

SNOWFLAKE

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EXECUTIVE SUMMARY

TAYLOR

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Navajo/Apache County

Southern

Sub Regional

Transportation Plan

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September 2007

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Southern Navajo/Apache County Sub-Regional Transportation Plan

Executive Summary

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Table of Contents

<u>Section</u>	<u>Page</u>
1.0 INTRODUCTION	1-1
1.1 STUDY BACKGROUND	1-1
1.2 STUDY PURPOSE	1-4
1.3 COMMUNITY INVOLVEMENT	1-4
2.0 EXISTING CONDITIONS	2-1
2.1 CURRENT SOCIOECONOMIC CONDITIONS	2-1
2.1.1 Year 2006 Population Estimate	2-1
2.1.2 Year 2006 Employment Estimate	2-1
2.2 CURRENT ROADWAY SYSTEM	2-4
2.2.1 Jurisdictional Responsibility	2-4
2.2.2 Roadway Functional Classification	2-4
2.2.3 Principal Sub-Regional Roadway Network	2-4
State Highway System	2-4
Regional/Local Road System	2-5
2.2.4 Existing Roadway Characteristics	2-6
Typical Cross-Sections	2-6
Intersection Flare	2-6
Number of Lanes	2-8
Traffic Counts	2-8
3.0 TRANSPORTATION MODEL DEVELOPMENT	3-1
4.0 SOCIOECONOMIC PROJECTIONS	4-1
4.1 PREVIOUS PLANS AND STUDIES	4-1
4.2 POPULATION AND EMPLOYMENT PROJECTIONS	4-1
4.2.1 Future Population Density	4-1
4.2.2 Employment Projections	4-2
4.2.3 Projected Population and Employment	4-2
4.2.4 Planned Developments & Land Ownership Patterns	4-2
5.0 FUTURE TRAVEL CONDITIONS	5-1
5.1 FUTURE ROADWAY SYSTEM	5-1
5.1.1 General Design Parameters	5-1
5.1.2 External Traffic Forecasts	5-1
5.1.3 Improvement Scenarios	5-2
Existing-Plus-Committed Roadway Network	5-2
Roadway Improvements	5-2
Evaluation of Roadway Network Deficiencies	5-2
Committed-Plus-Planned Roadway Network	5-4
Roadway Improvements	5-4
Evaluation of Roadway Network Deficiencies	5-4
Alternative 'A' Roadway Network	5-8
Roadway Improvements	5-8

EXECUTIVE SUMMARY

Evaluation of Roadway Network Deficiencies _____ 5.11

5.1.4 Year 2015 Mid-Term Improvement Needs _____ 5.11

5.2 INTERSECTION ANALYSIS _____ 5-16

5.2.1 Mid-Term, Year 2015 Intersection Performance _____ 5-16

5.2.2 Long-Term, Year 2030 Intersection Analysis _____ 5-16

6.0 IMPLEMENTATION PLAN _____ 6-1

6.1 FUTURE ROADWAY FUNCTIONAL CLASSIFICATION PLAN _____ 6-1

6.2 YEAR 2030 ROADWAY IMPROVEMENT PLAN _____ 6-1

6.3 TRANSPORTATION REVENUE OUTLOOK _____ 6-4

6.4 IMPLEMENTATION ACTION ITEMS _____ 6-4

6.4.1 Stakeholder Coordination _____ 6-7

6.4.2 Corridor Studies _____ 6-7

6.4.3 Roadway Safety Review _____ 6-7

6.4.4 Traffic Data Collection _____ 6-7

6.4.5 Household Travel Survey _____ 6-8

6.4.6 Monitor and Update Sub-Regional Travel Demand Model and Transportation Plan _____ 6-8

List of Figures

<u>Figure</u>	<u>Page</u>
Figure 1-1 Vicinity Map	1-2
Figure 1-2 Study Area and Major Roadway Network.....	1-3
Figure 2-1 Year 2006 Estimated Population Density by Traffic Analysis Zone	2-2
Figure 2-2 Year 2006 Estimated Employment Density by Traffic Analysis Zone	2-3
Figure 2-3 Typical Roadway Cross-Sections.....	2-7
Figure 2-4 Year 2006 Roadway Network and Traffic Counts.....	2-9
Figure 3-1 Travel Demand Model Development Process	3-1
Figure 4-1 Year 2015 Estimated Population Density by Traffic Analysis Zone	4-3
Figure 4-2 Year 2030 Estimated Population Density by Traffic Analysis Zone	4-4
Figure 4-3 Year 2015 Estimated Employment Density by Traffic Analysis Zone	4-5
Figure 4-4 Year 2030 Estimated Employment Density by Traffic Analysis Zone	4-6
Figure 4-5 Land Ownership and Planned Developments	4-8
Figure 5-1 Existing-Plus-Committed Roadway Network	5-3
Figure 5-2 Forecast Level-of-Service: Existing-Plus-Committed Roadway Network.....	5-5
Figure 5-3 Committed-Plus-Planned Roadway Network.....	5-6
Figure 5-4 Forecast Level of Service: Committed-Plus-Planned Roadway Network	5-9
Figure 5-5 Alternative 'A' Roadway Network.....	5-10
Figure 5-6 Forecast Level of Service: Alternative 'A' Roadway Network	5-12
Figure 5-7 Phased Improvements: 2015 and 2030.....	5-14
Figure 5-8 Forecast Level of Service: Year 2015 Improvements	5-15
Figure 5-9 Study Area Intersections	5-17
Figure 5-10 Possible Interchange Designs	5-19
Figure 6-1 Future Roadway Functional Classification Plan	6-2
Figure 6-2 Year 2030 Roadway Improvement Plan.....	6-3

List of Tables

<u>Figure</u>	<u>Page</u>
Table 2-1 2006 Employment in the Southern Navajo/Apache County Sub-Region	2-4
Table 2-2 Characteristics of Roadway Functional Classifications.....	2-5
Table 2-3 Roadway Width and Right-of-Way Requirements for Major Roadways.....	2-8
Table 4-1 Sub-Region Population and Employment Estimates	4-2
Table 5-1 Current and Future External Daily Traffic Volume Estimates.....	5-2
Table 5-2 Planned Sub-Regional Roadway Network Improvements	5-7
Table 5-3 Cut-Line Analysis Comparison: Year 2030 Committed-Plus-Planned Network v. Alternative 'A' Network	5-13
Table 5-4 Traffic Control at Study Area Intersections: Existing, 2015, & 2030.....	5-18
Table 6-1 Estimated Total Sub-Region Roadway Improvement Cost.....	6-4
Table 6-2 Estimated Sub-Region Roadway Improvement Costs by Jurisdiction	6-5

1.0 INTRODUCTION

Navajo and Apache Counties are located in the central portion of eastern Arizona, as shown in Figure 1-1. This region, known as the White Mountain Region, currently is experiencing tremendous pressure for development. Regional growth has led to the need for an updated plan to address transportation issues and infrastructure needs of the communities located within the White Mountain Region.

1.1 STUDY BACKGROUND

During 1999, the White Mountain Region completed the *White Mountain Regional Transportation Plan*, which covered the southern area of Navajo and Apache counties. At that time, it was identified that the area was becoming increasingly popular for both winter and summer activities, and as a location for retirement and second homes for residents of the Phoenix and Tucson areas. At the time of the 1999 Plan, average annual population growth was approximately:

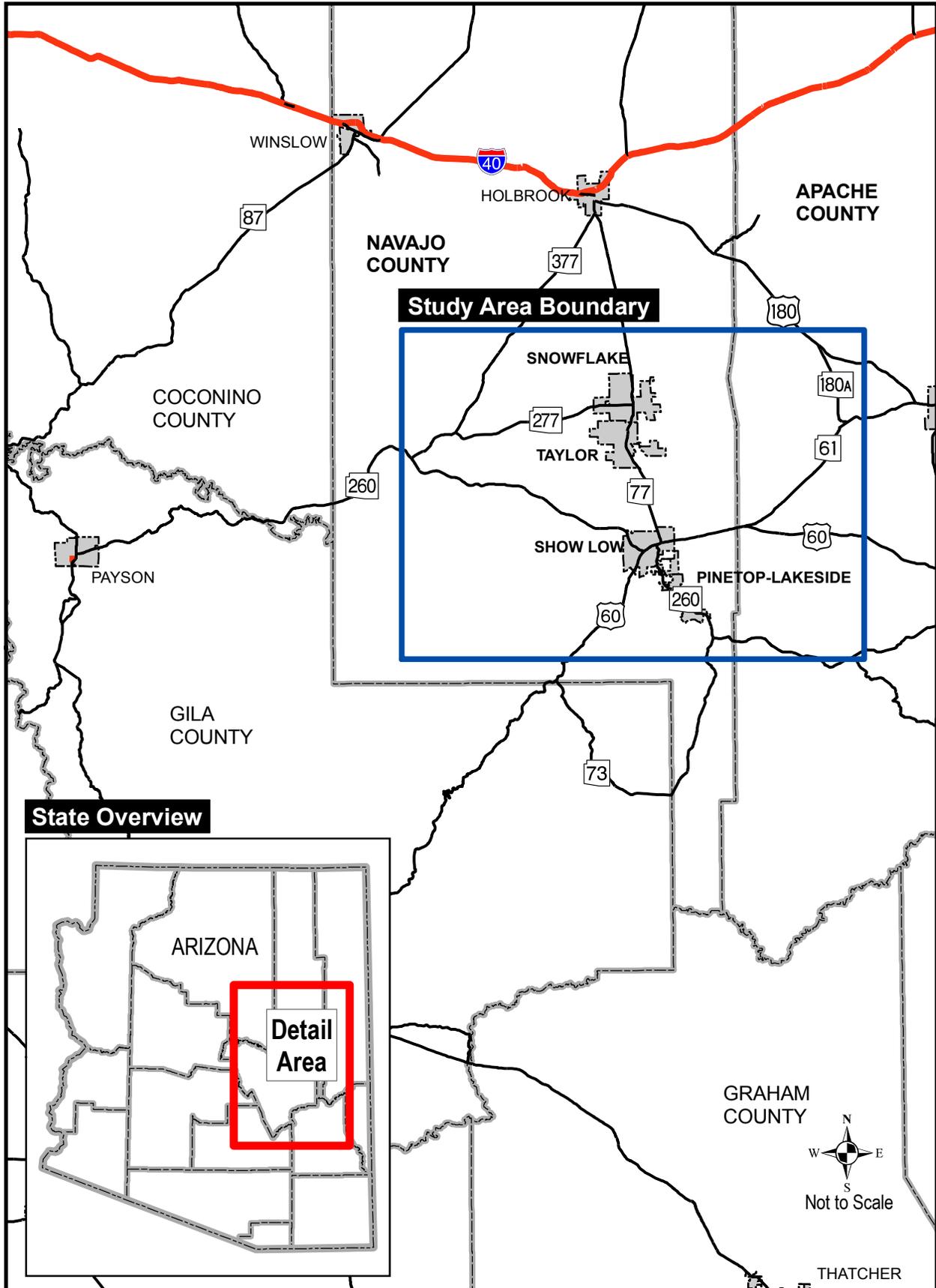
- 1.3 percent for Apache County;
- 1.4 percent for Navajo County;
- 2.4 percent for Snowflake;
- 6.2 percent for Show Low;
- 2.2 percent for Taylor; and
- 5.7 percent for Pinetop-Lakeside.

Unexpected, significant growth has occurred primarily in a sub-region of the Plan's defined study area since completion of the 1999 Plan.

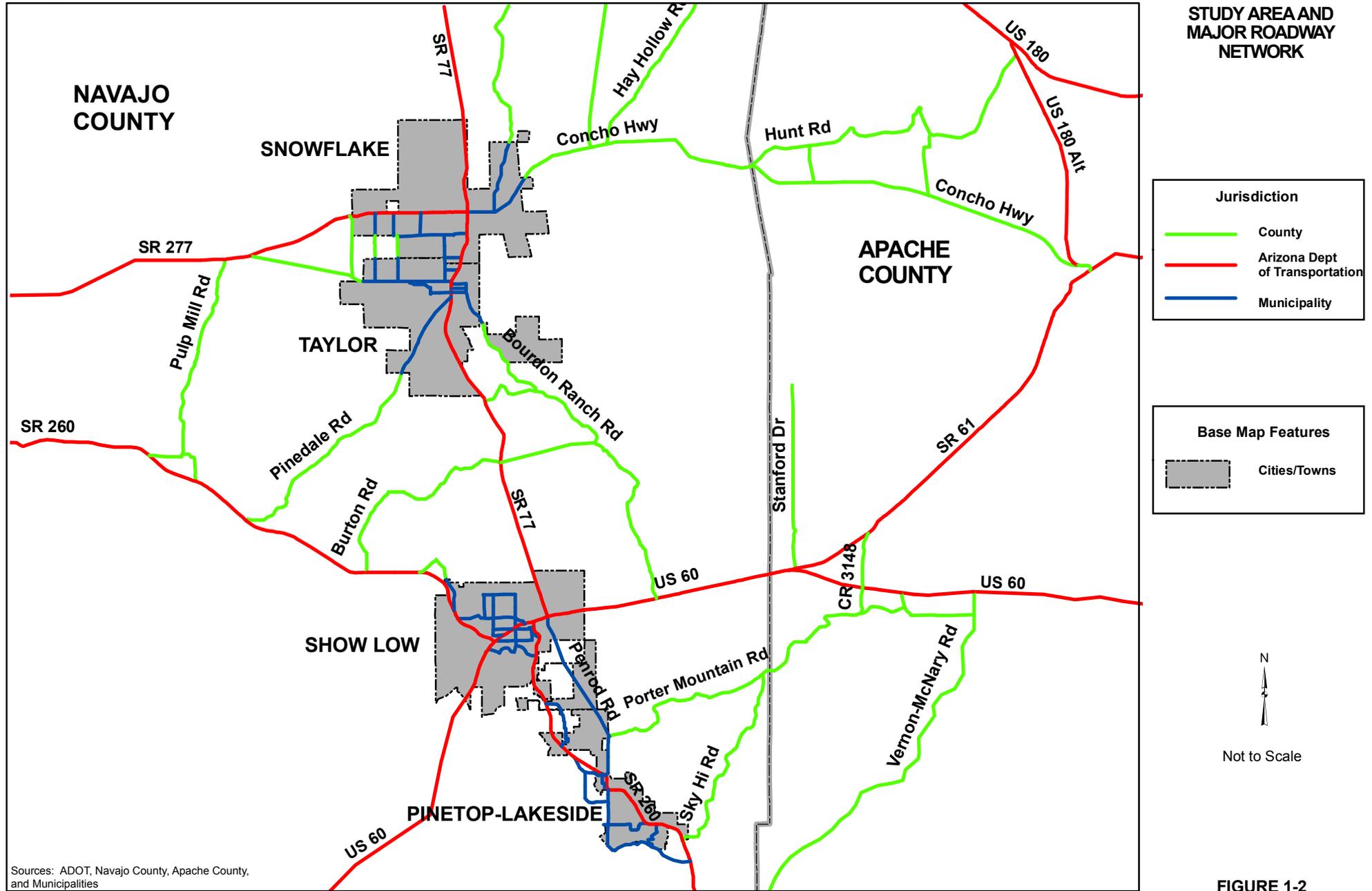
A need was identified to develop a Sub-Regional Transportation Plan to address needed transportation improvements to accommodate the unanticipated growth. Subsequently, the City of Show Low approved their General Plan in October 1999 and a Major Streets and Routes Plan was completed in January 2002. Also, the City of Snowflake completed their General Plan in November 2000; Pinetop-Lakeside completed their Regional Plan during March 2001; and, Navajo County completed their Comprehensive Plan during May 2004. All of these planning documents used the findings from the 1999 White Mountain Regional Transportation Plan as the basis for their transportation planning efforts. Most recently, the Town of Pinetop-Lakeside completed a Pinetop-Lakeside Population Projection report, dated July 27, 2005, in an attempt to better understand how growth is occurring. Growth projections presented in the report range from 3.0 to 7.0 percent annual growth; 3.0 to 4.0 percent is recommended for planning purposes.

This *Southern Navajo County/Apache County Sub-Regional Transportation Plan* specifically addresses the needs of the Town of Snowflake, Town of Taylor, City of Show Low, Town of Pinetop-Lakeside, and the unincorporated areas of southern Navajo and Apache Counties, including the communities of Concho and Vernon. The focus of this Sub-Regional Transportation Plan is the roadway system in southern Navajo County between Pinetop-Lakeside in the south, Snowflake/Taylor to the north, Pulp Mill Road to the west, and the Concho area in Apache County to the east. Figure 1-2 depicts the Sub-Regional Study Area adopted for planning purposes.

Southern Navajo/Apache County Transportation Plan



Navajo/Apache County Study Area Overview



Sources: ADOT, Navajo County, Apache County, and Municipalities

FIGURE 1-2

1.2 STUDY PURPOSE

The scope of the Sub-Regional Transportation Plan was developed in a collaborative process involving a project-specific Technical Advisory Committee (TAC) and the standing White Mountain Regional Transportation Committee (WMRTC). The TAC was composed of staff from the following entities:

- Navajo County;
- Apache County;
- Arizona Department of Transportation (Globe District);
- Town of Snowflake;
- Town of Taylor;
- City of Show Low; and
- Town of Pinetop-Lakeside.

The Sub-Regional Transportation Plan addresses transportation issues associated with each community participating in the study. Individual community plans, developed from the Sub-Regional Transportation Plan, focus specifically on the transportation matters relevant to the municipal partners located in the Study Area.

TAC members helped to shape the scope of the planning effort by shaping goals and deliverables. The TAC also provided valuable data regarding existing conditions for their specific municipality or unincorporated area, including: previous studies, comprehensive planning documents, and submitted development proposals. Five goals were set to be addressed within the framework of the Sub-Regional Transportation Plan:

- (1) Understand key stakeholder issues and needs;
- (2) Identify imminent and future developments within the defined Sub-Region;
- (3) Develop a customized travel demand model to enable estimation of transportation volumes relative to both the existing and forecasted land use;
- (4) Produce growth forecasts for each municipality and unincorporated area; and
- (5) Analyze feasible alternatives for improving the roadway network in the Sub-Region.

1.3 COMMUNITY INVOLVEMENT

TAC meetings were held at major project milestones to review study results and provide guidance to the planning process. These meetings included workshops that helped to shape the scope of this project in terms of goals and deliverables, and also provided valuable existing conditions data for their specific municipality or unincorporated area including previous studies, comprehensive planning documents, and submitted development proposals. The recommended roadway transportation improvement plan was presented to the White Mountain Regional Transportation Committee on May 11, 2007. The plan was presented to the Navajo County Board of Supervisors on May 1, 2007.

