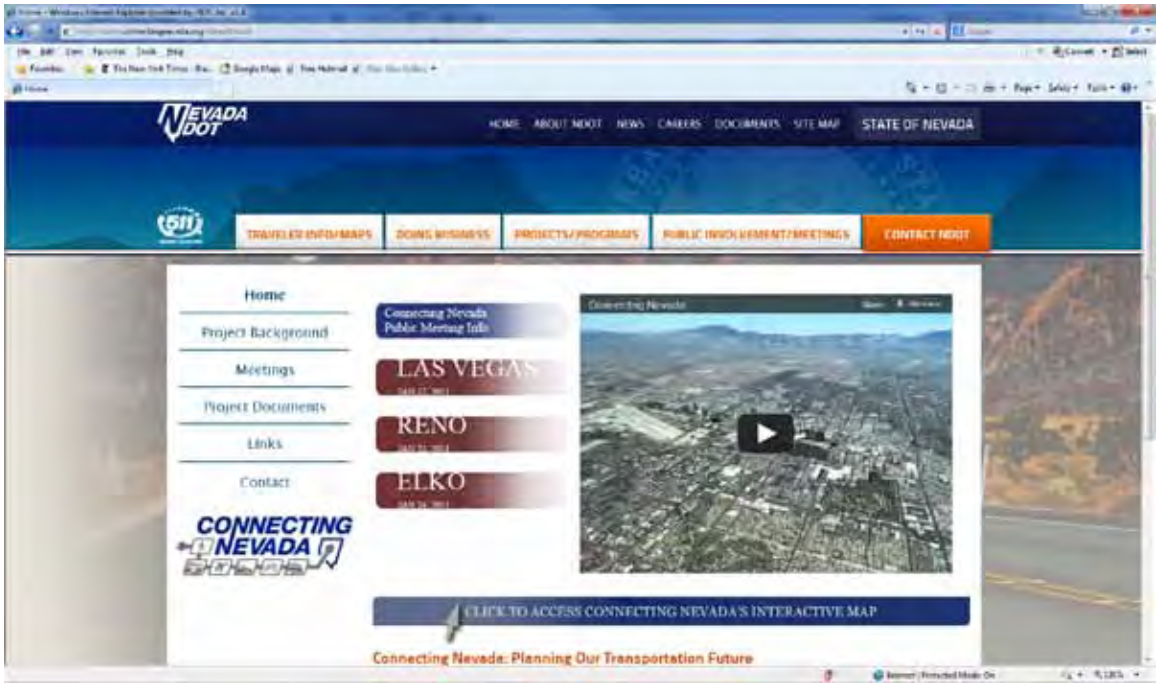
Meetings. Meeting information, handouts, agendas, etc.

Project Documents. All of the study documents are contained here including graphics, maps, and the project schedule.

Links. A list of important web resources from outside the study

Contact. Connecting Nevada contact information

Figure 27. The Connecting Nevada Website



The website features several webpages providing visitors access to project information and resources (see www.connectingnevada.org).

Connecting Nevada Webmap

The Connecting Nevada webmap (see Figure 28 below) brings together various data layers that were developed in support of the Connecting Nevada project. This tool was introduced during the second round of stakeholder outreach held during August 2012. The webmap was developed to allow users to peruse the data layers developed for Connecting Nevada at their leisure from their internet browser. The goal of this tool was to allow easy access to the data that was assembled for the study.

A link to the Connecting Nevada webmap may be found at www.ConnectingNevada.org. Table 11 on the following page describes the data layers in the map and the source of the material for each layer.

Figure 28. Screen capture of the Connecting Nevada Webmap

The webmap provides internet browser access to data developed as part of the Connecting Nevada project (see gisapps.hdrprojects.com/ConNev_Secured/index.html.

