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16. Abstract

The Arizona transportation history project was conceived in anticipation of Arizona's centennial, which will be celebrated in 2012. Following approval of the Arizona Centennial Plan in 2007, the Arizona Department of Transportation (ADOT) recognized that the centennial celebration would present an opportunity to inform Arizonans of the crucial role that transportation has played in the growth and development of the state.

The report consists of a historical narrative and a series of topical essays. The seven-chapter historical narrative is a history of Arizona's highways that extends from the pre-Columbian era to the present.

The 14 topical essays extend the scope of the history beyond the state's highway system. They include overviews of the development of other transportation modes (railroads, aviation, and urban transit), a brief history of highway pavements, a lighthearted look at the motoring experience during the 1920s and 1930s, and an exploration of how changes in transportation infrastructure affected some Arizona communities. The topical essays also provide additional historical information on bridges, urban freeways, the Interstate system, ADOT and its predecessor agencies, and famous roads such as U.S. Route 66, U.S. Route 89, the Black Canyon Highway, and the Beeline Highway.

The report also includes a timeline of transportation-related developments. This chronology not only provides an accessible overview of Arizona's transportation history; it also places that history in a larger context by including transportation-related developments from the rest of the nation and around the world.

Finally, the report contains a guide to archives in Arizona that hold significant collections of historical photographs related to the state's transportation history, a bibliography of published historical sources related to the history of highways in Arizona, and a discussion of how the historical narrative and topical essays could be used to produce publications and media that would be made available to the public.

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SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
		AREA		
in^2	square inches	645.2	square millimeters	mm^2
ft^2	square feet	0.093	square meters	m^2
yd^2	square yards	0.836	square meters	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	square kilometers	km^2
		VOLUME		
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
	NOTE: Volumes greater than 1000L shall be shown in m^3.			
		MASS		
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000lb)	0.907	megagrams (or "metric ton")	mg (or "t")
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5(F-32)/9 or (F-32)/1.8	Celsius temperature	°C
		ILLUMINATION		
fc	foot candles	10.76	lux	lx
fl	foot-Lamberts	3.426	candela/m^2	cd/m^2
		FORCE AND PRESSURE OR STRESS		
lbf	poundforce	4.45	newtons	N
lbf/in^2	poundforce per square inch	6.89	kilopascals	kPa

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
		AREA		
mm^2	Square millimeters	0.0016	square inches	in^2
m^2	Square meters	10.764	square feet	ft^2
m^2	Square meters	1.195	square yards	yd^2
ha	hectares	2.47	acres	ac
km^2	Square kilometers	0.386	square miles	mi^2
		VOLUME		
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	Cubic meters	35.315	cubic feet	ft^3
m^3	Cubic meters	1.308	cubic yards	yd^3
		MASS		
g	grams	0.035	ounces	oz
kg	kilograms	2.205	pounds	lb
mg	megagrams (or "metric ton")	1.102	short tons (2000lb)	T
		TEMPERATURE (exact)		
°C	Celsius temperature	1.8C + 32	Fahrenheit temperature	°F
		ILLUMINATION		
lx	lux	0.0929	foot-candles	fc
cd/m^2	candela/m^2	0.2919	foot-Lamberts	fl
		FORCE AND PRESSURE OR STRESS		
N	newtons	0.225	poundforce	lbf
kPa	kilopascals	0.145	poundforce per square inch	lbf/in^2

SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380

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In allowing material from *Building the Grand Canyon State* to be incorporated into this study, the Arizona Chapter of the APWA has made an important contribution to the study of Arizona's transportation history, and for that the authors and the Arizona Department of Transportation are grateful.

EXECUTIVE SUMMARY

PROJECT BACKGROUND

The Arizona transportation history project was conceived in anticipation of Arizona's centennial, which will be celebrated in February 2012. Following approval of the Arizona Centennial Plan in 2007, the Arizona Department of Transportation (ADOT) recognized that the centennial celebration would present an opportunity to inform Arizonans of the crucial role that transportation has played in the growth and development of the state. However, there was no written history of transportation in Arizona that the department could use as the underpinning of such a public outreach effort. Seeking to erase this shortcoming in Arizona's historical record, the department commissioned this history of transportation in Arizona.

PROJECT GOALS

The solicitation for the Arizona transportation history project was issued in the spring of 2008. It called for the preparation of a history of the state's transportation network, from prehistoric times to the present, that would also highlight the role played in that development by the department and its predecessor agencies. It would cover all major modes of transportation, but the greatest emphasis would be on roads and highways, which have always been the core of Arizona's transportation infrastructure.

After the project's completion, the history would then be used by the department to develop a variety of publications and media that could be distributed to the public. To assist the department in planning these publications, the project solicitation asked the authors of the history to suggest how such publications might be formatted, what topics they might cover, and which audiences they might target.

REPORT COMPONENTS

The bulk of the Arizona transportation history presented in this report consists of a historical narrative and a series of topical essays. The seven-chapter historical narrative is essentially a history of Arizona's highways that extends from the pre-Columbian era to the present.

The 14 topical essays extend the scope of the history beyond the state's highway system. They include overviews of the development of other transportation modes (railroads, aviation, and urban transit), a brief history of highway pavements, a lighthearted look at the motoring experience during the 1920s and 1930s, and an exploration of how changes in transportation infrastructure affected some Arizona communities. The topical essays also provide additional historical information on bridges, urban freeways, the Interstate system, ADOT and its predecessor agencies, and famous roads such as U.S. Route 66, U.S. Route 89, the Black Canyon Highway, and the Beeline Highway.

The report also includes a timeline of transportation-related developments. This chronology not only provides an accessible overview of Arizona's transportation history; it also places that history in a larger context by including transportation-related developments from the rest of the nation and around the world.

Finally, the report contains a guide to archives in Arizona that hold significant collections of historical photographs related to the state's transportation history, a bibliography of published historical sources related to the history of highways in Arizona, and a discussion of how the historical narrative and topical essays could be used to produce publications and media that would be made available to the public.

RESEARCHING ARIZONA'S TRANSPORTATION HISTORY

Owing to the limited budget for this project, certain limitations had to be imposed on the research conducted for the narrative history and topical essays. No substantial archival research was done. Such research is always time-consuming, but for this project this would have been especially so, owing to the fact that archival sources relevant to Arizona's transportation history are, for the most part, unindexed, difficult to locate, and scattered across the state. Just identifying these materials, let alone examining them, would have consumed much of the research budget for the project.

Consequently, most of the research was done in published sources, including published government documents, *Arizona Highways* magazine articles, books, journal articles, and other sources (for a list of the major sources, see the bibliography in this report). The reliance on government documents and *Arizona Highways* (which began as an official construction bulletin) was largely a matter of necessity. Very few scholarly books and articles have been published on Arizona's transportation history, and almost none has been written about the state's highway system.

Fortunately, the publications and reports of the State Engineer, Arizona Highway Department, Arizona Highway Commission, Arizona Department of Transportation, and Arizona State Transportation Board provided an ample quantity of information—certainly enough to produce a narrative of the scope envisioned by the department.

THE HISTORY OF ARIZONA'S HIGHWAY SYSTEM

The history of the state's highway system is the centerpiece of this report because roads and highways have always been the dominant means of getting to and around Arizona. Indeed, it was only during the heyday of the railroads, from the 1880s to the early 1950s, that there was any significant alternative to travel by road. (Airlines have turned out to be important for interstate travel to and from Arizona, but much less so for intrastate travel.) The history of Arizona's highway system can be divided into seven distinct periods, each of which is described in one chapter of the narrative.

Roads and Transportation in Early Arizona, 1400s-1863

During this period, which ended with the creation of Arizona Territory in 1863, roads in Arizona were few and poorly maintained. Prior to the arrival of Americans in 1846, roads

were not so much constructed as they were blazed by travelers. The first roads to be built in Arizona were constructed by the federal government and in particular by the U.S. Army.

Road Building During the Territorial Period, 1864-1911

After a brief but unsuccessful experiment with private toll roads, the Territorial Legislature began financing the construction of Territorial wagon roads, only to see that effort halted by federal legislation that limited borrowing by the territories. For most of the Territorial period, it was the counties that built Arizona's highways, financing their efforts through special road taxes. Then, in 1909, the Territorial Legislature appointed a Territorial Engineer and established a modest highway system consisting of two roads.

Building a State Highway System, 1912-1925

In 1912, after Arizona became the nation's 48th state, the Arizona Highway Department was created. Its earliest efforts to build highways were limited by poor funding, as the counties received most of the state's road funds and continued to build most of the state's roads. This changed in 1916, when the first federal highway aid bill was enacted. Using federal aid, the Arizona Highway Department established Arizona's "seven-percent system" of highways, laying the foundation for the state's modern road network.

Arizona's Highway System Grows Up, 1926-1945

In 1927 the Arizona Highway Department was reorganized and the Arizona Highway Commission established. Funding was also reformed, finally giving the department the resources it needed to make major improvements to Arizona's seven-percent system. Aided substantially by federal funding for not only highways but also forest roads and New Deal public works, Arizona's patchwork highway system was transformed into an integrated network of hard-surfaced state and federal highways.

The Highway Boom Years, 1946-1973

This was the boom period for Arizona, a time of spectacular population growth and urban expansion that in turn led to an unprecedented surge in highway construction. Arizona's federal and state highways were completely paved, and many roads in the state system were improved to meet modern safety standards. Then came the inauguration of the Interstate highway system. As construction of these new four-lane highways began, new standards for speed, comfort, and safety in automobile travel were established.

Meeting the Challenges of Growth, 1974-1990

In 1974 the Arizona Department of Transportation (ADOT) and Highway Users Revenue Fund were established, once again overhauling financing of the state's highways. The energy crises of the 1970s and early 1980s posed further problems for the state's highway funds, but these were resolved by increasing the gasoline tax and creating the Regional Area Road Funds, which made possible the expansion of the Maricopa County freeway system. During this period the Interstate system was completed in Arizona, followed by the decommissioning of some of the state's first federal highways.

Modernizing Arizona's Highway System, 1991-Present

With the completion of Interstate 10 through Phoenix in 1990, Arizona's highway system reached maturity. Now the challenge facing Arizona was not so much planning and constructing new roadways as it was increasing the capacity of existing highways through realignment, widening, and bypasses. It was during this period that the Intermodal Surface Transportation Efficiency Act (ISTEA) was enacted, significantly broadening the federal government's role in local transportation funding and planning, and that the Maricopa County freeway system was significantly expanded.

PRESENTING ARIZONA'S TRANSPORTATION HISTORY TO THE PUBLIC

The most effective medium for educating the public about history today is the Web, which is also an especially good way to reach the state's students, who increasingly rely on Web sites for their research projects. The historical narrative and topical essays are, to a large degree, already Web-ready; both could be placed on a Web site without having to do any substantial additional research or writing. The same material could also be formatted as a PDF file that would be available at the Web site for downloading.

Ideally this would become a top-level section of the ADOT Web site, which would be reached via a "History" button on the main menu in the left-hand column of the Web site. Once this "History" page is set up, it would be linked to the Web sites of museums, libraries, archives, and historical organizations in Arizona and the Southwest.

To reach the broadest possible public audience, and to facilitate the distribution of historical materials at public events and festivals, museums, places of business, tourist bureaus, and the like, printed publications remain useful. The historical narrative and topical essays are substantial enough to be used as the basis for a full-length illustrated book on the history of Arizona's highway system.

The narrative and essays also can provide content for brochures and booklets. If prepared with an eye to statewide coverage, such short publications could be used in a wide variety of settings and locations. Topics that lend themselves well to such treatment include: historic bridges, canyon and mountain highways (describing some of Arizona's more celebrated roadways, many of which were engineering achievements), Arizona's Interstate system, and a comparison of automobile travel conditions during different eras.

Finally, the narrative and essays could be used as the basis for collaborative projects with such entities as the Arizona Office of Tourism and the Arizona Heritage Traveler. Using the historical information contained in this report, ADOT would provide a brief history of each road's location, construction, and development, while the partnering agency would provide information on tourist attractions and traveler's facilities along the road. These guides could be made available online, as printed brochures, or as posters to be displayed by businesses and attractions along the highways covered by the guide.

PART 1

HISTORICAL NARRATIVE

ROADS AND TRANSPORTATION IN EARLY ARIZONA 1400s-1863

PRE-COLUMBIAN TRAILS

Long before Europeans arrived in what is now the American Southwest, Native Americans established many travel routes across the deserts, grasslands, and mountains of Arizona (see Figure 1). Traveling long distances by foot, Arizona's first inhabitants maintained active contact with peoples scattered across the Southwest and northern Mexico. "It could be argued," one historian has written, "that travel was a defining and central experience of Native American life."[1]

The journeys were made for many different reasons. Native Americans traded for shells, stones, minerals, bells, and figurines, and for organic goods like herbs, animal hides, and feathers. They made spiritual journeys to sacred locations where they gathered plants and minerals, captured animals, and conducted ceremonies. And they carried out raids on neighboring peoples, sometimes returning with captives.

Some of Arizona's native peoples are believed to have traveled widely. For example, the Hohokam, who lived in the river valleys of central Arizona, visited and traded with other peoples in present-day Mexico, California, Baja California, New Mexico, and Colorado, using routes that in Arizona typically followed rivers and washes.

The Hopi also traveled long distances and were doing so when the first Spaniards came to Arizona in 1540. They made ceremonial trips to the Grand Canyon and trading journeys to New Mexico, southern Colorado, the Gila River, and Mexico. They also ventured north of the Colorado River, using the crossing that would later be known as Lee's Ferry.

Native Americans living in other regions also traveled to Arizona. The Ancestral Puebloans, or Anasazi, who established the Chaco culture in northwestern New Mexico, built an impressive road network that extended into northeastern Arizona. Archaeologists have estimated that the Chaco road system included more than 400 miles of roadway.

Most of these native trails were unmarked, especially in the open desert, yet archaeologists have still been able to identify traces of them on the desert floor. In some parts of Arizona, especially the rugged canyon country to the north, native trails were sometimes marked and improved by the construction of handholds and stairs in rough terrain. Many of these routes were later used by Spaniards, Mexicans, and Americans, in large part because they were near water sources.

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[1] Pat H. Stein, *Historic Trails in Arizona from Coronado to 1940* (Phoenix: Arizona State Historic Preservation Office, 1994), 2-3.

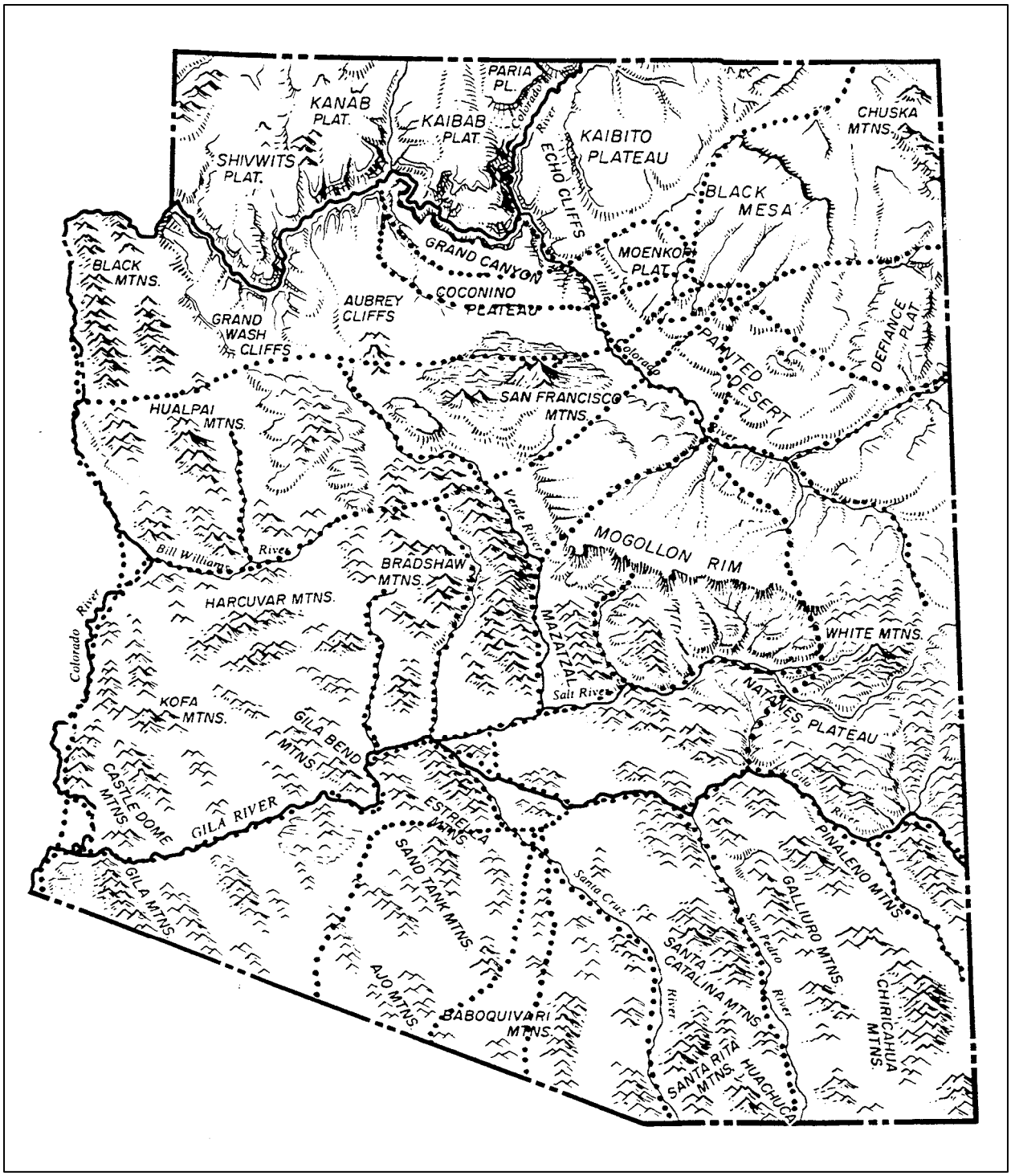

Figure 1. Prehistoric and Early Historic Trails in Arizona.

From Pat H. Stein, *Historic Trails in Arizona from Coronado to 1940* (Phoenix: Arizona State Historic Preservation Office, 1994), 4.

SPAIN, MEXICO, AND THE SANTA CRUZ ROAD

Following Francisco Vásquez de Coronado's entry into Arizona in 1540, and continuing for nearly three centuries, Spanish explorers and missionaries traveled widely across what is now the American Southwest. Many of their journeys, especially in Arizona, were one-time ventures that left no permanent trace. Others followed well-worn paths that became the region's first roads (see Figure 1).

Spain's foothold in Arizona was always tenuous. Spaniards established missions at the Hopi mesas in northern Arizona; missions, presidios, or settlements in Tucson, Tubac, Tumacácori, and a few other locations in southern Arizona; and a mission at Yuma in southwestern Arizona. The settlements that grew up at these locations were sparsely populated and isolated.[2]

The usual travel route to the Hopi mesas was west from New Mexico via Zuni Pueblo. From the Hopi mesas, Spanish explorers and missionaries traveled to the Grand Canyon, the Verde Valley, and the lower Colorado River, with some continuing on to California.

Spanish missionaries and settlers traveled from Mexico to Arizona by several routes. The most commonly used route followed the San Pedro River or the Santa Cruz River to Tucson; from there travelers could head north to the Gila River and then west to California. Less commonly used was the famed Camino del Diablo, or Devil's Highway. This was a direct route from northern Mexico to Yuma that crossed the inhospitable deserts of northwestern Sonora and southwestern Arizona.

After the Spanish missions at Hopi were destroyed in the Pueblo Revolt of 1680, the Spanish presence in Arizona was confined to the Tucson region and Yuma. The Santa Cruz road became the main Spanish route from Mexico to Arizona, providing access to all of the mission communities and to the presidios at Tubac and Tucson. From Tucson this road crossed the desert en route to the Pima Villages on the Gila River, and then turned west to follow the Gila to the Yuma crossing of the Colorado River.

During the Mexican period of Arizona history (1821-1848), the Santa Cruz road offered the only safe travel route through the region. It later became part of the Gila Trail, which brought thousands of California-bound gold miners through Arizona starting in 1849.[3]

COOKE'S WAGON ROAD AND THE GILA TRAIL

The first American attempt to establish a road in Arizona came during the Mexican-American War, when a detachment of soldiers known as the Mormon Battalion marched across southern Arizona en route to California (see Figure 2). Commanded by Capt. Philip St. George Cooke, the battalion had orders not only to reinforce American forces in California but also to establish a wagon road that the Army could use to travel between Santa Fe and San Diego.

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[2] Henry P. Walker and Don Bufkin, *Historical Atlas of Arizona* (2d ed.; Norman: University of Oklahoma Press, 1986), Map 13; Stein, *Historic Trails in Arizona*, 5-7.

[3] Walker and Bufkin, *Historical Atlas*, Map 40.

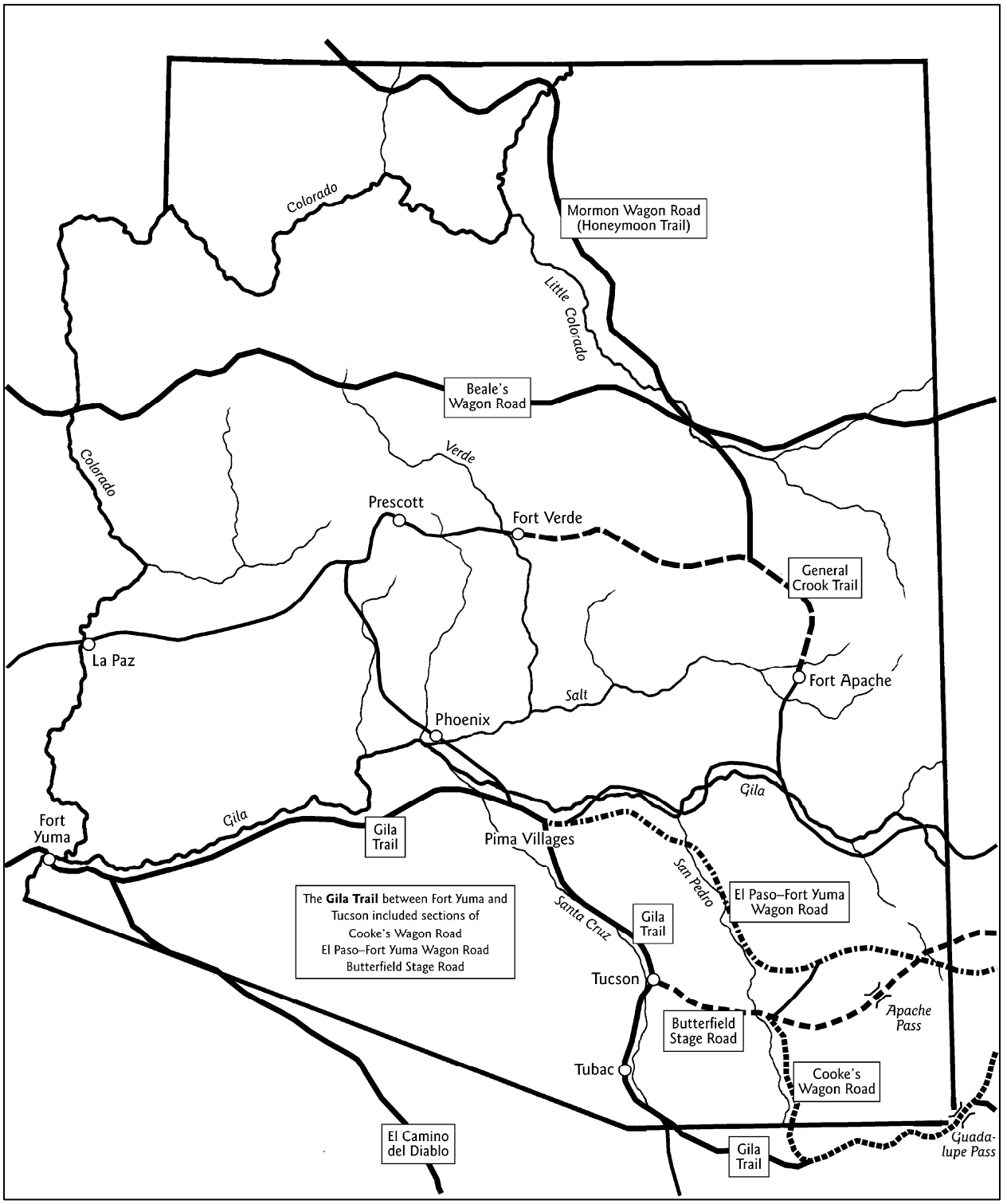

Figure 2. Early Trails and Roads in Arizona Territory.

The map shows some of the more important routes used from the 1840s to the 1870s in Arizona. Adapted from Map 40, "Major Trails," in Henry P. Walker and Don Bufkin, *Historical Atlas of Arizona* (2d ed.; Norman: University of Oklahoma Press, 1986).

The Mormon Battalion entered Arizona through Guadalupe Pass in 1846, near what is now the southeastern corner of the state, and traveled west along the present-day Mexican border to the San Pedro River. After following the river north for some distance, the men turned northwest toward Tucson. There they connected with the historic Spanish road, which they followed to the Pima Villages, the Gila River, and Yuma.

Cooke's men did little actual road building. Mainly they marked their route and removed major obstructions like brush and rocks; otherwise they made no improvements. As one historian wrote, "When the going was smooth, it appears that they marched along, moving from water hole to water hole, convinced that the marks left by their turning wheels had established a road."[4]

Known thereafter as Cooke's Wagon Road, in truth it was more a trail than a developed road. Nevertheless, for a decade it was the best known travel route across Arizona, and the only one suited for wagons. During the California gold rush of 1849, it was used by thousands of would-be gold miners who chose to risk the dangers of an overland journey to the western gold mines (most traveled by sea).

By 1849 a section of Cooke's road through southeastern Arizona was part of the Gila Trail, which was the popular name for a series of roads that connected El Paso with southern California. For three decades, from the late 1840s to the late 1870s, the Gila Trail was the primary travel route across southern Arizona. It was followed not only by miners and adventurers but also by settlers and ranchers traveling from the east.[5]

CREATION OF NEW MEXICO TERRITORY

After the war between the United States and Mexico, and the signing of the Treaty of Guadalupe Hidalgo in 1848, Americans took possession of the Southwest—California, Arizona, Nevada, Utah, Colorado, and New Mexico. Two years later, in 1850, California became a state and the area comprising today's Arizona and New Mexico was designated New Mexico Territory.

The Territory's capital was in Santa Fe, a long distance and many days of travel from the settled parts of Arizona, which in the 1850s were confined to the same areas that the Spaniards and Mexicans had occupied: southern Arizona and the lower Colorado River at Yuma.

At the time, Arizona had very few residents who were not Native Americans and hardly anything that passed for an economy. Aside from a few struggling silver mines, economic activities such as ranching, farming, and lumbering were conducted on practically a subsistence basis. Virtually all of Arizonans' trade was local. Warfare with the Apaches of southeastern Arizona made travel dangerous and greatly retarded the development of Arizona's economy.

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[4] W. Turrentine Jackson, *Wagon Roads West: A Study of Federal Road Surveys and Construction in the Trans-Mississippi West, 1846-1869* (Berkeley: University of California Press, 1952), 21.

[5] Because the Gila Trail was not a formally developed road but simply a popular name for a travel route, there has always been some uncertainty about its exact location in some parts of Arizona. For example, some maps show the Gila Trail passing through Apache Pass rather than Guadalupe Pass.

Away from the well-used Santa Cruz–Gila River route, travel through Arizona continued to be over rough roads and trails blazed by the Territory's native peoples, traders, ranchers, and miners. When work was required to maintain or improve these roads, it was carried out not by any government entity but by informal groups of residents or travelers who furnished their own labor, material, and funds.

ARMY ROAD SURVEYS IN THE WEST

The expansion of U.S. territory to California and the Southwest, and the gold rush to California, created an urgent need to improve communication and transportation links between the West and the rest of the nation. In 1853 Congress appropriated $150,000 for surveys of potential railroad routes to the Pacific Ocean that would be conducted by Army topographical engineers. Over the next two years, the Army carried out six surveys; two of them, the Whipple and the Parke surveys, crossed Arizona. Although their purpose was to identify transcontinental railroad routes, the surveys in fact first led to the construction of wagon roads.[6]

In 1853, Lt. Amiel Whipple led an Army survey party on the first of these surveys, with orders to find a railroad route on or near the 35th parallel. This route had already been partially explored by Capt. Lorenzo Sitgreaves, who in 1851 had traveled from Zuni Pueblo, near the northeastern border of Arizona, across northern Arizona. He and his Army reconnaissance party traveled along the Little Colorado River, past the San Francisco Peaks, and then directly west to the Colorado River, which they crossed near present-day Needles. Whipple's route was similar to that taken by Sitgreaves, except that in northeastern Arizona he and his men traveled along the Puerco River. In northwestern Arizona they traveled farther south than Sitgreaves had, following the Bill Williams River to the Colorado.

A year later, in 1854, Lt. John Parke led Arizona's second railroad survey party along the 32nd parallel in southern Arizona. Parke's men entered Arizona west of present-day Lordsburg, New Mexico, and traveled directly west to Tucson. From there they followed the Gila Trail, traveling first to the Pima Villages and then following the Gila River to Yuma.

The route surveyed by the Whipple party, with some modifications based on the earlier report of Sitgreaves, was eventually followed by the Atchison, Topeka & Santa Fe Railroad. Later, when highways were built, the routes blazed by Sitgreaves and Whipple were followed by U.S. Route 66 and Interstate 40. The route marked out by the Parke survey was eventually used by the Southern Pacific Railroad. Later U.S. Route 80 was built along parts of the Parke route, and Interstate 10 followed the route almost in its entirety.

BEALE'S ROAD AND EL PASO–FORT YUMA ROAD

Construction of these two railroads lay two decades in the future, though, and in the meantime an effective means of traveling across Arizona was still needed. Since the

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[6] William H. Goetzmann and Glyndwr Williams, *The Atlas of North American Exploration* (New York: Prentice Hall, 1992), 162-63, 166-67; Walker and Bufkin, *Historical Atlas*, Map 23.

conclusion of the Mexican-American War, westerners had been lobbying for federal assistance in building wagon roads. However, many in Congress believed that it was unconstitutional to spend federal money on "local" improvements such as roads, and so proposals to build wagon roads in the West faced significant opposition.