2.0 EXISTING CONDITIONS

This section provides an overview of socioeconomic and roadway conditions within the Sub-Regional Transportation Plan Study Area for the year 2006. It includes an updated population and employment estimate and an inventory of roadway facilities.

2.1 CURRENT SOCIOECONOMIC CONDITIONS

An estimate of year 2006 population and employment was developed from several sources including Census 2000 population data, historic building permit activity, and a commercial employment database. This section presents estimates of the 2006 population and employment for the Sub-Region.

2.1.1 YEAR 2006 POPULATION ESTIMATE

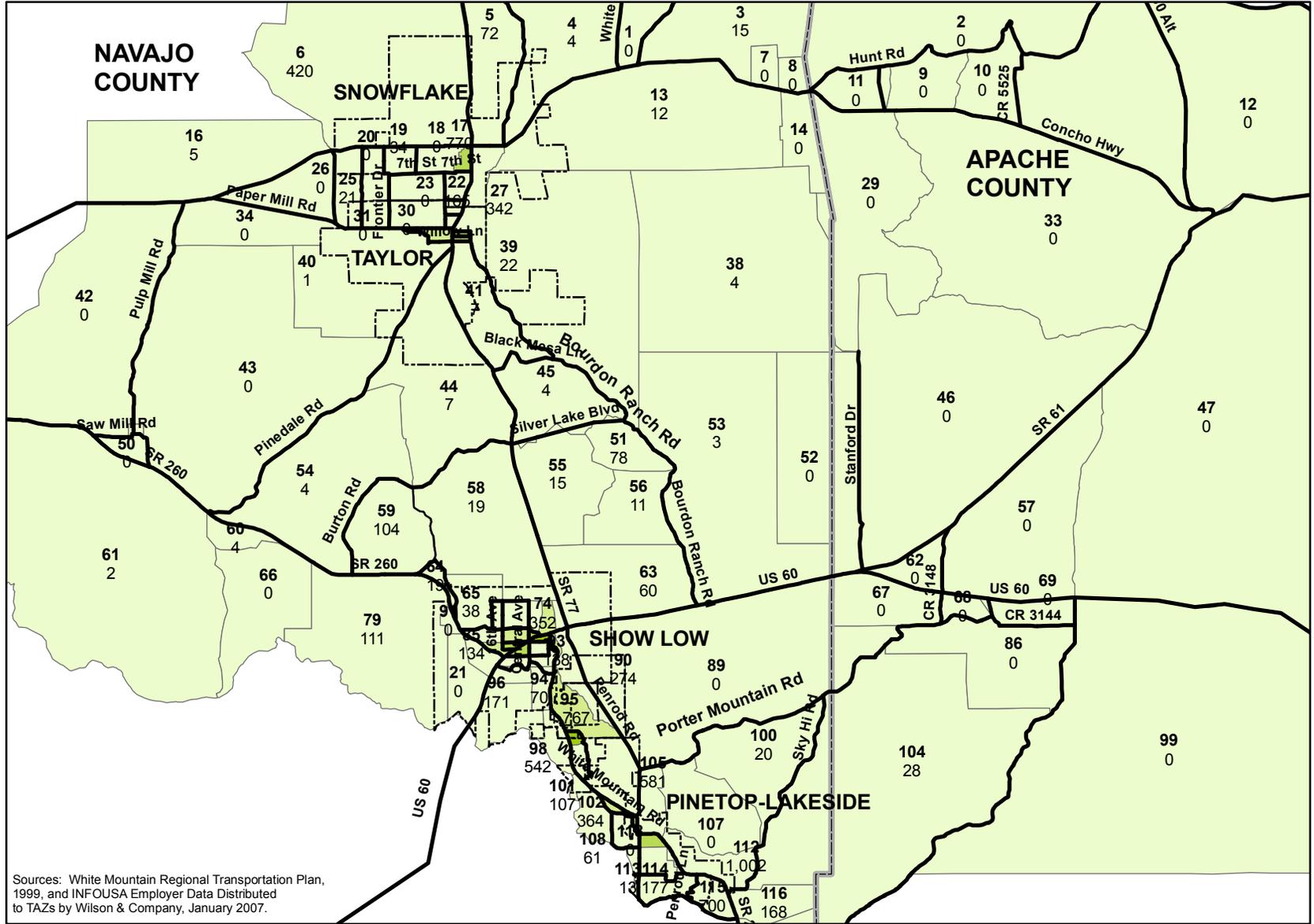
Significant growth has occurred within the Sub-Region since the year 2000. In 2000, the Census Bureau identified over 22,900 dwelling units (DUs) within the Sub-Region. Census Bureau reports indicated over 35,600 people forming 13,000 households. Approximately 57 percent of the total DUs were occupied on census day, which was April 1, 2000. This low occupancy rate (the rate for the State of Arizona is close to 75%) reflects the large number of seasonal summer homes in the Sub-Region. In addition to variations in seasonal occupancy, the number of persons living in each household also varied by location. There was an average of 2.74 persons per household in the Sub-Regional Study Area.

Building permit information obtained from local jurisdictions participating in preparation of the Sub-Regional Transportation Plan was used to develop an estimate of the population in 2006. The number and type of building permits indicated nearly 5,400 new individual DUs were added between January 1, 2000, and May 31, 2006. Therefore, the estimated number of DUs in the Sub-Region in 2006 was determined to be 28,300. This estimated growth translates into nearly a five percent annual increase in DUs between 2000 and 2006. The estimated 2006 Sub-Region population was determined by applying the seasonal occupancy patterns and household size reported in Census data to the new estimated number of DUs in 2006. This method resulted in an estimated population of 43,870 in the Sub-Region in 2006. Figure 2-1 shows the year 2006 estimated population density of the Sub-Region by traffic analysis zone (TAZ).

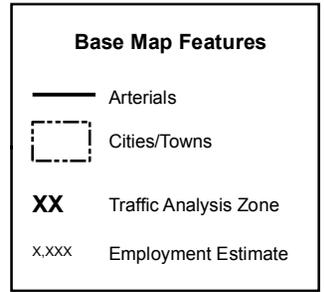
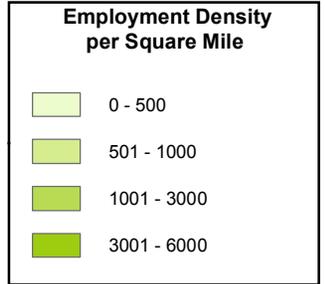
2.1.2 YEAR 2006 EMPLOYMENT ESTIMATE

Employment estimates were developed for the Sub-Region using data from the 1999 *White Mountain Regional Transportation Plan* coupled with a commercial database purchased for this study. The employment database provided information on business locations, number of employees, and industry type. Focusing on the major employers, the database information was then cross-checked against employer information included in the 1999 Plan. The study team verified this employment database with study participants and the TAC. Through this process, an estimate of 15,200 jobs was established for the Sub-Region. Figure 2-2 shows the year 2006 estimated study area employment density by TAZ. Table 2-1 shows the total number of jobs by major employment classification.

Navajo/Apache County Study Area Overview



YEAR 2006 ESTIMATED EMPLOYMENT DENSITY BY TRAFFIC ANALYSIS ZONE



Not to Scale

Sources: White Mountain Regional Transportation Plan, 1999, and INFOUSA Employer Data Distributed to TAZs by Wilson & Company, January 2007.



FIGURE 2-2

TABLE 2-1
2006 EMPLOYMENT IN THE SOUTHERN NAVAJO/APACHE COUNTY SUB-REGION

Classification	Employment
Retail	5,028
Office	7,164
Government	1,273
General	1,761
Total	15,226

Sources: White Mountain Regional Transportation Plan, 1999; InfoUSA, 2006; Wilson & Company, May 2007.

2.2 CURRENT ROADWAY SYSTEM

2.2.1 JURISDICTIONAL RESPONSIBILITY

The State of Arizona is responsible for all State routes in the Sub-Region. Navajo County and Apache County administer all roadways in the unincorporated portions of their respective jurisdictions. The municipalities of Snowflake, Taylor, Show Low, and Pinetop-Lakeside administer all non-State roadways within their corporate limits.

2.2.2 ROADWAY FUNCTIONAL CLASSIFICATION

Roads are classified according to specific design and traffic characteristics. The functional classification process categorizes roads by how they perform in regard to providing access and mobility within the community. A principal arterial, for example, typically provides mobility for longer distance trips with higher speeds and less access to adjoining properties. Conversely, the function of a local street is to provide direct access to neighborhoods with lower speeds. The Sub-Region's roadway network includes four roadway functional classifications.

As the functional classification changes from arterial roadway to local roadway, the level of access generally increases, the capacity decreases, and the purpose of the roadway changes from efficiently moving vehicles to providing direct property access. Table 2-2 provides a summary of the characteristics of each of the four roadway functional classifications applicable to the Show Low community.

2.2.3 PRINCIPAL SUB-REGIONAL ROADWAY NETWORK

STATE HIGHWAY SYSTEM

State and Federal highways form the arterial backbone of the existing sub-regional roadway system in southern Navajo and Apache Counties. They are maintained by the Arizona Department of Transportation (ADOT) and provide intra-regional mobility between the communities of Pinetop-Lakeside, Show Low, Taylor, and Snowflake. ADOT facilities also provide inter-regional linkages between the Sub-Region and other population centers, including the Phoenix metropolitan area. There are three State Principal Arterials serving the Sub-Region (refer to Figure 1-2):

**TABLE 2-2
CHARACTERISTICS OF ROADWAY FUNCTIONAL CLASSIFICATIONS**

Functional Classification	Characteristics
Principal Arterial	Provides regional mobility with limited direct access. Direct commercial access can occur, but access is infrequent to preserve capacity and mobility.
Minor Arterial	Provides access between Principal/Major Arterial and Major Collector routes. The level of access generally is less than on a Major Arterial, but more than a Major Collector. Direct commercial access typically is provided on Minor Arterial routes.
Major Collector	Provides access between Major Collector and Minor Arterial routes. The level of access generally is less than on a Minor Collector, but more than a Minor Arterial.
Minor Collector	Provides access between local streets and Major Collector routes

Source: Wilson & Company, May 2007.

- US 60:** US 60 (aka Deuce of Clubs in Show Low) is part of the National Highway System (NHS) and, as such, provides access between an arterial and a major port, airport, public transportation facility, or other intermodal transportation facilities. In the Sub-Region, US 60 functions as a State Principal Arterial and provides connectivity between Show Low and Globe and the Phoenix metropolitan area to the southwest and Springerville/Eager in Apache County to the east, as well as New Mexico. In rural portions of the Sub-Region, this facility exists as a two-lane highway. Through Show Low, where it is coincident with SR 260 and SR 77, US 60 is a four-lane facility with a continuous center turn lane between these two State highways.
- SR 260:** SR 260 is a State Major Regional Principal Arterial. SR 260 (Clark Road, northwest of Show Low) provides access from Show Low to Payson to the west and Pinetop-Lakeside to the southeast. SR 260 is coincident with US 60 and SR 77 through Show Low. South of US 60, SR 260 (White Mountain Road, between Show Low and Pinetop-Lakeside) connects with Springerville/Eager southeast of Show Low. In rural portions of the Sub-Region, this facility exists as a two-lane highway. In the urbanized area between Show Low and Pinetop-Lakeside, SR 260 is a four-lane facility with a continuous center turn lane.
- SR 77:** SR 77 (aka Penrod Road north of US 60) is a State Principal Arterial providing connectivity between the communities of Show Low and Snowflake/Taylor to the north. Beyond Snowflake to the north, SR 77 provides a connection with Holbrook, the Navajo County seat, and Interstate 40. SR 77, which is coincident with US 60/SR 260 through Show Low, connects Show Low with Globe and Tucson to the south. In rural portions of the Sub-Regional Study Area, this facility exists as a two-lane highway.

REGIONAL/LOCAL ROAD SYSTEM

There are three major highways forming the regional/local road system that are significant in terms of sub-regional access.

- **Bourdon Ranch Road:** Bourdon Ranch Road is a County Minor Arterial providing access to growing development in the White Mountain Lakes area. Bourdon Ranch Road is a rural two-lane highway. This facility is expected to become a significant reliever to SR 77 as growth occurs in this corridor.
- **Lone Pine Dam Road:** Lone Pine Dam Road (Old Highway 60) is a County Minor Arterial that provides access between the Linden area west of Show Low and SR 77 near the White Mountain Lakes area. It exists as a rural two-lane highway. Navajo County anticipates this facility will serve as a key bypass facility to SR 77.
- **Penrod Road:** Penrod Road is a Municipal Minor Arterial that parallels SR 260 south of Show Low and provides access between Pinetop-Lakeside and SR 77 at US 60 east of Show Low. It exists as a rural two-lane highway.

2.2.4 EXISTING ROADWAY CHARACTERISTICS

This section summarizes key characteristics and attributes of the roadway system serving the Southern Navajo/Apache County Sub-Region.

TYPICAL CROSS-SECTIONS

Roadway cross-sections from the *2002 City of Show Low Major Streets and Routes Plan* were adopted and applied for purposes of the Sub-Regional Transportation Plan (Figure 2-3). Descriptions of roadway cross-sections by functional classification are provided below.

- **Principal Arterial:** The adopted cross-section for a Principal Arterial requires 100 feet of right-of-way (R/W). In urban areas, there typically are four travel lanes and a 12-foot median that could be a raised median or a center two-way, left-turn lane. As shown in Figure 2-3, the two outside lanes are 14 feet in width, measured to the face of curb. In rural areas, there typically are two 12-foot travel lanes with a paved shoulder.
- **Minor Arterial:** A Minor Arterial has two, four, or six travel lanes constructed within a 120-foot R/W. The travel lanes are divided by a two-way, left-turn lane or a raised median. Figure 2-3 shows that a bike lane is included in the cross-section.
- **Major Collector:** A Major Collector consists of two travel lanes constructed within an 80-foot R/W. As shown in Figure 2-3, opposing travel directions are separated by a two-way left turn lane or a raised median. A bike lane is included in the cross-section.
- **Minor Collector:** The cross-section for a Minor Collector includes two travel lanes constructed within 60 feet of R/W (refer to Figure 2-3). The 36-foot roadway consists of two 12-foot travel lanes flanked by 6-foot bike lanes in each direction.

INTERSECTION FLARE

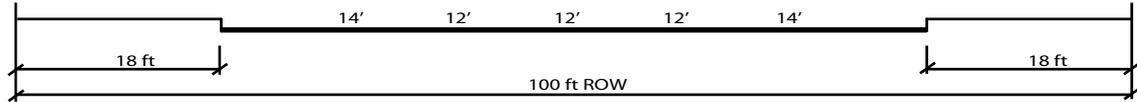
An additional 20-foot by 150-foot parcel of R/W generally is integral to principal arterial/principal arterial, principal arterial/minor arterial, and arterial/major collector intersections to accommodate turn lanes.

RIGHT-OF-WAY REQUIREMENTS

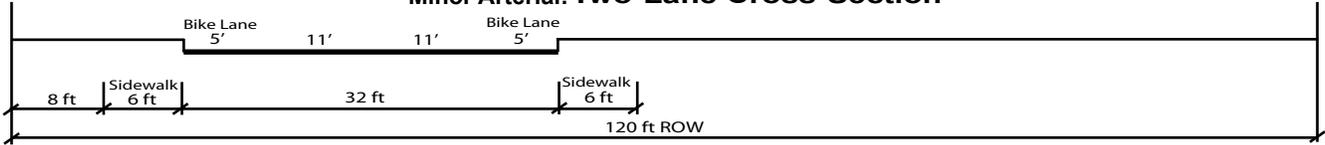
Roadway widths and R/W requirements for the four functional classifications identified above are summarized in Table 2-3.

Southern Navajo/Apache County Sub-Regional Transportation Plan

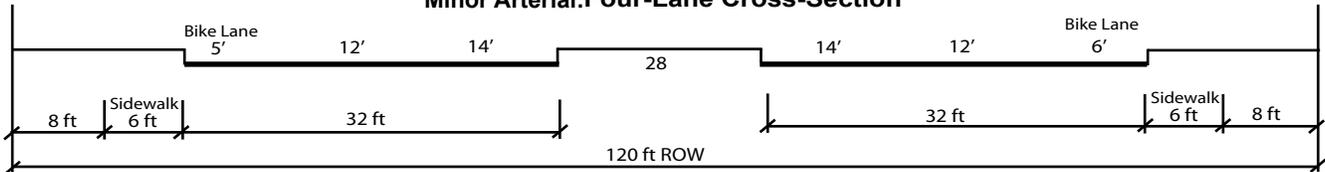
Principal Arterial



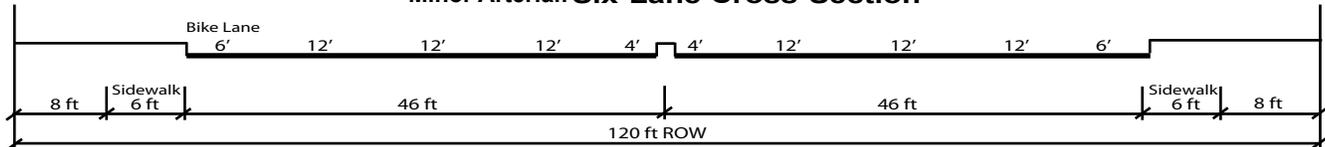
Minor Arterial: Two-Lane Cross-Section



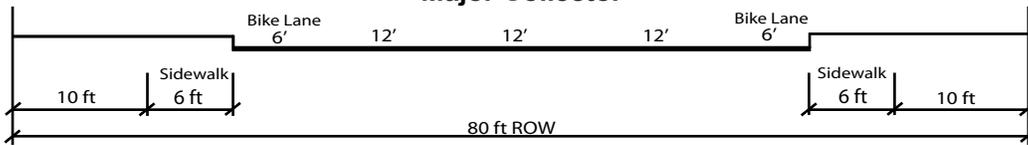
Minor Arterial: Four-Lane Cross-Section



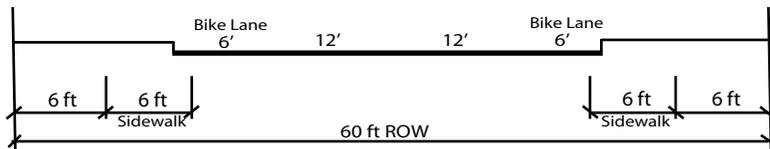
Minor Arterial: Six-Lane Cross-Section



Major Collector



Minor Collector



SOURCE: 2002 City of Show Low Streets and Routes Plan

**TABLE 2-3
ROADWAY WIDTH AND RIGHT-OF-WAY REQUIREMENTS FOR MAJOR ROADWAYS**

Classification	Roadway Width	Right-of-Way Width	Number of Lanes
Principal Arterial	64 feet	100 feet	5
Major Arterial	32 to 92 feet	120 feet	2 to 6
Major Collector	48 feet	80 feet	3
Minor Collector	36 feet	60 feet	2

Source: City of Show Low Major Streets and Routes Plan, Olsson Associates, 2002.