Table 11. Sources of Webmap Data Layers

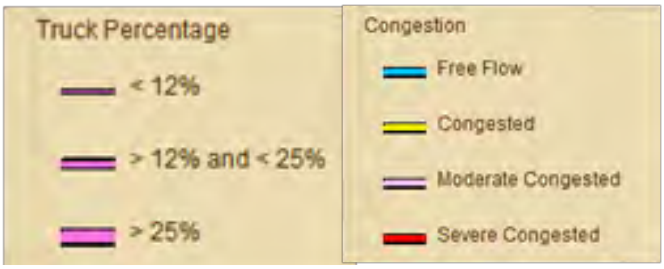
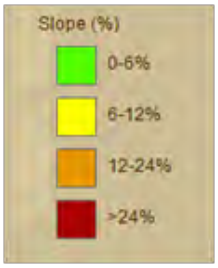
The 2060 **Truck Percentage** and 2060 **Congestion** data layers are outputs of the Nevada Statewide Travel Demand Model (HDR Engineering, Inc., 2012)	
The **Airports** layer is from Tele Atlas (2009). Tele Atlas is a private firm that provides digital data for a broad range of interests.	
The **Transportation Network** layer is from NDOT's Highway Performance Monitoring System (HPMS) [2011].	
The existing **Transportation Functional Class** layer was created using information from NDOT's HPMS (2011).	
The **Slope (%)** layer was generated from U.S. Geological Survey Digital Elevation Model (DEM) data (2009).	

Table 11. Sources of Webmap Data Layers (continued)

The **Biological Constraints** layer sources:

Areas of Critical Environmental Concern – Bureau of Land Management (2007)

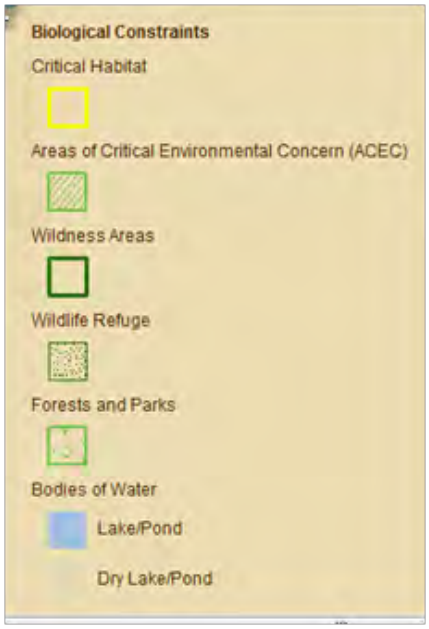
Critical Habitat – U.S. Fish and Wildlife Service (2010)

Wilderness Areas – U.S. National Atlas and U.S. Geological Survey (2010)

Wildlife Refuges – U.S. Fish and Wildlife Service (2011)

Forests and Parks – Tele Atlas and ESRI (2010)

Bodies of Water – U.S. Geological Survey, U.S. Environmental Protection Agency, and ESRI (2010)

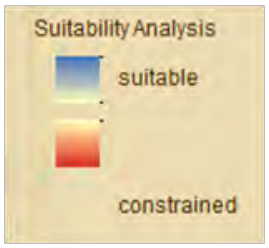


The **Base Mapping Options** (aerial, streets, topo) are from ESRI Webmap Services.

The **Sage-grouse Habitat Categories** layer is from the Nevada Department of Wildlife's Greater Sage-grouse Habitat Categorization Map, an analysis tool that incorporates the best available data into a statewide prioritization of Greater sage-grouse hab

Table 11. Sources of Webmap Data Layers (c ontinued)

The **Suitability Analysis** layer looks at several layers and develops suitability based on the combined effect of these layers. Values range from "suitable" (blue) to "constrained" (red). The layers used and their weighting and category scores are shown below.



Suitability Analysis

This method assigns weighting to each criterion (data layer) and scores to each category of that criterion (see Table 12). The resultant scores are then combined into one layer. This layer shows the suitability for development based on the sum of the assigned values. The suitability scale is relative and ranges from suitable to constrained. This technique allows users to consider several constraints in concert and may be used as another tool while evaluating corridors. Values can be easily adjusted to test sensitivity to a particular resource.