Finally, in 1857, Congress ordered the construction of two federal wagon roads through New Mexico Territory, one across the northern part and the other across the southern.[7]

Construction began in 1857 on the northern road, which came to be known as Beale's Wagon Road, after construction superintendent Edward Fitzgerald Beale (see Figure 2). The first phase of the work, which cost $50,000 and took five months to complete, established the route. Beale followed Whipple's survey route except in western Arizona, where he went more directly westward rather than turning south to the Bill Williams River. Many years later, when U.S. Route 66 was built, it mostly followed Beale's route.

When Beale and his men traveled eastward over the new road in 1858, it took them a month to cross Arizona and northwestern New Mexico. Beale then recommended more improvements. This second phase of work, which cost $100,000 and was carried out in 1859, involved the construction of a few bridges, some grading and straightening, and—most importantly—digging wells and building water tanks.

When it was finished, the road was advertised as suitable for six-mule teams pulling wagon loads as heavy as 3,500 pounds. Returning to New Mexico on his second trip along the road, Beale needed only 108 hours to travel from the Colorado River to Albuquerque.

The southern road, the El Paso–Fort Yuma Wagon Road, was begun in 1858. For the most part it followed the route laid out by Parke in his 1855 survey (see Figure 2). After entering southeastern Arizona near Apache Pass, the road headed directly west to the San Pedro River, which it followed north to the Gila River. This route bypassed Tucson—a decision made by the construction superintendent in order to avoid the long waterless stretch past Picacho Peak north of Tucson.

The southern road cost just under $200,000 and required two years to complete. Workers graded 35 miles of roadway, cleared brush along another 62 miles of road, and built one water tank on the Arizona section of the road. "Much clearing of loose stone from roadway was done, which was not measured," an official later reported.[8]

In later years the maintenance of these two roads was spotty and infrequent. When repairs were made, they were typically carried out by travelers who occasionally cleared away downed trees and filled in potholes. Nevertheless, these roads were important to frontier Arizona. The El Paso–Fort Yuma road in particular helped connect the Territory's far-

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[7] Jackson, *Wagon Roads West*, 163ff, 241ff.

[8] A. H. Campbell, *Report upon the Pacific Wagon Roads* (1859; Fairfield, Wash.: Ye Galleon Press, 1969).

flung settlements with each other, and it provided a much-needed trade route to California, New Mexico, and Texas.

It was along portions of this southern road that the first stagecoaches to reach Arizona operated. The most celebrated of these was the Butterfield Overland Mail, which carried passengers and mail to and from Arizona between 1858 and 1861. The Butterfield coaches for the most part followed the El Paso–Fort Yuma Road, except that instead of detouring north around Tucson, they stopped in the town, which was served by one of the 18 stations in Arizona built by the stage line.

The stations, which were located 17 to 37 miles apart, were simple adobe structures with enclosed courtyards that served as corrals for the company's horses and mules. The coaches ran night and day, stopping at the stations only long enough for employees to change animals and for passengers to grab a quick meal. On its first run through Arizona, the Butterfield stage needed only three-and-a-half days to travel 437 miles from Stein's Pass on the New Mexico border to the California border at Yuma.[9]

CREATION OF ARIZONA TERRITORY

The Civil War brought a dramatic slowdown in the settlement and development of Arizona, as Army troops were withdrawn from frontier posts to fight in the war. Yet the war also gave rise to the creation of Arizona Territory, which was established in 1863. Federal officials were concerned that the Confederacy might try to break the Union blockade of the South by occupying New Mexico Territory and establishing a trade route across the Southwest. By creating a new territory that encompassed just Arizona, Congress would bring greater federal authority to the region—a move that Arizona's residents had been seeking for some time.

Everyone in the new territory agreed that Arizona's most pressing need was for wagon roads. Freight and passengers had been able to reach Arizona by boat since 1852, when steamboat service was established on the lower Colorado River. But travel inland from the river still required a difficult and time-consuming journey by horse or stagecoach, one made worse by the poor condition of the few existing roads.

However, when the Territorial Legislature met for the first time in 1864, at the new Territorial capital in Prescott, it passed only one measure related to roads. Legislators approved a resolution declaring the already-built Woolsey Trail, which connected Prescott with the Pima Villages, to be Arizona's first public road. It was to be "a *county road*, free for all intents and purposes."[10] Like most public officials at the time, the Territorial legislators considered road building to be the responsibility of the counties, not the Territory.

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[9] *The Butterfield Overland Mail Across Arizona, 1858-1861* (Tucson: Arizona Pioneers' Historical Society, 1961), 9-10, 14, 33.

[10] *Acts, Resolutions and Memorials, Adopted by the First Legislative Assembly of the Territory of Arizona* (Prescott: Arizona Miner, 1865), 20.

ROAD BUILDING DURING THE TERRITORIAL PERIOD 1864-1911

The early officials of Arizona Territory were in a difficult position when it came to building roads. Arizona was a sprawling territory of 114,000 square miles, much of it rugged desert and mountain terrain that posed serious technological and logistical challenges to road builders. Construction projects were made more difficult and expensive by the distances that separated the Territory's towns, ranches, and mines. Supplies and water had to be hauled to construction sites, and camps often had to be set up for the workers.

At the same time, the financial resources available to the Territory were limited. Arizona was sparsely populated and there was little taxable economic activity. Incomes were low, and the Territory's residents made it clear that holding down taxes should be one of the legislature's first priorities. Furthermore, many legislators believed that road building was the responsibility of the counties, not the Territory. Under these circumstances, it was hardly surprising that progress in improving Arizona's roads came slowly.

TOLL ROADS

Although Arizona's early legislatures were unwilling to finance the construction of public roads, they did encourage private road development. Six franchises were awarded to toll road companies in 1864. Most were planned to serve the Territory's mines, which were concentrated in southern Arizona, the Prescott-Wickenburg area, and western Arizona. One company, the Tucson, Poso Verde, and Libertad Road Company, had ambitious plans to build three roads, one of which was to connect Tucson with Sonora. At its second session in 1865, the Territorial Legislature authorized two more toll road franchises—one from Prescott to Lynx Creek, another originating at the Mowry mine in southern Arizona.

Most of these roads were never built, and those that were proved to be poor investments. Eventually, after relatively short periods of service, all of Arizona's early toll roads were abandoned or converted into public roads.

The most successful by far was the Mojave and Prescott Toll Road, also known as the Hardyville Road. Authorized in 1864 and constructed in 1865, the 161-mile road connected Prescott with Fort Mojave on the Colorado River.[11] In return for gaining the exclusive right to build a road over that route, the company was required to spend at least $3,000 on construction and follow a toll schedule prescribed by the legislature. A wagon pulled by two draft animals was charged $2.42 to travel the road, while a horse and rider were charged $1.21. Native Americans, and anyone traveling by foot, were granted free passage on the road.

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[11] *Acts, Resolutions and Memorials, Adopted by the First Legislative Assembly of the Territory of Arizona* (Prescott: Arizona Miner, 1865), 32-35.

The design and construction of the road were left entirely up to officials of the Mojave and Prescott Toll Road Company, which worked with almost no direct supervision by Territorial officials. Establishing a practice that would be followed for most of Arizona's Territorial period, the legislature required that a temporary road commissioner inspect and approve the road after it had been built.

The commissioner, Jerome Calkins, traveled the completed road in the summer of 1865. "A large amount of work has been done on said Road in grading, clearing out rocks, filling arroyos and gullies," he reported to the Arizona Territory governor. "It is in a condition now throughout its whole length for teams with heavy loads to pass over, with safety and comparative ease, although portions of the distance are naturally rough."[12]

COUNTY ROAD DISTRICTS

With the Territorial government leaving public road construction to the counties, progress in improving Arizona's roads was slow. The counties operated with tight budgets, reflecting their limited tax bases, and all county officials except the sheriff worked part-time.

Following Territorial law, which prescribed how Arizona's counties conducted most of their affairs, county road building was done by temporary construction crews under the supervision of a three-man "viewing committee." These "viewers," as they were called, were typically prominent local citizens who may or may not have had practical experience in construction. They were responsible for determining each new road's route, mediating disputes over the right-of-way, hiring and supervising work crews, and inspecting the road after it was built.[13]

Once roads were built, they were turned over to county road overseers, each of whom was responsible for maintaining the public roads in his local road district. The overseers were part-time officials and could earn as much as $6 per day for their work, most of which involved keeping roads clear of obstructions and organizing temporary repair crews. There were no formal education or experience requirements for the position, which meant that sometimes overseers were given their jobs as a reward for political work.

The work crews they supervised were composed of either hired laborers or local residents performing their required road maintenance service. All "able-bodied men" in the county were required to either pay a $6 annual road tax or donate two days of labor to road work. When laborers, materials, or equipment had to be hired or purchased, the expenses were paid with funds raised by a property tax devoted specifically to road improvements.

This system remained in place, with minor changes made by the legislature, until 1909—a period that spanned more than four decades. In 1871 the legislature eliminated the viewing committees, dividing their authority between the county boards and the road overseers. Henceforth, new road construction work would be contracted directly by the supervisors,

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[12] Letter from Jerome Calkins to Gov. John N. Goodwin, Mojave and Prescott Toll Road Co. files (FE Sacks 19/5 and 24/11), Arizona Historical Foundation, Hayden Library, Arizona State University.

[13] *The Compiled Laws of the Territory of Arizona, Including the Howell Code and the Session Laws, from 1864 to 1871* (Albany, N.Y.: Weed, Parsons and Co., 1871), 548ff.

with the overseers left in charge of the work itself. The labor donation requirement was kept, though it was lowered to one day per year, where it remained until 1909.

During the late 1860s and early 1870s, this system was sufficient to keep Arizona's roads in more or less adequate repair. However, the revenue generated by the road taxes was not enough to fund more than a few small construction projects. Until the counties could borrow money for road construction by selling bonds, which required approval by the Territorial Legislature, they would have to tolerate the roads they had.

ARMY WAGON ROADS

Most of the roads built in Territorial Arizona were local, that is, they were designed to connect towns with nearby ranches, farms, and mines. Few of these roads were designed to efficiently connect with other roads, nor were they located to reduce traveling times or distances. As a result, many of the Territory's roads were not particularly useful to long-distance travelers.

The exceptions were the roads located and built by the Army, which until the late 1870s was the only authority in Arizona building roads specifically designed for long-distance travel. Even though many of these Army roads were trails rather than properly constructed roads—they were usually called "routes"—they were nevertheless important to Arizona. One popular guidebook published in 1878, the *Hand-Book to Arizona*, identified 41 military routes to and across Arizona.[14]

These military roads connected the forts and camps that the Army had established to support its campaigns against the Territory's Native Americans. They ranged in length from the 39-mile route between Fort Verde and Fort Whipple, which was located at Prescott, to the 316-mile route between Fort Apache, in the White Mountains, and Maricopa Wells, a station on the newly built Southern Pacific Railroad. The guidebook's route descriptions included information about the available water, wood, and grass supplies and provided some instructions on route-finding.

One of the better-known military routes was the General Crook Trail, which was established in the early 1870s between Fort Apache and Fort Whipple. Named after General George Crook, who at the time was the Army commander for Arizona Territory, the road followed the Mogollon Rim from Fort Apache to Fort Verde, where it then descended into the Verde Valley, crossed the Verde River, and followed the Cherry Creek road to Prescott (see Figure 2). The route was laid out by Crook in 1871, and construction work started in 1872. Most of the work was confined to removing large obstacles such as trees and rocks from the roadbed. By 1873 the trail was declared ready for pack trains, and by 1874 it was considered usable by wagons.[15]

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[14] Richard J. Hinton, *Hand-Book to Arizona: Its Resources, History, Towns, Mines, Ruins and Scenery* (1878; Tucson: Arizona Silhouettes, 1954), xxii (appendix).

[15] Eldon Bowman and Elaine Cassey, *A Guide to the General Crook Trail* (N.p.: Museum of Northern Arizona and Boy Scouts of America, 1978).

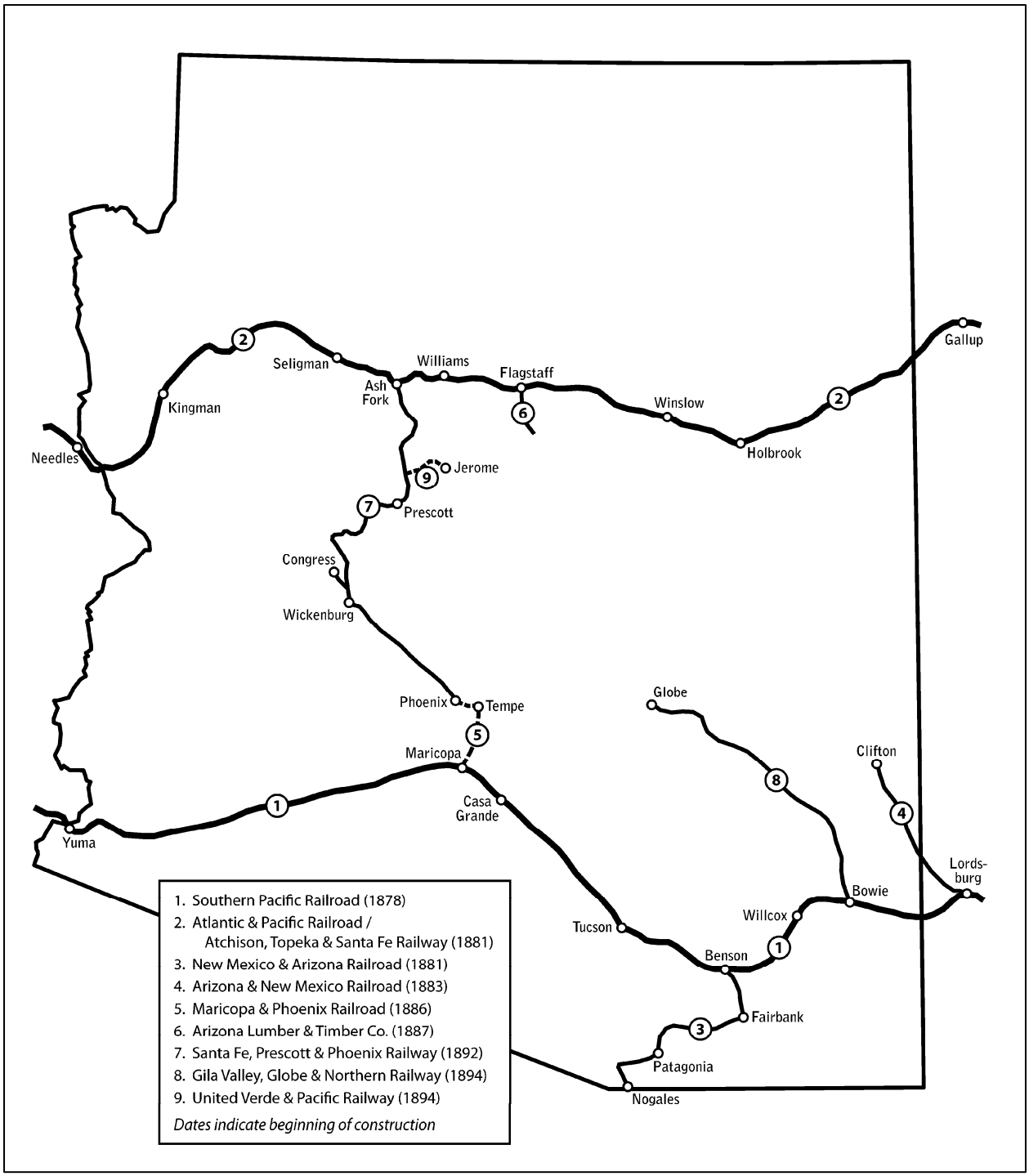

Figure 3. Early Arizona Railroads, 1894.

With the exception of the two transcontinental railroads, the Southern Pacific and the Santa Fe, most of the early railroads in Arizona were built to serve the Territory's mining regions. Based on data from Donald B. Robertson, *Encyclopedia of Western Railroad History; The Desert States: Arizona, Nevada, New Mexico, Utah* (Caldwell, Idaho: Caxton Printers, 1986).

Travel on the General Crook Trail was never easy. One Army wife who took the road soon after its opening, Martha Summerhayes, vividly recalled the experience many years later: "For miles and miles the so-called road was nothing but a clearing, and we were pitched and jerked from side to side of the ambulance as we struck large rocks or tree-stumps; in some steep places, logs were chained to the rear of the ambulance, to keep it from pitching forward onto the backs of the mules."[16]

The completion of Arizona's transcontinental railroads rendered Crook's Trail unnecessary for long-distance wagon freighting, but the road continued to be used by Army troops on patrol and by settlers and ranchers in the Mogollon Rim country. Many parts of it can still be traveled today using U.S. Forest Service trails and roads.[17]

ARRIVAL OF THE RAILROAD

Some relief for Arizona's lack of good roads was provided in the late 1870s, when railroads came to the Territory. The Southern Pacific Railroad was the first to build in Arizona, completing its line across the Territory in 1880. It was followed soon thereafter by the Atlantic and Pacific Railroad, a subsidiary of the Atchison, Topeka and Santa Fe Railroad (commonly known as the Santa Fe), which completed its Arizona line in 1883 (see Figure 3).[18]

The Southern Pacific line, which largely followed the 32nd parallel route surveyed by Lt. John Parke in 1854, originally was to have been built by the Texas and Pacific Railway. However, when the Southern Pacific arrived at Fort Yuma in 1877, after building east from the California coast, the Texas and Pacific had yet to lay any track outside Texas. Although the Southern Pacific was not authorized by its federal charter to build in Arizona, it nevertheless constructed a bridge across the Colorado River and extended its tracks into the town of Yuma, which it reached on September 30, 1877.

After securing a charter from the Arizona legislature authorizing it to build a railroad across the Territory, the Southern Pacific resumed its eastward advance in late 1878. By the spring of 1879 the railroad had reached Maricopa, which became the station serving Phoenix, and in March 1880 the railroad arrived in Tucson.

Later that year, in October 1880, Southern Pacific tracklayers crossed the New Mexico border east of San Simon. A year after that, in 1881, Arizona gained its first direct railroad link to the Midwest and East, as the Santa Fe built a line south from Albuquerque to Deming, New Mexico, connecting the Southern Pacific to the Santa Fe's rapidly growing transcontinental network.

Like the Southern Pacific, the Santa Fe was not chartered by the federal government to build in Arizona. That right had been given to the Atlantic and Pacific Railroad, which

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[16] Martha Summerhayes, *Vanished Arizona* (Lincoln: University of Nebraska Press, 1979), 69.

[17] Public Lands Information Center, "General Crook National Recreation Trail, Arizona," http://www.publiclands.org/explore/site.php?id=967, accessed November 17, 2009.

[18] Janus Associates, *Transcontinental Railroading in Arizona, 1878-1940* (Phoenix: Arizona State Historic Preservation Office, 1989).

planned to follow the 35th-parallel route surveyed in 1853 by Lt. Amiel Whipple. However, after completing less than 400 miles of track in Missouri, the Atlantic and Pacific went bankrupt in 1876. Eventually the Santa Fe acquired a controlling interest in the Atlantic and Pacific and, using the latter's transcontinental charter, began surveying a route across northern Arizona.

Construction started in Albuquerque in the summer of 1880. By the following May, track-laying crews had reached Lupton, Arizona, on the border with New Mexico. Work proceeded rapidly as far as Winslow, which was reached in December 1881, but then progress slowed as the tracklayers waited for other Santa Fe workers to erect a bridge across Canyon Diablo, a 225-foot-deep canyon that had always been a major obstacle to east-west travel across northern Arizona.

The Canyon Diablo bridge, together with a bridge across Canyon Padre, was finished in the summer of 1882, allowing the Santa Fe's track-laying crews to continue their westward push. In August 1882, the first Santa Fe trains reached Flagstaff. A year later, on August 13, 1883, they rolled into Needles, California, where the Santa Fe connected with the Southern Pacific. Arizona now had its second transcontinental railroad service.

Curiously, neither of these railroads served Phoenix, which was rapidly growing and would become Arizona's capital in 1889. The closest rail stop was the Southern Pacific station at Maricopa, leaving Phoenix-bound passengers with a 35–mile stagecoach ride to complete their journey. It was not until 1887, when the Maricopa and Phoenix Railroad was completed, that Phoenix received direct rail service (see Figure 3).

The arrival of the Southern Pacific and the Santa Fe laid the groundwork for the development of Arizona's modern economy. Some of the changes were immediately felt, while others would not occur until the early years of the 20th century. The railroad greatly reduced the cost and time required to ship goods to and from Arizona. More importantly, it made it economical for producers to ship bulky agricultural and mining products. This allowed such critical Arizona industries as citrus and cotton farming, copper mining, and cattle ranching to grow and prosper.

The beginning of rail service in Arizona also increased the demand for improved roads, as businesses and towns across the Territory pushed for better connections to the two railroads' depots. Before the railroads could be used to ship goods to and from Arizona, new roads had to be built to transport those goods.

TERRITORIAL WAGON ROADS

In 1877, with the Southern Pacific poised to enter the Territory at Yuma, Arizona legislators finally brought the Territorial government into the road-building business. The Territory's first project was a wagon road between Phoenix and Globe that was funded with $10,000 in Territorial bonds ($205,000 in current dollars)—the first bonds in Arizona to be issued for a highway construction project.

Establishing a supervisory procedure that would be followed until 1909 for all Territorial road projects, the legislature appointed three road commissioners to oversee the project. In return for a salary of $6 per day, these three men—all prominent Maricopa County residents—were expected to oversee the survey, location, and construction of the road. They could either supervise the work directly or delegate that responsibility to contractors, who were required to submit competitive bids.

Between 1877 and 1885, the Territory issued additional road bonds totaling more than $70,000. This represented a substantial increase in spending compared to previous years, yet it was still a modest sum—less than $10,000 per year—considering how many miles of roadway were needed to serve a territory as large as Arizona.

Not everyone was satisfied with that level of spending, however. In 1879 Governor John C. Fremont urged the Arizona legislature to appropriate $500,000 for road projects in the Territory. The legislators demurred, though, and instead of endorsing Fremont's ambitious spending plan, they authorized just two road projects: $40,000 for roads between Globe and Tucson, Globe and Florence, and Gillett and the Tiger Mine in Yavapai County, and $10,000 for a road between Agua Fria and Camp Verde.

A typical Territorial road project of this era was the Ehrenberg-Yuma road, which was funded in 1881 with a $10,000 bond issue. For the first 50 miles of the road, from Yuma to the Castle Dome Mountains and Kofa Mountains, workers improved existing roads built to serve mines in the area. For the remaining 60 miles, from the Kofa Mountains to Ehrenberg, they surveyed and built a new roadway. It was completed in 1882, at which time the commissioners in charge of the project reported, "The entire road is in excellent condition, and can be kept in repair at small expense. The road is traveled over by four and six horse teams; and has proven of immense benefit to people living above Yuma."[19]

Four years later, in 1885, the Arizona legislature authorized several road projects, one of which was the first bridge to be built by the Territory. Crossing the Gila River near Florence, the bridge was erected by a California company at a cost just over $15,000. Nearly a thousand feet long, it was constructed of redwood pilings and had a wooden roadway that was 16 feet wide. "The Bridge has been tested, at different times, by a twenty mule team with four heavily loaded wagons without spinning [sic] or giving away in the least," the bridge commissioners reported after its completion.[20]

In 1886 the Territory's road-building program was brought to a halt by Congress' passage of the Harrison Act, which was intended to reform the financial affairs of all of the nation's territories. The law imposed new limits on how much debt each territory could incur, and because Arizona had already exceeded those limits, the Arizona legislature was forced to stop issuing bonds for roads and other public works. For the next 23 years, all road construction in Arizona was undertaken by the counties, which could more easily float the bond issues required to finance such large projects.

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[19] Miscellaneous Road Records, Secretary of the Territory, RG 6, Arizona State Archives.

[20] Records of the Secretary of Territory, RG 6, Box 1, Arizona State Archives.

ROAD BUILDING BY THE COUNTIES

In fact the counties had been issuing road bonds for some time, in some years spending more than the Territorial government on road construction. In 1877, the same year that the Territorial government had approved a $10,000 bond issue for the Phoenix-Globe road, Maricopa County sold $15,000 in bonds to pay for the construction of wagon roads from Phoenix to several destinations. This included two roads to Prescott, one via Black Canyon and the other via Wickenburg; a road to Yuma via Agua Caliente; and a road to Globe. Also that year, Yavapai County issued $40,000 in bonds to build wagon roads from Prescott into the Bradshaw Mountains, to Iron Springs, and into Black Canyon.

Between 1879 and 1885, Arizona's counties were authorized by the Territorial Legislature to issue nearly $60,000 in bonds to finance road projects—a sum almost as great as that spent by the Territory on road building during that period. Most of these new county roads were in Maricopa and Yavapai counties, but Pinal and Graham counties also were able to carry out projects. All of these bond issues were to be repaid using property taxes.

The fact that most of these new roads were being built by only a few counties pointed to a problem that would bedevil road planners in Arizona for many decades: while some counties saw rapid improvement of their roads, others remained "road poor." Using property taxes to finance road construction, as Arizona's counties did, it worked to the advantage of wealthier and more populous counties like Maricopa, Pima, and Yavapai, and to the disadvantage of less developed counties like Apache, Navajo, and Santa Cruz.

Even if the counties had wanted to seek new funding sources, they could not do so without approval from the Territorial Legislature, which did not extend home rule to Arizona's counties. The legislature's 1871 law establishing the county road districts remained in effect until 1909. Some counties secured passage of special road laws by the legislature, as Maricopa County did in 1883, but these were nearly identical to the 1871 law. Indeed, the only real changes made for Maricopa County were to drop the requirement that county residents do road work each year and to adjust the county's road tax rates.

After passage of the 1886 Harrison Act, Arizona's counties also were forced to limit their debt, though not so much that they could no longer issue road bonds. They built roads all through the Territorial period, and many of these new county roads laid the groundwork for what would later become Arizona's first state highway system. For example, the wagon roads built by Maricopa County and Yavapai County between Phoenix and Flagstaff would eventually be incorporated into U.S. Route 89 and State Route 69. By the later years of the Territorial period, Arizona's counties together were spending an average of $200,000 a year on road construction and maintenance—a significant increase from the limited expenditures of earlier years.[21]

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[21] *Report of the State Engineer of the State of Arizona, July 1, 1909, to June 30, 1914* (Phoenix, 1914), 19.

However, the quality of road construction varied enormously from county to county and from road to road. There still was only one major bridge in Arizona, the one across the Gila River at Florence, and none of the Territory's roads were paved. Indeed, only a few miles of roadway were even surfaced with gravel; most Arizona roads still had surfaces of unimproved dirt. Maintenance was spotty, with most work supervised not by engineers but by local contractors and officials whose primary credentials were political rather than professional.

None of this was necessarily anyone's fault. In 1910, two years before statehood, Arizona had only 204,000 residents and little taxable property by national standards. Its centers of population and economic activity were separated by large distances and rugged terrain that posed significant challenges to highway engineers. Under such circumstances, it was difficult and expensive to construct even the most basic of road networks.

Fortunately for Arizona, the lack of good roads was not a serious problem during most of the Territorial period. In many parts of the Territory, where the climate was dry and the soils rocky, the mud that plagued road users in other parts of the country was blessedly absent for most of the year. And when conditions were bad, the horses and mules that Arizonans used for transportation were usually able to negotiate even the worst trails.

THE TERRITORIAL ENGINEER AND ARIZONA'S FIRST HIGHWAY SYSTEM

The world was changing, though. The modern industrial economy taking shape in the United States depended on good roads. So, too, did a new mode of transportation coming onto the scene—the automobile.

Recognizing this, the Territorial Legislature took Arizona's first step toward creating a modern road system in 1909, when it overhauled the Territory's road law. Most importantly, the legislature placed Territorial road construction and maintenance under the supervision of a Territorial Engineer who was required to be "a practical competent civil engineer." In return for a salary of $3,000, and aided by a $2,500 appropriation for office expenses, the Territorial Engineer was expected to set up a formal Territorial highway system, design and supervise the construction of all new Territorial roads, and provide engineering support to the counties.[22]

The legislature also ordered changes at the county level. The road districts were abandoned and the local road overseers replaced by county road superintendents "skilled and experienced in the construction of roads and highways." Each superintendent was required to "give his full time to the duties of his office and shall conduct no other business requiring attention," bringing to a close the era of part-time political road commissioners and overseers.[23]

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[22] *Report of the State Engineer…1909 to 1914*, 16ff.

[23] *Acts, Resolutions and Memorials of the Twenty-Fifth Legislative Assembly of the Territory of Arizona* (Phoenix: Phoenix Printing Co., 1909), 164.

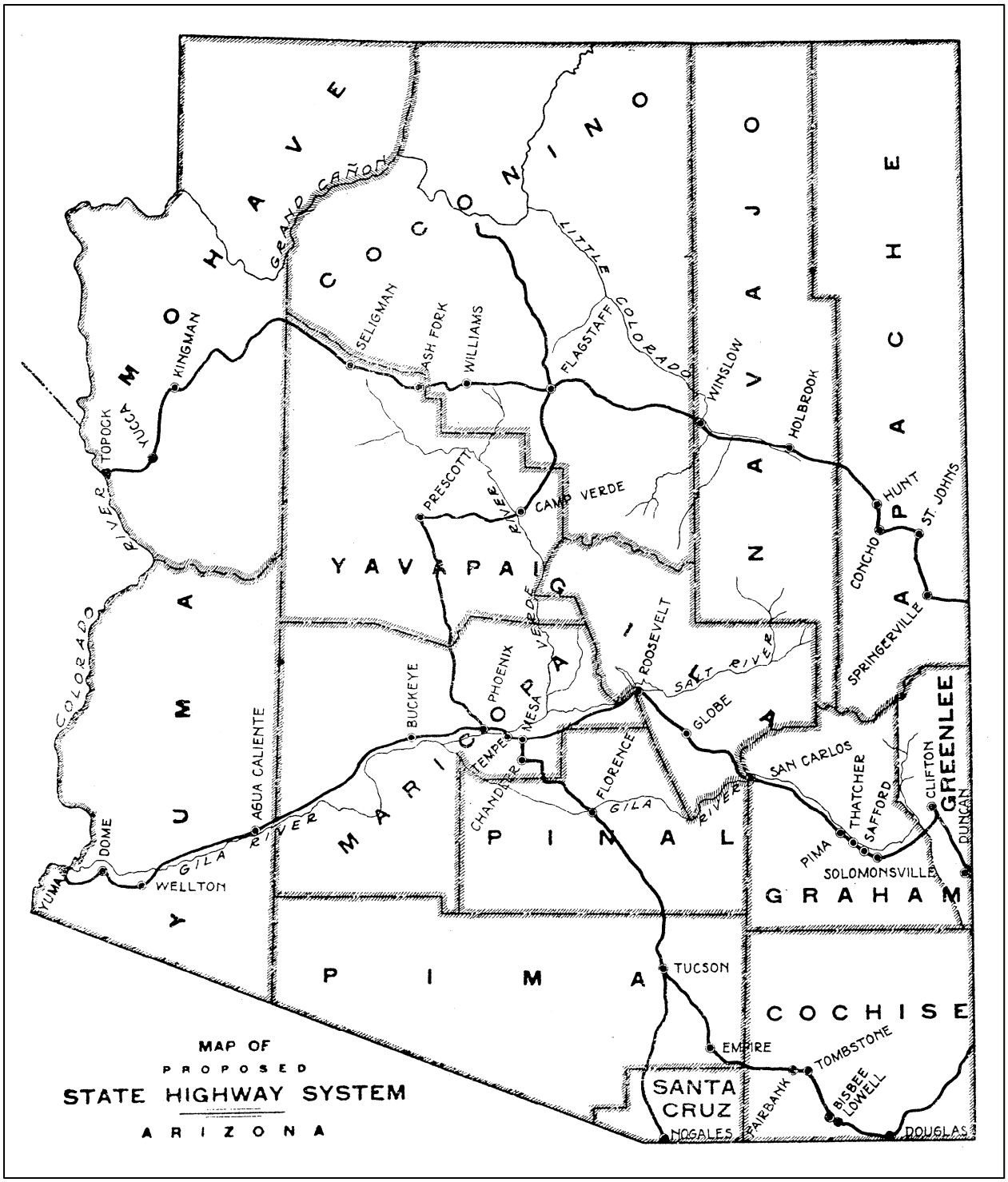

Figure 4. Arizona's First Highway System, 1914.