NUMBER OF LANES

Most roadways in the Sub-Region are two-lane facilities, providing one travel lane in each direction (i.e., two directional travel lanes). In the central urbanized area of Show Low between SR 260 (Clark Road) and SR 77 (Penrod Road), US 60 (Deuce of Clubs Highway) is a four-lane facility with two travel lanes in each direction (four directional lanes) and a continuous center turn lane. South of US 60, SR 260 also is a four-lane facility with two travel lanes in each direction and a continuous center turn lane. Figure 2-4 shows the number of directional travel lanes associated with major roadways in the Sub-Region in 2006.

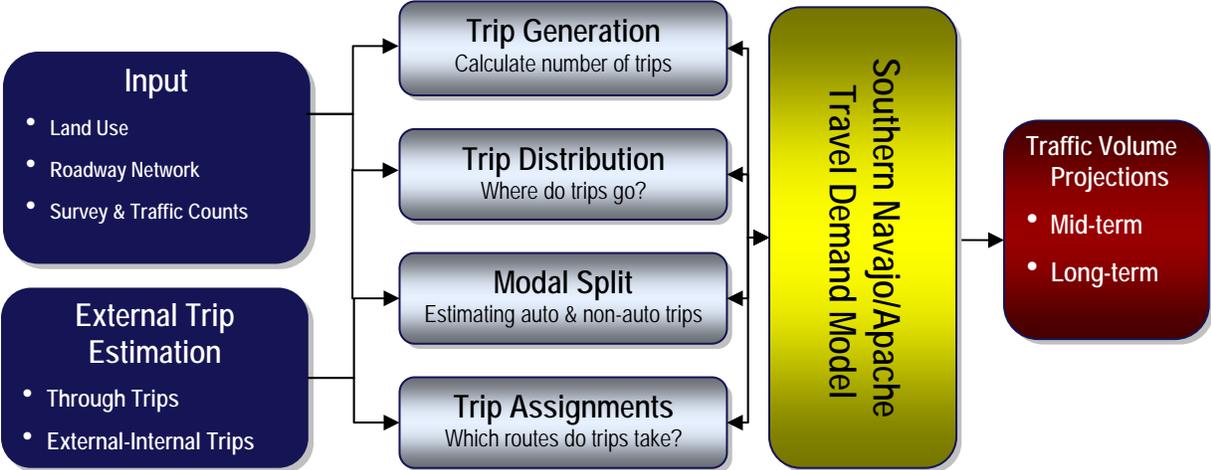
TRAFFIC COUNTS

A year 2006 traffic count database was compiled from ADOT, Navajo County, Apache County, and municipal sources. Where necessary, historic traffic count data were adjusted based on recent growth trends to approximate year 2006 traffic levels (refer to Figure 2-4 for a summary of traffic counts within the Sub-Region). The highest traffic counts in the Sub-Region (exceeding 20,000 vehicles per day) are associated with US 60 (Deuce of Clubs) in the central portion of Show Low, SR 260 in the central portion of Pinetop/Lakeside, and SR 260 west of Show Low. Current traffic counts on SR 77 between the central portion of Snowflake and US 60 in Show Low are in excess of 10,000 vehicles per day. Generally, the major thoroughfares of Sub-Region carry from 1,500 to over 5,000 vehicles per day.

3.0 TRANSPORTATION MODEL DEVELOPMENT

The travel demand model of the 1999 *White Mountain Regional Transportation Plan* was adopted for this study. Figure 3-1 depicts the traffic model development process employed in preparation of the *White Mountain Transportation Plan*. A brief summary of the modeling process used for forecasting future travel demand and traffic levels on streets and highways in the Sub-Region is presented below. More detailed information on the process is presented in the *Southern Navajo/Apache County Sub-Regional Transportation Plan*, which is included herein by reference.

FIGURE 3-1 TRAVEL DEMAND MODEL DEVELOPMENT PROCESS



The model follows a four-step process to determine/project traffic volumes for a defined roadway network based on specified inputs and estimates of external trips. The Trip Generation Module converts household information into vehicle trips between TAZs. Each household generates approximately ten trips daily – five separate round-trips. Employment information is used in the Trip Distribution Module to determine where the trips generated by households want to go. The model includes a Modal Split Module to determine the number of trips or parts of trips by automobile versus transit as part of a trip (this function was not applied for this study). Finally, the Trip Assignment Module then makes a determination as to which routes would be taken by household trips. The fundamental criteria for this determination are the shortest path in the shortest amount of time. Trip assignment takes into account speed, functional class of the roadway, capacity of the roadway, and the amount of traffic using that route. If a route is too congested, the model will assign a different route that offers a shorter travel time. The final result is a forecast of anticipated traffic flows, based on the areas socioeconomic characteristics and the available roadway network. However, before a forecast can be made, a current year model is built to calibrate the model based on existing traffic counts.

4.0 SOCIOECONOMIC PROJECTIONS

Growth within the Sub-Region of southern Navajo and Apache Counties is expected to continue through year 2030, driven by a rising demand for the lifestyle and recreational opportunities offered by the White Mountain region. This section identifies relevant previous studies focused on future conditions, presents base estimates of future population and employment, and provides a summary image of the current growth patterns.

4.1 PREVIOUS PLANS AND STUDIES

General Plans, county Comprehensive Plans, and other planning studies provided a context for the year 2030 growth scenario developed for the Sub-Region. These studies provided information on land use, circulation, and growth areas for input into existing and future socioeconomic forecasts. Relevant plans referenced for this study included:

- *White Mountain Regional Transportation Plan*, Lima & Associates, et al., April 1999.
- *Navajo County Comprehensive Plan*, May 2004.
- *Apache County Comprehensive Plan*, August 2004.
- *Town of Snowflake General Plan*, July 1999.
- *Town of Taylor 2015 General Plan*, December 2003.
- *City of Show Low General Plan, CSC/Counts*, October 1999.
- *City of Show Low Major Streets and Routes Plan*, Olsson Associates, January 2002.
- *Town of Pinetop-Lakeside/Navajo County Regional Plan*, BRW, March 2001.
- *Pinetop-Lakeside Population Projection Report*, July 2005.
- *Traffic Impact Study for Show Low Bluff Planned Unit Development*, Ironside Engineering & Development, Inc., December 2004.

The City of Show Low, the largest community in the Sub-Region, is actively involved in the process of updating its General Plan, which is planned for adoption March 2008. Relevant available transportation-related information associated with this process was incorporated to the extent possible.

4.2 POPULATION AND EMPLOYMENT PROJECTIONS

Population and employment forecasts for years 2015 and 2030 were developed in consultation with the TAC. The process included a review of growth projections from previous plans and studies cited above. Land ownership patterns within the Sub-Region also were assessed; these are discussed in the following section. A workshop was conducted with the TAC to identify planned and approved developments and long-range growth areas. Through this process, population and employment growth projections were established for the Sub-Region.

4.2.1 FUTURE POPULATION DENSITY

Year 2015 and 2030 population projections were developed by applying rates for both seasonal dwelling unit (DU) occupancy and number of persons per household to DU projections. The adopted rates for DU occupancy and persons per household vary by location throughout the Sub-Region. On average, the census data shows that 57 percent of the DUs in the Sub-Region are occupied in April. Projected growth of DUs was based on a compound annual growth rate of five percent between year 2006 and year 2030. The

growth rate would be more gradual at first but would increase as the Sub-Region population base expands. This annual rate is consistent with the growth associated with historic building permit data from year 2000 to year 2006. Between 2006 and 2030, an average of 2,700 new DUs is expected to be added to the Sub-Region annually. An average of 2.74 persons per household was established for future planning purposes. Figures 4-1 and 4-2 show the expected change in estimated population density in the Sub-Region by TAZ for the years 2015 and 2030, respectively.

4.2.2 EMPLOYMENT PROJECTIONS

Employment growth is predicted to increase at the same pace as population growth. In 2006, average employment in the Sub-Region was less than one job per household. This low jobs/housing balance means that many persons living in the Sub-Region rely on outside sources of income or jobs outside the Sub-Region. This also reflects the high number of retirement and second homes in the Sub-Region. For planning purposes, the demographic character of the Sub-Region is not expected to change significantly through the year 2030 planning horizon. It is anticipated that the overall ratio of jobs per household in year 2030 will be similar to year 2006. Figures 4-3 and 4-4 show the expected change in estimated employment density in the Sub-Region by TAZ for the years 2015 and 2030, respectively.

4.2.3 PROJECTED POPULATION AND EMPLOYMENT

Table 4-1 shows the population and employment projections for the Sub-Region for 2015 and 2030. Year 2000 census data and year 2006 population and employment estimates have been included for reference.

**TABLE 4-1
SUB-REGION POPULATION AND EMPLOYMENT ESTIMATES**

Year	Dwelling Units	Occupied Dwelling Units	Population	Employment
2000	22,904 ^a	13,010 ^a	35,653 ^a	9,502 ^b
2006	28,299 ^c	16,135	43,870	15,300 ^d
2015	44,300 ^e	26,500	74,200	23,800 ^e
2030	93,500 ^e	61,200	177,000	51,704 ^e

Source: Wilson & Company, May 2007.

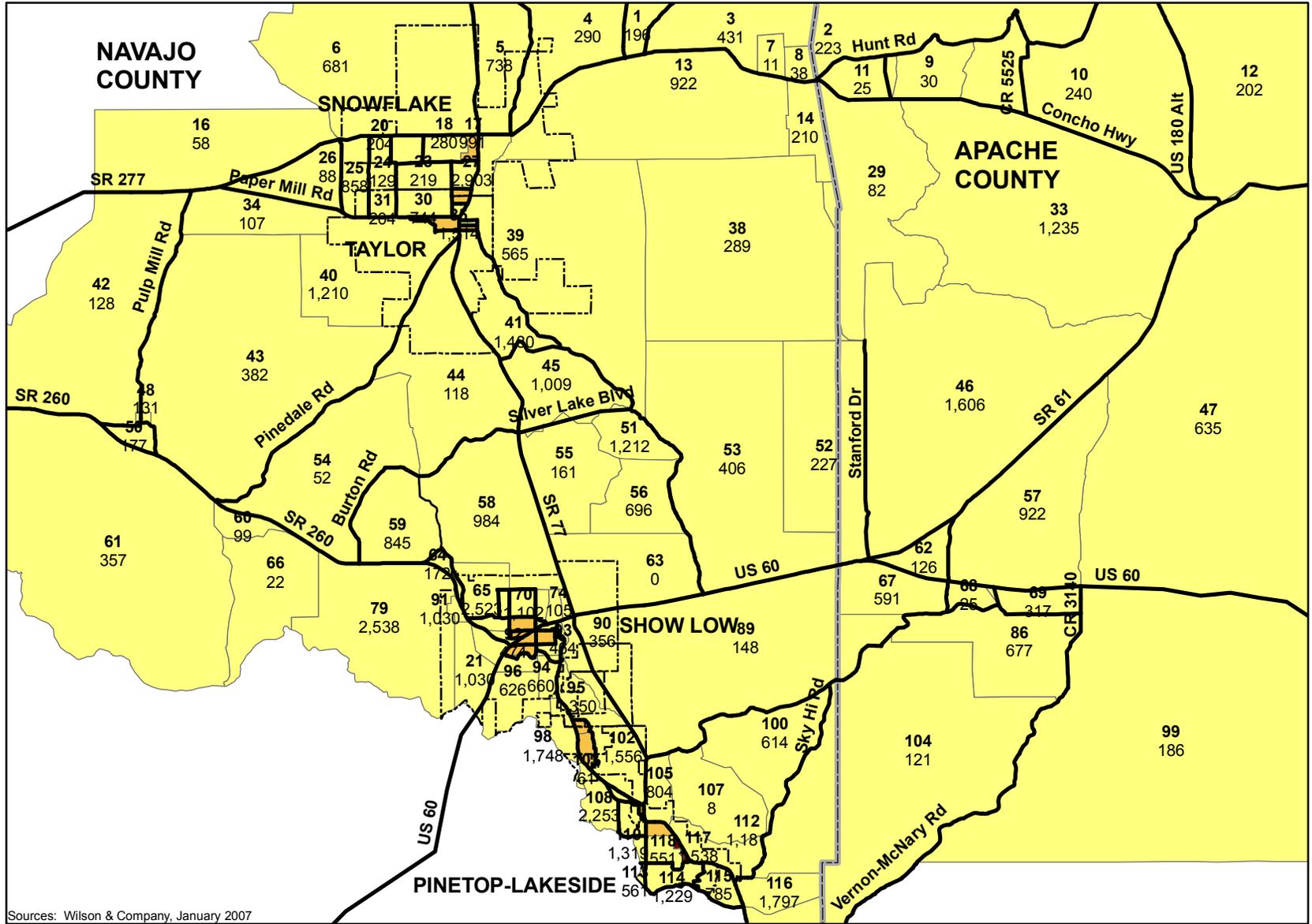
Sources:

- a) U.S. Census Bureau
- b) US Census Bureau ZIP Code Business Patterns, 2000.
- c) Includes 5,400 single- and multi-family building permits issued between January 1, 2000, and May 31, 2006.
- d) Estimate by Wilson & Company based on July 2006 InfoUSA employment data.
- e) Estimate by Wilson & Company based on growth projection.

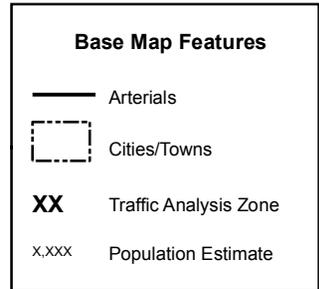
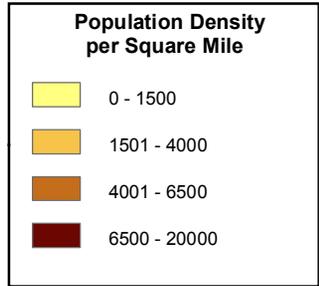
4.2.4 PLANNED DEVELOPMENTS & LAND OWNERSHIP PATTERNS

At a workshop held with the TAC, each participating jurisdiction provided the study team with known active development and residential subdivision information. The jurisdictions identified the following development activity within the Sub-Region that has either been initiated or the entitlement process has been started:

Navajo/Apache County Study Area Overview



YEAR 2015 ESTIMATED POPULATION DENSITY BY TRAFFIC ANALYSIS ZONE



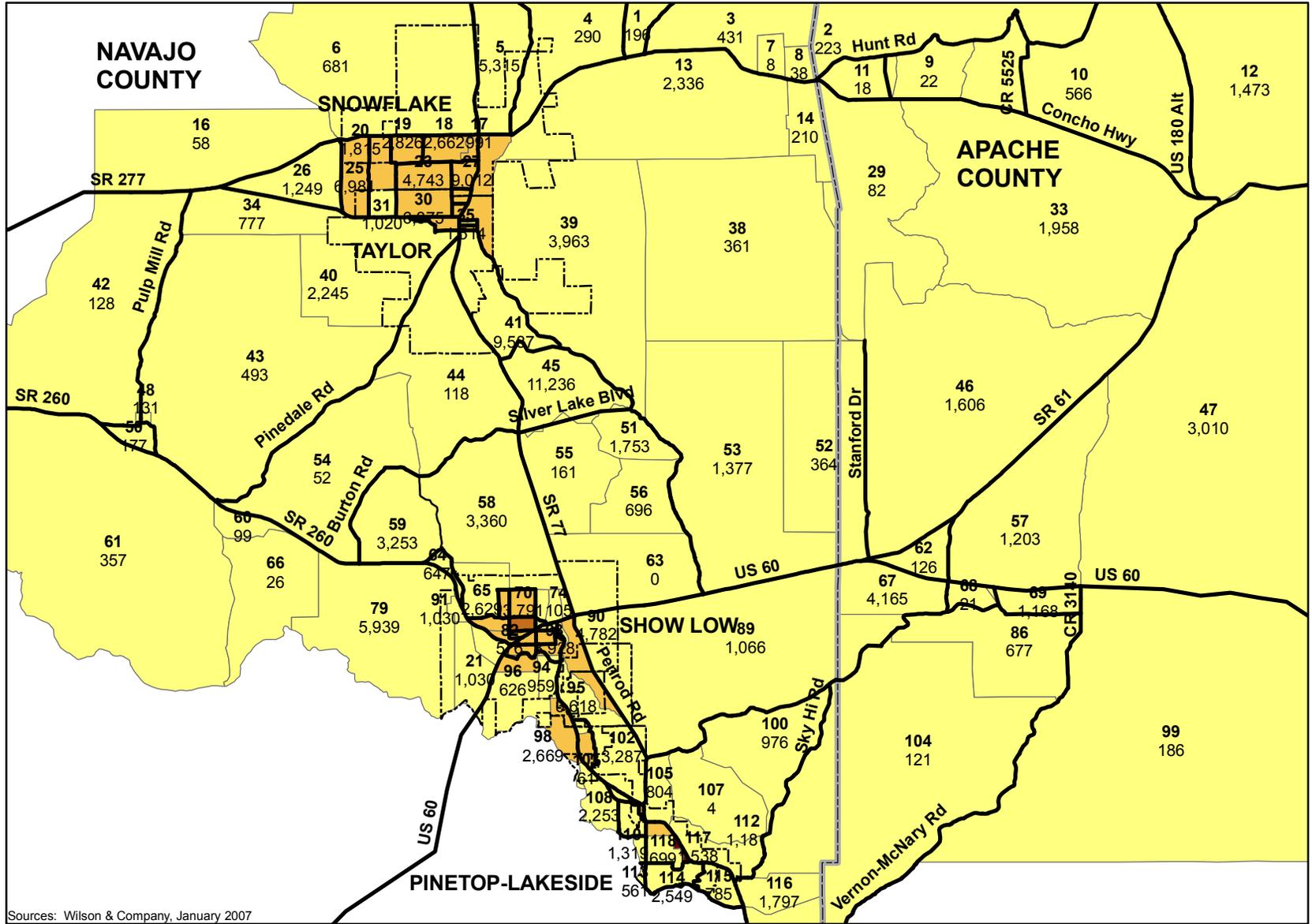
Not to Scale

Sources: Wilson & Company, January 2007

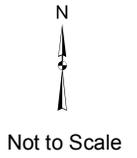
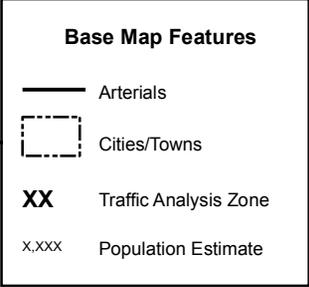
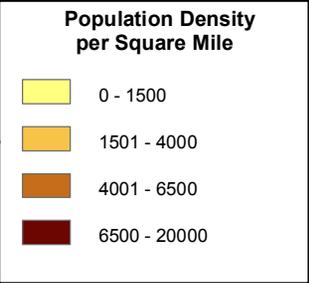