Table 12. Suitability Analysis Criteria Weighting

Criterion (weighting)	Categories	Score
Slope (0.25)	<12% unconstrained	10
	12%–24% constrained	7
	>24% not developable	1
Land ownership (0.125)	Bureau of Land Management, State of Nevada	10
	Bureau of Reclamation, private	7
	Bureau of Indian Affairs, U.S. Department of Energy, U.S. Fish and Wildlife Service	4
	Forest Service, National Park Service	2
	U.S. Department of Defense	Restricted*
Environmental constraints (0.5)	Wetlands and waters of the United States, dry lake/pond, wilderness areas, wildlife refuge	2
	Areas of Critical Environmental Concern, critical habitat	1
Parks (0.125)	National Park, State Forest	2
	State and County parks	1

* The"Restricted" value assigned to the U.S. Department of Defense land indicates that this area is unsuitable for development.

Data Compilation

Data on Nevada's roadway network comprises the core of information processed as part of the project. The state's Highway Performance Monitoring System (HPMS) was used as a starting point for the Connecting Nevada base map, and the information on extent, performance, use and operating characteristics from the HPMS formed the basis for the Nevada Statewide Travel Demand Model (NVTDM).

Data formed the backbone of the analysis for the NVTDM and webmap tool. In order to successfully compile this information it was necessary to review previous transportation planning studies and reports, consult with the Metropolitan Planning Organizations, review land ownership, demographics, and the transportation network. A compilation of this information is contained in the Technical Memorandum #1 - Data Collection report that is available on the Connecting Nevada webpage.

List of select datasets and sources for the Connecting Nevada project:

1. Highway Performance Monitoring System (HPMS), Nevada Department of Transportation (2011).
2. Traffic forecasts – Nevada Statewide Travel Demand Model (HDR, 2012)
   a. 2020, 2030, and 2060 Traffic Congestion
2. Traffic Analysis Zones - Socioeconomic Forecast (HDR, 2012)

   Note: Socioeconomic projections were derived from various sources for the purpose of understanding future regional travel demand, and should not be construed as official projections of population or employment. All forecasts beyond state projection horizons were created by HDR as part of the development of the NVTDM. Socioeconomic forecasts were developed for: 2010 (base year), 2020, 2030, and 2060 (planning horizon).

   Sources:

   - Arizona, ADOT Statewide Travel Demand Model (May, 2012) through 2050;
   - California, Department of Finance (2012) through 2050;
   - Colorado, Colorado Dept. of Local Affairs (2012) through 2030;
   - Idaho, U.S. Census (2005) through 2030;
   - Nevada (rural areas), Nevada State Demographer [2011], HDR (July, 2012);
   - Nevada (urban areas), Carson Area MPO (CAMPO), RTC of Sourthern Nevada, Tahoe MPO and Washoe RTC;
   - New Mexico, U.S. Census (2005) through 2030;
   - Oregon, Oregon Office of Economic Analysis (2004) through 2030;
   - Utah, UT Governor's Office of Planning and Budget (2011) through 2060;
   - Washington, State Office of Financial Management (2011) through 2030;
   - Wyoming, WY Department of Administration and Analysis (2011) through 2030.
3. Airports (Tele Atlas, 2009)
4. Land Ownership (BLM, 2010; supplemented by ESRI, 2010)