From *Report of the State Engineer of the State of Arizona, July 1, 1909, to June 30, 1914* (Phoenix, 1914).

The Territorial road system created by the Arizona legislature in 1909, at first existed only on paper. It consisted of just two roads, one running east-west between Yuma and Duncan, on the New Mexico border in southeastern Arizona, and the other running north-south between Douglas and the Grand Canyon (see Figure 4).

To pay for this new system, the legislature created Arizona's first road tax: a property tax administered by the counties. In counties with no Territorial highway—the two roads in the system did not pass through every Arizona county—the tax rate was lower than in counties served by a highway in the new system. The new tax did not raise large sums of money, a reflection not only of the low tax rate but also Arizona's limited tax base. During the last three years of the Territorial period, Arizona collected just $546,000 in road taxes and spent $560,000 on road surveys and construction—an average of $187,000 per year.[24]

Not surprisingly, given Arizona's size and the poor condition of its existing roads, progress in building the new Territorial system was slow. During the three final years of Territorial government, the engineer surveyed more than 1,200 miles of roadway but was able to construct only 145 miles of new roadway, most of which was part of the Douglas–Grand Canyon highway.

As a result, most travelers in Arizona noticed few real improvements. Isolated sections of roadway were graded, drained, and surfaced with crushed gravel, but they were still interspersed with long sections of roadway that had been built with nothing more than dirt and other local materials. For more significant road improvements, Arizonans would have to wait for assistance from the federal government, which did not come until after Arizona attained statehood.

[24] *Report of the State Engineer…1909 to 1914*, 17, 30.

BUILDING A STATE HIGHWAY SYSTEM 1912-1925

Statehood brought many changes to Arizona, but a new system of road administration was not one of them. The Territorial Engineer was rechristened the State Engineer, and his department given a new name—the Arizona Highway Department—but otherwise the division of authority and funds between the state and the counties remained largely unchanged. Indeed, the legislation establishing the highway department assumed that much of the construction and all maintenance would be carried out by the counties.

ARIZONA HIGHWAY DEPARTMENT

To fund the new highway department, the Arizona Legislature established a statewide road tax, which was a property tax like the road tax previously collected under the 1909 Territorial road law. The legislators did not specify a tax rate; instead they required only that the tax be "sufficient" to raise $250,000 per year (see Table 1, p. 41). Each year's tax collections were divided between the state and the counties, with 75 percent of the revenue distributed among the counties in proportion to their road tax collections. Although all road tax receipts were deposited into a single fund, the State Road Tax Fund, in practice they were divided between two funds that became known as the 75-percent fund and the 25-percent fund.[1]

The counties did not have a free hand in spending the money placed in the 75-percent fund, for the State Engineer was given a supervisory role in all projects financed from it. Indeed, for all practical purposes the 75-percent fund was used for the development of the state highway system rather than on county roads. This system nevertheless left the highway department with rather little control over where much of the state's highway budget would be spent. And, it tended to concentrate spending on roads in the wealthier counties with large tax bases, which meant that many miles of roadway in the less populated counties received minimal attention.

The modest amount ($62,500) remaining under the exclusive control of the highway department, which was placed in the 25-percent fund, was supplemented by vehicle license fees, which in the first two years of statehood averaged $25,000 per year. It was also supplemented by the state corrections budget, which included funds for hiring prisoners as road workers. During the early years of statehood, prison workers were used on some of state's most notable projects, including the Tempe bridge built in 1913, the Phoenix-Tempe highway, the Bisbee-Tombstone highway, and a new bridge over the San Pedro River at Fairbank.

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[1] *Report of the State Engineer of the State of Arizona, July 1, 1909, to June 30, 1914* (Phoenix, 1914), 40ff.

As a result of this distribution scheme, the State Engineer was left with exclusive control of less than $100,000 a year to spend on plugging the gaps in the new state highway system. In fact, during the first two years of statehood, the State Engineer had $191,000 at his disposal for state projects, of which he spent $152,000—just over $75,000 per year. In addition to designing and supervising construction of state highways and bridges, the State Engineer also assisted the counties in locating, designing, building, and maintaining their roads.

Not surprisingly, county road expenditures continued to dwarf those of the state. From 1912 to 1914, counties received $417,000 in road funds from the state, of which they spent $355,000—an average of just under $178,000 per year. This was more than twice what the state spent directly, yet it was only a portion of what the counties spent on roads. Counties also had their own road taxes, as well as funds derived from bond sales and special assessments. Together, these funding sources were often larger than the counties' annual share of state road tax revenues. In 1914, for example, county road revenues totaled $764,000—more than twice the state's revenues of $356,000, which included the counties' 75-percent fund.

The condition of Arizona's state highways reflected these levels of spending; almost all of the state's roads were built of dirt and other local materials, and few had been properly graded or drained. "There are a few miles of graveled road in Graham, about ½ mile in Yuma and several miles of caliche road in Maricopa," State Engineer Lamar Cobb reported to Governor George W. P. Hunt in 1913. "I know of no other improved roads in the state, outside of cities, towns or special road districts, though I may have missed a half mile or so elsewhere."[2]

THE GOOD ROADS MOVEMENT IN ARIZONA

Arguing that a better and more coherent statewide network of roads was needed, and that such a system would be possible only if state funding were increased, the Arizona Good Roads Association in 1914 proposed a $5 million bond issue to finance a statewide road construction program. At the time, according to the association, Arizona was the fifth-largest state in the nation in area but ranked 46th in road mileage, with just 5,987 miles of public roads.[3]

The Arizona Good Roads Association was a product of the "good roads movement" that had been growing in the United States since the late 1880s. At first the movement represented the interests of urban bicyclists. Bicycling organizations had tried to win the support of farmers and other rural residents, but at first they were rebuffed. Most rural Americans did not want to see their taxes raised to pay for new roads that they thought would benefit only city dwellers. However, as more rural Americans came to see that poor roads significantly increased their transportation costs, farm groups became a powerful

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[2] *Report of the State Engineer…1909 to 1914*, 73. Caliche, or hardpan, is a sedimentary rock containing calcium carbonate; its cement-like quality makes it a durable road surface.

[3] The figure included both state and county roads. See "Announcement of Meeting of the Arizona Good Roads Association … Prescott, Arizona, July 3, 1914," Arizona Collection CE EPH O-40, Department of Archives and Special Collections, Hayden Library, Arizona State University.

constituency in the good roads movement. Once motor vehicles began appearing on the nation's roads, a third group of supporters joined the good roads coalition: automobile owners. As their numbers grew rapidly, "automobilists" helped make good roads a potent issue at every level—national, state, county, and local.

The bond measure proposed by the Arizona Good Roads Association received high-profile support, with State Engineer Cobb and Governor Hunt both speaking in favor of the measure. Three years earlier, Cobb's predecessor, Territorial Engineer J. B. Girand, had argued in favor of good roads in economic terms: "It is estimated that each man, woman and child in the United States bears a tax of $12.50 because of bad roads. By far the greatest part of this needless waste could have been avoided, if the roads had been properly constructed in the first place."[4]

When the bond proposal went to the voters in November 1914, though, it was soundly defeated, with 13,215 Arizonans voting in favor but 23,499 voting against it. The largest margin of defeat was in Maricopa County, which ironically would begin its own ambitious and expensive highway paving program only five years later.

The bond measure's defeat left the Arizona Highway Department in a difficult position. The state could afford little new road construction and would have to continue to emphasize improvements, many of which were incremental. Nor could the department afford to begin paving the state's highways; instead it surfaced all roads, including new ones, with gravel. As a result, by 1916 there was still not a single mile of concrete or asphalt highway in the state highway system. Arizona's best roads were surfaced with crushed rock or gravel; the rest were not surfaced at all, having been built simply by grading the existing dirt or rock surface.

Meanwhile, automobile registrations in Arizona were rising quickly, from 1,852 in 1912 to 12,124 in 1916.[5] More importantly, automobile tourism was on the rise, and Arizona's business owners wanted to capture a share of this growing market. Arizona's good roads advocates had been arguing for some time that the state's reluctance to spend money on road improvements was costing it valuable tourist business. Arizona had famous attractions such as the Grand Canyon, the Hopi villages, Spanish missions, and the Painted Desert, the Territorial Engineer had written in 1911. "Yet today," Girand lamented, "few of these wonderful points of interest are within reach of the tourist, and none of the motorist."[6]

THE NATIONAL OLD TRAILS HIGHWAY AND OTHER NAMED ROADS

Throughout these early years, Arizona's highway system was a system in name only. Virtually all of the state's roads were built piecemeal, with the work done by the counties rather than the territory or the state. The location of these roads was determined primarily by the needs of local traffic moving in and out of towns, and secondarily by regional traffic moving between towns.

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[4] J. B. Girand, "Arizona Roads," *Arizona: The New State Magazine* 1, no. 6 (July 1911): 1-2.

[5] Motor vehicle registration data can be found in the annual reports of the Secretary of State.

[6] Girand, "Arizona Roads," 1-2.

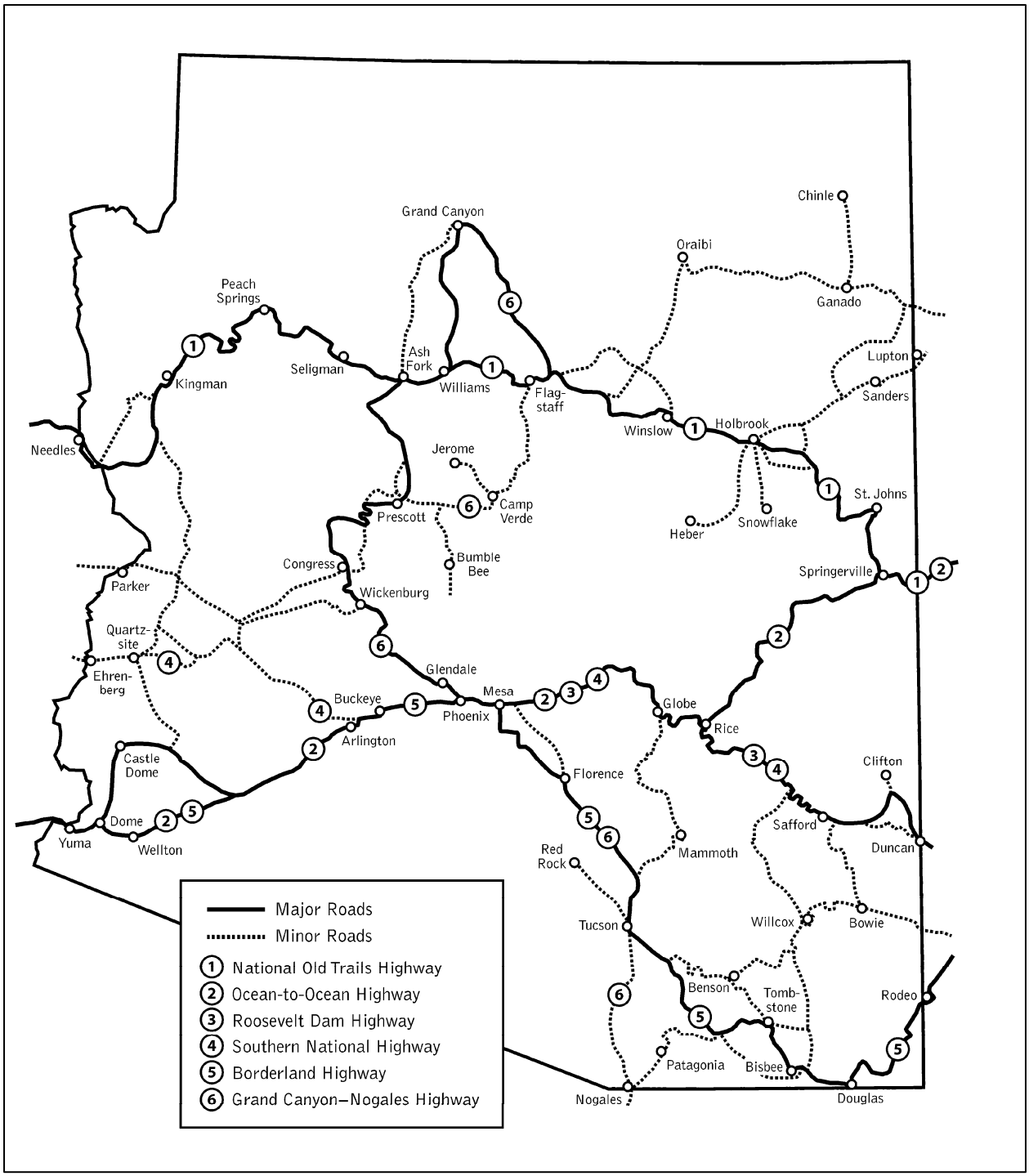

Figure 5. Automobile Roads and Routes in Arizona, 1917.

This map shows the named routes and other roads that were recommended for automobile tourists near the close of the First World War (some minor spur roads and connecting roads are not shown for clarity's sake). Adapted from map in *Clason's Guide to Arizona, with Map of Auto Routes* (Denver: Clason Map Co., 1918).

Little was done to plan direct, efficient roads that crossed the state, and even less thought was given to integrating Arizona's roads into a national system or network, which at any rate did not exist yet. It was for this reason that most of Arizona's roads were known by the towns they connected—the Phoenix-Tempe highway, for example, or the Tombstone-Bisbee road.

When the first "national" roads were routed through Arizona—an effort started by private business interests rather than the highway department—these, too, were given names. By the time the Arizona Good Roads Association proposed its $5 million bond program in 1914, there were five named roads across Arizona: the National Old Trails Highway; the Ocean-to-Ocean Highway; the Borderland Highway; the Roosevelt Dam Highway; and the Grand Canyon–Nogales Highway.

The National Old Trails Highway, Ocean-to-Ocean Highway, and Borderland Highway were regional or national routes (see Figure 5). They were assembled from existing county roads strung together by local and state groups working cooperatively under national associations. The associations coordinated efforts to erect road signs to identify the routes, provide directions and mileage, publish road guides, and promote travel along the roads. Towns and counties along the routes were eager to cooperate, hoping that they might capture some of the business of lodging and feeding automobile tourists.

The National Old Trails Highway, which would eventually find fame as part of U.S. Route 66, was begun in 1911 as a project of the Missouri chapter of the Daughters of the American Revolution. After the initial route between St. Louis and Kansas City was established, road promoters in Missouri began working with like-minded groups in other states to establish a route between Washington, D.C., and Los Angeles.[7]

In 1913 the National Old Trails Highway Association announced the road's route through Arizona. Starting at Lupton near the New Mexico border, it followed the Santa Fe Railroad tracks across northern Arizona to Topock, at the California border. In fact there was not yet a passable road from Lupton to Holbrook, so an alternative route was established that entered Arizona east of Springerville and went through St. Johns to Holbrook, where it joined the main Old Trails route. Reflecting its location alongside the railroad, the National Old Trails Highway was also known in Arizona as the Santa Fe Highway.

For a time the National Old Trails Highway Association cooperated with a second road group, the Ocean-to-Ocean Transcontinental Highway Association, which was founded in 1911 by highway promoters from Arizona, New Mexico, and California. The Ocean-to-Ocean group favored an Arizona route that entered the state near Springerville and then headed to Phoenix via Globe and the Apache Trail (which ran between Roosevelt Dam and Mesa). From Phoenix the route passed through Buckeye and Arlington before following the Gila River to Yuma and California. Eventually the National Old Trails and Ocean-to-Ocean planners parted company, and the Ocean-to-Ocean promoters developed their own route.

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[7] Harold Ray Housley, "A History of United States Highway 66 in Arizona" (M.A. thesis, Arizona State University, 1996), 19-25.

The Borderland Highway was a regional route that connected El Paso and Los Angeles. It entered Arizona at Rodeo, on the New Mexico border, and passed through Douglas, Bisbee, and Tombstone en route to Tucson. From there it continued north through Florence and Florence Junction, where it turned west along the same route followed by the Ocean-to-Ocean Highway. Passing through Mesa, Tempe, downtown Phoenix, Buckeye, and Wellton, the road crossed the Gila River at Dome and the Colorado River at Yuma.

The Roosevelt Dam Highway was the Arizona Highway Department's name for the road connecting Mesa with Duncan, on the New Mexico border. Between Mesa and Rice, a small town located just east of Globe, this route was identical to that of the Ocean-to-Ocean Highway; at Rice it left the Ocean-to-Ocean route and angled southeast through Safford to Duncan, continuing on to Lordsburg, New Mexico.

On some maps this road is also identified as the Southern National Highway, a minor cross-country route established in 1913.[8] Little is known about this road in Arizona, but according to one source, the Southern National route was the same as the Roosevelt Dam Highway and the Ocean-to-Ocean Highway between Mesa and Arlington; west of Arlington the Southern National passed through Quartzsite and Ehrenberg before crossing the Colorado River and entering California.[9]

Arizona's other named road was the state's only truly home-grown highway: the Grand Canyon–Nogales Highway, which connected the south rim of the Grand Canyon with Nogales. From the Grand Canyon it passed through Flagstaff, Camp Verde, Prescott, Wickenburg, and Glendale en route to downtown Phoenix. From there it followed the Borderland route as far as Tucson, where it turned directly south toward Nogales and the border with Mexico. The Grand Canyon–Nogales Highway remained the state's principal north-south road, but the Prescott–Grand Canyon segment via Flagstaff and Camp Verde was soon eclipsed in popularity by an alternative route from Prescott to the canyon via Ash Fork and Williams.

The National Old Trails Highway, which was Arizona's most popular and heavily traveled road during this period, survived until the establishment of the federal highway system in the early 1920s. All of the other named east-west roads were either abandoned as named routes or incorporated into other, more successful cross-country roads: the Dixie Overland Highway, the Bankhead Highway, and the Lee Highway.

Development of the Dixie Overland Highway, which connected Savannah, Georgia, with San Diego, began in 1917; its western route through Arizona and California was decided

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[8] Richard F. Weingroff, "Dr. S. M. Johnson – A Dreamer of Dreams," Highway History, Federal Highway Administration, http://www.fhwa.dot.gov/infrastructure/johnson.cfm (accessed December 3, 2009).

[9] The Southern National may have had two branches in western Arizona, with the second following the Ocean-to-Ocean Highway through Yuma; see "Southern National Highway," http://academic.marion.ohio-state.edu/schul/trails/national/snh.html (accessed December 3, 2009).

in 1919.[10] The Bankhead Highway, which ran between Washington, D.C., and San Diego, was first proposed in 1916 and its route through Arizona announced in 1920.[11] Development of the Lee Highway, which also ran between the nation's capital and San Diego, began in 1919.[12]

In Arizona, all three of these named roads followed the same route as the Borderland Highway, which connected Rodeo, New Mexico, with Yuma and passed through Douglas, Tucson, and Phoenix. In addition, the Lee Highway established a northern branch in eastern Arizona that followed the Duncan-Mesa route originally known as the Southern National Highway and Roosevelt Dam Highway.

The Dixie Overland, Bankhead, and Lee highway associations were better-organized and their routes better-publicized than their predecessors. As a result, the earlier road names used in Arizona faded into obscurity, even as the routes themselves survived. One section of an early named road—the Ocean-to-Ocean Highway segment between Rice and the New Mexico border—was abandoned altogether as a named route.

These names, which evoked feelings of romance and history, were the principal means of identifying Arizona's highways well into the 1920s. When the State Engineer published his biennial report in 1918, he could describe Arizona's highway system only by referring to these named highways—there was no numbering system or even a consistent method of marking roads. Indeed, the only aspect of Arizona's highway system that was systematic was its coverage of the state: every county and county seat was served by at least one of the named roads.

FEDERAL AID COMES TO ARIZONA

Convinced that a modern highway system could never be built without tapping the federal government's financial resources, good roads activists in Arizona and other states for years had been lobbying Congress to fund the construction of state roads.

In 1914 the National Highways Association proposed a 50,000-mile national highway system and pushed the federal government to fund its construction; three of the roads in the proposed system would cross Arizona from east to west. "All attempts to develop roads by first building local roads have failed," a representative of the association stated. Referring to the success that railroads enjoyed in bridging the continent, he continued, "Not until trunk lines were built was there any material advance in road building. These trunk lines brought about the desire for and building of the local feeder lines. … It must be the same with roads."[13]

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[10] Richard F. Weingroff, "U.S. Route 80: The Dixie Overland Highway," Highway History, Federal Highway Administration, http://www.fhwa.dot.gov/infrastructure/us80.cfm (accessed November 25, 2009); "Dixie Overland Highway," American Roads, http://www.americanroads.us/autotrails/dixieoverland.html (accessed December 3, 2009).

[11] "Bankhead Highway," American Roads, http://www.americanroads.us/autotrails/bankheadhighway.html (accessed November 25, 2009)

[12] "Lee Highway," American Roads, http://www.americanroads.us/autotrails/leehighway.html (accessed November 25, 2009).

[13] "Announcement of Meeting of the Arizona Good Roads Association," 5.

To a limited extent, the federal government was already involved in road matters. However, the Office of Public Roads, which had been established in 1893 as the Office of Road Inquiry, had only an advisory role in highway affairs. It conducted technical studies on road building and advised the states on construction issues, but it had no regulatory or supervisory authority, nor any funds to expend directly on road construction. So far all attempts to give it such authority or funding had been defeated in Congress by opponents of federal funding for "local improvements" such as roads, who argued that such aid was unconstitutional.[14]

In the first decade of the 20th century, however, the opposition to federal involvement in highway construction was greatly undercut by four developments. First was the increase-ing popularity of good roads among farmers, who were a powerful political force in many states. Second was the inauguration of rural mail delivery (Rural Free Delivery, or RFD), which greatly increased the demand for better roads. Third was the rising popularity of the automobile, which needed improved roads in ways that draft animals and wagons had not. And fourth was a Supreme Court ruling, in 1907, that the federal government could in fact construct highways under its authority to regulate interstate commerce.

In 1916, advocates of federal involvement in road construction finally triumphed, winning passage of the Federal Aid Road Act, which committed the federal government to providing funds to the states for highway construction. To gain approval of the measure, good roads advocates agreed to a provision that left the states and counties in charge of the actual design and construction work. The primary role of the federal government, acting through the Office of Public Roads (soon to be renamed the Bureau of Public Roads), would be to provide funds and set technical standards for highway design.

The Federal Aid Road Act of 1916 was among the most important pieces of public works legislation in American history. It established a model for federal participation in highway development that prevailed for the remainder of the century. State highway officials submitted project proposals to the Office of Public Roads (OPR), which reviewed them for compliance with federal highway standards. Construction began only after OPR approval; federal funds for a project were released to the state only after its completion. Each state received a fixed amount of annual aid, which was determined by the OPR's budget, and reimbursement for each project was limited to half of its total cost.[15]

Arizona's initial share of federal aid funds was a modest $68,500, but that share grew quickly, rising to $890,000 in 1919 and to $1.3 million in 1920. Not all of this money was actually received by Arizona and spent by the highway department, however. The states were required to match any federal aid they received, and in some years property tax collections and legislative appropriations in Arizona were insufficient to match the federal contribution. In 1919 and 1920, for example, Arizona actually received only

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[14] Richard F. Weingroff, "Federal Aid Road Act of 1916: Building the Foundation," Federal Highway Administration, http://www.fhwa.dot.gov/infrastructure/rw96a.cfm (accessed April 23, 2009).

[15] The 1916 act is reproduced in *Third Biennial Report of the State Engineer* (Phoenix, 1918), 22ff.

$573,000 in federal aid—much less than it was eligible to receive, yet still a substantial new source of highway funding.[16]

Arizona would have received even less had the 1912 formula for funding state highways remained in effect. However, state officials quickly realized that capping the annual appropriation for the highway department had the effect of also capping federal aid, so they pressured the legislature to overhaul the state's highway funding scheme. This was done in 1917, when the legislature fixed the road tax at one mill, or 10 cents per $100 of assessed valuation, and eliminated the $250,000 cap on the revenue that could be collected from the tax.

Under the new law, the funds collected for the highway department increased dramatically, rising from $250,000 in 1916-17 to $697,000 in 1917-18 and $841,000 in 1918-19. The counties benefited as well, as the 75-percent fund (which was left intact by the 1917 legislation) swelled in size. Even allowing for these continued payments to the counties, the highway department was now receiving much more money than it had during the first few years of statehood.

At the same time, other state revenues were rising as well. Motor vehicle license receipts were increasing and would reach $160,000 by 1920. And the legislature was now willing to make additional annual appropriations for individual road and bridge projects—a tacit acknowledgment that even the new property-tax revenue formula was perhaps not as productive as needed. Taking all of these new revenue sources together—federal aid, increased property tax revenues and license fees, and appropriations—Arizona had more money to spend on highway construction and maintenance than ever before. In 1919-20, state highway revenues reached $1.58 million, of which $741,400 was given to the counties through the 75-percent fund.

With rising funding came more construction. In the eight years that had passed since statehood in 1912, Arizona had been able to construct 335 miles of "permanent" roads—a small portion of a state system that was slated to include 1,600 miles of roadway, but a major step forward nonetheless.

Most importantly, these new miles of roadway included Arizona's first stretches of paved highway. Drivers now could travel on asphalt or concrete along sections of the Bisbee-Douglas road, the National Old Trails Highway through Flagstaff and Winslow, the Tucson-Florence highway, and the Tucson-Nogales road. By far the longest segment of paved road in Arizona was the highway that ran through the Salt River Valley from Mesa, on the east, to Buckeye, on the west. It was here that three of Arizona's major roads—the Lee Highway, the Bankhead and Dixie Overland highways, and the Grand Canyon–Nogales Highway—converged, making it one of the most heavily traveled roadways in the state. By 1921, all but one mile of this 64-mile stretch was either paved with asphalt or concrete or under construction with pavement. The lone unpaved mile was at the Agua Fria River, where plans were being made for a new bridge.[17]

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[16] *Fourth Biennial Report of the State Engineer* (Phoenix, 1920), table following 108.

[17] "Longest Paved Highway in State," *Arizona Highways*, December 24, 1921, 5.

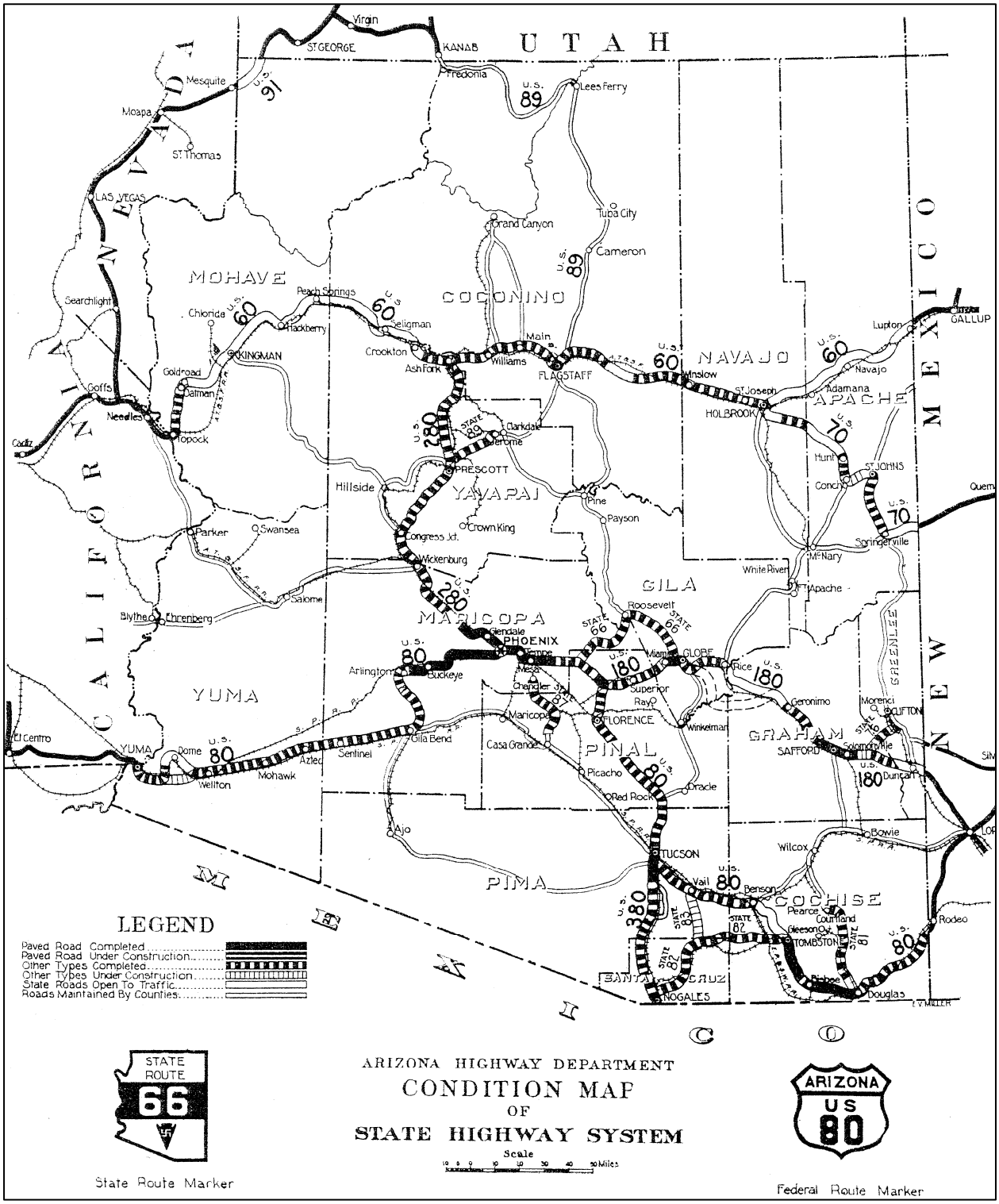

Figure 6. Arizona's Seven-Percent System, 1926.