FIGURE 4-1

Navajo/Apache County Study Area Overview



YEAR 2030 ESTIMATED POPULATION DENSITY BY TRAFFIC ANALYSIS ZONE

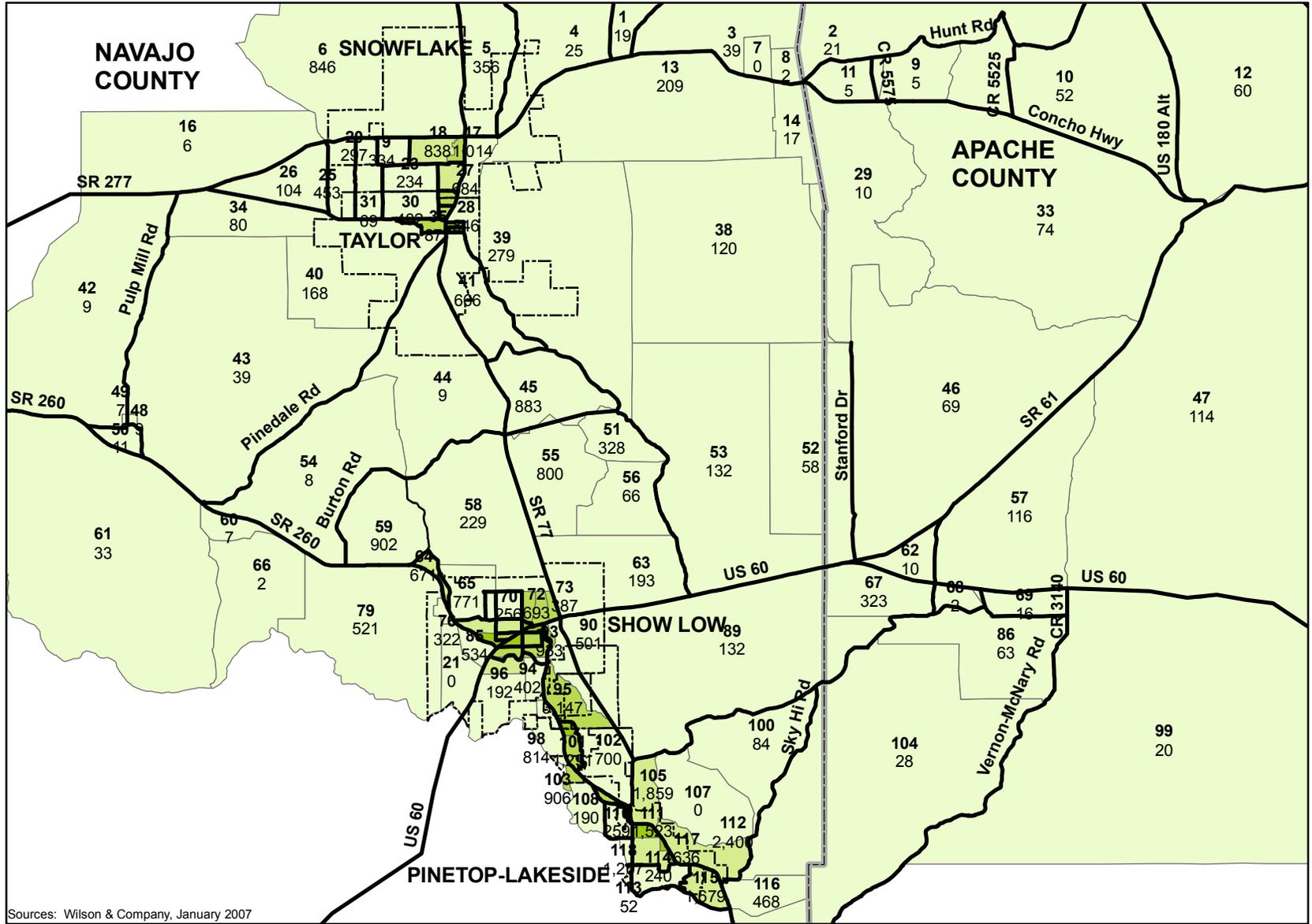


Sources: Wilson & Company, January 2007

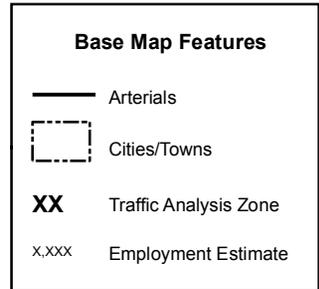
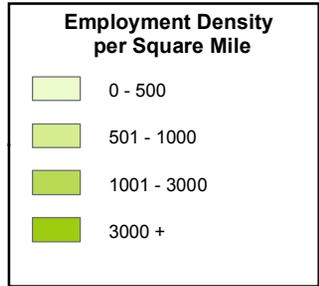


FIGURE 4-2

Navajo/Apache County Study Area Overview



YEAR 2030 ESTIMATED EMPLOYMENT DENSITY BY TRAFFIC ANALYSIS ZONE



Not to Scale

Sources: Wilson & Company, January 2007



FIGURE 4-4

- Approximately 23,000 new residential lots;
- 232 acres of commercial development;
- 15 acres of office park; and
- 60 acres of industrial development.

In order to present the overall context of this growth activity relative to the Sub-Region, Figure 4-5 shows the mosaic of State, Federal, Native American lands, and private lands together with planned developments and future development areas. New development is expected to occur in relation to existing concentrations, particularly within Show Low and Snowflake/Taylor. An important area of new development with respect to the Sub-Region's transportation system is the SR 77/Bourdon Ranch Road corridor southeast of Taylor.

5.0 FUTURE TRAVEL CONDITIONS

The purpose of this section is to identify for evaluation and modeling purposes the characteristics of the Sub-Region's roadway network. Having an understanding of future roadway network characteristics is fundamental to estimating traffic volumes and developing appropriate improvement alternatives. The evaluation and modeling includes analyses of both roadway segments and key intersections. This section discusses the following aspects of the study to evaluate future travel conditions:

- General Roadway Network Design Parameters;
- External Traffic Forecasts;
- Improvement Scenarios, including possible improvements and potential deficiencies; and
- Intersection Control and Development Requirements.

5.1 FUTURE ROADWAY SYSTEM

5.1.1 GENERAL DESIGN PARAMETERS

The maximum roadway cross-section for the planning period 2006 through 2030 has been limited by consent of the study participants to two travel lanes in each direction. Specifically, urban arterials are limited to a five-lane cross-section with two travel lanes in each direction and a continuous center turn lane. Rural arterials are limited to a four-lane cross-section with two travel lanes in each direction. This policy reflects the desire of Sub-Region communities to meet mobility needs with transportation facilities that maintain the area's rural character. This means that when all existing routes have been widened to the maximum cross-section, new alternative alignments must be considered to accommodate travel demand generated by the year 2030 population and employment growth increment.

Typically, the goal of the long-range transportation planning process is to provide for level of service (LOS) 'C' on new roadways and LOS 'D' on existing roadways. The planning goal for rural state highways is LOS 'B'. Nevertheless, constraints to capacity improvements, such as physical barriers, policy decisions, or funding limitations, can limit the ability of a plan to accommodate future travel demand estimates at a desirable LOS.

It also should be noted that the year 2030 travel demand forecasts prepared for this study are an order of magnitude higher than the year 2020 estimates shown in the 1999 *White Mountain Regional Transportation Plan*. The 1999 Plan accommodated year 2020 travel demand estimates at a desirable LOS. However, as projected growth of the Sub-Region occurs, it will be increasingly difficult to maintain a roadway system that satisfies the higher LOS goal generally characteristic of traditional rural areas.

5.1.2 EXTERNAL TRAFFIC FORECASTS

External traffic growth (trips with an origin or destination outside of the Sub-Region) is an important component of understanding how the future roadway network will operate and developing reliable future year travel demand forecasts. External traffic growth was estimated based on historic traffic and population growth trends. Table 5-1 shows the existing year 2006 daily traffic counts and 2015 and 2030 daily traffic volume forecasts at five external stations located at the perimeter of the Sub-Region. These data were

**TABLE 5-1
CURRENT AND FUTURE EXTERNAL DAILY TRAFFIC VOLUME ESTIMATES**

Location	Year		
	2006	2015	2030
US 180, West of SR 180A	710	930	1,750
US 180, East of SR 180A	460	610	1,130
SR 61, East of Concho	2,480	7,600	13,950
US 60, East of Vernon	2,140	4,200	7,600
SR 260, South of Rim Rd. (Pinetop-Lakeside)	9,570	15,900	36,800
US 60, West of Rim Rd (Show Low)	3,040	5,900	10,800
SR 260, West of Paper Mill Rd.	4,390	6,900	12,800
SR 277, West of Paper Mill Rd.	2,590	5,080	9,300
SR 77, North of Snowflake	4,500	6,900	12,600
TOTAL	29,880	54,020	106,730

Source: Wilson & Company, May 2007.

employed in the travel demand modeling process. In 2006, there were close to 30,000 daily vehicle trips in and out of the Sub-Region on an average weekday. Weekday external daily vehicle trips in the Sub-Region are forecast to grow at five percent per year over the 24-year planning horizon. In 2030, it is estimated there will be over 106,000 average weekday vehicle trips traveling to, from, and through the Sub-Regional Study Area.

5.1.3 IMPROVEMENT SCENARIOS

EXISTING-PLUS-COMMITTED ROADWAY NETWORK

Existing-Plus-Committed Roadway Improvements

As southern Navajo and Apache Counties grow, new roadway facilities are being added both to provide access to new developments and to meet additional travel demand. When a roadway capacity improvement is incorporated in a jurisdiction's Five-Year Capital Improvement Program (CIP), it is considered a "committed" improvement. Two committed roadway improvements were identified that are relevant to definition of the sub-regional roadway network. They primarily are developer-funded and related to growth in the SR 260 corridor between Pinetop-Lakeside and Show Low:

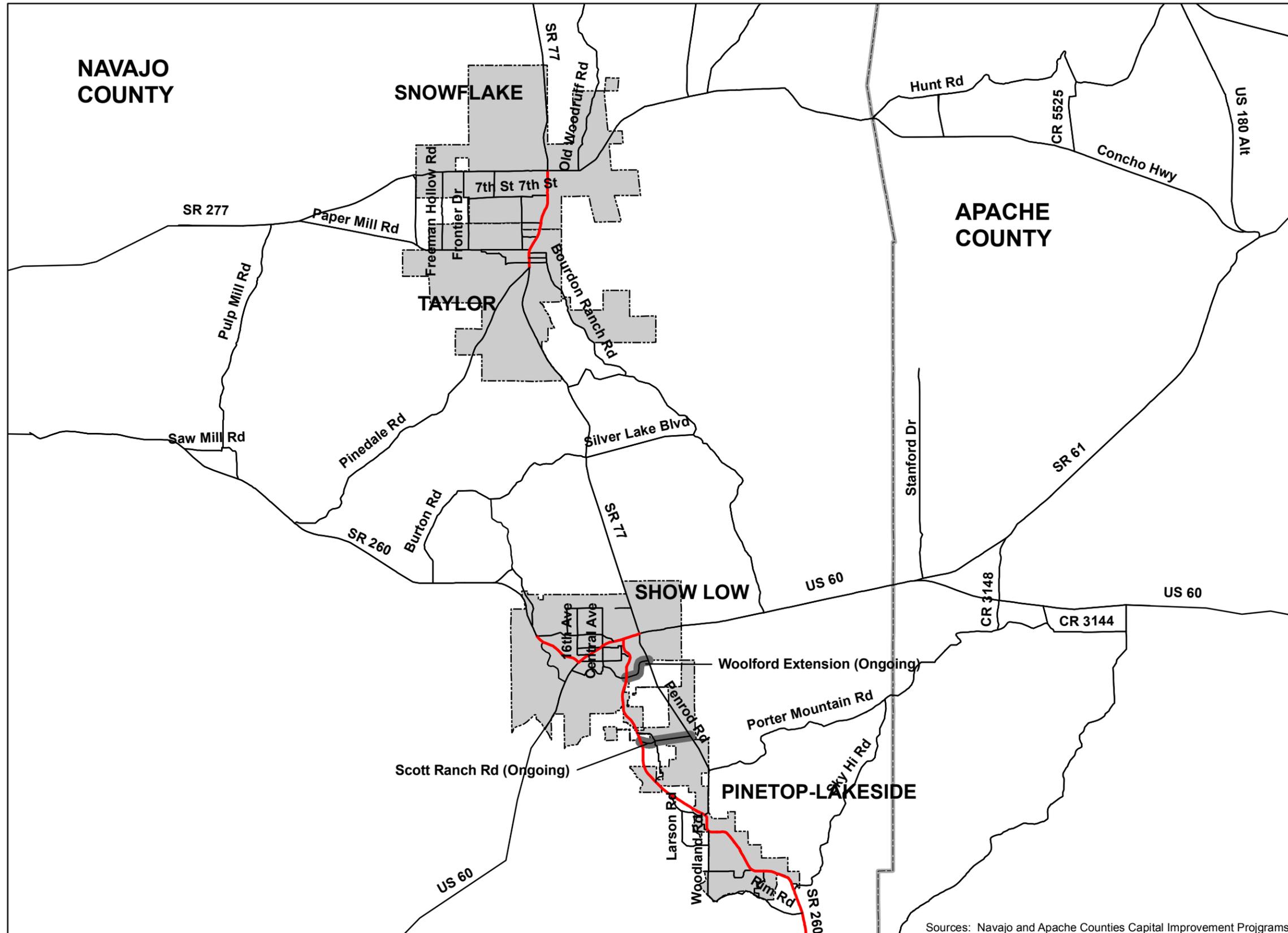
- Show Low Bluffs Road, SR 260 to Penrod Road, new two-lane road; and
- Scott Ranch Road, SR 260 to Penrod Road, new two-lane road.

These five-year programmed roadway improvements were incorporated into the Existing-Plus-Committed transportation network, which is shown in Figure 5-1. As no major new roadway improvement projects are anticipated under the 2030 Existing-Plus-Committed roadway network, it essentially represents a "No-Build" or "Do-Nothing" improvement scenario.

Evaluation of Roadway Network Deficiencies

The Southern Navajo/Apache County Travel Demand Model was used to distribute and assign average daily traffic to the Existing-Plus-Committed sub-regional roadway network. Traffic levels were based on a

Navajo/Apache County Study Area Overview



EXISTING-PLUS-COMMITTED ROADWAY NETWORK

Directional Lanes

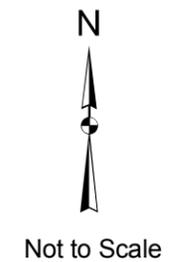
- 1 Lane
- 2 Lanes

Improvement Scenario

- Existing-Plus-Committed

Base Map Features

- Cities/Towns



Sources: Navajo and Apache Counties Capital Improvement Programs

FIGURE 5-1

forecast of trips generated from the year 2030 population and employment growth estimates for the Sub-Region. Figure 5-2 shows that under this “No-Build” scenario a large number of roadways forming the Existing-Plus-Committed network would be carrying daily traffic volumes in excess of available capacity, i.e., LOS ‘E’ and LOS ‘F’.

Figure 5-2 also shows a second level of assessment—a focused “cut-line” analysis. Cut-line analysis is a technique involving an imaginary line drawn across all of the major roadway facilities in a given travel corridor. The total traffic volume crossing the cut-line on individual roadways in the corridor is summed up. The cut-line volume represents the total demand for travel in a given direction over a broader portion of the network. The total volume is compared to available capacity to yield a volume-to-capacity (V/C) ratio. A V/C ratio greater than one means the forecast traffic volume is greater than the capacity of the roadway segments crossing the cut-line.

The Year 2030 Cut-Line Summary table inset to Figure 5-2 indicates the principal north-south corridor roadways connecting the four communities of the Sub-Region will be well over capacity, assuming the magnitude of growth projected by 2030. The worst conditions in the Sub-Region will occur in the north-south corridor between Show Low and Pinetop/Lakeside, which is served by SR 260 and Penrod Road (Cut-line 4). A V/C ratio of 2.15 is forecast for this corridor. Similarly, the corridor to the north of Show Low (Cut-line 3), served by SR 77 (Penrod Road) and Bourdon Ranch Road, is forecast to have a V/C ratio of 1.77. Clearly, the more significant capacity problems will be associated with travel into and out of Show Low, which is the largest urban community in the Sub-Region.

COMMITTED-PLUS-PLANNED ROADWAY NETWORK

The analysis of 2030 travel demand on the Existing-Plus-Committed roadway network shows a definite need for improving existing facilities, particularly in the Sub-Region’s north-south corridors, and adding new capacity. Clearly, the Existing-Plus-Committed network will not provide adequate capacity to handle projected year 2030 travel demand within the Sub-Region without significant improvement to existing facilities and the addition of new sub-regional transportation corridors. Steady population growth is forecast for the Sub-Region through the year 2030 planning horizon. The travel demand results and cut-line analysis indicate additional capacity is needed in the Sub-Region.