5. Solar Potential (National Renewable Energy Laboratory Webmap Service) Sources: < http://mapserve3.nrel.gov/ArcGIS/Services>, 2011)
6. BLM Solar Energy Study Areas (U.S. Department of Energy and Interior, 2011)
7. West-Wide Programmatic EIS Energy Corridors (U.S. Department of Energy National Argonne Lab, 2008)
8. Slope Percent layer (U.S. Geological Survey Digital Elevation Model data [2009])
9. Biological Constraints
    a. Areas of Critical Environmental Concern (Bureau of Land Management, 2007)
    b. Critical Habitat (United States Fish and Wildlife Service, 2010)
    c. Wilderness Areas (US National Atlas and USGS, 2010)
    d. Wildlife Refuges (US Fish and Wildlife Service, 2011)
    e. Forests and Parks (Tele Atlas and ESRI, 2010)
    f. Bodies of Water (USGS, EPA, and ESRI, 2010)
10. Base mapping options (Aerial, Streets, Topo) – ESRI Webmap Services (WMS), additional information may be found at: http://www.esri.com/software/arcgis/arcgis-online-map-and-geoservices/map-services).
11. Greater sage-grouse habitat (Nevada Department of Wildlife, Greater Sage-grouse Habitat Categorization Map, 2012)
12. Suitability Analysis (suitability based on combined effect of the following layers)
    a. Slope
    b. Land Ownership
    c. Environmental Constraints
    d. Wetlands
    e. Waters of the U.S.
    f. Dry Lake/Pond
    g. Wilderness Areas
    h. Wildlife Refuge
    i. Areas of Critical Environmental Concern (ACEC),
    j. Critical Habitat
13. Parks
    a. National Park, State Forest
    b. ii. State and County Parks

Planning and Environmental Linkages (PEL)

NDOT seeks to use unified and dedicated efforts to deliver transportation solutions that improve the quality of life for Nevadans. Improvements to the transportation system are typically accomplished through infrastructure projects. Federal and state transportation improvement funds and NDOT's construction program and projects are scheduled and delivered through the STIP. For 40 years, Congress directed the sequencing of funding flow, triggered by metropolitan and statewide transportation planning processes that serve as the basis for project decisions and incorporate an emphasis on public involvement, environmental considerations, and other factors.

The National Environmental Policy Act NEPA established a national environmental policy intentionally focused on federal activities and the desire for a sustainable environment balanced with other, essential, present and future needs of Americans. Additional information about NEPA may be found at www.epa.gov/compliance/nepa/index.html.

If the planning project manager decides that the PEL program is appropriate for the project, then NDOT's PEL questionnaire and checklist will be used as tools to guide proper documentation and selection of information gathered during the planning process that will later be made available for input, review, and possible incorporation by reference during the NEPA project development process.

The questionnaire and checklist will be used to effectively influence the scope, content, and process employed for NDOT transportation planning studies that focus on specific transportation corridors or on transportation network subareas (versus statewide transportation studies). Completion of the questionnaire and checklist will support the PEL process and serve dual objectives:

- provide guidance to transportation planners on the level of detail needed to ensure that information collected and decisions made during the transportation planning study can be used during the NEPA process for a proposed transportation project
- provide the future NEPA study team with documentation on the outcomes of the transportation planning process, including the history of decisions made and the level of detailed analysis undertaken

Major issues to consider when conducting a transportation planning study that links to the future NEPA process include:

- identifying the appropriate level of environmental analysis for the study
- identifying the appropriate level of agency, stakeholder, and public involvement
- defining unique study concurrence points for seeking agreement from relevant resource agencies, stakeholders, and members of the public
- developing a process to ensure that the study will be recognized as valid within the NEPA process
- identifying when to involve resource agencies in the study, and to what extent they influence decision making

These issues should be considered throughout the transportation planning study process. Users of the NDOT Planning and Environmental Linkages Questionnaire and Checklist should review the entire document at the beginning of the study to familiarize themselves with whatever local and general issues may be operative. The questionnaire is provided in two parts: one to be completed by transportation planners at the beginning of the study and one to be completed at the end. The checklist (Part 3) should be used by NEPA specialists throughout the study and should be finalized at the end of the study. The NDOT Planning and Environmental Linkages Questionnaire and Checklist may be found in its entirety on the ConnectingNevada.org website (see Project Documents webpage, Technical Memorandum #5 - Planning and Environmental Linkages).

Upon completion of the transportation planning study, if used, the questionnaire and checklist should be included as an appendix to the study's final report to document how the study meets the requirements of 23 C.F.R. § 450.212 or § 450.318 (Subpart B: Statewide Transportation Planning and Programming or Subpart C: Metropolitan Transportation Planning and Programming, respectively).

US 50 Cave Rock Tunnel, Lake Tahoe

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