This map of Arizona's state and U.S. highways was published just after the first highway numbers were assigned. Some of the numbers were later changed. From *Arizona Highways*, January 1926.

MARICOPA COUNTY'S ROAD BOND PROGRAM

The biggest road improvement success story in Arizona, though, was local. In 1919, Maricopa County voters approved a $4 million bond issue to pave 283 miles of county roads with concrete. It was, as *Arizona Highways* magazine observed, "the most ambitious county paving undertaking in the United States" and one that attracted "no end of interest among highway engineers the country over."[18]

Construction began in 1920. It soon became apparent that rising concrete prices would make it impossible to pave as many miles as originally planned, so a second bond issue of $4.5 million was proposed to county voters that year. It, too, was approved, and within a year the county had surfaced 125 miles of road, out of a total of 312 miles slated for paving under the expanded program.

Material costs remained high enough that the county was not able to complete as much paving as it had first hoped. Yet, it still was able to surface far more miles of roadway than any other county in Arizona. By 1927, Maricopa County had 277 miles of paved county roads. With the 82 miles of paved state highways that traversed the county, this gave Maricopa County a total of 359 miles of paved roadway—more than the rest of the state combined.[19]

Although the cost of these paved roads was high compared to earlier roads, county and state officials argued that paving projects paid for themselves over time. Unpaved roads exacted a hidden tax on drivers in premature tire wear, higher maintenance costs, and increased gas and oil consumption. Writing in *Arizona Highways*, which at the time was a road construction magazine rather than a travel magazine, highway official Ira Wood estimated that the unpaved road tax was 2.6 cents per mile. For the 82 miles of paved state highway in Maricopa County, Wood calculated, the 816,000 cars that traveled over them in one year "saved" $1.6 million—enough to pay for the paving of those 82 miles of roadway in less than two years.

CREATION OF THE SEVEN-PERCENT SYSTEM

The 1916 federal highway bill was not without its flaws, chief of which was its failure to require that new state highways be connected to each other in a system that efficiently served long-distance travelers. This oversight was remedied in 1921, when Congress passed a new Federal Aid Highway Act that significantly increased road funding for the states but also required that each highway department designate seven percent of its highway system as part of a national highway network. These roads, which soon were dubbed "seven-percent" roads, would be given first priority for federal funding.

When the 1921 legislation was passed, Arizona had 21,400 miles of county and state roads, so its initial seven-percent system was set up to include 1,453 miles of highway. Most of that mileage came from the state's existing highway system, and Arizona's initial seven-percent system included 9 out of every 10 miles of roadway that had been built by the Territorial and state governments since 1909 (see Figure 6).[20]

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[18] "Maricopa County Highway Program," *Arizona Highways*, December 24, 1921, 3.

[19] Ira L. Wood, "Eighty-Two Miles of Paving in Maricopa County Saves Car Owners $1,594,265 a Year," *Arizona Highways*, March 1927, 1.

[20] *Fifth Biennial Report of the State Engineer* (Phoenix, 1922), 19-23.

At first Arizona's seven-percent system consisted simply of the named highways set up in the 1910s. The National Old Trails Highway, or Santa Fe Highway, was incorporated into the system as the state's principal east-west road across northern Arizona; both the Holbrook-Lupton segment and the alternative route through Springerville and St. Johns were included. The Lee/Bankhead/Dixie Overland highways, which ran from Rodeo on the New Mexico border to Yuma, were included as the principal east-west highway across southern Arizona. The third east-west road was the northern branch of the Lee Highway, which ran from Duncan on the New Mexico border to Florence Junction.

The only north-south road in the seven-percent system was the Grand Canyon–Nogales Highway. At first the highway department proposed that the road follow Black Canyon between Prescott and Phoenix, along a route that more or less corresponds to the present-day alignments of State Route 69 and Interstate 17. This would have been a major departure from the established route of the Grand Canyon–Nogales Highway, which passed through Wickenburg, Yarnell, and Prescott. Although an increasing number of travelers used the Black Canyon route, which was then a county road, neither was a particularly good road and both were the subject of many complaints from Arizona drivers.

Yavapai County officials strenuously objected to the Black Canyon route, largely because the county had just issued $1.5 million in road bonds to pay for improvements to the highway's White Spar segment, which climbed through the Bradshaw Mountains immediately south of Prescott.[21] In the end, state and federal officials (who had to approve Arizona's seven-percent system designations) concluded it would be less expensive to improve the existing alignment through Wickenburg and Yarnell. This would remain the route of Arizona's principal north-south highway, U.S. Route 89, until well after the Second World War.

Once the seven-percent system was in place, the Arizona Highway Department's first goal was to improve Arizona's roads to the point where travelers could average 30 miles per hour. This was a daunting task, for many miles of Arizona roadways were not even surfaced with gravel. It also required a dramatic increase in expenditures compared to earlier years. Between 1922 and 1924, the state and counties together spent $6.4 million on highways, with nearly a third of those funds ($2 million) coming from the federal government. Without federal aid, much less progress would have been made on constructing and improving Arizona's highway system; from 1916 to 1924, the state received a total of $5.5 million in federal aid.[22]

Despite the accelerated spending, progress in improving the state's roads was slow. Of the 1,453 miles of highways in Arizona's seven-percent system in 1924, only 175 miles were paved with asphalt (39 miles) or concrete (136 miles). All of those paved roads were in and around the state's largest towns. Away from the towns, drivers could expect to find rougher conditions. Half of the state highway system (723 miles) was surfaced

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[21] The dispute over the route is briefly described in C. C. Small, "Prescott-Phoenix Highway Location," *Arizona Highways*, July 1925, 7.

[22] *Sixth Biennial Report of the State Engineer* (Phoenix, 1924), 262, 117.

with gravel, and more than a third of the system (555 miles) was not surfaced at all. At best these unsurfaced roads had been graded and drained; in some places, though, they remained unimproved.

NUMBERING ARIZONA'S HIGHWAYS

It was in late 1925 that the final step was taken toward setting up a modern highway network in Arizona. Following guidelines developed by the American Association of State Highway Officials (AASHO) and approved by the Bureau of Public Roads, the highway department assigned each of Arizona's highways a unique number, with the east-west roads getting even numbers and the north-south roads getting odd numbers (see Figure 6).[23]

The National Old Trails Highway, which ran from Lupton to Topock via Holbrook, Winslow, Flagstaff, Ash Fork, and Kingman, was initially designated U.S. Route 60. Soon thereafter it was renumbered U.S. Route 66. Under that number, as the celebrated Route 66 connecting Chicago with Los Angeles, this highway would become Arizona's most famous stretch of roadway. The Springerville-Holbrook alternate route of the National Old Trails Highway was numbered U.S. Route 70, a designation it would lose in the mid-1930s, when it was renumbered U.S. Route 260.

The Lee/Bankhead/Dixie Overland highways, which ran from Rodeo, New Mexico, to Yuma via Bisbee, Benson, Tucson, Florence, Phoenix, and Gila Bend, was numbered U.S. Route 80. This had been Arizona's first complete east-west highway, and now, as part of U.S. Route 80, it made up one section of the Southwest's most important highway, connecting El Paso with Tucson, Phoenix, and Los Angeles.

The northern branch of the Lee Highway, from Duncan, on the New Mexico border, to Phoenix via Globe, was designated U.S. Route 180; later, in the mid-1930s, it was renumbered U.S. Route 70.

Parts of the Grand Canyon–Nogales Highway were designated U.S. Route 380 (south of Tucson) and U.S. Route 280 (between Phoenix and Ash Fork), while a new highway from Flagstaff to Fredonia, on the Utah border, was designated U.S. Route 89. Soon the 380 and 280 numbers were dropped, and the entire highway from Nogales to Fredonia was made part of U.S. Route 89, which eventually would connect Mexico and Canada.

Arizona also began numbering its own highways. The first numbered state highways were State Route 79, from Prescott to Jerome; State Route 87, from Mesa to Casa Grande; State Route 88, which was the Apache Trail; State Route 83, from Vail to

[23] At first this numbering convention was inconsistently followed in Arizona, and some north-south roads were assigned even numbers; over time, though, it became the norm for all U.S. routes. A description of Arizona's initial numbering system can be found in *Arizona Highways*, February 1927, pages 11 and 14. In 1973 the AASHO changed its name to the American Association of State Highway and Transportation Officials (AASHTO).

Sonoita; and State Route 82, from Nogales to Tombstone via Patagonia and Sonoita. Several of these highways still bear the same numbers today.[24]

It was also at this time that the now-familiar symbols for U.S. and Arizona highways were adopted. Federal highways were marked with a shield, while state highways were marked with an outline of the state. The Arizona Highway Department also began putting up standardized road signs, under a system devised by the AASHO and approved by the federal government. These included octagons for stop signs, black-on-yellow diamonds for warning signs, and circles for railroad signs. As part of this signing program, all previous signs put up by the private highway associations and local governments were taken down.[25]

[24] See the map in *Arizona Highways*, February 1927, 14.

[25] E. V. Miller, "Signing of Arizona's Highways," *Arizona Highways*, February 1927, 11, 14 (map).

Table 1

Registered Vehicles, Highway Mileage, Vehicle Miles Traveled, and State Transportation Expenditures in Arizona, 1912-2005

Year	Population	Registered vehicles	State system mileage	Vehicle miles traveled (000s)	State transportation revenues ($)	State transportation expenditures ($)
1912	204,354	3,098	1,500	--	276,300	151,236
1915	--	7,318	--	--	401,072	455,160
1920	334,162	34,619	--	--	--	--
1925	--	67,924	1,853	256,000	--	--
1930	435,573	112,261	2,771	--	7,578,946	7,242,207
1935	--	108,445	3,091	930,931	6,294,643	--
1940	499,261	147,048	3,640	1,355,000	7,067,925	7,043,808
1945	--	154,975	3,825	1,573,000	--	--
1950	749,587	294,139	3,945	2,944,000	17,502,807	17,591,874
1955	--	445,688	3,975	4,415,000	26,710,215	25,805,440
1960	1,302,161	702,536	4,435	6,536,000	65,782,721	67,677,432
1965	--	942,063	5,225	8,339,000	113,642,639	99,227,278
1970	1,775,399	1,310,738	5,517	12,122,000	132,110,104	143,711,366
1975	--	1,691,357	6,023	16,031,000	168,875,556	171,479,686
1980	2,716,546	2,098,166	6,085	18,816,000	317,721,793	312,696,421
1985	--	2,283,832	6,119	29,052,000	499,032,000	470,704,000
1990	3,665,339	2,822,304	6,150	35,455,000	722,445,000	1,185,050,000
1995	--	2,945,574	6,137	39,566,000	883,812,000	852,181,000
2000	5,130,632	3,983,860	6,158	48,568,000	1,272,618,000	1,509,342,000
2005	5,952,083	4,556,448	6,157	58,796,000	2,764,499,000	2,980,277,000

Notes on Data

Unless otherwise noted below in the source notes, all data are for either the indicated calendar year or the fiscal year ending that year (1912-13 = 1913). The twin hyphens (--) indicate years for which data are not available.

State system mileage includes all federal and state highways but excludes county and forest roads.

Vehicle miles traveled (VMT) is an estimate, based on survey data, of the total miles traveled by all vehicles in the state for the year. It is the most commonly used measurement of highway "demand."

Both revenue and expenditure data are for the Arizona Highway Department (through 1970) and then for the Arizona Department of Transportation as a whole. Figures for the latter include some expenditures for aviation and urban mass transit.

Data Sources

Population — All data are from the U.S. Census for that year, except that the 1912 figure is from the 1910 Census and the 2005 figure is from the 2007 Census estimate.

Unless otherwise indicated, all reports listed below were published in Phoenix by the Arizona Highway Department or Arizona Department of Transportation.

1912 — Registrations (for October 1912–December 1913): *Report of the Secretary of State* (Phoenix, 1916). System mileage: *Report of the State Engineer* (1914), 5. Revenues and expenditures: *Report of the State Engineer* (1914), 82.

1915 — Registrations: *Report of the Secretary of State* (1916). Revenues and expenditures: *Second Biennial Report of the State Engineer* (1916), 256.

1920 — Registrations: *Report of the Secretary of State* (Phoenix, 1921). Revenues and expenditures: no single-year data available for this period (see *Fourth Biennial Report of the State Engineer* [1920]).

1925 — Registrations: *Factual Review* (1950), 11. System mileage: *History of the Arizona State Highway Department* (1939), 21. Miles traveled (for 1926): *Seventh Biennial Report of the State Engineer* (1926), 15. Revenues and expenditures: no single-year data available for this period (see *Seventh Biennial Report of the State Engineer* [1926]).

1930 — Registrations: *Factual Review* (1950), 11. System mileage: *History of the Highway Department*, 21. Revenues and expenditures (for 1930-31): *Factual Review* (1952), 57.

1935 — Registrations: *Factual Review* (1950), 11. System mileage: *History of the Highway Department*, 21. Miles traveled: *Factual Review* (1956), 73. Revenues: *History of the Highway Department*, 21.

1940 — Registrations: *Factual Review* (1950), 11. System mileage (for 1940-41): *Factual Review* (1952), 57. Miles traveled: *Factual Review* (1950), 9. Revenues and expenditures (for 1940-41): *Factual Review* (1952), 57.

1945 — Registrations: *Factual Review* (1950), 11. System mileage: *Factual Review* (1962), 41. Miles traveled: *Arizona Motor Vehicle Crash Facts* (1997), 4.

1950 — Registrations: *Factual Review* (1952), 66. System mileage: *Factual Review* (1962), 41. Miles traveled: *Motor Vehicle Crash Facts* (1997), 4. Revenues and expenditures: *Factual Review* (1952), 57.

1955 — Registrations: *Factual Review* (1956), 102. System mileage: *Factual Review* (1962), 41. Miles traveled: *Motor Vehicle Crash Facts* (1997), 4. Revenues and expenditures: *Factual Review* (1956), 49.

1960 — Registrations: *Factual Review* (1962), 113. System mileage: *Factual Review* (1962), 41. Miles traveled: *Motor Vehicle Crash Facts* (1997), 4. Revenues and expenditures (for 1960-61): *Factual Review* (1962), 71.

1965 — Registrations: *Factual Review* (1968), 127. System mileage: *Factual Review* (1966), 47. Miles traveled: *Motor Vehicle Crash Facts* (1997), 4. Revenues and expenditures: *Factual Review* (1966), 74-75.

1970 — Registrations: *Arizona Highway Commission Annual Report: Statistical Summary* (1971), 52. System mileage: *Arizona Highway Commission Annual Report [AHCAR]* (1971), 16. Miles traveled: *Motor Vehicle Crash Facts* (1997), 4. Revenues and expenditures (for 1970-71): *AHCAR* (1971), 18-19.

1975 — Registrations: *Factual Review* (1977), 47. System mileage: *Factual Review* (1976), 8. Miles traveled: *Motor Vehicle Crash Facts* (1997), 4. Revenues and expenditures: *Arizona Department of Transportation Annual Report* (1975), 19.

1980 — Registrations: *Arizona Transportation in Review* (1985), 29. System mileage: *State Highway System Log* (1981), 13. Miles traveled: *Motor Vehicle Crash Facts* (1997), 4. Revenues and expenditures: *Arizona Department of Transportation Financial Statements* (1980), 3, 15, 22, 28, 34, 40, 46.

1985 — Registrations: *Motor Vehicle Crash Facts* (1997), 3. System mileage: *State Highway System Log* (1986), 12. Miles traveled: *Motor Vehicle Crash Facts* (1997), 4. Revenues and expenditures: *Component Unit Financial Report* (1991), Table II, Table I.

1990 — Registrations: *Motor Vehicle Crash Facts* (1997), 3. System mileage: figures extracted from annual HPMS reports by Multimodal Planning Division, Arizona Department of Transportation (communication with author). Miles traveled: *Motor Vehicle Crash Facts* (1997), 4. Revenues and expenditures: *Comprehensive Annual Financial Report* (1998), 64-65.

1995 — Registrations: *Motor Vehicle Crash Facts* (1997), 3. System mileage: see note for 1990 above. Miles traveled: *Motor Vehicle Crash Facts* (1997), 4. Revenues and expenditures: *Comprehensive Annual Financial Report* (2000), 63-64.

2000 — Registrations: *Motor Vehicle Crash Facts* (2002), 3. System mileage: see note for 1990 above. Miles traveled: *Motor Vehicle Crash Facts* (2002), 3. Revenues and expenditures: *Comprehensive Annual Financial Report* (2000), viii-ix.

2005 — Registrations: *Motor Vehicle Crash Facts* (2005), 4. System mileage: *State Highway System Log* (2005), Va-4. Miles traveled: *Motor Vehicle Crash Facts* (2005), 4. Revenues and expenditures: *Comprehensive Annual Financial Report* (2005), 72-73.

ARIZONA'S HIGHWAY SYSTEM GROWS UP 1926-1945

By the mid-1920s, the Arizona Highway Department was not only the largest government agency operating in Arizona but also the largest employer in the state. Yet, one Arizona highway official would later refer to this period as the "dark ages" of road construction. Although Arizona was making great strides in designing and building highways, State Highway Engineer T. S. O'Connell wrote a decade later, "no intelligent method of financing the Highway Department had been established by the Legislature."[1]

As a result, increases in federal aid were not always matched by increases in state funding, which still depended on the modest one-mill property tax enacted in 1917. Highway construction expenditures had been steadily rising since 1912, yet much of the increase had been financed not by the state but by federal aid and county bond issues. The state's more populous and therefore wealthier counties, such as Maricopa and Yavapai, occasionally financed both their own highway projects and some state projects with large bond issues.

The less-populous counties, however, were either unable or unwilling to raise the funds needed to substantially improve their roads, let alone contribute to the improvement of the state highway system. As a result, many rural areas of Arizona were as underserved by highways as they had been during the final years of the Territorial period. In 1926, three counties—Apache, Mohave, and Greenlee—still had no paved roads.

The disparities in road conditions among the counties were striking. "Parts within the wealthy counties could be highly improved," one highway official wrote in 1928, "while in the majority of the counties they would be only fair or barely passable." Under those circumstances, he added, "criticism and abuse of the highway department and the officials became quite audible from all sides."[2]

REORGANIZING THE ARIZONA HIGHWAY DEPARTMENT

Responding to these complaints, the Arizona Legislature enacted a major overhaul of the Arizona Highway Department in 1927. The legislature created a five-member Arizona State Highway Commission and placed it in charge of the Arizona Highway Department, whose chief administrator was now known as the State Highway Engineer. To prevent the larger counties from dominating the commission, the legislation stipulated that no county could hold more than one seat on the commission.

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[1] T. S. O'Connell, "Highways in Review," *Arizona Highways*, January 1937, 18.

[2] I. Perle McBride, "The Arizona Highway Department: The Past, Present and Future," *Arizona Highways*, January 1928, 5-6.

The Highway Commission was given authority over the highway department's annual budget (which was required to itemize construction projects), highway location decisions, and construction contracts. Most importantly, the commission was given full control of all highway funds raised by the state. The State Road Tax Fund, and the 75-percent and 25-percent funds that had been used to divide road funds between the counties and the state, were abolished. They were replaced by a single State Highway Fund, which was to be funded through a $250,000 annual appropriation, a one-mill property tax, vehicle registration fees, and drivers' license fees. In addition, the fund would receive revenue from Arizona's first gasoline tax, which was set by the legislature at four cents per gallon, and its first common carrier taxes, which were imposed on bus and freight lines operating in the state.[3]

The impact of these funding changes was substantial. In 1927-28, the first year under the new system, the Arizona Highway Commission approved a $5.65 million budget that called for spending $3.3 million on highway construction and $2.35 million on maintenance. Although nearly half of the funding came from the federal government ($2.57 million), this still represented a major increase in state funding. In 1919-20, by comparison, the state had spent only $1.58 million on both construction and maintenance.

ARIZONA'S HIGHWAYS IN 1926

At the end of 1926, the year in which Arizona's highways received their first numbers and first standard road signs, the state highway system comprised 2,034 miles of roadway. Of those, 208 miles were paved with concrete or asphalt, 1,207 miles were surfaced with gravel, and 259 miles were graded and drained but not surfaced. The remainder of the system's mileage (360) was either unimproved or under construction.[4]

Arizona's primary roads—the state's seven-percent system—were the 1,452 miles of U.S. highways. These included all of the state's paved roads (208 miles), as well as most of its gravel-surfaced roads (790 miles). Yet, even a substantial portion of the seven-percent system (454 miles) remained unsurfaced, unimproved, or under construction.

In getting to this point, Arizona had relied heavily on federal aid. Between 1916 and 1928, Arizona used federal highway aid and other federal funds to build or improve 889 miles of highway. Granted, all but 153 miles of these new roads were unpaved, but this still represented a substantial addition to the makeshift system that had existed in 1916, when the federal aid program began.

"The State Highway System is generally considered to be in excellent condition and so much better than many of the States," W. W. Lane, the highway department's chief engineer, wrote in 1926. But he qualified that assessment with the observation that "this is mainly true in fair weather," and he expressed concern about the system's durability. In the previous year, Lane wrote, gasoline sales in Arizona had risen 18 percent and the number of cars using Arizona's highways was rapidly increasing. Lane estimated that Arizona and

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[3] A one-mill property tax is 10 cents per $100 of assessed valuation. See *Acts and Resolutions of the Third Special Session, Eighth Legislature of the State of Arizona, 1927* (Phoenix, 1928), 73-74, 77-78.

[4] *Seventh Biennial Report of the State Engineer* (Phoenix, 1926), 20, 27, 28.

out-of-state drivers logged 256 million vehicle miles on the state's roads in 1926, with some state highways carrying as many as 5,000 cars per day. Sounding a theme that would be repeated by many of his successors, Lane warned that some sections of the state system would have to be rebuilt or "the sections must go backward, as they are not now withstanding the traffic strain in spite of constant and expensive maintenance."[5]

Maintaining and improving Arizona's highways was not just a matter of convenience for drivers; the condition of the state's roads also had a significant impact on Arizona's economy. As Lane pointed out, Arizona's highways brought "many tourists and much prosperity to the State at large, and the welfare of the State is materially dependent upon the maintaining or betterment of these [road] conditions."

Tourism was increasingly important to Arizona's economy, and more and more of the tourists visiting the state were arriving by car rather than railroad. Indeed, automobile tourism had been growing in popularity all across the country during the 1920s. But the trend was especially noticeable in less-developed states such as Arizona, where even modest increases in tourist traffic could have a striking effect on the state's income.

According to one study conducted by the highway department, 385,440 out-of-state cars traveled to and through the state in 1928. If one assumed, as the department's planners did, that each car carried an average of 3.5 persons and that each person spent $3 per day, this resulted in an inflow of $20.24 million dollars. That figure was nearly four times the highway department's budget for that year ($5.65 million), which meant that "tourists in 1927 not only paid the cost of good roads … but the citizens of the state received a net dividend."[6]

FOREST ROADS IN ARIZONA

The federal highway aid program was not the only source of outside funding for improvements to Arizona's road system. Since 1916, Arizona had been receiving money from the federal government to survey, build, and maintain highways through the state's national forests. The sums were modest compared to the highway aid program—Arizona received just $715,000 in forest road funds from 1916 to 1923—and the projects were largely controlled by the U.S. Forest Service rather than the highway department. Yet, they still contributed to the improvement and expansion of the state highway system. The White Spar segment of U.S. 89 south of Prescott, as well as a segment of U.S. 66 east of Flagstaff, originated as forest road projects and then were incorporated into Arizona's seven-percent system.

By 1926, there were 862 miles of forest roads in Arizona. Some of these roads were fully funded by the federal government and built by one of its agencies, typically the Forest Service or the Bureau of Public Roads. One such road was the Clifton-Springerville highway, later called the Coronado Trail, which was completed in 1926 at a cost of $874,000.

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[5] *Seventh Biennial Report of the State Engineer*, 15-17.

[6] G. J. West, "Citizens of Arizona Derive Great Benefit from Good Roads," *Arizona Highways*, May 1928, 9.

Other forest roads were financed with both federal and state funds, with the highway department overseeing the construction work; most of these roads were among the 140 miles of forest roads incorporated into the seven-percent system. And, still other roads were built by the counties, which often ended up paying for the projects with their own funds, for the Arizona Highway Department preferred to use the state's forest roads appropriation to pay for improvements to the seven-percent system.

Although almost all forest roads were unpaved, and therefore less expensive to build than state or federal highways, expanding and improving the forest road network was nevertheless an expensive proposition. In 1928, when the state had 960 miles of forest roads, one highway official estimated that more than a third of that mileage was in substandard condition. Yet, improving those 342 miles of substandard roadway would cost Arizona $5.5 million, an amount far larger than its current annual forest roads appropriation of $279,000.[7]

As it turned out, forest road funding levels were significantly increased that year—Arizona's allotment nearly doubled—and Arizona was able to make substantial progress on its forest road network after 1928. By the end of the Second World War, there were 3,377 miles of forest roads in Arizona; more than half of that mileage was still unimproved, but a substantial portion (1,300 miles) had now been at least graded and drained.[8]

Over time some of these forest roads became important parts of the state highway system. In the late 1930s, the Coronado Trail was incorporated into U.S. Route 666, which at the time connected Douglas with the town of Sanders on U.S. 66. After the war, State Route 260 along the Mogollon Rim was assembled almost entirely from existing forest roads.

OILED ROADS IN THE 1920s AND 1930s

Although much progress had been made in improving Arizona's highway system, most of the highway department's efforts had been devoted to locating and grading new roads and new alignments. Paving those roads had been much less of a priority. Indeed, at the rate that Arizona was surfacing its roads in 1928, it would take years to pave every mile of Arizona's seven-percent system, let alone do the same for state highways. It also would be expensive. The department's chief engineer, W. W. Lane, estimated that it would cost $75 million to pave every mile of roadway in the state system. "With the present small population and valuation of the State," he said, "this figure is too great to be considered."[9]

At the same time, Lane conceded, something had to be done. "The present traffic has already taxed to the limit the present so-called gravel surfacing," he wrote, and "the dust alone is becoming a menace beyond our desire to admit, in addition to the discomforts of the corduroys and other objections."

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[7] "Importance of Hard Surfaced Roads in Arizona Stressed by Swift and Morrison," *Arizona Highways*, February 1928, 7; "Forest Road Funds," *Arizona Highways*, February 1928, 8.

[8] *Status of the Road Systems Mileage by Counties as of June 30, 1944* (Phoenix: Arizona Highway Department, Highway Planning Survey).

[9] W. W. Lane, "Oil Surfacing," *Arizona Highways*, May 1928, 7; West, "Citizens of Arizona," 9.

The highway department's solution to this dilemma was to oil the state's gravel-surfaced roads. "Low-type bituminous surfacing," as oiling was called by highway engineers, was originally conceived as a temporary treatment for gravel roads, but tests conducted by the Arizona Highway Department in 1928 showed that oiling lasted long enough to be considered a semi-permanent method of surfacing. "Oil surface is not a pavement nor will it replace a pavement duty, but for light traffic will serve as a pavement," Lane wrote. Most importantly, oiling cost about one-sixth as much per mile as did paving, and an oiled surface was cheaper to maintain as well.

The first segment of Arizona roadway to be oiled was on the Tucson-Nogales highway; this was done in 1928. Over the next few years, Arizona highway engineers conducted extensive testing on oiled roads, in the process developing a method of oiling that became known as the "Arizona Standard" and was adopted by other states.[10]

By 1933, the Arizona Highway Department had oiled nearly a thousand miles of roadway, making it the leading state in the West in treating its highways with oil. There were significant stretches of oiled gravel surface on every major highway in Arizona, including U.S. 66, 60, 80, and 89 (see Figure 7, p. 48). By counting oiled graveled roads as surfaced highways, the highway department was able to claim, at the end of that year, that all of the state's U.S. highways were "surfaced," with the exception of "a few short gaps" in U.S. 89 north of Flagstaff.

Although highway engineers did not always consider oiled gravel a type of pavement, over time the Arizona Highway Department came to equate the two, and its official maps in the late 1930s and early 1940s included oiled roads in the "paved" category. As one department official noted, "To the motorist [oil surfacing] serves every principal purpose of the finest 'high-type' slab, and underneath his wheels spin by with as much precision and ease as on the most expensive kind of roadway."[11]

He may have been right. When the last segment of State Route 87 south of Chandler was oiled in 1933, and it became possible for the first time to travel from Tucson to Phoenix without driving on a gravel road, it was seen as a cause for celebration. "An automobile journey which only a few years ago required tedious hours of jolting through vast clouds of dust may be made in comfort today at almost any speed the motorist desires," *Arizona Highways* noted in announcing the milestone.[12]

NEW DEAL ROAD-BUILDING PROGRAMS

Much of the oiling of Arizona's highways was done with funding provided by the many federal government programs set up to aid recovery from the Great Depression, which began in 1929. In many respects, the Depression actually benefited Arizona's highway system, as the federal government embraced highway projects as a preferred method of providing jobs to the unemployed.

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[10] "The Era of Oil," *Arizona Highways*, May 1933, 5; "Arizona Leads West in Oiled Roads," *Arizona Highways*, October 1933, 12.

[11] "The Era of Oil," 5.

[12] "Phoenix and Tucson Connected by Oil," *Arizona Highways*, June 1933, 3.