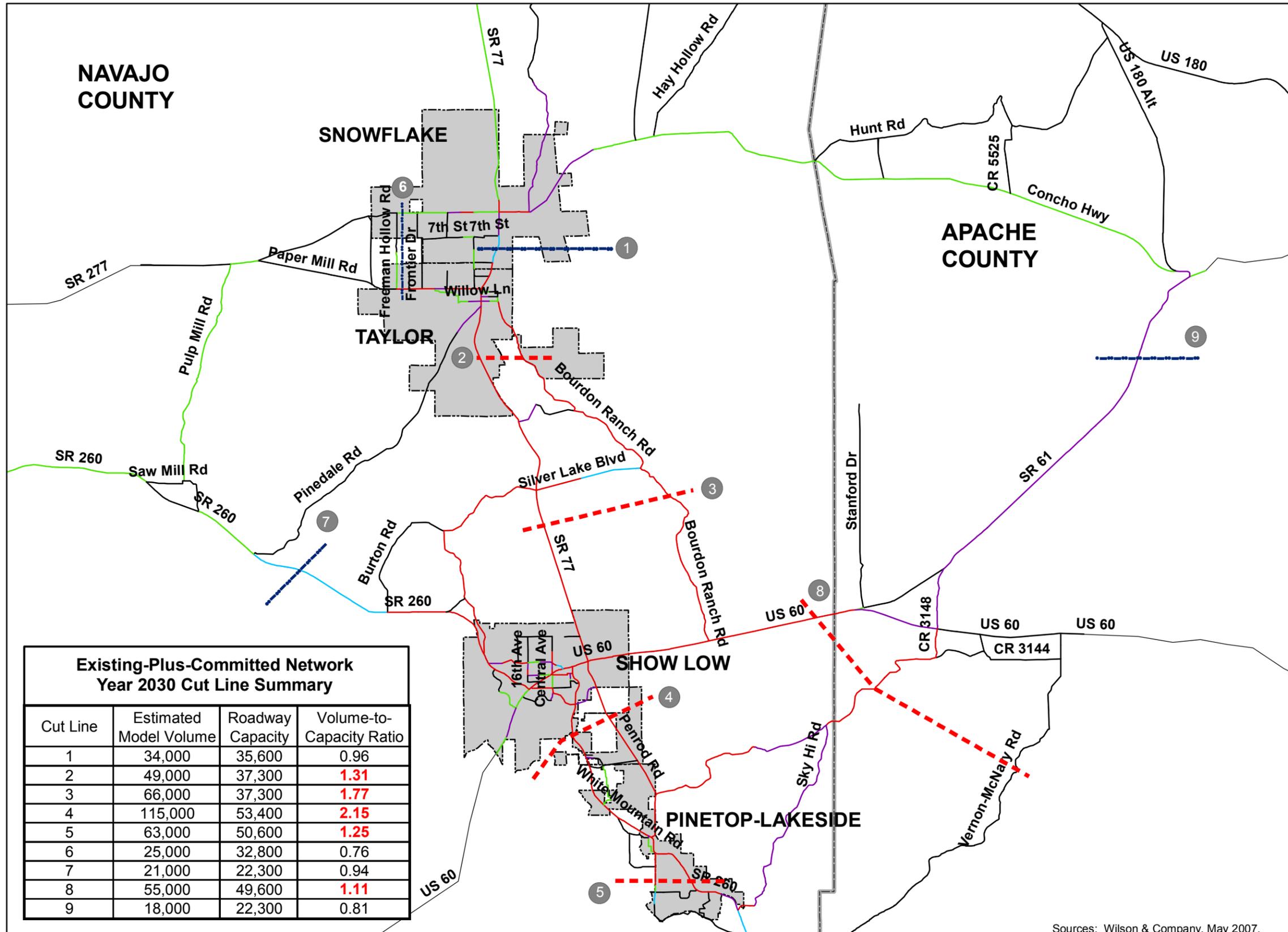
Committed-Plus-Planned Roadway Improvements

The Committed-Plus-Planned roadway network is an augmentation of the Existing-Plus-Committed roadway network. The Committed-Plus-Planned roadway network includes the two capacity improvements incorporated in the Existing-Plus-Committed network plus: planned capacity improvements; new alignments and widenings proposed through earlier planning studies; and other needed widening of existing facilities. A map showing the Committed-Plus-Planned roadway network for the Sub-Region is presented in Figure 5-3. Table 5-2 summarizes the specific improvements planned within the Sub-Region by sponsoring agency.

Evaluation of Roadway Network Deficiencies

An analysis was conducted to determine how the sub-regional roadway network likely would respond with the addition of capacity improvements. The sub-regional Southern Navajo/Apache County Travel Demand Model transportation network was modified to incorporate the Committed-Plus-Planned improvements. A new traffic assignment was generated based on the same year 2030 population and employment data used to generate the Existing-Plus-Committed roadway network traffic assignment. The new table of forecast

Navajo/Apache County Study Area Overview



**FORECAST 2030
LEVEL OF SERVICE:
EXISTING-PLUS-COMMITTED
ROADWAY NETWORK**

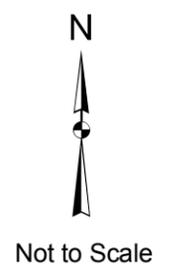
Level of Service

- LOS A - B
- LOS C
- LOS D
- LOS E
- LOS F

* Based on 2030 Socioeconomic Data

Base Map Features

- ▭ Cities/Towns
- ① Cut Line Reference Number
- - - Cut Line Over Capacity
- · - · - Cut Line Under Capacity

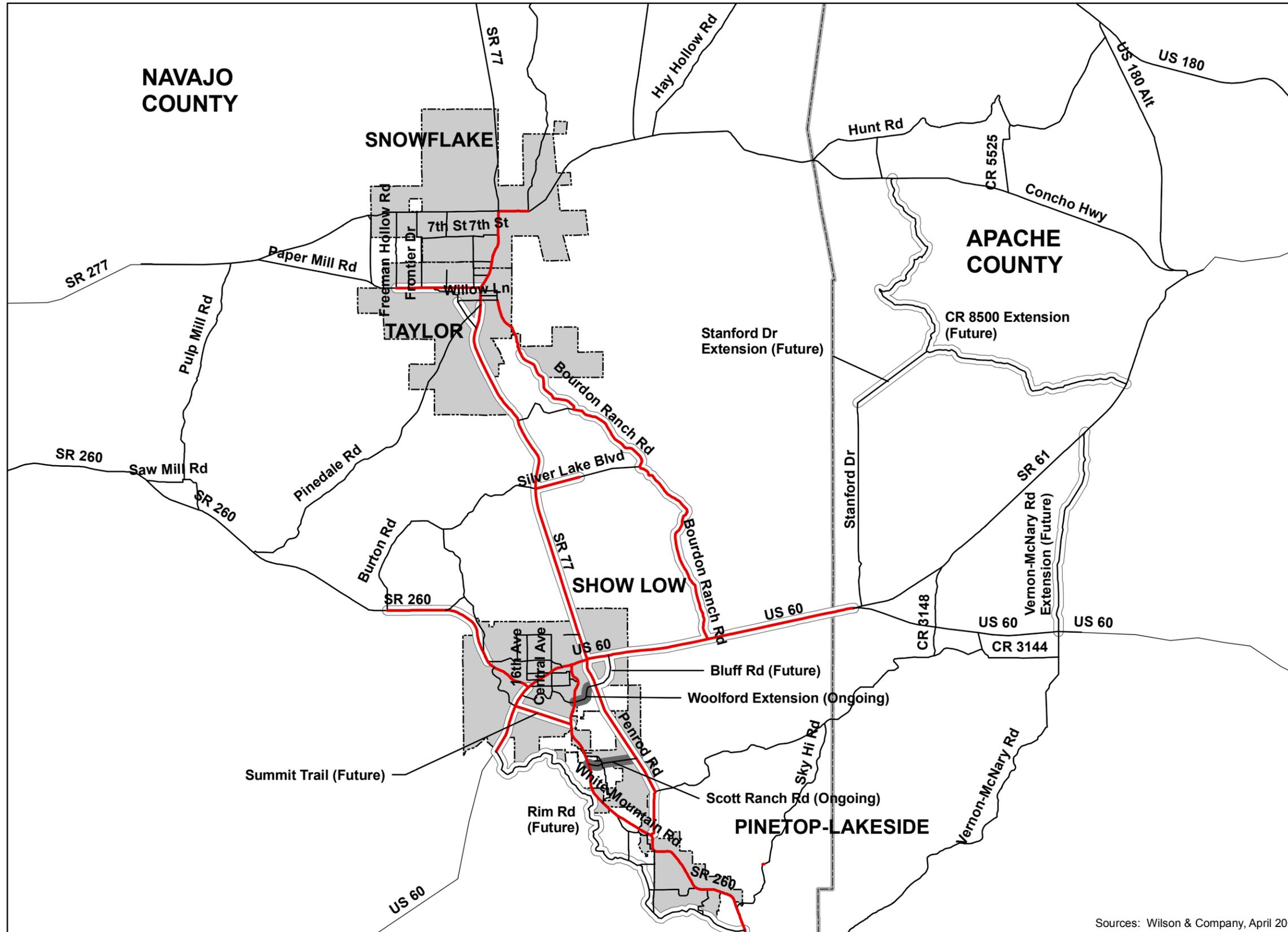


Sources: Wilson & Company, May 2007.

FIGURE 5-2



Navajo/Apache County Study Area Overview



COMMITTED-PLUS-PLANNED ROADWAY NETWORK

Directional Lanes

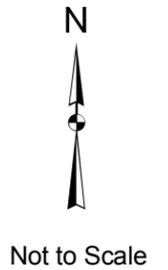
- 1 Lane
- 2 Lanes

Improvement Scenario

- Existing-Plus-Committed
- Committed-Plus-Planned

Base Map Features

- Cities/Towns



Sources: Wilson & Company, April 2007.

FIGURE 5-3

**TABLE 5-2
PLANNED SUB-REGIONAL ROADWAY NETWORK IMPROVEMENTS**

Agency	Roadway	From	To	Forecast 2030 Daily Traffic Volume	Planned Improvement
ADOT	US 60 (West)	Rim Road	Summit Trail	23,000+	Widen to four lanes *
	US 60 (West)	Summit Trail	SR 260 (Clark Rd)	39,000+	Widen to four lanes *
	US 60 (East)	SR 77	Bourdon Ranch Rd	66,000+	Widen to four lanes *
	US 60 (East)	Bourdon Ranch Rd	SR 61	33,000+	Widen to four lanes *
	SR 260 (Clark Rd)	Burton Rd	Old Linden Rd	35,000+	Widen to four lanes *
	SR 77	SR 260	Silver Lake Blvd	73,000+	Widen to four lanes *
	SR 77	Silver Lake Blvd	Pinedale Rd	55,000+	Widen to four lanes *
Navajo County	Bourdon Ranch Rd	US 60	Silver Lake Blvd	25,000+	Widen to four lanes
	Bourdon Ranch Rd	Silver Lake Blvd	Town of Taylor	19,000+	Widen to four lanes
	Silver Lake Blvd	White Mtn Lake Rd	SR 77	29,000+	Widen to four lanes
Apache County	Stanford Dr	Existing Stanford Dr	Concho Hwy	NA	New two-lane roadway
	CR 8500	Stanford Dr Extension	SR 61	NA	New two-lane roadway
	Vernon-McNary Rd	US 60	SR 61	NA	New two-lane roadway
Town of Pinetop-Lakeside	Rim Road	US 60	SR 260 (White Mtn Rd)	19,000+	General Improvements
	Penrod Rd	US 60	Porter Mtn Rd	54,000+	Widen to four lanes *
	Porter Mtn Rd	SR 260 (White Mtn Rd)	Penrod Rd	42,000+	Widen to four lanes *
City of Show Low	Penrod Rd	US 60	South of Porter Mtn Rd	54,000+	Widen to four lanes *
	Summit Trail	US 60	SR 260 (White Mtn Rd)	21,000+	Four-lane extension
	Rim Road	US 60	SR 260 (White Mtn Rd)	19,000+	General Improvements
	Bluff Rd	YS 60	Penrod Rd	16,000+	New two-lane roadway
Town of Snowflake	No Improvements Identified				
Town of Taylor	Paper Mill Rd	Freeman Hollow Rd	SR 77	28,000+	Widen to four lanes
	Airport Access Rd	SR 77	Airport Rd	NA	New two-lane roadway

Source: Improvements identified in published plans; TAC; and improvements identified through the Existing-Plus-Committed roadway network by Wilson & Company, May 2007.

Notes: * Includes strict access management

traffic volumes for roadway segments provided a basis for determining whether deficiencies remained in the sub-regional roadway network. This was accomplished by revising the cut-line analysis. Figure 5-4 presents a map showing the level of service expected with implementation of the Committed-Plus-Planned roadway network. The table inset in Figure 5-4 summarizes the results of the cut-line analysis. It is clear from Figure 5-4 and the cut-line analysis results, the planned improvements would address many of the deficiencies identified within the Existing-Plus-Committed roadway network (refer to Figure 5-2). In particular, sufficient capacity is anticipated along each of the east-west cut-lines with the Committed-Plus-Planned roadway network. However, key north-south arterials are still forecast to have 2030 traffic volumes in excess of their capacities.

The cut-line analysis indicates substantial improvement for the southeast corridor serving the City of Show Low and the Town of Pinetop-Lakeside. The V/C ratio of Cut-Line 4 would improve from 2.15 to 1.49; however, roadways in the corridor still would be operating over capacity. Cut-Line 3, north of Show Low, also would show improvement over the Existing-Plus-Committed roadway network. The V/C ratio for the SR 77/Bourdon Ranch Road corridor between the community Show Low and Snowflake/Taylor definitely would improve with implementation of planned projects for the area. However, the V/C ratio of 1.06 indicates roadways in the corridor still would be operating over capacity in 2030. Cut-lines 7 and 8, west and east of the City, respectively, would experience notable relief with planned improvements. The V/C ratio for the former would be reduced almost 50 percent, while the latter would be cut by more than half.

ALTERNATIVE 'A' ROADWAY NETWORK

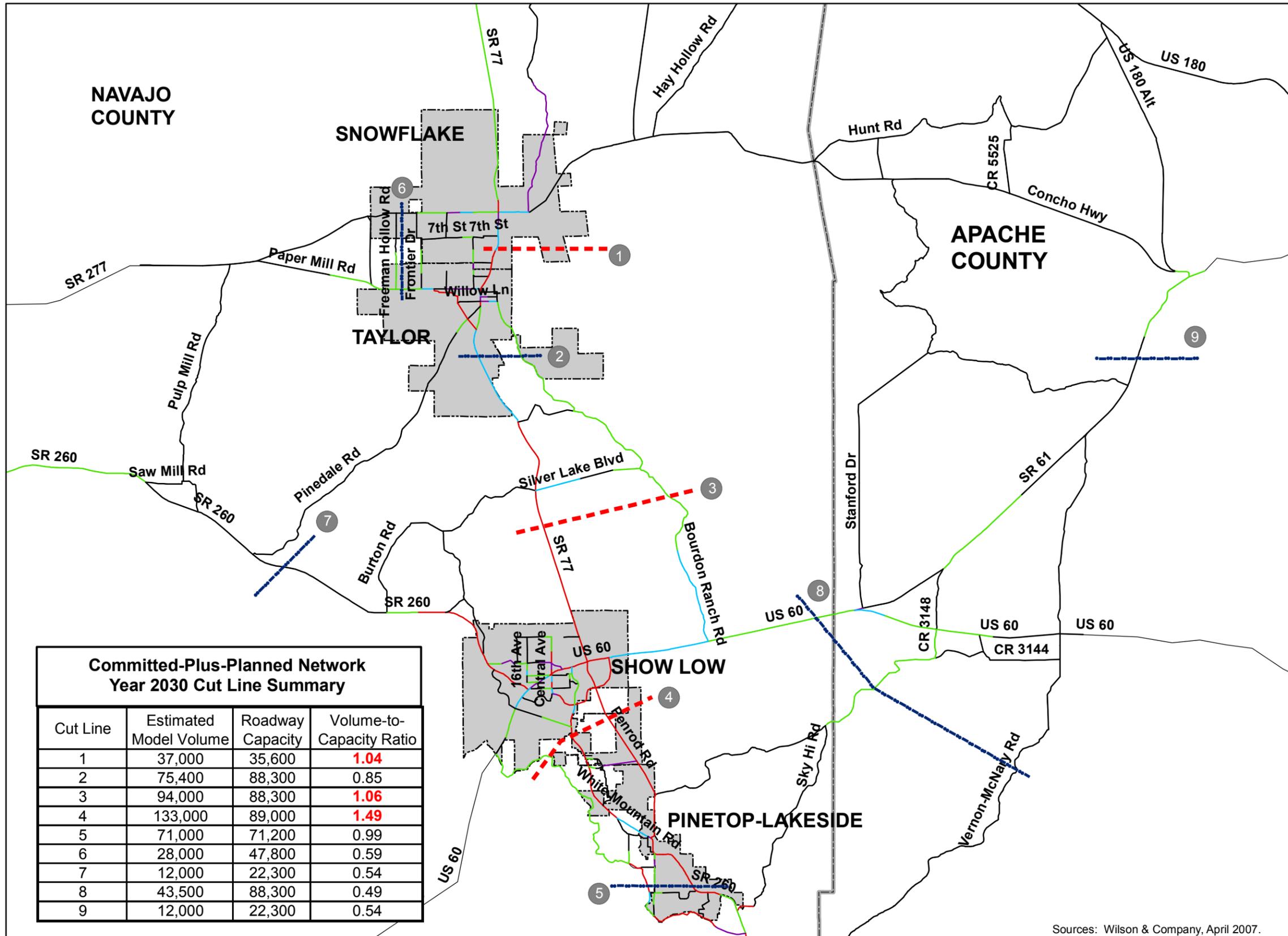
Information in the previous section indicates the Committed-Plus-Planned roadway network still will need enhanced network capacity and connectivity to facilitate efficient north-south travel. In consultation with the TAC, possible new Navajo County transportation corridors were added to the Committed-Plus-Planned roadway network to address this need. These potential new transportation improvements, when added to the Committed-Plus-Planned roadway network, constitute Alternative 'A'.

Alternative 'A' Roadway Improvements

Figure 5-5 shows the Alternative 'A' roadway network with planned and proposed system improvements. The five possible improvements that could augment the Committed-Plus-Planned roadway network are discussed below.

- **Bourdon Ranch Road Extension:** This possible extension of Bourdon Ranch Road offers the potential for a new north-south, two-lane minor arterial east of the Towns of Taylor and Snowflake, extending from Old Woodruff Road at Concho Highway in northeast Snowflake to Bourdon Ranch Road southeast of Taylor. Connectivity would also be provided to the existing street network in Snowflake and Taylor to the west. This new alignment would help relieve some congestion expected in the year 2030 in Taylor and Snowflake along SR 77. Connectivity would be enhanced with the extension of the city streets to the new Bourdon Ranch Road Extension. Year 2030 traffic volume on this new facility is expected to approach 18,000 vehicles per day on some sections.
- **North-South Road:** A new North-South Road – a two-lane minor arterial – west of the Town of Taylor, extending from Centennial Boulevard at Paper Mill Road in the north to Lone Pine Dam Road in the south would serve to relieve the congested SR 77 corridor between Show Low and Taylor. This proposed new roadway generally would follow the existing Forest Road 133 alignment between Lone Pine Dam Road and Pinedale Road. This new facility Year 2030 traffic volume on this new corridor is expected to exceed 13,000 vehicles per day on some sections.