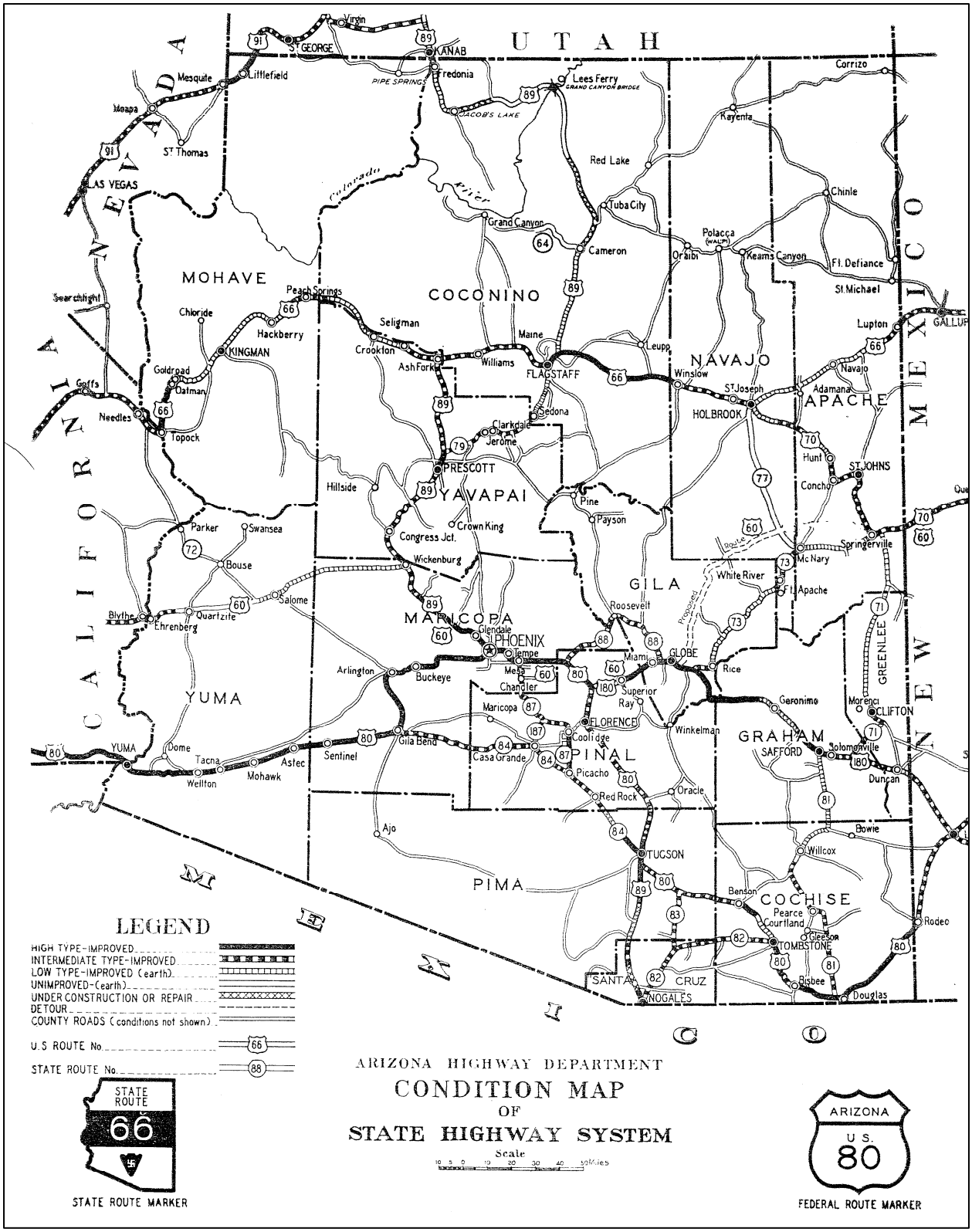

Figure 7. Arizona State Highway System, 1931.

From *Arizona Highways*, November 1931.

Among the earliest Depression programs, the Reconstruction Finance Corporation (RFC), established in June 1932, provided $1.5 million in grants and loans to Arizona. Most of that money was used to fund "work relief," which consisted of labor-intensive projects whose workers were selected from the ranks of the unemployed on the basis of need. The Bush Highway, which provides access to the lower Salt River northeast of Mesa, was built with RFC funding starting in 1933.[13]

The Civil Works Administration, established in November 1933 but lasting only a few months, financed nearly 400 projects in Arizona, of which more than 100 were highway and street projects; most of these road projects were carried out by the counties and cities.

The Federal Emergency Relief Administration (FERA), which was established in the spring of 1933, gave grants to the states for direct relief (welfare) and work relief. Road projects were a good way to provide jobs to the unemployed, so FERA made highway construction and improvement projects a major priority. In Arizona, state highway projects financed with FERA funds included improvements to State Route 79 between Jerome and Clarkdale and State Route 82 between Nogales and Tombstone. The FERA work relief program was effectively ended in 1935, when the Works Progress Administration, or WPA, was created.

Of far greater importance to Arizona was the Public Works Administration (PWA), which was established in 1933 to implement the public works component of the National Recovery Act. Taking on a role similar to that of the Reconstruction Finance Corporation, the PWA funded grants to the states for public works projects.

In 1933, the PWA gave Arizona $5.2 million for road projects. These funds made possible road improvements such as grading and draining (252 miles), oiling (277 miles), sealing (219 miles), and paving (11 miles), as well as widening shoulders, building bridges, and constructing grade-separated railroad crossings. In addition, the agency gave the state $4.84 million to be spent on road improvements in the national forests, national parks, and Native American reservations.[14]

In allocating the New Deal money it received from the federal government, the Arizona Highway Department concentrated on closing gaps in the state highway system and eliminating such hazards as dangerous railroad crossings, while at the same time spreading the funds around the state. Almost every incorporated city or town in Arizona that was served by the seven-percent system received at least some money for street improvements, however, the bulk of the PWA-financed street projects were undertaken in just a few communities: Douglas, Flagstaff, Phoenix, and Tucson.

Undoubtedly, the most famous of the New Deal public works programs was the Works Progress Administration, or WPA, which was established in 1935. Among the WPA

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[13] William S. Collins, *The New Deal in Arizona* (Phoenix: Arizona State Parks Board, 1999), 46-49.

[14] "Arizona's New Highway Program," *Arizona Highways*, August 1933, 6-7; Collins, *New Deal in Arizona*, 151-52, 158-61.

projects undertaken in Arizona, those related to roads and streets received more funding than any other category of work. Much of the WPA's road work in Arizona was done on city streets, with a particular focus on sidewalks, gutters, and curbs, but still a substantial portion went to improve highways and other rural roads as well.

From 1935 until 1940, when funding for the WPA in Arizona began to shift to defense-related projects, the agency funded the construction or improvement of 1,714 miles of roads and streets; most of that mileage was on rural roads, but it also included city streets and alleys and roads in national parks. WPA funding also was used to build or repair 272 bridges and viaducts; to install culverts, roadside drainage ditches, guardrails, traffic signs and striping, street and road lights, sidewalks, curbs, and gutters; and to landscape 465 miles of roadside.[15]

Several segments of Arizona's highway system were built or improved with WPA funding. These included the Douglas-Elfrida road, which later became part of U.S. Route 666; the Williamson Valley Road in Yavapai County, later part of State Route 96; the Clifton-Morenci road, later incorporated into U.S. Route 666; U.S. Route 60 between Miami and Globe; State Route 82 between Nogales and Patagonia; and U.S. Route 95 between Yuma and Somerton. U.S. Route 89 between Nogales and Tucson was also improved with WPA funding, as was U.S. Route 80 between Phoenix and Buckeye, U.S. Route 60-80 between Phoenix and Tempe, and the Black Canyon road.[16]

The most dramatic and celebrated Depression-era road project in Arizona was the construction of U.S. Route 60 between Globe and Springerville. Although, technically not a New Deal project—mostly it was funded with regular federal highway aid funds—it was the highway department's largest construction project of the Depression years. It opened the Mogollon Rim to travelers from central and southern Arizona, providing a major transportation link between the Salt River Valley and Show Low, Pinetop-Lakeside, Springerville, and central New Mexico.

In 1925, the U.S. Route 60 designation in Arizona had been given to the National Old Trails Highway, but that road was soon renumbered U.S. Route 66. The U.S. Route 60 number was resurrected in the early 1930s and given to Arizona's newest east-west highway, which was to run from Springerville, near the New Mexico border, to Ehrenberg, at the California border. It was part of a 3,053-mile route connecting Norfolk, Virginia, with Los Angeles—the nation's shortest transcontinental highway at the time.

Most of the Arizona portion of U.S. Route 60, which passed through Globe-Miami, Phoenix, and Wickenburg, was easily assembled from existing state and county roads. However, the segment linking Globe with Show Low had to be built entirely from scratch, and doing so required crossing the rugged canyon of the upper Salt River.

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[15] *Summary of Inventory of Physical Accomplishments by the Work Projects Administration, from July 1, 1935 to January 1, 1940* (Phoenix: Work Projects Administration, 1940), 14-17.

[16] "WPA Building Highways," *Arizona Highways*, February 1936, 6-7.

Work began in 1931, with the highway department concentrating first on opening the road from Globe to the Salt River. Once materials and machinery could travel over that stretch of road, work began on the steel bridge across the river. U.S. Route 60 was opened to traffic between Globe and the river in the fall of 1933, and the bridge was completed in mid-1934. "The work of getting into and out of the Salt River canyon on U.S. Route 60 is by far the heaviest continuous construction ever undertaken by this department," State Highway Engineer T. S. O'Connell observed in 1935. On one four-mile section of the road, he noted, contractors excavated 350,000 cubic yards of dirt and rock—enough to cover 54 football fields to a depth of 30 feet.[17]

By September 1936, all but 6 of the 137 miles of roadway between Globe and Springerville were completed or under construction. The last construction work on the project was completed in late 1938, but work on surfacing of the road—most of it was oiled rather than paved—continued until early 1941.

Together with U.S. Route 89 north of Flagstaff, the Salt River Canyon segment of U.S. Route 60 represented a new kind of highway, one built primarily to serve tourists. "Arizona, year by year, is depending more and more upon its tourist traffic and its winter and summer visitors, or, to put it another way, on its scenic and climatic attractions, for its annual income," *Arizona Highways* magazine observed in 1935. "Recognizing that important fact, the Arizona State Highway Department each year is extending its system of improved and paved roads into districts which offer a maximum of drawing power to tourist business, and it is employing every resource at its disposal to promote the use of those highways."[18] What was at stake for Arizona? Two years later, in 1937, the highway department estimated that 2 million tourists visited the state and spent $75 million—a valuable "tourist crop" that would only grow larger once the Depression had ended.[19]

ARIZONA HIGHWAYS ON THE EVE OF THE SECOND WORLD WAR

By 1938, the Arizona highway system had grown to include nearly 3,500 miles of highway. In just two decades, and with substantial financial support from the federal government—nearly $40 million in aid from various sources since 1917—the Arizona Highway Department had built a "modern" highway system. The state's tourist economy had been given a tremendous shot in the arm, and a foundation had been laid for the high-speed and high-capacity highways that would be built after the Second World War.

The work done in the preceding decade was impressive. Major bridges had been built over the Colorado River (Navajo Bridge) and Salt River (Mill Avenue Bridge). The Miami-Superior Highway had been opened, U.S. Route 60 had been cut through the Salt

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[17] "Millions to Build Arizona Highways," *Arizona Highways*, February 1935, 2. A football field is 6,396 square yards in area.

[18] "Highways and Better Housing," *Arizona Highways*, November 1935, 4-5.

[19] "Arizona's Highways," *Arizona Highways*, October 1937, 10.

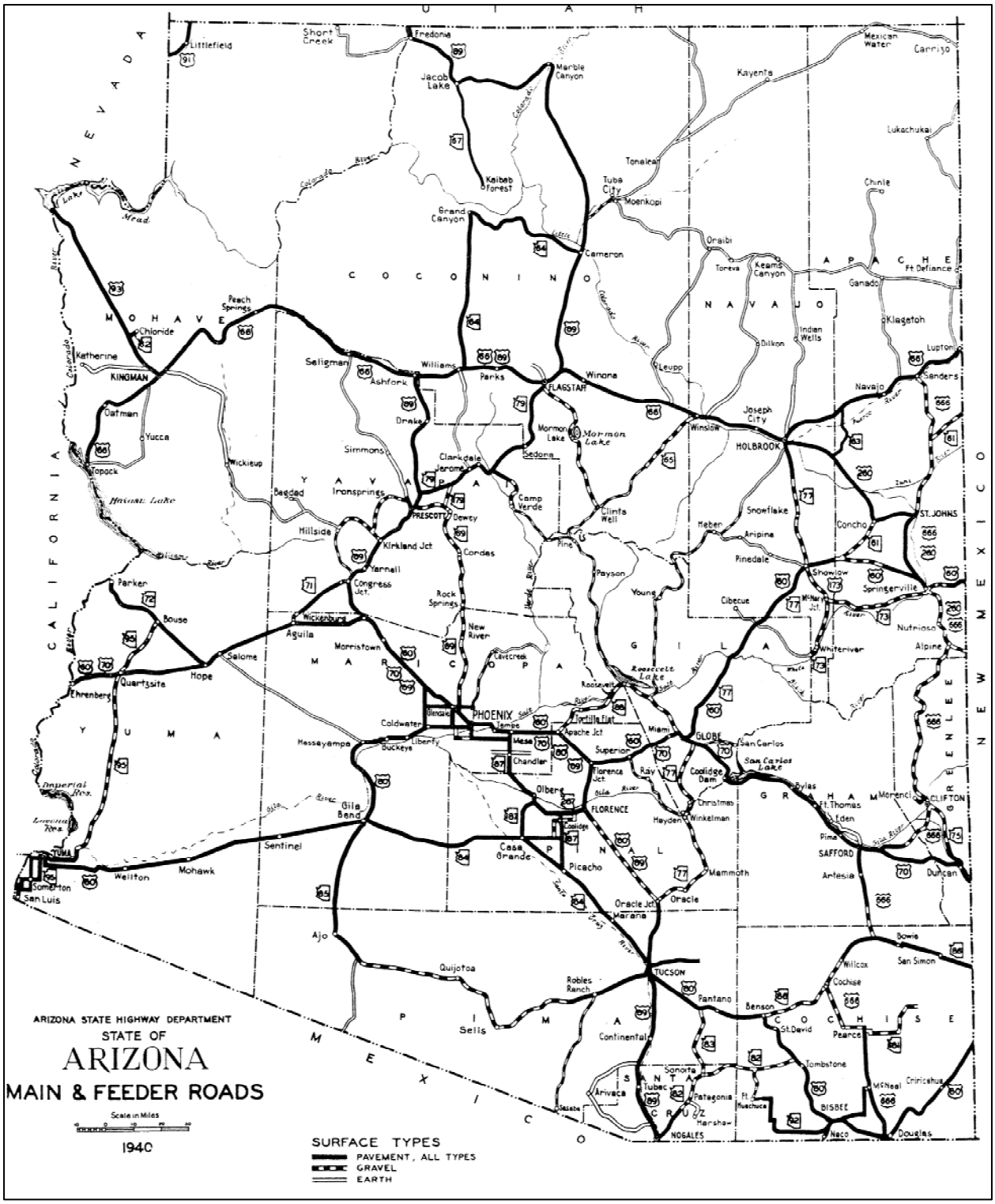

Figure 8. Arizona State Highway System, 1940.

From *Arizona Park, Parkway and Recreational Area Plan: Progress Report* (Tempe: Arizona Highway Commission, Arizona Resources Board, Arizona State College, 1941).

River Canyon, and U.S. Route 89 had been completed to Utah. Arizona motorists could now travel directly to Nevada over U.S. Route 93 and Boulder Dam (see Figure 8).

In just a decade, between 1927 and 1937, the Arizona Highway Department had either built or improved 3,144 miles of roadway—nearly 90 percent of the state highway system. Much of the system still lacked permanent pavement, for during that decade fewer than 50 miles of new asphalt- or concrete-paved highway had been built in Arizona. Nevertheless, road surfaces were vastly better than they had been a decade earlier, thanks largely to the department's oiling program, which had treated 1,676 miles of roadway.[20]

By the spring of 1939, all of the mileage in Arizona's two most important east-west roads, U.S. Route 80 and U.S. Route 66, was either paved or surfaced with oil. So was all of U.S. Route 70, which connected the Salt River Valley with New Mexico via Globe and Safford. On U.S. Route 89, the Mexico-Utah highway, all but the northernmost stretch between Jacob Lake and the Utah border was paved or oiled. Indeed, among Arizona's U.S. highways, only U.S. Route 60 and U.S. Route 666, which connected Springerville with Clifton and Douglas, still had substantial stretches of gravel surface, and these were not yet major travel routes.[21]

As much as Arizona's highway engineers might have wanted to rest on their laurels, though, significant challenges remained. Automobiles were getting larger, heavier, and faster, and this posed a problem for Arizona's roads. "Our greatest problem in this day of speed," the state highway engineer wrote in 1937, "is adequate design for present day traffic. You have heard often enough that road design is ten years behind the automobile."[22]

Because the highway department had, for most of the Depression years, devoted a large share of its resources to surfacing existing roads rather than building new ones, much of the mileage in Arizona's highway system now lacked up-to-date design features. Department officials had been very deliberate about this. Arizonans had at times been reluctant to pay for modern roads, they suggested, so one of their goals had been to stimulate the public's appetite for safer roads by gradually improving road standards each year. But now that it had succeeded in raising the expectations of Arizona motorists, the department was now faced with the prospect of having to replace roads that were less than a decade old.

"A road considered adequate as a first class highway several years ago is today dangerous," one highway department engineer wrote in 1937.[23] Whereas early roads from the 1920s had been built for speeds of 35 to 50 miles per hour, modern drivers now wanted to travel at 60 to 70 miles per hour. They also wanted wider lanes, paved surfaces, and bridges instead of dips that flooded with seasonal rains. "We really have but

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[20] "Ten Years of Road Building," *Arizona Highways*, February 1938, 2-4.

[21] "Road Map of Arizona, 1939," *Arizona Highways*, May 1939, back cover.

[22] "Highways in Review," *Arizona Highways*, January 1937, 19.

[23] Leslie McDougall, "New Highway Design," *Arizona Highways*, February 1937, 7.

a comparatively few miles of real modern highway," another engineer observed that same year. "Some of the roads built in the last year or two can be so classed but hardly any built prior to 1934 have all the safety features."[24]

IMPACT OF THE WAR ON HIGHWAYS

Those improvements would have to wait, for the Second World War brought highway work in Arizona almost to a standstill. Even before America's formal entry into the war, the federal government had been urging the states to concentrate their highway work on roads that served military installations or were otherwise considered critical for defense. Most WPA funding for road construction after 1940 was channeled to defense-related projects, and federal highway officials used their approval authority over each state's federal aid program to steer all highway work toward similar projects.[25]

This shift in emphasis was formalized with the Defense Highway Act of 1941, which was enacted just before the attack on Pearl Harbor. Replacing the peacetime federal highway aid bill, the 1941 legislation established a national Strategic Network of Highways and limited federal highway funding to roads that were part of that network. As a result, most wartime highway funds were spent on building and maintaining access roads to military bases, war industry factories, and mines that were deemed necessary to the war effort. One such project in Arizona was a segment of State Route 92 constructed between Fort Huachuca and State Route 82 to the north.

State funding for highways was affected by the war as well. In 1933, the Arizona Legislature had repealed the road property tax, leaving the Arizona Highway Fund dependent on the five-cent-a-gallon fuel tax, vehicle license fees, and various fees and taxes imposed on trucking companies, bus lines, and other "common carriers."[26] Once the war began, automobile travel in the state dropped precipitously, pulling down the gasoline tax revenues that Arizona depended on to finance road projects. For example, private vehicle traffic on U.S. Route 66, which was Arizona's most heavily traveled highway, was the same in 1942 that it had been in 1936. The main reason for the decline was gasoline and tire rationing, both of which were imposed nationally in 1942. Also, new cars were in very short supply during the war. After 1941 Detroit cut its civilian production by 94 percent, and fewer than a thousand automobiles were built each year from 1943 to 1944.[27]

Even if Arizona's highway revenues had remained stable, there would have been little that the Arizona Highway Department could have purchased with its funds. Most of the materials used to build highways—steel, petroleum for asphalt and tar, and cement—were declared essential to the war effort, all but ending their availability for stateside uses that were not defense-related. For example, most of the available asphalt and tar was used

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[24] E. V. Miller, "Building Safety Into the Highway," *Arizona Highways*, April 1937, 6, 23 (quote).

[25] *America's Highways, 1776-1976: A History of the Federal-Aid Program* (Washington, D.C.: Department of Transportation, Federal Highway Administration, 1976), 142ff.

[26] *History of the Arizona State Highway Department* (Phoenix: Arizona Highway Department, Highway Planning Survey, 1939), 32.

[27] *America's Highways, 1776-1976*, 147.

for maintenance to prevent the deterioration of "war transport arteries" and therefore was not available for new construction.

As a result, not only did new construction slow to a crawl, but maintenance on Arizona's highways also lagged well behind needs. The timing of the maintenance cutbacks could not have been worse, for the state's highways took a pounding from truck traffic, which mushroomed during the war. Defense contractors and the military shipped millions of tons of war materiel by truck, and many of those trucks carried loads that would have been illegal before the war. But a new uniform weight code was developed by the federal government in 1942, essentially forcing the states to accept heavier trucks, which only compounded the damage to their highways.[28]

One history of American highways has described the Second World War as "the end of the highway boom," by which it meant the more than two decades of uninterrupted highway construction that had followed passage of the first federal aid bill in 1916. Yet, even though the war effectively stopped highway construction, highway planners in the federal government and most of the states, including Arizona, were still looking forward to the time when road building would resume.

Much of their attention was focused on "superhighways"—roads with multiple lanes, limited access, and higher travel speeds. Just before the war, in 1941, an Arizona Highway Department engineer speaking at the annual Arizona Roads and Streets Conference had told his audience that the freeway would be "the next problem of the development of our highway system in Arizona." Not every prediction made by a highway planner comes true, but this one would soon prove to be correct.[29]

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[28] *America's Highways, 1776-1976*, 144-47.

[29] E. V. Miller, "Freeways," *Papers Presented at the Fourth Arizona Roads and Streets Conference…1941* (Tucson: University of Arizona and Arizona Highway Department, 1941), 30.

THE HIGHWAY BOOM YEARS
1946-1973

When the Second World War ended in 1945, few Arizonans would have predicted that a highway construction boom was about to begin. Despite the cessation of hostilities and wartime rationing, automobile manufacturers and highway contractors faced material shortages and rising labor costs. Many Americans expected a crippling recession such as the one that followed the First World War.

Yet, within a few years, Detroit had converted its production lines from armaments to motor vehicles, and automobile sales were rising. Americans began buying and driving automobiles in record numbers, imposing terrific strains on an outdated highway system. In Arizona the need for new road construction was especially pronounced. In addition to the maintenance backlog from the war, which required immediate attention, new roads would soon be needed to accommodate the dramatically higher traffic volumes.

ARIZONA HIGHWAY TRAFFIC SURGES

Few states in the nation experienced a postwar surge in traffic more acutely than Arizona. The war had brought a major influx of new residents to the state, thanks to the military bases and defense industries built here. Now, many of those transplants were choosing to stay in Arizona, and even more new residents were arriving each year. Together they fed a growth juggernaut that would, over the next five decades, dramatically transform the state and every facet of its economy.

By 1950, the state's population was nearing the 750,000 mark—an increase of 50 percent from 1940, when the state had just under 500,000 residents. Yet, that was only a prelude to the stunning growth that would take place over the next two decades. By 1960, there were 1.3 million Arizonans—an increase of 73 percent—and by 1970 the state's population had surged to 1.8 million. In just two decades, the state's population more than doubled, with most of the new residents settling in the Phoenix and Tucson areas (see Table 1).

The influx of new residents combined with changing patterns of automobile ownership to bring an even greater increase (at least in percentage terms) in the number of vehicles in Arizona. In 1945, at the end of the Second World War, just over 154,000 motor vehicles were registered in the state. In just nine years that number jumped to 413,000 (in 1954), and by the close of the 1950s it reached 649,000 (1959). From there the numbers only kept climbing, to 908,000 in 1964, 1.2 million in 1969, and 1.7 million in 1974.

Given the explosive growth in Arizona's population and vehicle registrations, it was hardly surprising that Arizona's streets and highways were flooded with traffic. The state's traffic woes were further compounded by an equally dramatic increase in tourist traffic. Arizona's tourism sector experienced record growth during the postwar years, as visitors poured in to visit the state's national parks and monuments, guest ranches, and resorts.

At the same time that traffic was increasing, automobiles were also getting larger and more powerful. To accommodate these new vehicles safely, Arizona's oldest roads needed to be widened, straightened, rerouted, and regraded. Most importantly, road surfaces needed to be improved. Arizona's oiled gravel roads, once the pride of the state, were now considered appropriate only for minor county roads and would have to be replaced by higher-quality asphalt highways.

POSTWAR MODERNIZATION PROJECTS

Fortunately the increases in traffic also brought higher gasoline tax revenues, giving Arizona the funds it needed to begin overhauling the state's roads. As a result, Arizona's highway system underwent major changes during the late 1940s and 1950s.

Some new roads were built during this period, but most of the Arizona Highway Department's efforts were focused on improving existing highways. Significant portions of U.S. Route 60 were rebuilt, most notably the Miami-Superior Highway, which was widened and moved to its present-day alignment in the early 1950s. U.S. Route 66, which received more funding than any other highway in Arizona during this period, was also significantly improved. More than 170 miles of U.S. Route 66 were rebuilt, including a new and safer alignment in western Arizona that was completed in 1952, bypassing the town of Oatman. Soon thereafter, the sections of U.S. Route 66 running through Williams and Winslow were divided into parallel one-way streets in hopes of easing traffic congestion in those towns.

Several postwar improvement projects were undertaken to accommodate increasing traffic between the Phoenix area and tourist destinations such as Prescott, Flagstaff, Payson, and Las Vegas. The Black Canyon Highway, which was now designated State Route 69, was realigned through Cordes Junction and paved between Phoenix and Prescott. Work also began on a new highway, State Route 79, to connect Cordes Junction with Flagstaff. It was completed in 1960, when the final section between Camp Verde and Flagstaff was opened. This road, which gave Phoenix its first direct highway connection with Flagstaff, would later be incorporated into Interstate 17.

The Beeline Highway, a valuable tourist artery connecting the Salt River Valley with the Mogollon Rim, was also reconstructed, with the first section opening in 1955. By 1958, the Beeline was paved as far north as Payson and incorporated into State Route 87, which later would be extended north to Winslow.

In western Arizona, the highway department undertook a decade-long project to build a new highway between Kingman and Congress Junction, which was located just north of Wickenburg. Designated State Route 93, the highway was opened in 1957 amid high hopes by Arizona officials that it would promote travel between Phoenix and Las Vegas.[1] Improvements were also made to U.S. Route 80 across southern Arizona and U.S. Route 89 between Nogales and Utah, and to a county road between Flagstaff and Valle, which

[1] "Kingman Celebrates State Route 93 Completion," *Highway Spotlight* 3, no. 3 (January 22, 1957), 2.

was located just south of the Grand Canyon. The Flagstaff-Valle road was opened in 1960 as State Route 164 and later renumbered U.S. Route 180.

THE "ROADS CRISIS" OF THE 1950s

Despite these improvements, Arizona's highway planners were struggling to keep up with ever-rising traffic volumes. As noted earlier, Arizona's population was growing rapidly, from 500,000 on the eve of the Second World War to 750,000 in 1950 and a projected 1.1 million by 1960 (the projections would end up being too low). Traffic volumes were rising even faster. In just a decade, between 1945 and 1955, the number of miles traveled each year on the state's roads more than tripled.

The highway department also was under pressure to keep pace with the rising expectations of Arizona motorists, who were less willing than before to follow slow vehicles on winding two-lane roads or sit in bumper-to-bumper traffic on crowded city streets. Somehow, the department's planners had to find a way to increase the capacity of the state's highways and accommodate the higher speeds that modern drivers clearly preferred.

Arizona was not alone in facing this dilemma, and there was a growing chorus of warnings from highway advocates of an impending national "roads crisis." Automobile ownership was exploding, yet, investment in the nation's highways was not keeping pace. As the gap between highway capacity and demand widened, some planners warned that traffic jams posed a threat not only to the nation's economy but also to its security. If a large city was threatened with attack by atomic weapons launched from the Soviet Union, they asked, how would Americans be evacuated if the highways leading out of their communities were clogged with traffic? Surveying the situation in the mid-1950s, President Dwight D. Eisenhower observed, "The obsolescence of the nation's highway system presents an appalling problem of waste, danger and death."[2]

CREATION OF THE INTERSTATE SYSTEM

Since the 1930s, the federal Bureau of Public Roads had been studying the feasibility of building a national network of high-speed four-lane "superhighways." Before the Second World War, the bureau's planners had sketched out a preliminary interstate network of such roads. The highway at the heart of these changes was something radically different. Access was controlled through entry and exit ramps. Intersecting streets and railroad lines passed over or under the highway. Traffic was separated and curves and grades were lengthened and made more gradual. The elimination of intersections and increase in sight lines reduced accident rates and smoothed traffic flow.

The nation's first superhighway, or freeway, was the Pennsylvania Turnpike, a cross-state toll road that was financed and constructed by the state of Pennsylvania and opened to travel in 1940. It was soon followed by four-lane toll roads in Maine, New York, New Hampshire, New Jersey, Ohio, Indiana, and Illinois. By 1955, it was possible to drive

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[2] William Kaszynski, *The American Highway: The History and Culture of Roads in the United States* (Jefferson, N.C.: McFarland, 2000), 163.

from New York to Chicago entirely on a controlled-access road, and to do so in dramatically shorter time than on other roads.

As fears of a national recession deepened during the early 1950s, highway construction projects were once again seen as a way to stimulate the nation's economy. Highway advocates in Congress and the White House dusted off the plans for an interstate highway system and began pushing for a federal highway bill that would finance it. However, while legislators and highway officials agreed on the need for new roads, they were far from united on how to administer and pay for such an ambitious program. When President Eisenhower in 1954 proposed a decade-long program to build interstate highways, it set off a two-year struggle in Congress over funding and whether the states or the federal government would be in charge of designing and routing the new Interstate system.

The stalemate was broken when the Interstate system's proponents, which included the oil, automobile, and trucking industries, dropped their opposition to user taxes and accepted the political reality that the new highways would have to be financed not from the general fund but by the nation's drivers. The Federal-Aid Highway Act of 1956 appropriated $25 billion to build the National System of Interstate and Defense Highways, and authorized funding construction on a pay-as-you-go basis.