Navajo/Apache County Study Area Overview



FORECAST 2030 LEVEL OF SERVICE COMMITTED-PLUS-PLANNED ROADWAY NETWORK

Level of Service

- LOS A - B
- LOS C
- LOS D
- LOS E
- LOS F

* Based on 2030 Socioeconomic Data

Base Map Features

- ▭ Cities/Towns
- ① Cut Line Reference Number
- - - Cut Line Over Capacity
- - - Cut Line Under Capacity

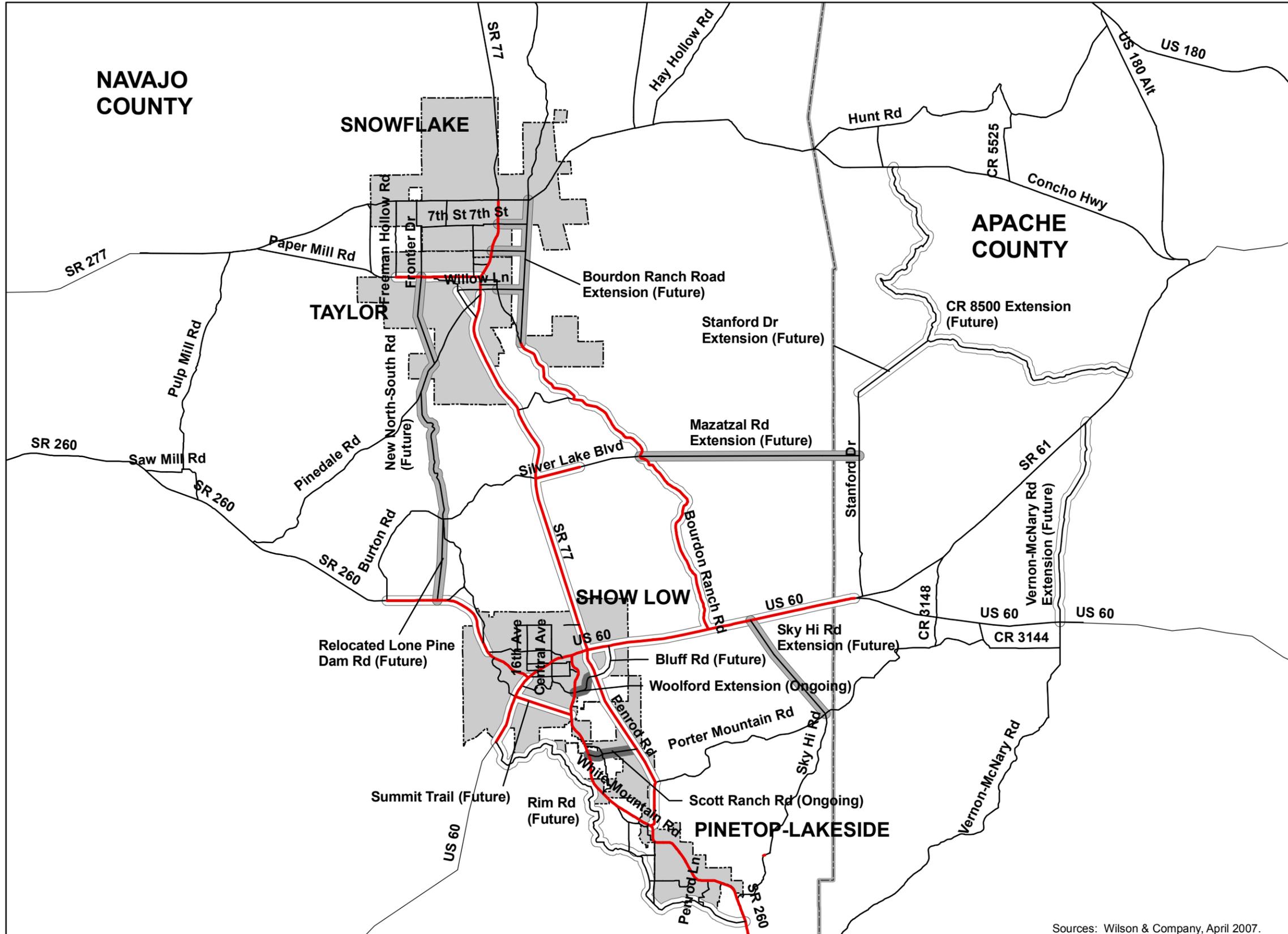
Cut Line	Estimated Model Volume	Roadway Capacity	Volume-to-Capacity Ratio
1	37,000	35,600	1.04
2	75,400	88,300	0.85
3	94,000	88,300	1.06
4	133,000	89,000	1.49
5	71,000	71,200	0.99
6	28,000	47,800	0.59
7	12,000	22,300	0.54
8	43,500	88,300	0.49
9	12,000	22,300	0.54



Sources: Wilson & Company, April 2007.

FIGURE 5-4

Navajo/Apache County Study Area Overview



**ALTERNATIVE A
ROADWAY NETWORK**

Directional Lanes

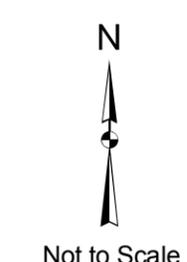
- 1 Lane
- 2 Lanes

Improvement Scenario

- Existing-Plus-Committed
- Committed-Plus-Planned
- Alternative A

Base Map Features

- Cities/Towns



Sources: Wilson & Company, April 2007.

FIGURE 5-5

- **Lone Pine Dam Road:** Lone Pine Dam Road is an important Navajo County minor arterial that provides a north-south bypass around Show Low between SR 260 (Clark Rd) and SR 77. This facility also forms the southern section of the new north-south corridor described previously. Year 2030 traffic volume on Lone Pine Dam Road is expected to exceed 18,000 vehicles per day. As part of upgrading Lone Pine Dam Road to handle this increased bypass traffic volume, the facility should be relocated west of its existing location away from the growing residential neighborhood at the existing SR 260/Lone Pine Dam Road intersection. A detailed corridor study should be conducted to select an appropriate new alignment to begin right-of-way protection.
- **Sky Hi Road Extension:** The unused Apache Railroad right-of-way between US 60 east of Bourdon Ranch Road and Porter Mountain Road is a potential opportunity for a new north-south, two-lane collector. This facility would enhance connectivity between Pinetop-Lakeside in the south and residential growth areas in Apache County. It also would serve to relieve the congested Penrod Road/White Mountain Road (SR 260) corridor. Year 2030 traffic volumes on this Sky Hi Road Extension are expected to exceed 7,000 vehicles per day.
- **Mazatzal Street Extension:** Another potential travel corridor to relieve over-capacity problems would be an extension of Mazatzal Street. This extension would provide a new east-west, two-lane collector between Bourdon Ranch Road in Navajo County and Stanford Drive in Apache County. This potential route would provide new connectivity between the White Mountain Lakes area and residential developments in the Stanford Drive area. Year 2030 traffic volume on the Mazatzal Street Extension is expected at 500 vehicles per day.

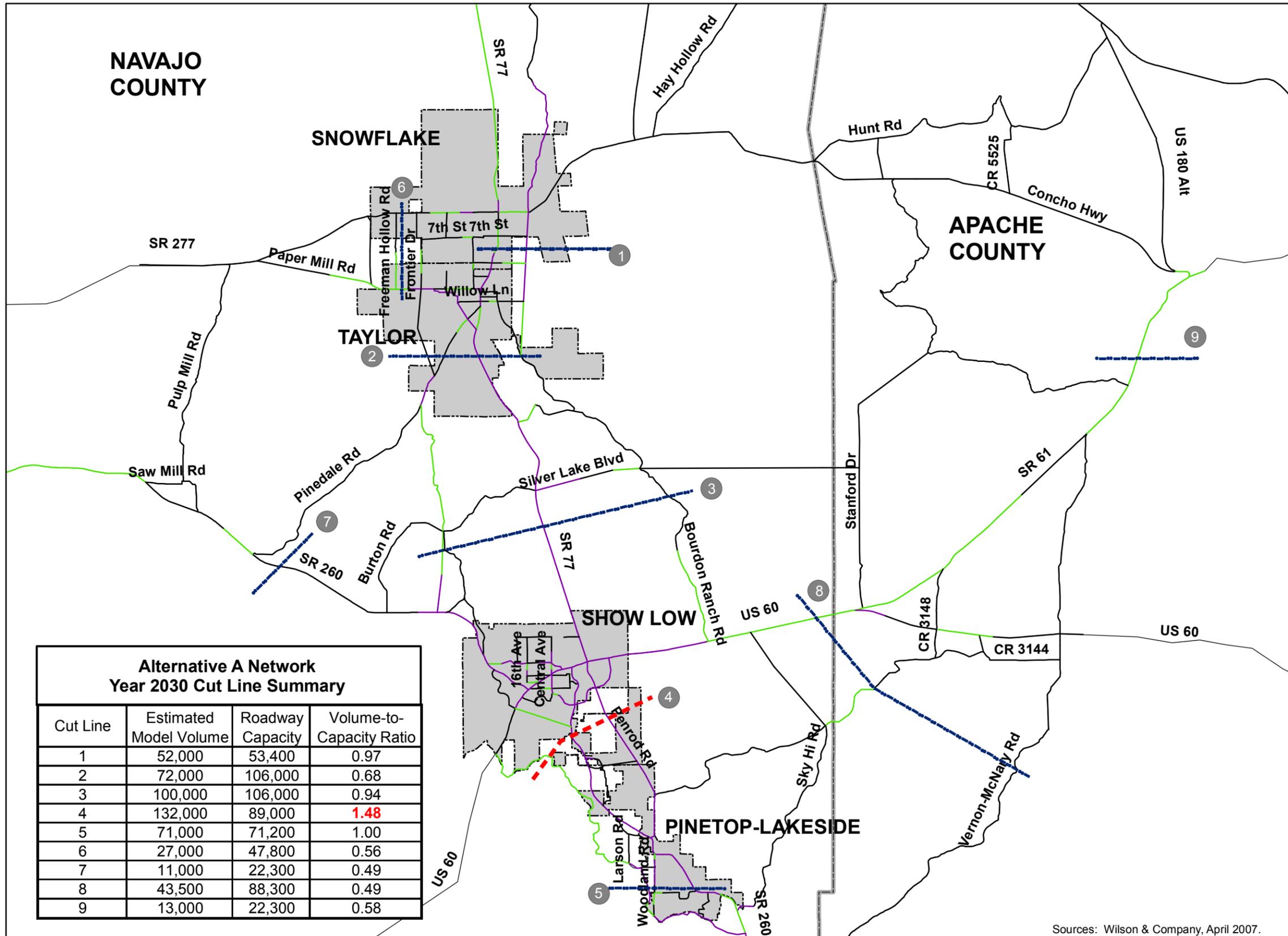
Evaluation of Roadway Network Deficiencies

Figure 5-6 presents a map showing the level of service expected with implementation of Alternative 'A'. Table 5-3 presents a comparison of the results of the cut-line analysis for the Committed-Plus-Planned roadway network with the improvements defined under the Alternative 'A'. Data in the Table 5-3 indicate enhancements to the sub-regional roadway network, as identified above, would provide the best network performance under year 2030 growth projections. The V/C ratios attained under Alternative 'A' show there would be a notable capacity improvement relative to the corridor north of Show Low (Cut-Line 3); the V/C ratio would be reduced from 1.06 to 0.94; still, a marginal capacity situation would exist. There only would be very slight improvement associated with Cut-Line 4 – the southeast corridor. The southeast corridor would remain well over capacity with a V/C ratio of 1.48. Some deterioration is forecast to occur at Cut-Lines 5 and 9, where the V/C ratio would increase slightly.

5.1.4 YEAR 2015 MID-TERM IMPROVEMENT NEEDS

The full menu of Alternative 'A' roadway improvements was analyzed in the context of the 2015 population and employment forecasts to prioritize the roadway capacity improvements needed to accommodate mid-term growth. Figure 5-7 presents a graphic depicting the phasing of the Alternative 'A' improvement plan in Snowflake for 2015 and 2030. Improvements by 2015 would include: SR 77 from US 60 to the White Mountain Lakes area (Silver Lake Boulevard); US 60 from SR 77 to Stanford Drive/SR 61; and Penrod Road from SR 260 (White Mountain Road) to US 60. The expected level of service on the sub-regional roadway network in 2015 with these mid-term improvements is shown in Figure 5-8. The inset table, providing results of the cut-line analysis revised to reflect mid-term improvements, indicates all major roadways in the Sub-Region would be well below capacity in 2015. No cut-lines have a V/C ratio exceeding 0.73.

Navajo/Apache County Study Area Overview



FORECAST 2030 LEVEL OF SERVICE: ALTERNATIVE A ROADWAY NETWORK

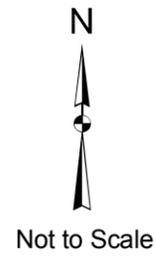
Level of Service

- LOS A - B
- LOS C
- LOS D
- LOS E
- LOS F

* Based on 2030 Socioeconomic Data

Base Map Features

- ▭ Cities/Towns
- ① Cut Line Reference Number
- - - Cut Line Over Capacity
- - - Cut Line Under Capacity



Sources: Wilson & Company, April 2007.

FIGURE 5-6

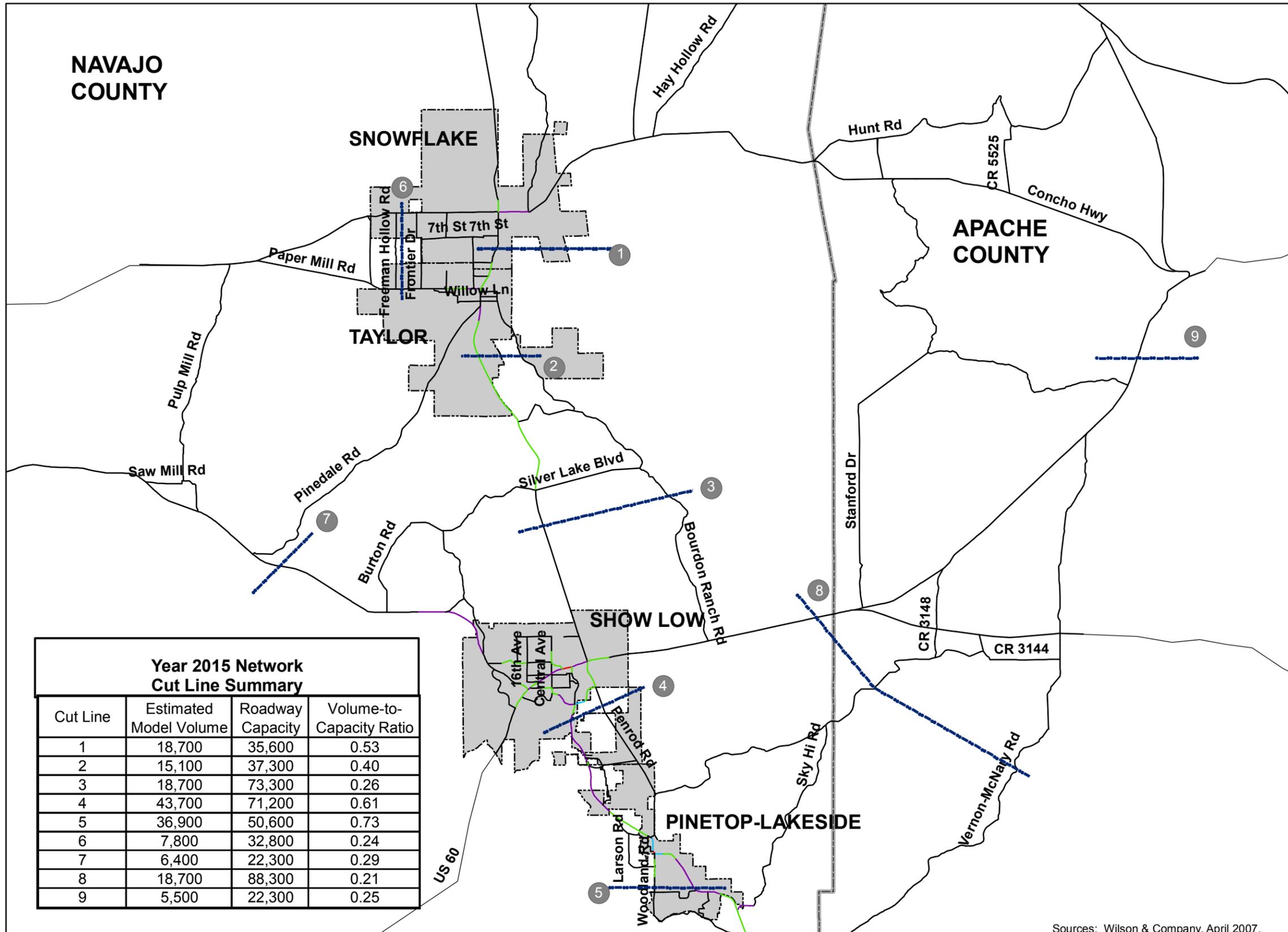
**TABLE 5-3
CUT-LINE ANALYSIS COMPARISON: YEAR 2030 COMMITTED-PLUS-PLANNED NETWORK V. ALTERNATIVE 'A' NETWORK**

Cut-Line	Location	Year 2030 Committed-Plus-Planned Network			Alternative 'A' Network		
		Forecast Daily Volume	Roadway Capacity	V/C Ratio	Forecast Daily Volume	Roadway Capacity	V/C Ratio
North-South Cut-Lines							
1	Town of Snowflake	37,000	35,600	1.04	52,000	53,400	0.97
2	Town of Taylor	75,400	88,300	0.85	72,000	106,000	0.68
3	Between Town of Taylor and City of Show Low	94,000	88,300	1.06	100,000	106,000	0.94
4	City of Show Low	133,000	89,000	1.49	132,000	89,000	1.48
5	Town of Pinetop-Lakeside	71,000	71,200	0.99	71,000	71,200	1.00
East-West Cut-Lines							
6	West of Towns of Snowflake and Taylor	28,000	47,800	0.59	27,000	47,800	0.56
7	West of City of Show Low	12,000	22,300	0.54	11,000	22,300	0.49
8	East of City of Show Low and Town of Pinetop-Lakeside	43,500	88,300	0.49	43,500	88,300	0.49
9	SR 61, West of Concho Highway	12,000	22,300	0.54	13,000	22,300	0.58

Source: Wilson & Company, May 2007.

Note: **Shading** indicates the cut-line V/C Ratio exceeds 1.00 and, therefore, denotes a corridor that would be over capacity.

Navajo/Apache County Study Area Overview



**FORECAST
LEVEL OF SERVICE:
YEAR 2015 IMPROVEMENTS**

Level of Service	
— (black line)	LOS A - B
— (green line)	LOS C
— (purple line)	LOS D
— (blue line)	LOS E
— (red line)	LOS F

Base Map Features	
▭ (dashed)	Cities/Towns
① (circle)	Cut Line Reference Number
- - - (red)	Cut Line Over Capacity
- · - · (blue)	Cut Line Under Capacity

Year 2015 Network Cut Line Summary			
Cut Line	Estimated Model Volume	Roadway Capacity	Volume-to-Capacity Ratio
1	18,700	35,600	0.53
2	15,100	37,300	0.40
3	18,700	73,300	0.26
4	43,700	71,200	0.61
5	36,900	50,600	0.73
6	7,800	32,800	0.24
7	6,400	22,300	0.29
8	18,700	88,300	0.21
9	5,500	22,300	0.25



Not to Scale

Sources: Wilson & Company, April 2007.