To fund the new program, this landmark highway bill established the Highway Trust Fund to receive collections of taxes on gasoline, diesel fuel, tires, and trucks. To ease the pain of what amounted to a tax increase for drivers, the federal government promised to pay 90 percent of construction costs on all Interstate system projects.[3] The funds would be distributed by the Bureau of Public Roads and later the Federal Highway Administration (FHWA), which replaced the venerable bureau in 1967 and also took over its mandate for conducting highway research and setting design and construction standards.

The national highway system envisioned by the legislation was expected to comprise 41,000 miles of divided, four-lane, limited-access roads built to the highest design standards and capable of handling traffic projections for 1972, which was the target date for completion of the system. It was an ambitious program, and it would turn out to be the largest public works project in American history.

CONSTRUCTION BOOM OF THE 1960s

As far as Arizona's highway officials were concerned, the National System of Interstate and Defense Highways and its innovative funding mechanism, the Highway Trust Fund, were just what the state needed. Now the Arizona Highway Department could begin building the four-lane highways that its planners were convinced offered the best chance of handling the traffic volumes projected for the future.

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[3] Richard F. Weingroff, "A Peaceful Campaign of Progress and Reform: The Federal Highway Administration at 100," Federal Highway Administration, http://www.fhwa.dot.gov/infrastructure/rw93.cfm (accessed May 26, 2009).

In Arizona, the proposed interstate network included routes that would replace or supplement four of the state's existing U.S. highways: U.S. Route 66 across the northern part of the state, U.S. Route 80 across southern Arizona, U.S. Route 60 from Phoenix to California, and U.S. Route 89 from Nogales to Flagstaff.

Work on Arizona's portion of the Interstate highway system began in 1957. By summertime of that year the highway department had issued contracts for 60 miles of interstate. By 1961, the Arizona Highway Department had completed 156 miles of interstate highway, and it had opened an additional 97 miles of interstate highway as two-lane roads.

Arizona might have built even more miles of interstate roadway during this period, but progress on the system was slowed nationally by funding problems. The cost estimates for the Interstate system included in the 1956 highway bill turned out to be woefully short of the mark. Two years later, in 1958, Congress agreed to augment the Highway Trust Fund with a $1.8 billion appropriation from the federal government's general fund, but even that proved inadequate. Congress then approved a temporary increase in the federal gasoline tax, which was made permanent in 1961 following an exhaustive study on how to equitably allocate the costs of the system to those deriving benefits from it. Resulting legislation put interstate highway funding back on a sound basis.[4]

With federal aid pouring into Arizona's coffers during the 1960s, the highway department repeatedly broke monthly and annual records for the value of construction projects under contract. Spending on highway construction climbed from $61 million in 1961-62 to $109 million in 1966-67. It dropped somewhat after that, but still remained high by historical standards, as each year the state spent between $80 million and $90 million on new highway construction.

Most of the money for these construction projects came from the federal government. Between 1956 and 1970, federal aid accounted for $414 million of the $447 million spent by Arizona on construction of the Interstate system, which during this period accounted for about two-thirds of the state's highway building projects.

BYPASS CONTROVERSIES

Arizona highway officials were grateful for these funds, but one problem that funding could not solve was opposition to the highway department's proposed alignments for the state's interstate highways.

Arizona's interstate routes were designed to replace existing highways: Interstate 40 would replace U.S. Route 66, Interstate 10 would replace parts of U.S. Route 80 and U.S. Route 60, Interstate 8 would replace U.S. Route 80, Interstate 19 would replace U.S. Route 89 from Nogales to Tucson, and Interstate 17 would replace State Routes 69 and 79 between Phoenix and Flagstaff.

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[4] *America's Highways, 1776-1976: A History of the Federal-Aid Program* (Washington, D.C.: Department of Transportation, Federal Highway Administration, 1976), 480.

However, in some places along these new interstate routes, policies established by the federal Bureau of Public Roads required the alignments to be located away from existing highways. In part, this was done to secure the right-of-ways needed to build wider and straighter roads, but primarily it was done to establish the most direct routes between the state's most important cities and towns. As federal officials never tired of pointing out, the main purpose of the Interstate system was to move traffic as quickly as possible between the nation's centers of population.

Arizona's most controversial bypasses, as these new alignments were called, were on Interstate 10 and Interstate 40. Instead of having Interstate 10 follow U.S. Route 60 from Phoenix through Wickenburg and Aguila, Arizona highway planners proposed to build a new highway along a more direct route west of Phoenix—an alignment that came to be called the Brenda Cutoff. Wickenburg business interests protested the realignment, which they argued would decimate the town's tourism-based economy.[5]

Planners for Interstate 10 also encountered opposition to their proposal for a new alignment through Pinal County. Instead of passing through Casa Grande and Coolidge, as U.S. Route 80 then did, the new Interstate 10 would follow a more direct route midway between the two towns. This time the opposition came from farmers who objected to having their properties cut into triangular parcels by a new highway angling across their cotton and alfalfa fields.[6]

The most heated location controversy erupted around the highway department's plans to route Interstate 40 around, rather than through, every one of the towns along U.S. Route 66 in northern Arizona. All of those communities along U.S. Route 66 still had clear memories of the economic disaster that befell Oatman in 1952, when U.S. Route 66 was moved away from the town to a more direct route. Now business owners and officials in Holbrook, Winslow, Flagstaff, Williams, Ash Fork, and Seligman mounted a campaign to stop the Interstate 40 bypasses and thereby keep their communities from meeting the same fate as Oatman.

In the end, the federal government's emphasis on efficiency and reduced travel times prevailed over local sentiments in favor of supporting Arizona's small-town economies. The Brenda Cutoff was approved, though the economic blow to Wickenburg was softened by the state's promise to build a new highway between Wickenburg and Interstate 17, which would be designated State Route 74. The Pinal County protests were defused with minor adjustments to Interstate 10's alignment through the county's farmlands.

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[5] Starting in 1950, with passage of the Federal-Aid Highway Act for that year, state highway departments were required to hold public hearings on any federal aid road project that would bypass a town or city. In 1956 and 1958, that hearing requirement was extended to all federal aid projects, including all Interstate highways. See *America's Highways, 1776-1976*, 221, 371.

[6] "Willey Says All Sides of Controversy Will Be Aired at Meeting," *Highway Spotlight* 5, no. 19 (May 12, 1959), 3.

The complaints in northern Arizona were not so easily addressed. State legislators considered outlawing urban bypasses altogether, but stopped after they were warned by Arizona's congressional delegation that doing so might threaten the state's share of federal highway funds. Eventually, the Arizona Highway Commission approved an alignment for Interstate 40 that not only bypassed the towns, but followed a more direct route between Seligman and Kingman, leaving Peach Springs and several other communities miles from the new highway. To ease the pain of losing so much traffic and to give the U.S. Route 66 communities time to adapt to the change, the highway department promised to delay building the bypasses until the other sections of the highway had been completed in Arizona.

With most of the alignment issues settled by late 1961, and with federal funding stabilized at a higher level, the stage was set in Arizona for rapid progress on constructing the Interstate system. By 1967, just under half of the state's total interstate mileage was open to traffic, with almost all of the remaining mileage either under construction or being designed. Five years later, in 1972, the Interstate system was 79 percent complete in Arizona. In the summer of 1973, the Brenda Cutoff opened, bringing the state's completed interstate mileage to more than one thousand miles. That year also marked the completion of Arizona's first interstate highway, as Interstate 15, in the northwestern corner of the state, was opened to traffic.

NEW AND IMPROVED HIGHWAYS FOR TOURISM

Although interstate construction accounted for the majority of Arizona's highway construction budget—often as much as two-thirds of each year's expenditures—there was still much work being done on other roads in the state highway system. Venerable highways such as U.S. Route 60 and U.S. Route 89 were widened and realigned to improve capacity and safety. And new roads continued to be built as Arizona planners sought to accommodate escalating tourist traffic to regions of the state previously served only by county roads.

Much of this highway work was driven by the needs of Arizona's tourism industry, which became an increasingly important sector of the state's economy. Arizona had long been an attractive destination for out-of-state visitors eager to see the state's national parks, archaeological sites, and Native American reservations. Now Arizonans themselves were helping to swell the number of tourists on the state's highways. Maricopa County's population boom of the 1950s and 1960s (with increases of more than 300,000 each decade) combined with postwar affluence to produce an explosion in vacation home ownership and weekend tourism on the Mogollon Rim, around Flagstaff and Sedona, and in the vicinity of Prescott.

The new interstate between Phoenix and Flagstaff, Interstate 17, was expected to handle most of the Flagstaff-bound traffic. But vacationers headed to other weekend destinations would still have to travel on older two-lane highways that were certain to be overloaded with traffic. And, so to accommodate this surge in tourist traffic, the highway department improved or rebuilt most of the state's highways favored by tourists, including virtually every major road connecting Phoenix to northern Arizona. Many of these projects, which

were begun in the late 1950s and 1960s, were long-term efforts that continued into the 1970s.

In 1962, Flagstaff officials and business owners helped celebrate the opening of the Navajo Trail, a new highway built to connect U.S. Route 89 near Tuba City with Kayenta and the Four Corners region. Initially numbered State Route 164, but later incorporated into U.S. Route 160, it was built not just to facilitate tourism, but also to improve access to oil, coal, and uranium deposits then being developed on the Navajo Indian Reservation. Together, with another segment of State Route 164 opened two years earlier between Flagstaff and Valle, this highway helped cement Flagstaff's role as the gateway to the Grand Canyon, Utah, and the Four Corners.

That same year, 1962, a new highway in eastern Arizona, the Coronado Trail, opened to travelers between Springerville and Clifton. The culmination of a 10-year construction effort, the Coronado Trail was intended to open the White Mountains to tourists, anglers, hunters, and other outdoor enthusiasts. Later, the road was incorporated into U.S. Route 666.

Also completed in the early 1960s was the realignment and repaving of U.S. Route 89 from Flagstaff to Utah. This was needed to support the construction of Glen Canyon Dam on the Colorado River. Before contractors could haul construction equipment and supplies to the dam site, a new bridge had to be built across the Little Colorado River at Cameron and the highway had to be realigned and widened. The improved road also served the newly created town of Page, which was established to house workers at the dam construction site.[7]

The Oak Creek Canyon road, U.S. Route 89A, which connected Sedona with Flagstaff, was partially widened and repaved starting in the late 1960s—a project that continued through the 1970s and into the early 1980s. On U.S. Route 60, the Phoenix-Wickenburg segment was widened to four lanes in the mid-1960s. As a sign of changes to come, Arizona highway engineers also began adding passing lanes to Arizona's mountain roads. The first such lanes were built in 1969 on the Beeline Highway near Rye; three years later the Yarnell Hill section of U.S. Route 89 between Prescott and Wickenburg was realigned and widened to include passing lanes. To accommodate escalating traffic between Phoenix and Las Vegas, State Route 93 was extended south to Wickenburg in 1965, when it was also designated part of U.S. Route 93; a year later a new bridge was completed over Burro Creek.

Several new roads, all of which were important to Arizona's tourist economy, were opened in the early 1970s. State Route 95, from Parker to Lake Havasu City, was dedicated in 1971. Three years later, in 1974, State Route 260 was completed from Payson to Show Low. On this project, which stretched over 14 years, highway engineers turned a string of gravel roads into a modern roadway complete with passing lanes on many of the steeper grades.

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[7] "Glen Canyon Road Will Be Part of State Highway System," *Highway Spotlight* 2, no. 28 (July 24, 1956), 2.

Also in 1974, a brand-new highway between Interstate 17 and Wickenburg, State Route 74, was opened after a decade of construction. This road had been promised to Wickenburg after the town was bypassed by Interstate 10, and, was an attempt to divert some of the Phoenix-Flagstaff tourist traffic through the historic resort town, thereby compensating the town's businesses for the loss of the California-bound traffic.

ARIZONA'S FIRST FREEWAYS

The growth boom that Arizona experienced after the Second World War was unprecedented in the state's history. As noted earlier, Arizona's population grew from 750,000 in 1950 to 1.3 million in 1960 and then to 1.8 million in 1970, an increase of more than a million residents in only two decades. With this population growth came a corresponding increase in automobile ownership. In 1945, there were only 154,000 motor vehicles in Arizona. Fifteen years later that number had risen to 649,000, and by 1969 it had reached 1.2 million—a startling jump of 580 percent in just 25 years. This was accompanied by a sharp rise in the number of miles traveled each day by Arizona drivers, which increased from 2.2 million in 1945 to more than 13 million in the late 1960s.

Arizona's rapid postwar population growth, and the dramatic increases in automobile registrations and vehicle traffic that it brought, posed serious challenges to Arizona's cities and towns. In most Arizona cities these challenges could be met by raising the capacity of arterial streets, but in Phoenix this simple remedy would not work. Despite new street construction, travel times across the Salt River Valley continued to increase, as did congestion and traffic delays. Faced with the prospect of permanent traffic jams, transportation planners began planning the city's first freeways.

Phoenix's freeway system began in 1950, with the Black Canyon Freeway, a joint city-state effort designed to relieve rush-hour congestion in Phoenix and also to increase the capacity of State Routes 69 and 79, which connected the Salt River Valley to the Verde Valley and Flagstaff. By modern standards, the Black Canyon Freeway was a modest undertaking: a four-lane controlled access highway (the state's first) that began west of downtown and ran north for a few miles before merging back into the city's arterial street network. Its premiere feature was the state's first freeway interchange, which was built at Grand Avenue and completed by 1957.

By the time the Grand Avenue interchange had opened, the Interstate highway system was being planned by the federal government, offering Phoenix officials new resources that could be used to significantly expand their new freeway system. The Black Canyon was designated part of Interstate 17, which was planned to connect Phoenix with Flagstaff, and plans were announced for a second freeway, the Maricopa Freeway, which would become part of Interstate 10 between Phoenix and southern Arizona.

Work began on the Maricopa Freeway in 1958, and soon contracts for both new freeways were being issued on a regular basis. By 1961, more than six miles of the Black Canyon were open to traffic, from McDowell Road to Northern Avenue, and work was proceeding at a rapid pace. In late 1964, the combined Black Canyon–Maricopa freeway was dedicated from 16th Street to just north of the Carefree Highway. At a cost of $33.5

million for 30 miles of roadway—more than a $1 million per mile—it was by far the most expensive highway built in Arizona up to that time.

By 1968, the only section of the Maricopa not completed was the Broadway Curve, which was then under construction as Arizona's first freeway-to-freeway interchange. It was here that the Salt River Valley's third freeway, the Superstition, was planned to branch off eastward from Interstate 10 to Tempe and Mesa. The first section of the Superstition, extending east to Mill Avenue, was completed in 1971, the same year in which the Maricopa Freeway was finished.

With the completion of the Maricopa, Phoenix now had its first freeway—an uninterrupted, controlled-access highway running from Baseline Road all the way to the mountain foothills north of the city. Yet, city and state planners had much more in mind than just this single ribbon of roadway, which at this point did not directly serve downtown Phoenix. They envisioned a network of freeways, with loops and beltways bringing traffic into the city center and carrying it around its periphery. However, they soon ran into problems carrying out this ambitious plan, for freeways were not only costly and time-consuming to build but also controversial to locate.

Two segments of Interstate 10 were especially difficult to complete. One was the extension of Interstate 10 westward from the Black Canyon Freeway. Initially, this project was held up by the dispute over the alignment of Interstate 10 in western Arizona. Yet, even after the dispute was resolved in 1961, with the decision to build the Brenda Cutoff, actual construction of that segment of Interstate 10 was still delayed. As a concession to towns along U.S. Route 60 that were bypassed by the Brenda Cutoff, the Arizona Highway Commission agreed to delay construction of the new alignment until the early 1970s. This would give the communities time to prepare for the loss of valuable highway traffic to the new interstate.

Construction of Interstate 10 through downtown Phoenix proved to be even more difficult. Dubbed the Papago Freeway, this segment of Interstate 10 was to form an inner freeway loop that would connect the Maricopa and Black Canyon freeways to downtown Phoenix. By 1960, highway officials were buying land for the Papago's right-of-way, and when the Arizona Highway Commission confirmed the alignment in 1964, the project seemed well on its way to realization.

In 1969, the Highway Commission approved plans for an elevated Papago Freeway that would rise as high as 100 feet above street level—a design feature that was supposed to minimize disruption of the city's existing street and utility grid. However, opposition to the elevated freeway design soon emerged, and it gained significant momentum when the state's largest newspaper, the *Arizona Republic*, came out against the plan. Although federal officials approved the elevated plan in 1970, the controversy only intensified, creating a stalemate that would not be resolved for nearly a decade.[8]

[8] It was at about this time that the public hearing requirement for federal aid road projects was expanded. In addition to a location hearing, which had been required since the late 1950s, state highway

Tucson, unlike Phoenix, had not been planning to build any freeways before the Interstate highway system was announced in 1956, so, the routing of Interstate 10 and Interstate 19 through the city represented a major change in the city's transportation infrastructure. Construction of Interstate 10 through Tucson proceeded quickly and without major controversy, in large measure because its alignment avoided downtown Tucson, passing instead through the southern and western sections of the city. The entire roadway through Tucson was completed by 1967, as was its interchange with Interstate 19, which by then extended south to Nogales.

Encouraged by the completion of Interstate 10 and Interstate 19, Tucson officials wanted to expand the city's nascent freeway system. As early as 1960, transportation planners had proposed building another freeway through the city, and in 1966, they had announced plans for a freeway that would run eastward from Interstate 10 between Speedway Boulevard and Grant Road. This proposal, however, was defeated by fierce local opposition, establishing a pattern that would be repeated in Tucson on many later occasions.

Responding to the opposition, and hoping to defuse it, Tucson officials in 1968 announced a plan to build a system of "parkways" that would carry high-speed traffic directly into the center of the city. The parkways would not be controlled-access highways; instead they would be four-lane roads with limited access but also grade-level intersections with signals. The initial parkway system comprised three new roads: the Butterfield Parkway, which would serve as an inner loop connecting Interstate 10 with the downtown; Interstate 710, which would connect the Butterfield to the Tucson airport; and the Rillito-Pantano Parkway, which would run from the Butterfield northwest along the Rillito River to Interstate 10. This plan was received no more eagerly than the earlier freeway proposal, however, and by 1970 it was unclear when, or even if, Tucson would get its next freeway.

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departments were required after 1969 to hold a second hearing on the design of each proposed roadway, giving opponents of the Papago additional leverage. See *America's Highways, 1776-1976*, 221, 371.

MEETING THE CHALLENGES OF GROWTH 1974-1990

As far as Arizona's highway planners were concerned, there was no reason to believe that the state's dramatic growth rate during the 1960s would not be repeated in successive decades. And, in terms of population growth, they were not disappointed. Arizona's population increased 53 percent during the 1970s and 35 percent in the 1980s, which meant that almost a million new residents moved into the state each decade, bringing the state's population to 3.7 million by 1990.

In terms of highway construction, though, the 1970s marked the end of the freewheeling boom years. Arizona was able to continue building highways during this decade, but only against a backdrop of uncertainty and change in the highway construction business. In 1972, Congress failed to renew the annual federal aid legislation, temporarily cutting off highway funds to the states—the first interruption in federal highway aid since 1916. Furthermore, the Nixon administration impounded already-appropriated highway funds in an effort to quell inflation. As a result, $123 million in federal aid promised to Arizona and expected by state highway officials was kept in Washington.

A new federal highway bill was finally passed in 1973, and the impounded funds were eventually released to the states. But the funding interruptions could be viewed as a warning to states like Arizona, which depended on federal highway funds to provide as much as three-fourths of its road construction budget.

CREATION OF THE ARIZONA DEPARTMENT OF TRANSPORTATION

Even with the restoration of federal highway aid, the Arizona Highway Department was still forced to institute a hiring freeze and reduce spending on everything except new highway construction, which was spared cuts to avoid further delays in the completion of the Interstate system. However, the department could not avoid trimming its five-year construction budget, raising the possibility that the construction slowdown would continue well into the future.

To keep the state's highway construction program from being compromised by these budget reductions, the Arizona Legislature in 1973 passed legislation allowing the state to finance road construction with revenue bonds, which could be repaid with future tax receipts. That same year, legislators also voted to combine the Arizona Highway Department with the Arizona Aeronautics Department.

The new agency, the Arizona Department of Transportation (ADOT), was given authority over the state's highways and state-owned airports, as well as a role in planning aviation, mass transit, bicycle, and even pedestrian facilities. As part of this reorganization, the Arizona Highway Commission was abolished and replaced by the

Arizona Transportation Board, which henceforth would be responsible for highway construction and policy decisions at the state level.[1]

A year later, in 1974, the legislature established the Highway Users Revenue Fund (HURF). From now on, all of the highway revenues previously collected by the highway department would be deposited into the fund, with one-third reserved for local governments. This represented an important shift in funding priorities. Counties and cities had always received a modest portion of the state's gasoline tax revenues, but this new distribution promised them substantially larger sums. And, because the distribution of HURF monies would be based on both population and gasoline tax collections, it was certain to bring a marked tilt in funding toward the Phoenix and Tucson metropolitan areas.

As far as urban officials were concerned, the shift was long overdue. Ever since the boom years of the 1950s, Arizona's cities had been absorbing the bulk of the state's population growth, yet highway spending had been concentrated on the Interstate system, most of which served rural areas and did little to solve urban traffic problems.

THE ENERGY CRISIS OF THE 1970s

The early 1970s also brought the Arab oil embargo of 1973 and America's first major energy crisis.[2] The inflation sparked by high energy costs raised highway construction costs at exactly the same time that Arizonans were cutting back on their driving, which led to declines in the gasoline tax revenues that funded road construction in Arizona. The state managed to survive this shock without cutting its highway construction expenditures in absolute terms. However, with each dollar of highway expenditure buying less actual construction work, Arizona highway officials were forced to postpone completion of the Interstate system.

Responding to the drop in gasoline tax revenues, Arizona lawmakers in 1974 raised the tax by one cent per gallon—the first increase since 1966. Yet, highway revenues in Arizona still declined when adjusted for inflation, and planners were soon predicting that the energy crisis would permanently change driving habits. Furthermore, they expected conservation measures such as the new 55-mile-per-hour speed limit to also permanently reduce gasoline sales.[3] Unless the gasoline tax was raised again, they warned, Arizona would have to scale back its road construction program and institute a "bare-bones" maintenance schedule.

Despite these concerns, Arizona managed to keep its highway revenues and expenditures from eroding significantly, and in the end the slowdown in highway construction

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[1] *The ADOT Story* (Phoenix: Arizona Department of Transportation, Public Information Office, 1986).

[2] The oil embargo was launched in October 1973 by Arab members of the Organization of the Petroleum Exporting Countries (OPEC) against countries, including the United States, that supported Israel in the 1973 Arab-Israeli War. The embargo, which ended in March 1974, resulted in significant oil price hikes and supply shortages.

[3] "Road Costs Rise Again," *Highway Spotlight* 20, no. 24 (June 14, 1974), 1.

spending was relatively brief. There were a few decreases in the construction budget from year to year, but the trend in spending was steadily upward. Expenditures began to rise again in 1974, and by 1975 highway spending was setting new records. Three years later, in 1978-79, the state spent $157 million on highway construction—almost double the $83 million it had spent just six years earlier, in 1972-73.

Rising prices were still a problem, though, as the national inflation rate reached a high of 11.2 percent during this period, but most budget problems were softened by the state's rapid growth. During the 1970s alone almost a million newcomers arrived in Arizona. Even if Arizona drivers cut back on their gasoline purchases, and even if inflation cut into state and county construction budgets, the losses were largely offset by the revenue gained from so many new residents buying gasoline and registering vehicles.

PROGRESS ON THE INTERSTATE SYSTEM

In 1978 Arizona highway officials celebrated their most productive year since beginning work on the interstate program 22 years earlier. Two of the state's interstate highways were now completed: Interstate 17 between Phoenix and Flagstaff and Interstate 8 between Yuma and its intersection with Interstate 10 just south of Casa Grande. A third, Interstate 19 between Tucson and Nogales, was open to traffic, with only minor additional work remaining to be completed the following year.

The final rural segment of Interstate 10 west of Phoenix was opened to traffic in 1978, as was the new alignment of Interstate 40 between Seligman and Kingman. Both of these interstates were now largely finished and open to travel. All that remained to be built were four bypasses on Interstate 40 and the final segment of Interstate 10 through central Phoenix. Work on the Interstate 40 bypasses continued for the next six years, with the last bypass completed in 1984 at Williams. By then work on the Papago Freeway segment of Interstate 10 was finally underway, following the resolution of a long-running dispute over its alignment and design.

The dispute over the Papago Freeway first erupted in 1969, when planners proposed an elevated freeway that would run along the north edge of downtown Phoenix. That plan was shelved in the face of public opposition, and it was not until 1977 that a new design was approved, this time for a freeway that ran partly underground. By then, rapidly escalating right-of-way costs along the proposed route had further slowed the project, and construction work did not begin until 1983.

The Papago Freeway through central Phoenix was completed in 1990—the last segment of Interstate 10 to be built and the longest-running single highway project in Arizona history. The $1.2 billion spent over the life of the Interstate 10 project in Arizona, between 1957 and 1990, also made it the most expensive construction project in the state's history.[4] Indeed, the Papago Freeway was one of the most expensive segments of interstate highway anywhere in the nation, and the cost per mile to build Interstate 10 through Arizona was by far the highest among the states served by that highway.

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[4] As always with comparisons of construction costs over time, inflation accounted for some of the increase.

Ironically, the first part of Interstate 10 to be built nationally—a four-lane bridge across the Colorado River—had also been in Arizona. Now, 33 years after opening that bridge, Arizona officials could finally celebrate the conclusion of the state's newest east-west highway.

THE FUNDING GAP OF THE 1980s

The gains in highway revenue experienced by Arizona during the mid-1970s were only temporary. The energy crisis returned following the Iranian revolution of 1979, and it only intensified with the onset of the Iran-Iraq war a year later. As gasoline prices reached their highest levels ever, Arizonans again responded by cutting back on driving and buying less gasoline. Just as planners had earlier predicted, gasoline tax revenues dropped, as did the balances in the Highway Users Revenue Fund.

The state's highway construction budget stagnated, with spending in 1983 remaining at the same level as in 1980. The problem was compounded by the fact that construction costs were still rising, not only from inflation, but also because some of the state's largest road projects—bypasses around the towns on Interstate 40 and construction of Interstate 10 through Phoenix—were being built in populated areas, where right-of-way, utility relocation, and traffic management expenses were high.

Finally, in 1982, the Arizona Legislature approved a series of increases in the state gasoline tax that eventually brought it to 18 cents per gallon in 1991. Yet, these increases were still not sufficient by themselves to allow Arizona to close its highway "funding gap." When adjusted to account for inflation, Arizona's gasoline tax was still lower in real terms than it had been in the mid-1960s.

The funding problem was especially acute in the Phoenix and Tucson areas. Arizona highway planners were now warning that it would take decades to amass enough gasoline tax revenues to build the freeways that highway advocates said those cities needed. As Arizona's population expanded beyond all previous expectations—2 million new residents moved to the state during the 1970s and 1980s—it was the cities that absorbed most of the growth. With the arterial streets in the Phoenix and Tucson metropolitan areas increasingly congested, some way had to be found to move these new residents around.

MARICOPA COUNTY FREEWAYS

Although three freeways had been officially opened by 1971—the Black Canyon, Maricopa, and Superstition—in reality there was only one substantial freeway, the combined Black Canyon–Maricopa. Built as part of the Interstate highway system, the Black Canyon–Maricopa now allowed uninterrupted travel from the southern edge of the Phoenix metropolitan area to its northern edge.

Various plans had been floated since the late 1950s for a much larger freeway network, including one published in 1960 that bore a striking similarity to the system that exists in the Salt River Valley today. However, the public support needed to support funding for such an ambitious system was squandered in a series of freeway controversies. As a

result, projects were abandoned or postponed, leaving large parts of the Salt River Valley without any controlled-access highways, a lack that was most keenly felt in the Valley's westernmost communities and in Scottsdale.

It was the drive to complete Arizona's Interstate system that kept Phoenix's freeway dreams alive. Opponents of the Papago Freeway segment of Interstate 10 tried one last time to block the highway's construction in 1979, but Phoenix voters that year soundly defeated a proposal to abandon the city's freeway program and commit to improving its arterial streets. Construction of the Papago Freeway began four years later, in 1983, with most of the freeway through central Phoenix located below street level. For a six-block section straddling Central Avenue in downtown Phoenix, the freeway was placed underground, beneath a large park. The new design also added high-occupancy vehicle lanes and included space for future transit facilities.

By 1986, the Papago was completed in west Phoenix and work was underway on "The Stack," the soaring interchange of Interstate 10 and Interstate 17. Over the next four years, construction crews worked steadily on the Papago, and, in August 1990 the last section, between Seventh Street and Seventh Avenue, was opened with a ceremony that marked the completion not only of a controversial freeway project, but also, of Interstate 10 in Arizona. The Papago was the most expensive highway project ever undertaken in Arizona, having cost $500 million to build and $150 million to acquire the right-of-way.

Meanwhile, plans to build a new freeway serving Paradise Valley and northeast Phoenix were also controversial. The proposed Squaw Peak Parkway ran into opposition not only from local residents but also from the Phoenix Parks and Recreation Board, primarily because the freeway was to be routed through Dreamy Draw in the North Mountain Preserve. Supporters of the Phoenix park system managed to place an initiative on the 1984 election ballot that would have terminated the Squaw Peak project, but it was defeated by voters and construction soon began.

REGIONAL AREA ROAD FUNDS

With work on the Papago and Squaw Peak underway, Phoenix finally seemed poised to get the freeways that most of its residents desperately wanted. The problem that remained was how to finance the new roads. At the rate construction was proceeding, it would take decades to build the ambitious freeway system that transportation planners had been arguing was needed in the Salt River Valley.

Several years earlier, in 1980, the Maricopa Association of Governments (MAG), a regional planning authority, had devised a freeway plan that proposed not only alignments but also a construction schedule and a mechanism for deciding which freeways should be built first. If a new source of financing could be found, MAG suggested, a comprehensive freeway network could be built rather quickly. By now freeway advocates were convinced that a special sales tax was needed, one whose proceeds would be committed to transportation projects.

Recognizing that a funding source dedicated solely to urban road construction was needed, the Arizona Legislature in 1985 agreed to let counties impose special road taxes, much as they had done many years before, when road construction was funded largely by county-wide property taxes. This time, though, the funding mechanism would be a sales tax. The monies thus collected would be placed in a Regional Area Road Fund, which would be administered by the state and used to build and improve highways, streets, and freeways in the county where they were collected. The selection of construction projects would be guided by a five-year transportation plan developed by the county.[5]

In Maricopa County, highway officials proposed to voters that a half-cent transportation sales tax be enacted. In two decades, planners argued, the tax would generate $8.5 billion in revenue—enough money to build 233 miles of controlled-access highway, which would quadruple the freeway mileage in the metropolitan area. Voters concurred and the tax was enacted.

The passage of Maricopa County's transportation sales tax marked the end of an era in more ways than one. It represented the abandonment of Arizona's long-standing practice of relying primarily on user taxes and fees to fund the state's share of highway construction costs—that is, on fuel and tire taxes, vehicle licensing fees, and driver licensing fees. Now every county resident, including those who did not drive or own vehicles, would pay for the new roads. In part this was a way of extracting funds from tourists, who everyone agreed contributed to traffic congestion.

Passage of the transportation tax also reflected Arizonans' increasing preference for the sales tax as a source of funding for government activities at every level. It also led to a shift in the state's construction priorities. Building new rural highways would no longer be the main goal of the Arizona Department of Transportation; now ADOT would devote more attention to easing traffic congestion in urban areas.

Of the remaining fourteen counties in Arizona, three have since enacted a sales tax dedicated to transportation funding. In 1986, Pinal County enacted a half-cent transportation tax to be used for highway, street, and bridge improvements, and in 1994, Gila County did the same. After turning down transportation sales tax proposals in 1986 and 1990, voters in Pima County approved a half-cent transportation tax in 2006.

RETIRING OLD HIGHWAY NUMBERS

During the 33 years it had taken to build Arizona's Interstate system, the state's highway map had been significantly redrawn. As in the 1920s, when Arizona's first highway numbering system was established, some highways long familiar to Arizona travelers were retired or renamed.

U.S. Route 66 was decommissioned in 1985 to make way for Interstate 40, which replaced the old highway along most of its route through Arizona. Parts of historic U.S.

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[5] "Introduction to the Phoenix Urban Area Regional Freeway System," Arizona Department of Transportation, Intermodal Transportation Division, http://www.azdot.gov/highways/RFS/History.asp (accessed May 5, 2009).

Route 66 still remained, including the segment between Seligman and Kingman, and these were renumbered State Route 66. U.S. Route 80 was decommissioned in Arizona as well, having been largely replaced by Interstate 10 and Interstate 8; its remaining segments in southeastern Arizona were renumbered State Route 80.

U.S. Route 89, which had once been the most important north-south highway in the state, was replaced along some stretches by Interstate 19 and Interstate 10. Those segments of U.S. Route 89 not incorporated into the Interstate system lost much of their traffic, especially in northern Arizona, where Interstate 17 now carried most of the travelers between central and northern Arizona. The U.S. Route 89 designation eventually was dropped from all but the northernmost segment of the road, between Flagstaff and Utah, and the remaining sections of the highway through southern and central Arizona were renumbered State Route 89.

Of Arizona's original federal highways, only U.S. Route 60 survived more or less intact, with just a small section incorporated into Interstate 10 in western Arizona. Later, in the 1990s, most of the urban segment of U.S. Route 60 through Mesa, Tempe, and Phoenix was moved from arterial streets to the Superstition and Maricopa freeways.

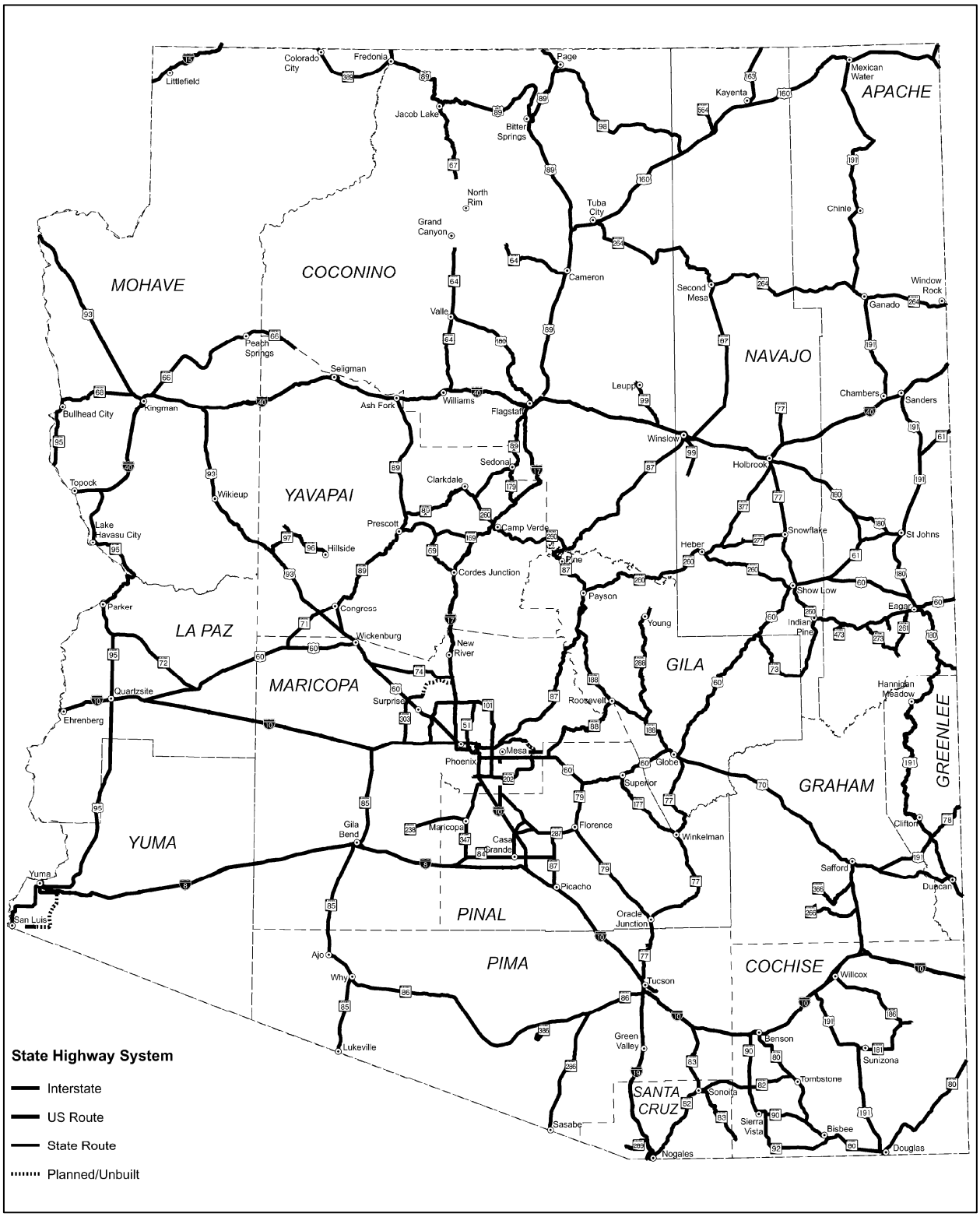

Figure 9. Arizona State Highway System, 2007.

From Arizona Department of Transportation Planning Division,
Data Bureau GIS Section, March 2007.

MODERNIZING ARIZONA'S HIGHWAYSYSTEM 1991-PRESENT

With the completion of Interstate 10 through Phoenix in 1990, Arizona's highway system reached maturity (see Figure 9). Now, the principal challenge facing highway planners in Arizona was maintaining the high standard they had set for vehicle travel in Arizona—a standard defined by the interstate highways and urban freeways, which under the best conditions allowed drivers to get to their destinations quickly and efficiently, unimpeded by traffic controls and slow vehicles.

In meeting this challenge they confronted two obstacles. First and foremost was Arizona's steady population growth, which continued to bring new vehicles and drivers and, eventually, greater traffic congestion. Second was the increasing complexity of highway construction projects. Compared to the 1950s and 1960s—the heyday of interstate highway construction—it now took Arizona's highway planners, engineers, and builders much longer to improve, let alone build, a segment of roadway. Higher construction standards, environmental and preservation regulations, increased right-of-way costs, the difficulty of managing construction projects amidst heavy traffic, increasing citizen activism—all contributed to this trend.

NEW ATTITUDES TOWARD HIGHWAYS

Starting in the 1960s, attitudes toward highways and highway construction had been changing across the country. Arizonans remained devoted to their cars and roads, and continued to press for new highway construction, yet Arizona's highway planners nevertheless found themselves facing new social and environmental constraints.[1]

Since 1950, Arizona highway officials had been required by federal legislation to conduct a public hearing on the location of any new federal-aid highway that might bypass a city or town. In 1956 and 1958, this requirement was extended to all federal-aid highway projects, giving potential highway critics an expanded forum for publicizing their views. After 1969, in response to increasing environmental concerns about highways, a second hearing was required during every federal-aid project's design phase.

Indeed, the 1960s brought a series of new federal requirements for the planning and design of highways built with federal aid. In 1964, the Bureau of Public Roads published a list of 20 social, economic, and environmental factors that had to be considered by state planners when locating and designing federal-aid highways. Two years later, in 1966, the Historic Preservation Act established the National Register of Historic Places and required that "special planning consideration" be given to any National Register site or

[1] See Chapter 5, "Right-of-Way and Environment," in Part 2 of *America's Highways, 1776-1976: A History of the Federal-Aid Program* (Washington, D.C.: Department of Transportation, Federal Highway Administration, 1976).

resource that might be affected by a federal-aid highway project. At the same time, federal legislation specifically prohibited any federal-aid highway project from using land from any public park, recreation area, wildlife area, or historic site unless there was "no feasible alternative" and the project included "all possible planning to minimize harm."[2]

The most well-known federal legislation affecting highway planning was the National Environmental Policy Act (NEPA) of 1969, which required highway planners to prepare environmental impact statements for all construction projects. An impact statement not only analyzed how a new or widened road might affect the environment, but also considered alternative plans that might minimize those impacts. Preparing an environmental impact statement added considerably to the time required to plan and develop a highway project. And the requirement that the public be allowed to comment on impact statements both delayed projects and gave highway opponents a mechanism for challenging them.

In order to mitigate the environmental impact of highway construction, in 1970 the highway department began replanting, rather than destroying, vegetation that had been moved to make way for road improvements. A year later, in 1971, it issued new construction guidelines aimed at controlling runoff and debris; contractors also were required to remove temporary access roads, material pits, and other physical evidence of their work.

It was also at this time that highway officials began experimenting with steel noise screens on the Black Canyon Freeway in Phoenix, setting in motion what would eventually become a major program to erect sound barriers and walls on all urban freeways in Arizona.

In succeeding years, highway engineers began to design roads that blended better with the landscape, and in particular they sought to reduce the visual impact of four-lane rural highways. On roads such as the Beeline Highway (State Route 87) and State Route 260, for example, the most recent four-lane segments were designed to retain some of the ambience of two-lane roadways; the newer road designs also incorporated bridges and underpasses that allowed wildlife to easily cross the roadway.

During construction, more resources were devoted to repairing the landscape in work zones and replanting cacti and trees that had been uprooted. On projects built over or next to rivers and washes, increasingly strenuous efforts were made to prevent construction debris from falling into the riverbeds and to restore them after construction was completed.

There also were changes in how ADOT planned and managed its highway projects. In addition to conducting public hearings prior to approving the final design and alignment of any project, the department began making use of the Internet to publicize design options and solicit citizen input. And, once projects were underway, the outreach efforts often intensified, with progress on the larger projects advertised in newsletters and on the Internet. Contractors

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[2] *America's Highways, 1776-1976*, 374.

were offered monetary incentives to reduce road closures and meet contract deadlines, and the projects themselves were scheduled to minimize disruptions to traffic flow and keep roads open to travel.

INTERMODAL SURFACE TRANSPORTATION EFFICIENCY ACT

In 1991, Congress passed the Intermodal Surface Transportation Efficiency Act (ISTEA), which replaced the highway aid bills that had been passed regularly by Congress since 1916. Although at the time it seemed like a dramatic shift in federal transportation priorities, in fact it brought to a close two decades of incremental change in highway policy that began in 1970, when the federal highway aid bill for the first time required that social, economic, and environmental factors be weighed in planning new highway projects.

Like its predecessor highway bills, the main purpose of ISTEA continued to be funding highways. However, it also for the first time committed the federal government to routinely using federal highway funds for projects that did not serve motor vehicles. These included not only mass transit facilities but also improvements designed to benefit pedestrians and bicyclists. State and local governments were given more flexibility to choose their own uses of transportation funds and to use the funds for environmental and air quality programs.[3]

The act created a National Highway System to focus federal funds on important interstate highways and their connections to other modes of transportation, with an emphasis on international commerce. It also designated "High Priority Corridors" within the system, including the CANAMEX Corridor from the Mexican border with Arizona to the Canadian border with Montana.

ADOT was designated as the lead agency in the CANAMEX Corridor Coalition, and some of the early projects funded for the corridor benefited Arizona directly. These included improvements to the Nogales commercial border-crossing facility and funding for a new bridge across the Colorado River at Hoover Dam. Other corridor projects, such as a study of the feasibility of turning the port at Guaymas, Sonora, into a terminal for container cargo ships, benefited Arizona indirectly.[4]

MARICOPA COUNTY FREEWAYS

Throughout the 1990s, the largest effort to expand the capacity of Arizona's highway network, in terms of its expense and the complexity of the projects involved, was in Maricopa County. Work on the freeway expansion program approved by county voters had begun in 1986 with the first segments of the Agua Fria and Pima freeways, which eventually formed parts of two outer loop expressways that circumnavigated the metropolitan area.

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[3] "Intermodal Surface Transportation Efficiency Act of 1991: Summary," Bureau of Transportation Statistics, National Transportation Library, http://ntl.bts.gov/DOCS/ste.html (accessed May 6, 2009).

[4] "CANAMEX Corridor (S^3: Safe, Smart and Secure) Overview," February 2007, CANAMEX Corridor Coalition, http://canamex.org/PDF/CANAMEX_CorridorOverview_021407.pdf (accessed May 6, 2009).

The Squaw Peak Parkway was opened to Glendale Avenue in 1990 and to Shea Boulevard in 1995. The Superstition Freeway was completed in 1991, when it reached its present-day junction with U.S. Route 60 east of Apache Junction, bringing to a close more than two decades of construction work. By then work was underway on a southern freeway, State Loop 202 (of which the Papago Freeway was one part), and a northern freeway, State Loop 101.

The Maricopa Association of Government's ambitious freeway program seemed well on the way to realization. Yet, by 1994 only 24 miles of the proposed 233-mile system had been built. According to MAG, which was responsible for overseeing the planning and construction of the system, the main reason for the slow progress was escalating costs, especially for right-of-way acquisitions but also for extra lanes and other features added after the initial design phase.

Hoping to accelerate construction, freeway advocates proposed a second sales tax, half of which would go to freeways and half of which would be spent on mass transit. The tax was defeated by Maricopa County voters, though, leaving transportation officials with little choice but to overhaul the freeway program in hopes of regaining public support. Cutbacks were made in landscaping and lighting, lanes were dropped, and the controversial South Mountain segment of State Loop 202 was dropped from the construction schedule after brief consideration had been given to building it as Arizona's first toll road.

In 1996 a citizens' oversight committee was established to help make scheduling decisions, and in 1997 new funding sources were developed. Some of the additional money was obtained through loans from city governments that wanted to speed up the completion of freeway segments in their jurisdictions; the rest was obtained by issuing revenue anticipation bonds. Both the loans and bonds would be repaid by future revenues from the county's transportation tax.

Bolstered by this new infusion of funds, state highway officials were able to restore most of the spending cuts made in 1994 and dramatically accelerate construction. In 2001, State Loop 101, which in fact consisted of three freeways (the Price, Pima, and Agua Fria), was completed, and two years later, in 2003, the Squaw Peak Parkway (soon to be renamed the Piestewa Parkway) was extended north to intersect with State Loop 101. By historic standards, these projects were finished in record time; while the Superstition Freeway required 24 years to complete, State Loop 101 required only 13 years to build, despite the fact that it was the longer of the two.

Progress on State Loop 202 was slower. The Red Mountain Freeway through Tempe and north Mesa was completed in the late 1990s, but other sections of the 202—the Santan Freeway and parts of the Red Mountain Freeway—were among the last freeway segments to be started. The Santan Freeway was completed in June 2006, and the SuperRedTan interchange, which connected the Superstition, Red Mountain, and Santan

freeways, was finished in the summer of 2007. A year later, in July 2008, the last segment of the Red Mountain Freeway was opened to traffic.

FREEWAY CONTROVERSIES

By and large, Salt River Valley residents eagerly supported new freeway construction. Still, there were controversies along the way. In addition to nearly constant wrangling among the cities over which freeways should receive funding priority, there were disputes over construction of the Paradise Freeway, widening of the Superstition Freeway, and the extension of State Loop 202 around South Mountain.

The most controversial was the Paradise Freeway, which was first proposed in the early 1960s. As plans were developed for an east-west alignment along Bethany Home Road and Lincoln Drive, there was a groundswell of opposition, especially from affected neighborhoods, which included some of the wealthiest areas in Phoenix. In 1994, after more than three decades of planning and debate, the project was abandoned. It was the only expressway project in the Phoenix metropolitan area to be canceled, which most observers attributed not only to the influence wielded by its opponents, but also to the fact that its projected cost had ballooned to nearly $1 billion owing to escalating right-of-way costs.

The widening of the Superstition Freeway in the late 1990s was opposed not by citizen groups but by the city of Tempe, which did so on the grounds that new lanes would do little to relieve congestion in the long run, yet, would increase noise, pollution, and arterial street congestion. In 1999, ADOT announced that it would not widen the Tempe section of the freeway at that time, though it reserved the right to do so in the future. A decade later the widening proposal was resurrected, and this time it was approved, with construction work starting in 2009.

Extending State Loop 202 into south Phoenix proved to be a much more difficult task. In 1998, a partial alignment for the South Mountain Freeway had been approved by the state; running along Pecos Road west of Interstate 10, it was envisioned as the first step in creating a loop that would allow through traffic on Interstate 10 to bypass downtown Phoenix. However, funding shortages in the freeway program led state and county highway officials to postpone construction of the South Mountain.[5]

Meanwhile, residents of Ahwatukee remained vocal in their opposition to the Pecos Road alignment, with many of them arguing instead for a route through the Gila River Indian Community. There was precedent for building freeways on Native American reservation land; the Pima Freeway segment of State Loop 101 was built on Salt River Indian Community land in return for a $250 million right-of-way payment. So far, though, Gila River officials have declined to endorse realignment of the South Mountain project, leaving its proposed route steeped in uncertainty and controversy. Even the western portion of the freeway has been controversial, with the state evaluating three proposed

[5] "Loop 202 (South Mountain Freeway)," Arizona Department of Transportation, http://www.valleyfreeways.com/Highways/Valley_Freeways/Loop_202/South_Mountain/index.asp (accessed May 27, 2009).

alignments between 55th Avenue and 99th Avenue before tentatively settling on the 55th Avenue route.

However divisive freeways were in the Salt River Valley, these controversies paled in comparison to those that erupted in Tucson. Opposition to freeways in Tucson was much more broadly based and better organized than in the Phoenix area, and opponents were able to defeat three parkways proposed in 1968, and two parkways proposed again in 1980.

After the 1980 defeat, city and state transportation planners eventually developed a compromise plan for a single roadway, the Aviation Corridor, which would connect downtown Tucson with Interstate 10 on the west and south sides of the city. However, that proposal was also controversial, and Tucson voters defeated a proposed sales tax increase that would have funded construction of the Aviation Corridor through downtown Tucson. By the time the highway was built, in the 1990s, it had been renamed the Barraza-Aviation Parkway and scaled back to a six-mile spur that abruptly ended at Broadway Boulevard. It also was no longer a full-fledged freeway; although the parkway included controlled-access sections with entrance and exit ramps, it also featured at-grade intersections with traffic signals.[6]

The proposal for a complete loop was not entirely dead, though. Responding to charges that the original freeway proposal isolated sections of the downtown and destroyed historic buildings, the city took over planning of the project from ADOT and made substantial modifications to its design and alignment. The project became a textbook study in the modern management of highway projects, with city planners soliciting the involvement of affected neighborhoods and businesses. The revised plan, which addressed issues related to historic preservation and flood drainage, included improved crossings of the Union Pacific Railroad, bicycle paths, and greenbelts.[7]

In 2006, voters authorized funding for the project under the newly created Pima County Regional Transportation Authority, and in 2008, the Tucson City Council gave final approval to the proposed alignment for the Barraza-Aviation Parkway.[8]

RURAL HIGHWAY WIDENING PROJECTS

Throughout this period, efforts continued to widen, realign, and rebuild Arizona's rural highways. Arizona drivers were no longer so happy driving on two-lane roads. After years of experience with the Interstate system, they had grown accustomed to faster driving speeds (especially after repeal of the national 55-mile-per-hour speed limit in 1995) and higher design standards such as gentle curves, shallow grades, and generous passing lanes. The only way to accommodate these expectations, it seemed, was to build

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[6] "Downtown Links: History Timeline," Regional Transportation Authority, http://www.downtownlinks.info/ History.aspx (accessed May 27, 2009).

[7] "Downtown Links," Regional Transportation Authority, http://www.downtownlinks.info/FAQs.aspx (accessed April 21, 2009).

[8] "Aviation Parkway Extension Route OK'd," *Arizona Daily Star*, July 9, 2008.

more four-lane roadways. In fact, the state had been working on this for some time, but the fruits of this expansion program were not fully realized until the 1990s.

The first major widening project to be completed was State Route 69 between Interstate 17 and Prescott. Started in 1988 and finished 11 years later, it transformed a winding two-lane roadway plagued by traffic backups into a high-speed, four-lane highway. The new highway was now capable of handling the increasing traffic volume to and from Prescott and Prescott Valley, which had become one of Arizona's fastest-growing urban areas outside Maricopa and Pima counties.

The next major road to be renovated was the Beeline Highway (State Route 87). Almost half of the Beeline, between Mesa and Payson, had already been expanded to either three or four lanes by 1983. Six years later, in 1989, work began on an ambitious effort to convert the entire highway to four lanes. The project concluded 12 years later with the opening of a new alignment that bypassed what had once been the Beeline's worst bottleneck: a narrow, twisting roadway alongside Sycamore Creek. That final segment, which required the construction of four bridges, was completed in 2001 and won several awards for its environmentally sensitive design and construction methods.[9]

Other projects posed more challenges. One was the widening of U.S. Route 93. Arizona's northern segment of U.S. Route 93, between Kingman and Hoover Dam, had already been widened to four lanes in the early 1980s, and passing lanes had been added to sections of the road south of Interstate 40. However, U.S. Route 93 was still regarded as one of the state's more dangerous roads, thanks to heavy truck traffic and the many late-night travelers going to and from Las Vegas.[10] Between Wickenburg and Interstate 40, a distance of 109 miles, fewer than 20 miles of the highway had been widened to four lanes.

By then U.S. Route 93 was part of the CANAMEX Highway, which was intended to serve as the primary north-south shipping corridor through the western United States. This promised to eventually increase the number of trucks on the highway, which in turn would lead to more traffic backups. In 1998, the state began rebuilding and widening U.S. Route 93, which required construction of a new bridge at Burro Creek; by 2006, one-third of the project had been completed. The state's ultimate goal is to convert the entire road to four lanes—an ambitious undertaking, given its remoteness and the rugged terrain it traverses.

At the same time, a similarly ambitious project was underway on the Mogollon Rim, where state highway officials had begun widening State Route 260. This important highway, which connected Payson with Show Low, had long been a favorite of tourists and vacation-home owners from the Phoenix metropolitan area but was increasingly subject to congestion. Work on the first stage of the widening project began in the fall of 2000, and planners expected the project to require two decades to finish. In part this

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[9] Stanley C. Brown, "Crossing the Mighty Mazatzals: From Indian Trade Route to Modern Highway," *Journal of Arizona History* 47, no. 4 (2006): 340.

[10] Bob Petrie, "Rural 'Blood Alleys' Are Top Killers," *Arizona Republic*, October 28, 1999, B-2.

extended timeline reflected the engineering and financial challenges inherent in widening a roadway that climbs through rugged mountain terrain; the first segment alone cost $23 million for three miles of new roadway and six new bridges. But it also reflected the constraints imposed by environmental regulations. In addition to building underpasses to allow wildlife crossings, contractors were limited to working on one segment at a time in order to conserve scarce water supplies.

BYPASSES AND NEW ALIGNMENTS

One reason that modern highway projects are so costly and time-consuming is that significant improvements in traffic flow can sometimes be realized only by moving roadways to new locations that bypass towns altogether. Bypasses are no more popular today among local businesspeople than they were in the 1960s, when town officials across Arizona fought plans to move the interstate highways away from their established corridors. Tourist-oriented businesses do not want to lose their customers, and property owners along the new alignments often do not want a modern, high-capacity highway built near them.

If a proposed realignment runs through public land, or through environmentally sensitive areas like riverbeds, the difficulties are multiplied. Any project to realign or widen a modern highway involves years of planning, expensive right-of-way acquisitions, public hearings, environmental disputes, and often protracted political negotiations before a single shovelful of dirt can be turned.

In Flagstaff, for example, U.S. Route 180 had been plagued for years by traffic congestion in the downtown and north Flagstaff neighborhoods through which it passed. This led state and federal highway planners to propose that the highway be moved to a new alignment that ran through the largely undeveloped McMillan Mesa area and Buffalo Park on the northern edge of the city. Attempts to create such a road were rejected by Flagstaff voters in 1986 and 1996.[11]

Another highway controversy developed near Sedona after state highway authorities proposed widening State Route 179 from two to four lanes and realigning it to cross Oak Creek at the much-photographed Red Rock Crossing. Eventually, this plan was shelved in response to the public outcry, to be replaced by a more modest proposal to widen the highway's shoulders, add turning lanes, and make other improvements to the existing two-lane highway.

On U.S. Route 60, which runs through such communities as Wickenburg and Globe-Miami, highway planners have been working for some time on proposals to reduce congestion on local arterial streets that are filled daily with trucks, recreational vehicles, and automobiles. This issue has been especially controversial in Wickenburg, which was bypassed by Interstate 10 in the 1960s. Despite protests by some local businesses, the town was bypassed once again as U.S. Routes 60 and 93 were relocated in 2009 and their

[11] Lisa Rayner, "What's the Future of McMillan Mesa?" (October 2001), Flagstaff Tea Party, http://www.flagteaparty.org/Publications/Headlines/Pages/2001/Oct_Nov%202001/WhatsthefutureofMcMillanMesa.html (accessed May 11, 2009).

intersection moved to the northern edge of the town. Farther east along U.S. Route 60, studies are now underway in preparation for bypassing Globe and Miami, and possibly Superior as well. It is not the Globe-Miami area's first experience with highway bypasses; in 1977, U.S. Route 60 was routed around downtown Globe. Some of the options for realigning this section of highway would take the roadway miles away from its current location.

Arizona highway planners are also considering proposals to build new highways that would relieve traffic on Interstate 10 between Tucson and Phoenix, the most heavily traveled highway in the state. According to a recent study, the transportation corridor linking the two cities, which has been dubbed the "Sun Corridor," is expected to see substantial increases in both population and traffic over the next few decades. Maricopa, Pinal, and Pima counties alone could see their combined population increase from 5 million (in 2006) to 13.3 million (in 2050).

Existing and currently planned roadways in the Phoenix and Tucson areas would not be able to accommodate the additional traffic that so many new residents would bring, and Pinal County would find its major transportation routes even more severely tested. With the idea of dispersing this additional traffic over a larger area, studies have identified possible routes for several new high-capacity, access-controlled roadways between the Tucson and Phoenix metropolitan areas. ADOT expects to study these proposals further, a process that could take years to complete.[12]

One of Arizona's most expensive and ambitious relocation projects has been underway on U.S. Route 93 in the far northwestern corner of the state. Ever since completion of Hoover Dam in 1936, the highway has crossed the river on a narrow two-lane roadway atop the dam. Now modern traffic levels make this stretch of highway a bottleneck for traffic. Nevada and Arizona highway planners located a new alignment for the highway that would allow it to be widened to four lanes, but that necessitated building a new bridge across the Colorado—the first to be built over the river in decades. Arizona's portion of the realignment project was completed in 2004, and the bypass and bridge opened to traffic in late 2010.

[12] One study explored the possibility of diverting some of I-10's traffic away from the Tucson and Phoenix metropolitan areas; it identified three possible alignments around Tucson and one possible alignment around Phoenix and its surrounding communities. See *I-10 Phoenix-Tucson Bypass Study; Final Report, January 2008* (Phoenix: Arizona Department of Transportation, 2008).

EPILOGUE
ONE HUNDRED YEARS
OF ARIZONA HIGHWAYS

Over the last century, Arizonans have seen impressive growth in the state's highway infrastructure. At statehood in 1912, the state highway system consisted of 1,500 miles of roadway, none of which was paved, and there were only two motor vehicles registered for every mile of highway (see Table 1). Highway revenues that year were just $276,300 ($6 million in current dollars), and the state received no federal aid for road building.

By 2005, the state highway system had grown to 6,157 miles and the number of registered motor vehicles to 4.6 million, which meant 747 cars and trucks for each mile of state highway (see Table 1). The year before, aided by $427 million in federal aid, ADOT spent $1.2 billion on highway construction and maintenance—a whopping 204 times what was spent in 1912 even after accounting for inflation.

As these figures suggest, modern highway systems are constantly changing and growing, a testimony to their centrality to the American way of life. This is hardly news to the Arizona motorist, who knows from personal experience that the work of building the state's elaborate road system (which also includes nearly 20,000 miles of county roads) will never really be finished.

If the past is any guide to the future, Arizona's quest to build an efficient highway system will never really end. Over the last two decades, between 1990 and 2007, almost 3 million new residents have settled in the state, with two-thirds of them choosing to make their homes in Maricopa County. This dramatic surge in population has brought a corresponding increase in the number of vehicles traveling the state's roads. In 1998, there were 3.7 million vehicles registered in Arizona; by 2007 there were 4.8 million motor vehicles in the state.[1]

Although the number of vehicles registered in Arizona has remained largely unchanged since then, thanks to the recession that began in late 2008, transportation planners still must find ways to cope with the substantial traffic loads found on many of the state's streets and highways. Transportation planning in Arizona is a constant struggle to balance the high cost of further improvements against the demands of motorists frustrated by congestion and long travel times.