FIGURE 5-8

5.2 INTERSECTION ANALYSIS

As traffic volumes on roadways in the Sub-Region increase, intersection upgrades will be an important part of the overall sub-regional mobility solution. The study team conducted planning-level analyses of key existing and future intersection locations to identify lane configuration and traffic control type required to meet 2015 and 2030 traffic demands and accommodate traffic at LOS 'D' or better. In all, 45 intersections in the Sub-Region were analyzed for the Alternative 'A' transportation improvement scenario (Figure 5-9). Table 5-4 shows the type of traffic control associated with existing and future intersections in the Sub-Region, as well as the control type anticipated to be needed in 2015 and 2030. Lane configuration recommendations also were developed for each intersection, based on forecast 2015 and 2030 peak-hour traffic volume estimates.

5.2.1 MID-TERM, YEAR 2015 INTERSECTION PERFORMANCE

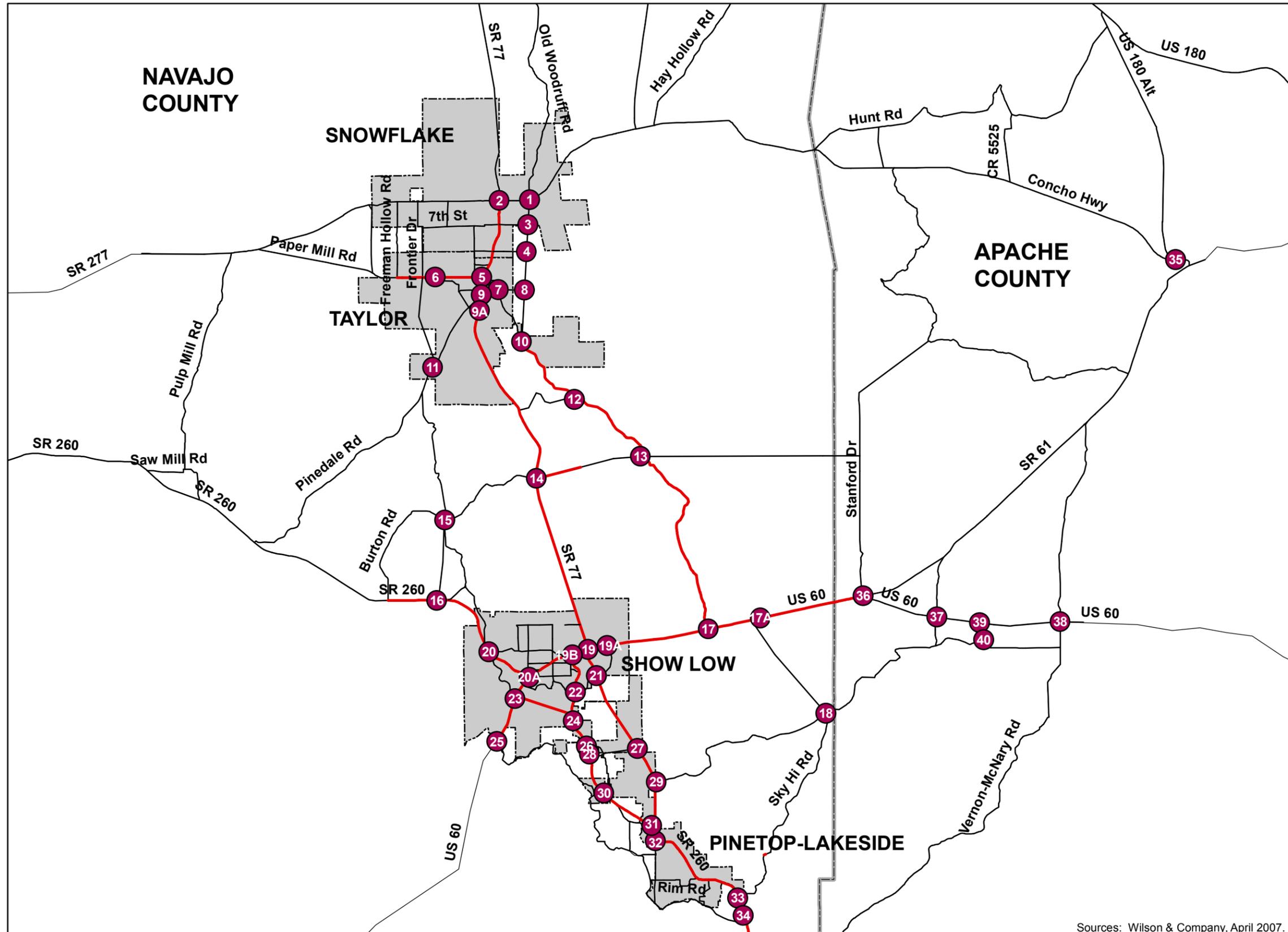
Most existing intersections in the Sub-Region should continue to function at LOS 'D' or better under current (2006) and anticipated year 2015 traffic conditions. Twelve intersections will require an upgrade in control type by 2015. The upgrade at nine of the twelve intersections would involve signalization.

5.2.2 LONG-TERM, YEAR 2030 INTERSECTION ANALYSIS

The population and employment growth projected to occur by 2030 will require significant upgrades at 19 intersections in the Sub-Region. To assure LOS 'D' performance, 17 intersections would require signalization. Two key intersections would require grade separation:

- **US 60/SR 77/Penrod Road:** Over 230,000 vehicles per day are expected to pass through the intersection of US 60, SR 77, and Penrod Road in 2030. This major intersection of key sub-regional roadways will require a grade-separated interchange to accommodate expected travel demand. The modified diamond interchange (Figure 5-10) proposed for this intersection includes a loop ramp in the southeast quadrant to reduce the potential impact to businesses on US 60 west of Penrod Road. While a detailed engineering study will be required to identify the best interchange solution, this concept shows the kind of investment needed to accommodate anticipated year 2030 travel demand.
- **SR 77/White Mountain Lake Road:** Growth in the White Mountain Lakes area will require a grade-separated interchange at the intersection of SR 77 and White Mountain Lake Road to accommodate traffic moving between the White Mountain Lake area and Show Low. Figure 5-10 shows a trumpet interchange, the type of facility required to accommodate the anticipated volumes at this location. The trumpet interchange design with a loop in the northwest quadrant would move the nose of the southbound on-ramp further north than a standard diamond interchange and, potentially, provide an adequate weave distance between the ramp and Lone Pine Dam Road. While requiring more right-of-way than a standard diamond, the trumpet design would not require a signal on the west side of the interchange. A detailed engineering study will be required to identify the best solution to accommodate access between White Mountain Lake Road and the Lone Pine Dam Road traffic and SR 77. However, this concept shows the level of investment required to accommodate anticipated year 2030 travel demand.

Navajo/Apache County Study Area Overview



STUDY AREA INTERSECTIONS

Legend

- 2 Travel Lanes
- 4 Travel Lanes
- XX Study Area Intersection

Base Map Features

- ▭ Cities/Towns



Not to Scale

Sources: Wilson & Company, April 2007.

FIGURE 5-9

**TABLE 5-4
TRAFFIC CONTROL AT STUDY AREA INTERSECTIONS: EXISTING, 2015, & 2030**

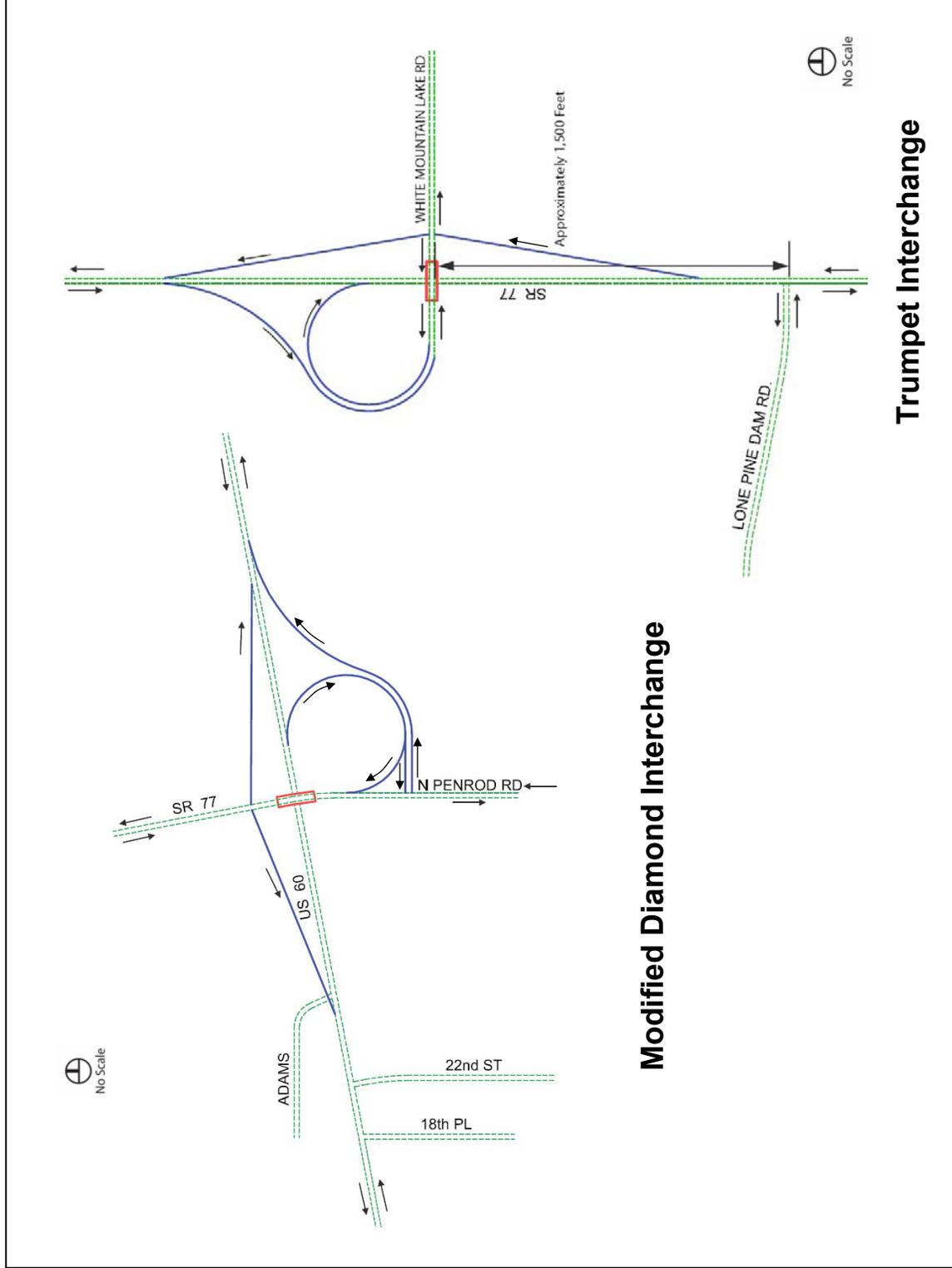
No.	Intersection	Existing	2015	2030
Snowflake/Taylor				
1	Concho Hwy/Old Woodruff Rd	Stop	Signal	Signal
2	SR 77/Concho Hwy	Signal	Signal	Signal
3	7th St/Bourdon Ranch Rd Extension (Future)	N/A	N/A	Signal
4	Rodeo Dr/Bourdon Ranch Rd Extension (Future)	N/A	N/A	Signal
5	Paper Mill Rd/SR 77	Signal	Signal	Signal
6	New North-South Rd/Paper Mill Rd (Future)	Stop	Stop	Signal
7	Willow Ln/Bourdon Ranch Rd	Stop	Stop	Stop
8	Willow Ln (or Center St)/Bourdon Ranch Rd Extension (Future)	N/A	N/A	Signal
9	SR 77/Pinedale Rd	Stop	Signal	Signal
9A	SR 77/Airport Road (Future)	N/A	N/A	N/A *
10	Bourdon Ranch Rd/Bourdon Ranch Rd Extension (Future)	N/A	N/A	Signal
11	New North-South Rd/Pinedale Rd (Future)	N/A	N/A	Signal
Navajo County				
12	Black Mesa Ln/Bourdon Ranch Rd	Stop	Stop	Stop
13	Silver Lake Blvd/Bourdon Ranch Rd	Stop	Stop	Signal
14A	SR 77/White Mountain Lake Rd	Stop	Signal	Grade-Separated Intersection
14B	SR 77/Lone Pine Dam Rd	Stop	Signal	Signal
15	Burton Rd/Relocated Lone Pine Dam Rd (Future)	N/A	Stop	Signal
16	SR 260/Relocated Lone Pine Dam Rd (Future)	N/A	N/A	Signal
17	US 60/Bourdon Ranch Rd	Stop	Signal	Signal
17A	US 60/Sky Hi Rd Extension (Future)	N/A	N/A	Signal
18	Sky Hi Rd/Porter Mtn Rd	Stop	Stop	Signal
Show Low				
19	US 60/SR 77	Signal	Signal	Grade-Separated Intersection
19A	US 60/Woolford Extension (Future)	N/A	N/A	Signal
19B	Deuce of Clubs (US 60)/White Mountain Rd (SR 260)	Signal	Signal	Signal
20	Clark Rd (SR 260)/Old Linden Rd	Stop	Signal	Signal
20A	Clark Rd (SR 260)/Deuce of Clubs (US 60)	Signal	Signal	Signal
21	SR 77/Penrod Rd (Future)	N/A	Signal	Signal
22	White Mountain Rd (SR 260)/Woolford Rd	Signal	Signal	Signal
23	US 60/Summit Trail	Stop	Signal	Signal
24	White Mountain Rd (SR 260)/Summit Trail (Future)	N/A	N/A	Signal
25	US 60/Rim Rd (Future)	N/A	N/A	Signal
26	White Mountain Rd (SR 260)/Show Low Lakes Rd	Signal	Signal	Signal
27	Scott Ranch Rd/Penrod Rd	N/A	Stop	Signal
28	White Mountain Rd (SR 260)/Scott Ranch Rd	Stop	Signal	Signal
Pinetop-Lakeside				
29	Penrod Rd/Porter Mountain Rd	Stop	Signal	Signal
30	White Mountain Rd (SR 260)/Show Low Lakes Rd	Stop	Stop	Signal
31	White Mountain Rd (SR 260)/Porter Mountain Rd	Signal	Signal	Signal
32	White Mountain Rd (SR 260)/Woodland Rd	Signal	Signal	Signal
33	White Mountain Rd (SR 260)/Buck Springs Rd	Signal	Signal	Signal
34	White Mountain Rd (SR 260)/Rim Rd	Stop	Stop	Signal
Apache County				
35	SR 180A/Concho Hwy	Stop	Stop	Stop
36	SR 61/Stanford Rd	Stop	Stop	Stop
37	US 60/CR 3148	Stop	Stop	Stop
38	US 60/Vernon-McNary Rd (Future)	N/A	Stop	Stop
39	US 60/CR 3154	Stop	Stop	Stop
40	CR 3154/CR 3144	Stop	Stop	Stop

Source: Wilson & Company, May 2006.

Notes:

Shading indicates change from the previous period.

* Intersection solution not resolved in time to be included in this study.



Southern Navajo/Apache County Sub-Regional Transportation Plan

FIGURE 5-10

6.0 IMPLEMENTATION PLAN

This section establishes the overall framework for the Southern Navajo/Apache County Sub-Regional Transportation Plan. It includes the following elements:

- Future Roadway Functional Classification Plan
- Year 2030 Roadway Improvement Plan
- Transportation Revenue Sources
- Implementation Action Items

The recommendations for each of these elements are based on the technical analyses of existing and future transportation conditions presented in the previous sections as well as input from the TAC.

6.1 FUTURE ROADWAY FUNCTIONAL CLASSIFICATION PLAN

The Future Roadway Functional Classification Plan, shown for the Sub-Region (Figure 6-1) is based on the 1999 *White Mountain Regional Transportation Plan*. It has been updated based on the results of the travel demand analysis for 2030 discussed above. The Future Roadway Functional Classification Plan establishes the overall design framework for guiding development of the Sub-Region's roadway network over the 2006-2030 planning period. Each major roadway is classified according to four principal roadway classifications: Principal Arterial, Minor Arterial, Major Collector, and Minor Collector.

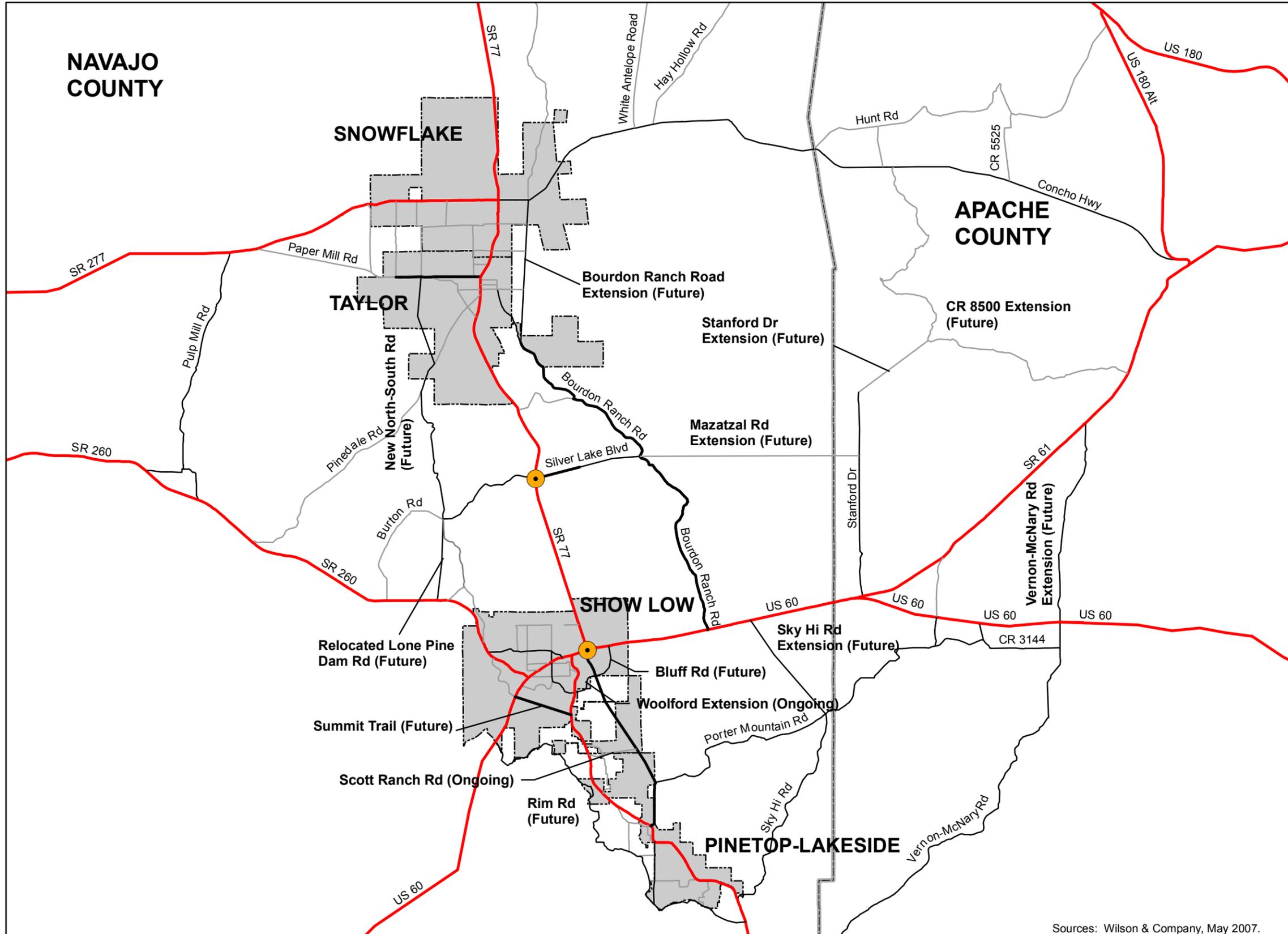
Protection of R/W is critical for implementing future roadway improvements needed to accommodate forecast 2030 travel demand. The functional classifications shown in Figure 6-1, therefore, establish a basis for formally protecting the R/W necessary to allow construction of roadways to the full design cross-sections identified above. Specific R/W requirements for each planned roadway should be considered when reviewing future development proposals.

6.2 YEAR 2030 ROADWAY IMPROVEMENT PLAN

This Year 2030 Roadway Improvement Plan (Figure 6-2) includes the improvement needs defined within the definition of Alternative 'A'. Based on the analyses conducted, these improvement recommendations should assure adequate roadway system capacity to handle the 2030 travel demand in the Sub-Region. It is important to note that the Year 2030 Roadway Improvement Plan is not expected to fully accommodate the seasonal influx of visitors experienced annually in the Sub-Region. That is to say, study participants and the TAC understand and expect the roadway system defined by Alternative 'A' will operate over capacity in several key corridors as a result of the seasonal increase in traffic.

Roadway improvements are defined in terms of their location, roadway capacity needs, planning-level capital cost estimate, and recommended time horizon for implementation. Table 6-1 shows a total estimated capital cost of \$620 million (2006 dollars) for the Alternative 'A' roadway improvements. The capital cost estimate presented in Table 6-1 assumes an average cost of \$1,270,000 per lane mile (2006 dollars), which is based on Maricopa County Department of Transportation (MCDOT) cost data presented in the 2006 *MCDOT Transportation System Plan Update*. When an existing two-lane roadway showed a need to be upgraded to four travel lanes, it was assumed that the entire facility would be reconstructed.

Navajo/Apache County Study Area Overview



**FUTURE 2030 ROADWAY
FUNCTIONAL
CLASSIFICATION PLAN**

Roadway Classifications

- Principal Arterial
- Minor Arterial
- Major Collector
- Minor Collector

Base Map Features

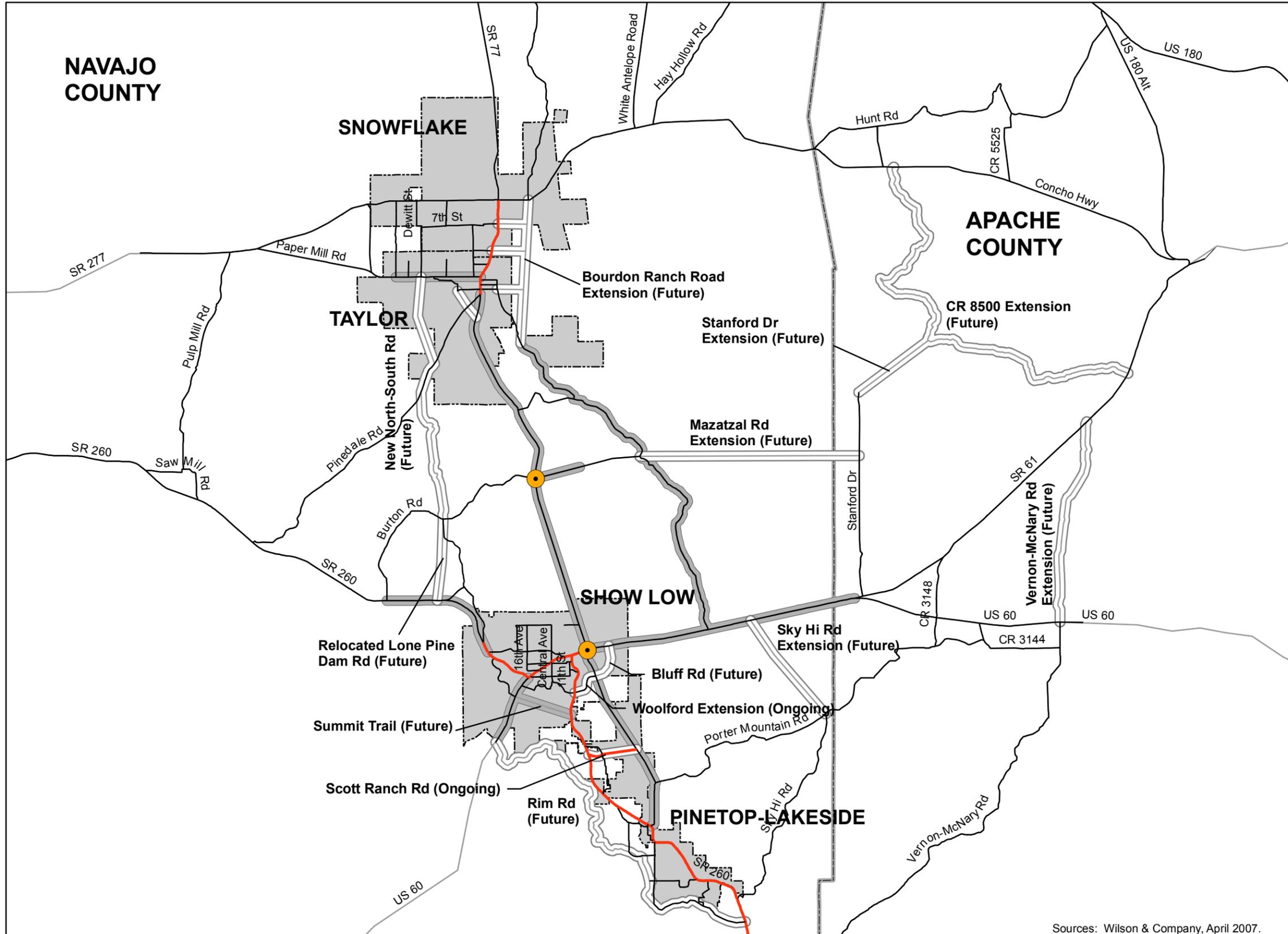
- Cities/Towns
- Traffic Interchange



Sources: Wilson & Company, May 2007.

FIGURE 6-1

Navajo/Apache County Study Area Overview



**YEAR 2030
ROADWAY
IMPROVEMENT PLAN**

Existing Roadway Network

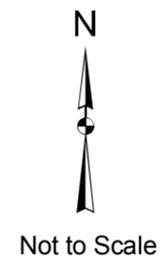
- 2 Lanes
- 4 Lanes

Future Network Improvement

- 2 Lanes
- 4 Lanes
- New Traffic Interchange

Base Map Features

- ▭ Cities/Towns



Sources: Wilson & Company, April 2007.

FIGURE 6-2

**TABLE 6-1
ESTIMATED TOTAL SUB-REGION ROADWAY IMPROVEMENT COST**

Jurisdiction	Needed Lane Miles	Estimated Improvement Cost
Navajo County	137	\$ 174 million
Apache County	70	\$ 89 million
ADOT	131	\$ 226 million
Municipalities	103	\$ 131 million
Total	441	\$ 620 million

Source: Wilson & Company, May 2007.

The total estimated cost of all improvements includes planning, design, construction management, and R/W acquisition. Details respecting the improvement projects are presented in Table 6-2.

6.3 TRANSPORTATION REVENUE OUTLOOK

Five existing and potential revenue sources available for funding the recommended Year 2030 Roadway Improvement Plan have been identified and are briefly described below.

- **Highway User Revenue Fund (HURF).** This is the principal source of funding for roadway construction and maintenance in Arizona. HURF revenues come from a variety of sources including state motor fuel taxes, motor carrier taxes, vehicle registration fees and a portion of vehicle license taxes. These funds are distributed by formula to every city and county in the state and to ADOT. The State Constitution earmarks HURF funds exclusively for street and highway purposes.
- **Local Transportation Assistance Fund (LTAF).** The LTAF provides State Lottery proceeds to cities and towns for transportation improvements. LTAF funds are allocated using a population-based formula.
- **Federal Highway Funds.** Federal Highway Funds are apportioned in accordance with the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) enacted by Congress in year 2005.
- **Developer Impact Fees.** Navajo County is currently starting the process to establish a development impact fee to help fund roadway infrastructure needed to accommodate growing travel demand. The City of Show Low and the towns of Pinetop-Lakeside and Snowflake also are considering a development impact fee for transportation.
- **Half-Cent Sales Tax.** Another funding alternative is a half-cent sales tax dedicated to transportation improvements. It is authorized in Arizona Revised Statute 42-1484: *County Transportation Excise Tax For Roads; Counties with Population of Four Hundred Thousand or Fewer Persons.* This revenue stream could have a significant role in funding the transportation improvements identified in this study.

6.4 IMPLEMENTATION ACTION ITEMS

The principal action items required to support and implement key elements of the Year 2030 Roadway Improvement Plan include: on-going stakeholder coordination; maintaining a current database of traffic

**TABLE 6-2
ESTIMATED SUB-REGION ROADWAY IMPROVEMENT COSTS BY JURISDICTION**

Street Name	From	To	Length	Number of Travel		Improvement Cost Estimate (2006 \$)	Recommended Priority
				Existing	Future		
Navajo County							
North-South Facilities							
Western North-South Bypass	Pinedale Rd	Paper Mill Rd	3.50	0	2	\$ 8,890,000	Long-Range
Forest Rd 133	Lone Pine Dam Rd	Pinedale Rd	5.50	0	2	\$ 13,970,000	Long-Range
Lone Pine Dam Rd	SR 260 (Clark Rd)	Forest Rd 133	3.20	0	2	\$ 8,128,000	Long-Range
Bourdon Ranch Rd	US 60 (Deuce of Clubs)	Silver Lake Blvd	8.20	2	4	\$ 41,656,000	Long-Range
Bourdon Ranch Rd	Silver Lake Blvd	Bourdon Ranch Rd Extension	7.00	2	4	\$ 35,560,000	Long-Range
Bourdon Ranch Rd Extension	Bourdon Ranch Rd	Concho Hwy	5.60	0	2	\$ 14,224,000	Long-Range
Porter Mountain Rd	SR 260 (White Mountain Rd)	Penrod Rd	0.90	2	4	\$ 4,572,000	Long-Range
Sky Hi Rd Extension	Porter Mountain Rd	US 60	4.50	0	2	\$ 11,430,000	Long-Range
East-West Facilities							
White Mountain Lake Rd	SR 77	Silver Creek Dr	3.25	2	4	\$ 16,510,000	Long-Range
Mazatzal Rd Extension	Bourdon Ranch Rd	Apache County Line	7.60	0	2	\$ 19,304,000	Long-Range
Total Estimated Improvement Need						\$ 174,244,000	
Apache County							
North-South Facilities							
Vernon-McNary Rd Extension	US 60	SR 61	8.20	0	2	\$ 20,828,000	Long-Range
East-West Facilities							
Mazatzal Rd Extension	Navajo/Apache County Line	Stanford Rd	1.00	0	2	\$ 2,540,000	Long-Range
CR 8500	Stanford Rd	SR 61	16.00	0	2	\$ 40,640,000	Long-Range
CR 8500	New East-West Rd	Concho Hwy	10.00	0	2	\$ 25,400,000	Long-Range
Total Estimated Improvement Need						\$ 89,408,000	
State of Arizona Department of Transportation (ADOT)							
North-South Facilities							
SR 77	Deuce of Clubs (US 60)	White Mountain Lake Rd	8.00	2	4	\$ 40,640,000	Mid-Range
SR 77	White Mountain Lakes Rd	Pinedale Rd	7.00	2	4	\$ 35,560,000	Long-Range
East-West Facilities							
SR 260 (Clark Rd)	Burton Rd	Old Linden Rd	5.00	2	4	\$ 25,400,000	Long-Range
US 60 (Deuce of Clubs)	Rim Rd	Clark Rd (SR 260)	1.96	2	4	\$ 9,956,800	Long-Range
US 60 (Deuce of Clubs)	SR 77	Bourdon Ranch Rd	4.80	2	4	\$ 24,384,000	Mid-Range
US 60	Bourdon Ranch Rd	SR 61	5.90	2	4	\$ 29,972,000	Long-Range
New Traffic Interchanges							
US 60 (Deuce of Clubs) at SR 77						\$ 30,000,000	Long-Range
SR 77 at Silver Lake Blvd						\$ 30,000,000	Long-Range
Total Estimated Improvement Need						\$ 225,912,800	

**TABLE 6.2
ESTIMATED SUB-REGION ROADWAY IMPROVEMENT COSTS BY JURISDICTION (CONTINUED)**

Street Name	From	To	Length	Number Of Travel		Improvement Cost Estimate (2006 \$)	Recommended Priority
				Existing	Future		
Pinetop-Lakeside							
Porter Mountain Rd	SR 260 (White Mountain Rd)	Penrod Rd	1.75	2	4	\$ 8,890,000	Mid-Range
Penrod Rd	Porter Mountain Rd	Show Low City Limits	1.50	2	4	\$ 7,620,000	Mid-Range
Rim Rd	SR 260 (White Mountain Rd)	Show Low City Limits	11.40	0	2	\$ 28,956,000	Long-Range
Total Estimated Improvement Need						\$ 45,466,000	
Show Low							
Bluff Rd	SR 260 (White Mountain Rd)	Penrod Rd	1.22	0	2	\$ 3,098,800	Short-Range
Summit Way	US 60 (Deuce of Clubs)	SR 260 (White Mountain Rd)	2.30	0	4	\$ 11,684,000	Long-Range
Scott Ranch Rd	SR 260 (White Mountain Rd)	Penrod Rd	1.94	0	2	\$ 4,927,600	Short-Range
Penrod Rd	Pinetop-Lakeside City Limits	US 60 (Deuce of Clubs)	4.60	2	4	\$ 23,368,000	Mid-Range
Rim Rd	Pinetop-Lakeside City Limits	US 60	5.00	0	2	\$ 12,700,000	Long-Range
Total Estimated Improvement Need						\$ 55,778,400	
Taylor							
Willow Ln (or Center St) Extension	Bourdon Ranch Rd	Bourdon Ranch Rd Extension	1.00	0	2	\$ 2,540,000	Long-Range
Paper Mill Rd	Freeman Hollow Rd	SR 77	3.33	2	4	\$ 16,916,400	Long-Range
Airport Rd	Willow Ln	SR 77	1.30	0	2	\$ 3,302,000	Long-Range
Total Estimated Improvement Need						\$ 22,758,400	
Snowflake							
7th St	SR 77	Bourdon Ranch Rd Extension	1.14	0	2	\$ 2,895,600	Long-Range
Hatch/Rodeo Dr	SR 77	Bourdon Ranch Rd Extension	1.33	0	2	\$ 3,378,200	Long-Range
Total Estimated Improvement Need						\$ 6,273,800	
Total Sub-Region Estimated Improvement Need						\$ 619,841,400	

Source: Wilson & Company, May 2007.

information; conducting key corridor studies; participating in regional planning efforts; and periodically updating this transportation study.

6.4.1 STAKEHOLDER COORDINATION

An important part of the long-term roadway improvement plan outlined in this report is continued coordination between the State, the Counties, and the municipalities. The White Mountain Regional Transportation Committee is an effective forum for coordinating timely improvements to the State Highway System to ensure regional mobility as growth occurs.

6.4.2 CORRIDOR STUDIES

Protection of R/W for future roadways is essential to maintaining the integrity of the planned high-capacity regional and sub-regional roadways identified in this long-range transportation plan. Corridor studies typically are the vehicle for identifying the required roadway R/W footprint, intersection configurations, bridges and other drainage needs, and potential environmental concerns. It is recommended that the key stakeholders in the Sub-Region, undertake detailed engineering studies to define and evaluate the following corridors:

- SR 77, between US 60 and White Mountain Lake Road;
- US 60, between SR 77 and Bourdon Ranch Road;
- Summit Trail, between US 60 and SR 260 (White Mountain Road);
- Rim Road, between US 60 west of Show Low and SR 260 (White Mountain Road) south of Pinetop-Lakeside; and
- New North-South Corridor, between SR 260 and Paper Mill Road in the Town of Taylor comprised of relocated Lone Pine Dam Road, National Forest Road 133, Pinedale Road, and a new connector to Paper Mill Road.
- Bourdon Ranch Road Extension, between Bourdon Ranch Road and Concho Highway
- Sky Hi Road Extension on Apache Railroad right-of-way, between US 60 and Porter Mountain Road.

These studies would be an essential tool in facilitating coordination between adjacent jurisdictions, the counties, ADOT, and the development community to maintain the integrity of future transportation corridors.

6.4.3 ROADWAY SAFETY REVIEW

Municipal and county transportation agencies should conduct periodic reviews of roadway accident data to identify safety trends.

6.4.4 TRAFFIC DATA COLLECTION

Permanent traffic count stations should be established at strategic locations to collect data on the daily, weekly, and annual variations in traffic volumes. Data from permanent count stations would be a valuable resource to engineers and planners establishing transportation infrastructure needs. Municipal and county transportation agencies also should continue updates of traffic conditions through periodic roadway inventories and/or an annual system-wide traffic count program.

6.4.5 HOUSEHOLD TRAVEL SURVEY

To provide more accurate travel demand forecasts, the municipal and county transportation agencies should participate in a household travel survey focusing on the Southern Navajo/Apache County Sub-Region. This household travel survey would seek to measure sub-regional trip making characteristics. It would facilitate collection of data on trip generation, trip length, and modal choice for both the permanent and seasonal populations. Comprehensive and current travel data would enable future studies to establish peak-season travel demand forecasts. Because transit will have an important role in future mobility solutions; data from a travel survey also would enable analysis of mode choice.

6.4.6 MONITOR AND UPDATE SUB-REGIONAL TRAVEL DEMAND MODEL AND TRANSPORTATION PLAN

To support periodic updates of the sub-regional travel demand model and project prioritization analysis, municipal and county transportation agencies should strive to maintain current DU and employment databases. Significant changes in development patterns should trigger an update of the travel demand forecasts for the Sub-Region. At a minimum, a major review of this transportation plan should be undertaken every five years.