Yet somehow, through all these changes and disruptions, Arizonans' romance with the highway has persisted. Indeed, the car remains central to Arizonans' conception of themselves, even if their memories of past driving experiences are increasingly at odds

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[1] *Arizona Motor Vehicle Crash Facts* (Phoenix: Arizona Department of Transportation, 1998), 3; *Arizona Motor Vehicle Crash Facts* (2007), 3.

with the newer reality of congested highways and urban traffic jams. Few things attest to this romantic attachment to the highway more than the continued lure of historic Route 66, which long ago was eclipsed by Interstate 40. Each year thousands of tourists visit northern Arizona to drive the surviving remnants of the “Mother Road,” and to experience once again the simple pleasures of traveling America’s highway.

PART 2

TOPICAL ESSAYS

THE LEGENDARY ROAD: U.S. ROUTE 66

No highway is more famous than Route 66. It has become the focus of a nostalgia industry based on the "open road" of 20th-century America. On the Route 66 of legend, endless prairies and desert vistas were punctuated by odd, individualistic cafes, motels, and roadside attractions, the whole effect symbolizing something essential about America. Arizona had its share of the quirky billboards and curio shops, and also offered real attractions for the cross-country rider: the Petrified Forest National Park, the Painted Desert, the Grand Canyon, and Meteor Crater, all located on or near the highway. But the 66 of legend was always about the journey, not the destination.

The route approximated the 19th-century California Trail from Fort Smith, Arkansas, which avoided the Indian Territory. In the 1920s, as officials laid out the first federal highway system, Oklahoman Cyrus Avery worked hard to create a major route through his state. He had to fight other interests, but through tenacity and compromise a route was created from Chicago to Los Angeles. The highway with the catchy number passed through Tulsa and Oklahoma City before heading across the Texas Panhandle, northern New Mexico, and Arizona.

Shortly after the route was stitched together out of shorter, less ambitious roads, a cross-country foot race in 1928 publicized the new "Main Street of America." The Tulsa-based Phillips Petroleum Company helped imprint the number on the national consciousness by adopting the name "Phillips 66," for its gasoline and service stations, shown in a shield-shaped logo similar to the U.S. highway marker.

But without doubt, the cultural product which made 66 a household number was John Steinbeck's 1939 novel of Oklahoma migrants, *The Grapes of Wrath*. As every Route 66 book, magazine, and nostalgia Web site will remind you, Steinbeck called 66 "the mother road, the road of flight." He set a memorable scene, later adapted for John Ford's movie of the book, in a roadside diner that offers a family of migrants a brief respite from the hardships of their journey:

> "We got a thousand miles to go, and we don't know if we'll make it." He dug in the pouch with a forefinger, located a dime, and pinched for it. When he put it down on the counter he had a penny with it. He was about to drop the penny back into the pouch when his eye fell on the boys frozen before the candy counter. He moved slowly down to them. He pointed in the case at big long sticks of striped peppermint. "Is them penny candy, ma'am?"

> Mae moved down and looked in. "Which ones?"
> "There, them stripy ones."
> The little boys raised their eyes to her face and they stopped breathing; their mouths were partly opened, their half-naked bodies were rigid.
> "Oh them. Well, no ... them's two for a penny."
> "Well, gimme two then, ma'am." He placed the copper cent carefully on the counter. The boys expelled their held breath softly. Mae held the big sticks out.
> "Take 'em," said the man.…
> "Thank you, ma'am." The man picked up the bread and went out the door, and the little boys marched stiffly behind him, the red-striped sticks held tightly against their legs. They leaped like chipmunks over the front seat and onto the top of the load, and they burrowed back out of sight like chipmunks.
> The man got in and started his car, and with a roaring motor and a cloud of blue oily smoke the ancient Nash climbed up on the highway and went on its way to the west.
> From inside the restaurant the truck drivers and Mae and Al stared after them.
> Big Bill wheeled back. "Them wasn't two-for-a-cent candy," he said.
> "What's that to you?" Mae said fiercely.
> "Them was nickel apiece candy," said Bill.[2]

In the postwar era, even as U.S. Route 66 was being torn up under the tires of a car-crazy nation, and about to be replaced by Interstate 40, the road came to symbolize the restless spirit of long-distance highway travel. In 1960, a television show, "Route 66," portrayed two young men who roam around the country in a Corvette convertible, finding themselves involved with new characters and dilemmas each week. While the pair spent only a little more time on or near U.S. Route 66 than any other highway, the production crew lived true to the ethos of the Mother Road, filming on location all over the United States with a crew of 50 people who traveled the country in a caravan of trucks and buses. If Steinbeck's scenes of the hardscrabble poor invoked memories of families crossing the continent in a covered wagon, "Route 66" recalled the roving cowpokes and gamblers of movie and TV westerns.

Route 66 inspired two memorable pieces of music: the breezy theme song of the TV show by Nelson Riddle, and a song, "Get Your Kicks on Route 66," written in 1946 by Bobby Troup after he drove the road to Los Angeles, where he hoped to make a career as a songwriter and musician. To pass the time Bobby and his wife Cynthia began playing word games and came up with a rhyming list of towns:

> It winds from Chicago to LA,
> More than two thousand miles all the way.
> Get your kicks on Route 66.
> Now you go through Saint Looey
> Joplin, Missouri,
> And Oklahoma City is mighty pretty.
> You see Amarillo,

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[2] John Steinbeck, *The Grapes of Wrath* (New York: Viking Press, 1939), 206.

Gallup, New Mexico.
Flagstaff, Arizona,
Don't forget Winona.
Kingman, Barstow, San Bernardino.
Won't you get hip to this timely tip:
When you make that California trip
Get your kicks on Route 66.[3]

Troup's career plan worked better perhaps than he had imagined. Upon arriving in Los Angeles, he almost immediately sold the song, which was recorded by Nat King Cole and became an enduring chestnut.

But Troup had no illusions about the joys of long-distance driving on 66 or any other road, recalling it as a grinding experience on a narrow, bumpy highway. Cynthia said, "It seemed to me it was just a long road with cheap motels and restaurants." And, as for the lyric itself, for which she could have claimed at least co-author status with Bobby, she said, "I can't believe he doesn't have Albuquerque in the song."[4]

[3] "Nat King Cole — Route 66 Lyrics," LyricsFreak, http://www.lyricsfreak.com/n/nat+king+cole/route+66_20098085.html (accessed November 18, 2009).

[4] Quinta Scott and Susan Croce Kelly, *Route 66: The Highway and its People* (Norman: University of Oklahoma Press, 1988), 149.

FROM BORDER TO BORDER: U.S. ROUTE 89

The geography of Arizona, in general terms, consists of the Colorado Plateau in the north, a belt of mountain ranges and canyons across the center of the state, and broad valleys spotted with mountain "islands" in the south. Two transportation routes across the state which have been followed at least since Arizona became part of the United States run from east to west across the northern and southern parts of the state. But that belt of rough country across the middle of the state discouraged the creation of a single, heavily used route from north to south. The only route that has ever traversed the entire state in that direction is U.S. Route 89.

U.S. Route 89 was at one time a Canada-to-Mexico highway, part of a projected intercontinental road all the way to Buenos Aires, Argentina. In Arizona, it cut a fairly straight path north from the border at Nogales through Tucson to Florence before veering west through Mesa and Phoenix to Wickenburg. There it began its mountain section by climbing up the Yarnell Hill, skirting the western slopes of the Bradshaw range to arrive in Prescott.

From Prescott the highway crossed forests, mountains, and the valley of the upper Verde River to reach Ash Fork, before turning east toward Flagstaff. A separate route, Alternate U.S. Route 89, or 89A, went from Prescott to Flagstaff through Jerome, the Verde Valley, and Oak Creek Canyon. The two routes rejoined at Flagstaff, where U.S. Route 89 headed north across the Navajo Indian Reservation to Page, then angled west before exiting the state at Fredonia. From there, U.S. Route 89 continued north through the Great Basin, the Rocky Mountains, and Yellowstone National Park. It ended at the Canadian border near Glacier National Park in Montana.

The Arizona section of the highway followed the path of two trails with unique and colorful histories. The Santa Cruz Road was an ancient route along the river of the same name through the Hohokam villages that long predated Nogales, Tucson, and Florence. Marcos de Niza crossed into Arizona near Nogales in 1539. Later the road connected the Spanish settlements of Arizona, including the mission at Tumacácori established by Father Eusebio Francisco Kino in the 1690s. In 1775, Juan Bautista de Anza followed the road from the Tubac presidio to forge a path to California.

In northern Arizona, U.S. Route 89 followed the route of Mormon colonization from southwestern Utah that passed through Fredonia, Lee's Ferry, and Tuba City. In the late 1800s and early 1900s, many young Mormon couples who were married in northern Arizona towns like Snowflake, Show Low, and St. Johns used this route to travel to St. George, Utah, to have their marriages blessed in the Latter-day Saints' temple there. This trip could take weeks by wagon (itself often a wedding present), and it became known as

the Honeymoon Trail. Traces of this wagon trail are still visible on private lands and Indian reservations of the area (see Figure 2).[1]

The need to establish a direct travel route between Prescott and Phoenix played a big role in the history of U.S. Route 89. In the late 1800s and early 1900s, a traveler could choose from four different roads between the two cities, but the two main ones were the Black Canyon route, along the Agua Fria River, and the Wickenburg route. One contemporary observer noted that travelers frequently used both roads in a round trip: "After one had traveled one route he always returned over the other in the vain hope of finding it better that the route already covered."[2]

Starting in the 1920s, controversy arose over which of these routes should receive funding to become a U.S. highway as part of Arizona's seven-percent system of federal-aid roads. When the government authorized construction of the 16-mile White Spar Highway south from Prescott toward Wickenburg through some of the roughest mountains in the region, it became the favored route for the new federal highway.

U.S. Route 89 was part of the first group of highways given numbers by the U.S. Bureau of Public Roads in 1925. At first the number was used just for the road connecting Flagstaff with central Utah. Within two years, though, it had been attached to a string of roads all the way to Nogales. By 1936, a pamphlet promoting the highway described its construction as "high-type gravel" from Fredonia to Flagstaff, "except for twelve or fifteen miles" (see Figure 6). From Flagstaff to Nogales, the writer pledged, "U.S. 89 of today is every inch in oil or concrete."[3]

North of Flagstaff, U.S. Route 89 crossed two important bridges. One was the Cameron Suspension Bridge, a one-lane structure built across the Little Colorado River in 1911 in a concerted effort between the Office of Indian Affairs and the contractor, Midland Bridge Company of Kansas City, Missouri. The other was the Navajo Bridge at Marble Canyon, which was erected in 1929; it was the first bridge constructed across the Colorado River between Topock, Arizona, and Green River, Utah.

Both of these bridges were later replaced. A new bridge was built at Cameron in the 1950s when U.S. Route 89 was widened and modernized from Flagstaff to Page to handle construction traffic to the new Glen Canyon Dam. The original intricate, cabled structure continued to be used, however, it now carries a pipeline across the Little Colorado River canyon. The Navajo Bridge was replaced in 1995. After a new bridge was built across Marble Canyon, the original one was converted into a pedestrian overpass on a new Alternate Route 89 (the main highway now crosses the river just below the Glen Canyon Dam, and the two routes rejoin in Kanab, Utah).

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[1] Will C. Barnes, "The Honeymoon Trail," *Arizona Highways*, December 1934, 6.

[2] C. C. Small, "Prescott-Phoenix Highway Location," *Arizona Highways*, July 1925, 7.

[3] Ray N. Vyne, "A Great North and South Highway, U.S. 89," Arizona Collection CE EPH XH-9, Department of Archives and Special Collections, Hayden Library, Arizona State University.

Much of U.S. Route 89's original function of connecting the state from north to south was taken over by Interstates 19, 10, and 17, at which point Flagstaff became the southern terminus of U.S. Route 89. The rest of the highway was decommissioned as a federal highway in 1992. The section from Wickenburg through Prescott to Ash Fork became State Route 89, while the former U.S. Route 89A from Prescott to Flagstaff became State Route 89A. These sections of the highway still provide a way to see some of the most rugged and beautiful scenery in Arizona.

THE BLACK CANYON HIGHWAY

Interstate 17, the Black Canyon Freeway, is such a heavily used route that it might seem it has always been the gateway to northern Arizona. In fact, it was one of the last major highways built in the state.

The original Black Canyon road followed an Indian trail along the Agua Fria River west of Phoenix through a gorge and then up onto the plateau that spreads from the Bradshaw Mountains to the edge of the Verde River valley. In 1864, the part of this route between Dewey and Prescott was declared the first public road in the new Arizona Territory, and soon it was being used by the U.S. Army as part of a route from Fort Whipple, outside Prescott, to Fort McDowell, east of Phoenix.

Over time the road was gradually improved and became an important freighting and stage route serving the mining camps of the Bradshaw Mountains and the Agua Fria drainage, which included Bumble Bee, Reliable, Columbia, and Big Bug. Black Canyon City was the halfway point between Phoenix and Prescott, a welcome rest stop in a wearying two-day journey.

Then, in the 1890s, an alternate route supplanted the Black Canyon road: the Santa Fe, Prescott and Phoenix Railway, a line from Ash Fork to Phoenix via Prescott and Wickenburg (see Figure 3). Though longer, this rail route was a faster and more comfortable way to travel. Two branch railroads were built from this line into the mining region between Prescott and the Agua Fria, further diminishing the need to use the Black Canyon road. When Arizona's first improved highway between Prescott and Phoenix was built as part of U.S. Route 89, it followed the Wickenburg route, running around the western side of the Bradshaw Mountains just as the Prescott-Phoenix railroad had.

Not until 1936 was a state highway, State Route 69, built between Prescott and Phoenix over the Black Canyon route (see Figure 7). This came about at least partly because of pressure from the city of Phoenix to improve access to a new recreation area it was developing at Bloody Basin, just off the Black Canyon road. Development of the road had already begun with a Works Projects Administration grant, and another grant was used to improve the section from Prescott to Dewey.[1]

However, the Second World War delayed completion of State Route 69. After the war the highway, now realigned out of the canyon north of Black Canyon City and up onto the mesa, bypassed Bumble Bee and the other old mining camps, which by then were mostly abandoned. The new highway was dedicated in December 1952, though it would not be completely paved until 1955—the cause for another celebration.

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[1] Jeb Stuart Rosebrook, "The Black Canyon Highway: Highway to History, 1863-1948" (M.A. thesis, Arizona State University, 1994), 112-14.

Upon completion of the improvements to State Route 69, work began immediately on a northern extension of the road. Starting from a spot christened Cordes Junction, the new route to Flagstaff was surveyed, designed, and engineered to the then-current standards of road construction in Arizona. It was built through a long series of contracts for 5- and 10-mile sections that progressed past Dugas, down into the Verde Valley, and through McGuireville up onto the broad forested plateau that surrounds Flagstaff. A typical contract, awarded in 1957 for grading and draining 16.4 miles north of McGuireville, was given to Copper State Construction Company and Rogers Construction Company, at a total cost of $2.7 million. Other contracts would be let for paving and for the construction of overpasses and other features.[2] Designated as State Route 79, the new highway opened in September 1961, giving the state its first direct road from Phoenix to Flagstaff.

Simultaneously with the construction of State Route 79 north from Cordes Junction, work progressed on the Black Canyon Freeway in Phoenix. This freeway, the first in Arizona, replaced the existing alignment of State Route 69. It followed 27th Avenue, through what was still mostly farmland in west Phoenix, north from Grand Avenue and Thomas Road. By 1960, the freeway was completed from McDowell Road to Dunlap Avenue.

Although the Black Canyon Freeway project had begun before the 1956 passage of the interstate highway program by Congress, the freeway was quickly integrated into that program as Interstate 17. Initially Interstate 17 ended where it met the Maricopa Freeway at Durango Street. By 1964, the Black Canyon Freeway section of Interstate 17 had been finished north to the Carefree Highway. It was completed to Flagstaff in 1978.

In Phoenix, Interstate 17, with its swooping cloverleaf interchanges every mile, spawned the development of a vast area north of town: Moon Valley, Deer Valley, and Happy Valley. Eventually most of the cloverleaf interchanges were replaced with diamond interchanges, which require exiting traffic to pass through a traffic signal.

The other important impact of Interstate 17 was to greatly ease travel from Phoenix to Prescott, Verde Valley, and Flagstaff. The miles of subdivisions that make up the town of Prescott Valley and the humming commerce of Sedona are both products of the development of the Interstate system and the desire of millions of Phoenix residents for a convenient way to escape the city and the desert.

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[2] "Over 3½ Million in Contracts Awarded," *Highway Spotlight* 3, no. 23 (June 27, 1957), 1.

CONNECTING COMMUNITIES: THE BEELINE HIGHWAY

Most of Arizona's early highway routes followed the tracks of native traders, Spanish missionaries, or the railroads, which kept as close as possible to river valleys and broad plateaus, avoiding rough terrain. For over a century, the difficult, mountainous route between Phoenix and Payson was known as one of the toughest, slowest, most dangerous passages a traveler could attempt.

In the 1800s, Apache and Yavapai Indians reigned in the mountains of central Arizona. The effort to control these Indians led to the construction of some roads and trails through central Arizona, but these barely penetrated the swath of mountains and canyons south of the Mogollon Rim. The Tonto Basin was one of the few parts of this rugged region suitable for farming, and the nearby community of Payson became a ranching center. But still, the only crossing of the Mazatzal Mountains between Tonto and Phoenix was a horse trail around Mount Ord.

The first good road into the area was the Apache Trail, built in 1905 from Mesa to the site of Roosevelt Dam at the southern end of the Tonto Basin. By the 1920s, a branch of this road had been extended north from Roosevelt toward Payson (see Figure 5). Circuitous and rough, this route nevertheless became the main road to the Tonto Basin, Payson, and the Mogollon Rim country beyond.

Then a Mesa lumberman named Harvey Bush and officials of the Tonto National Forest promoted a road across the Mazatzal Mountains that roughly followed the old Mount Ord horse trail. In 1933, this road, known as the Bush Highway, received federal funding.

As a Depression work-relief project, much of the construction work on the Bush Highway was done by labor crews with hand tools. The men did not have equipment that could cut through hills or fill in slopes. Historian Stanley Brown described the resulting road as a rocky washboard surface that shook parts off vehicles, punctured tires, and overheated radiators on the steep grades. Even though it took nine hours to drive from Phoenix to Payson, as many as 50 cars a day began using the route soon after it opened.[1]

After the Second World War, the need for an improved Phoenix-Payson highway increased, as did the funding possibilities. Construction on a new road, which was designated State Route 87, began in the early 1950s. The new road was given the nickname "Beeline Highway" because it was a much more direct route to Payson. It started at Country Club Drive north of Mesa, crossed the Fort McDowell Indian Reservation, and then headed north from Slate Creek to Rye, rather than following the

[1] Stanley C. Brown, "Crossing the Mighty Mazatzals: From Indian Trade Route to Modern Highway," *Journal of Arizona History* 47, no. 4 (2006): 328.

Bush Highway route into the heart of the Tonto Basin. The two-lane paved highway was dedicated in July 1958.

The Beeline Highway in a sense created modern Payson. Along with the paving of State Route 160 (later State Route 260) to Heber and Show Low, its completion opened a vast section of the Mogollon Rim country to Phoenix residents, who could now easily make the area a weekend destination in the summer.

This very ease of travel, however, eventually contradicted the highway's name. By the 1980s northbound travelers swamped the road on Friday evenings, and on Sunday afternoons the return traffic to Phoenix caused backups and dangerous conditions in the southbound lanes. The rest of the time the road was pleasant and scenic, but some of the curves and grades that made it scenic did not meet modern design standards. Slow-moving vehicles such as trucks and campers impeded traffic on the two-lane sections, and traffic accidents exceeded the national average for similar highways by 46%. An Arizona Department of Transportation (ADOT) study showed that a redesigned and rebuilt Beeline would reduce the highway's accident rate by 65% while increasing its traffic capacity by 75%.[2]

Remaking State Route 87 into a four-lane divided highway for its entire length from Payson to the Salt River Valley was a much different construction project than the scraping and jack hammering that created the Bush Highway. The National Environmental Protection Act and other federal laws now required planners to consider all the potential environmental impacts of the construction and the completed road. These included impacts on native plants and animals, riparian areas, and archaeological sites, as well as erosion and noise, and consideration of the scenic qualities both of the road itself and of the areas it traversed. In addition, the highway's importance to commerce and tourism, as well as safety requirements, meant that construction would have to be managed in a way that kept traffic disruptions to a minimum.[3]

Highway planners concluded that some of these concerns could be addressed best by constructing several long and innovative bridges over steep canyons. This would not only eliminate dangerous grades and curves, but also prevent the destruction of riparian areas and preserve important birding areas and wildlife corridors.

In one area, planners had to thread a route between the Mazatzal Wilderness Area, which the Sierra Club wanted to preserve with a buffer zone separating it from the road, and Kitty Joe Canyon, where the National Audubon Society expressed concern for the bird habitat. The final route was selected only after ADOT heard extensive comments from these and other groups and local residents.

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[2] *Draft Environmental Impact Statement for the State Route 87 Upgrading Project, Saguaro Lake Road to Gila County Line*, (Phoenix: Arizona Department of Transportation and Federal Highway Administration, 1992), 1-1, 1-2.

[3] *Draft Environmental Impact Statement for … State Route 87*, 1-6, 1-7, 1-8.

The Beeline project won several awards for its design and environmental mitigation features. One of the bridges, the 1,080-foot Screwtail Bridge, won an architectural award for its combination of elegant design and environmental benefits. At a time when major construction projects often sparked polarizing conflicts, the Beeline reconstruction effort brought together not just the communities of Payson and Phoenix, but all those who contributed to the road's planning and construction.

BUILDING BRIDGES

Although Arizona is an arid state, its rivers and washes have always posed serious challenges to travelers. Often dry, Arizona rivers become dangerous during flash floods, and the steep canyons they have created forced early travelers to travel miles out of their way in search of a safe crossing.

Arizona's first bridge across a major river was erected in 1885, across the Gila River at Florence. Built by the Territorial government at a cost of $15,150, it was 965 feet long and set on redwood piles with a 16-foot–wide roadway made of pine. In 1910, the Territory replaced this with a concrete girder bridge, the first of a group of bridges built around the time of statehood that closed gaps in Arizona's infant highway system.[1] 1911 saw completion of a steel truss bridge across the Verde River at Camp Verde and a steel suspension bridge across the Little Colorado River at Cameron. The first highway bridge over the Salt River, a concrete arch bridge at Ash Avenue in Tempe, opened in 1913.

By 1915, new bridges crossed Canyon Padre and Canyon Diablo on the main highway across Arizona's northern plateau. That year, backers of the Ocean-to-Ocean Highway built the first highway bridge across the Colorado River at Yuma. The steel truss bridge was actually built on land and then slid out over the river on rails until it could be attached to the abutment on the California side.

The next year, another highway bridge across the Colorado was completed at Topock. Prior to its erection, automobiles had crossed the river on a railroad bridge covered with wooden planks. Although the new Topock bridge could barely accommodate two-way traffic—automobiles had to wait while trucks crossed alone—at least now travelers on both of Arizona's major east-west highways could continue to California without stopping to arrange for ferry service.

A second spurt of bridge construction came in the late 1920s, after federal highway aid increased. In 1927, a bridge over the Gila opened at Gillespie Dam, north of Gila Bend. It was the longest steel bridge in Arizona—a 1,701-foot structure with a 21-foot concrete roadway. Its opening meant drivers on U.S. Route 80 no longer had to cross the river on the dam's apron, which was closed to traffic whenever water crested the dam. Another bridge across the Gila was completed in 1929 at Dome, northeast of Yuma. This suspension bridge had a main span of 800 feet, and served not only U.S. Route 80, but also the highway from Yuma to Parker.

The 1929 dedication of the steel-arch Navajo Bridge opened the first span over the Colorado River in a 600-mile stretch of the river. Located on U.S. Route 89 between Flagstaff and Utah at Marble Canyon, the 616-foot bridge arched between sheer walls of sandstone.

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[1] Records of the Secretary of Territory, RG 6, Box 1, Arizona State Archives.

Although Arizona made great strides in bridge building during the early 1900s, many of these early bridges quickly became obsolete. Erected when highway standards and construction methods were still evolving, they no longer served well for bigger cars and heavier traffic. The chief bridge engineer of the Arizona Highway Department complained in 1927 that bridges were the main weakness in the state road system: "At present there is not a single major route through our State which is not subject to traffic tie-ups at one or more major stream crossings."[2]

In 1915, only five years after the construction of the new concrete bridge over the Gila River at Florence, floods destroyed its approaches. The Hassayampa River Bridge at Wickenburg was washed out and rebuilt in 1916 and again in 1919. A replacement bridge built in 1921 quickly became inadequate and a new bridge was built in 1937.[3] That one would also be replaced in 1962.

The Ash Avenue Bridge in Tempe, erected in 1913, was built for wagons, and after only 18 years of service it was replaced in 1931 by the Mill Avenue Bridge. At 1,577 feet long and 46 feet wide, the concrete-arch Mill Avenue Bridge carried not only local traffic, but that of three major highways, U.S. routes 60, 80, and 89. Decades later, the Mill Avenue Bridge would be one of only two bridges over the Salt River to survive the floods that struck in 1978 and 1980.

After the Second World War, the emphasis in bridge construction in Arizona shifted from developing new crossings to improving highway alignments and coping with the heavy traffic that came with the state's rapid postwar growth. This required bridges to be higher, wider, stronger, and longer.

For the realignment of the narrow and winding Miami-Superior segment of U.S. Route 60, the roadway had to be moved to a higher elevation, which could only be done by building new bridges at Pinto Creek and Queen Creek. Using an identical design for both locations—a graceful steel arch design that won a national award—the bridges were completed in 1950 and 1953.

Another replacement bridge was a new four-lane concrete bridge built in 1956 across the Colorado River at Fourth Avenue in Yuma, which became the new alignment for U.S. Route 80. The old Ocean-to-Ocean bridge, although no longer part of the state highway system, remained open to local traffic until 1988, when it was closed to vehicles. In 2002, after a $2 million renovation, it reopened to one-way automobile traffic.

With a few exceptions, such as the Burro Creek Bridge on State Route 93 (completed in 1966) and the Bill Williams River Bridge on State Route 95 (completed in 1967), most of Arizona's major bridge projects during the 1960s and 1970s were carried out as part of the state's massive interstate highway construction program.

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[2] Ralph Hoffman, "Lack of Finances Held Responsible for Washing Away of Bridges in Flood Times," *Arizona Highways*, February 1927, 10.

[3] "Wickenburg's New Safety Structures," *Arizona Highways*, May 1937, 4.

The four-lane bridge across the Colorado River at Ehrenberg, planned as an improvement to U.S. Route 60, had already been designed when Congress created the Interstate system in 1956. Arizona highway engineers quickly added a second structure with two additional lanes and designated the twin spans part of Interstate 10. When the Ehrenberg bridge opened in 1960, it was one of the first segments of Interstate 10 to be completed anywhere in the country.

Among the more spectacular spans built in Arizona during this period were the five bridges in an 11-mile section of Interstate 15 that crossed Arizona's northwestern corner from Utah to Nevada. Because nearly the entire segment was situated in the Virgin River Gorge, it was one of Arizona's most expensive highway projects ever, costing $50 million to build. The most difficult section cost $100 an inch and included a bridge that began and ended on the same side of the river.[4]

By 1980, the Interstate system had been largely completed in Arizona and the pace of bridge construction slowed dramatically. Once again the emphasis shifted to accommodating increasing traffic loads and other consequences of Arizona's rapid growth.

In 1990, a new steel-arch bridge opened across Roosevelt Lake on State Route 188, adjacent to Roosevelt Dam. Previously traffic on the road between Globe and Payson had crossed the Salt River on a roadway atop the dam, but a project to raise the dam's height required that the roadway be removed. Four years later, in 1994, the 1934 Salt River Canyon Bridge on U.S. Route 60 was replaced.

On U.S. Route 89A at the Colorado River, a new Navajo Bridge replaced the 1929 original in 1995. By then it was no longer the main river crossing on U.S. Route 89, whose main route crossed the Colorado just south of the Glen Canyon Dam on a bridge erected in 1964. The new Navajo Bridge was almost identical in appearance if not structural qualities to the original span, which became a pedestrian crossing with an interpretive center.

Meanwhile, planning began for the first new bridge to be built over the Colorado River in nearly 50 years. Located just downstream of Hoover Dam, it would replace the roadway atop the dam, which could no longer efficiently handle the heavy traffic carried by U.S. Route 93 under new security requirements instituted after the tragedy of September 11, 2001. Work on the 1,900-foot bridge began in 2003 and is expected to be completed in late 2010. The $293 million project also includes realignment of U.S. Route 93 on both the Arizona and Nevada sides of the river.

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[4] Kenneth Arline, "'Best Job' Covers Most Expensive Strip of Highway," *Phoenix Gazette*, August 19, 1977, A-26.

FROM GRAVEL TO OIL CAKE TO RUBBER CRUMBS: PAVING ARIZONA'S HIGHWAYS

One of the great engineering achievements of the Roman Empire was paved highways. Roman roads endured because of their construction: dug out to a depth of several feet, and then filled in with layers of rubble and fine and coarse limestone, they were topped with lime-grouted flat stones. The resulting road, impervious to water and the buckling caused by freezing and thawing, stood up to the pounding of feet, hooves, and wagon wheels.

The roads of the United States during the nation's first century did not measure up to this standard. Many city streets had adequate paving, but beyond most city limits, roads generally consisted of a path worn in the dirt by constant use. Rough and dusty in dry weather, highways became muddy and often impassible under wet conditions. Whenever possible, travelers and freighters avoided highways altogether in favor of trains or boats.

When automobiles were added to the transport mix, they had to be able to negotiate these existing roads. They needed plenty of clearance to operate in deep ruts and mud, and they couldn't travel very fast. However, as automobile use and technology quickly began to advance, they put more pressure not only on the roads but also on politicians to improve them.

In most places, roads were first improved by adding gravel. This could vary from an engineered macadam road of broken stone held in place by curbs and rolled smooth, to a crude surface of crushed rock spread over a graded roadbed.

Arizona had some advantages and some disadvantages in road building. Pioneer writer Will C. Barnes, who came to Arizona Territory in 1879, noted that the soil of Arizona was composed not of sand but of "a gravelly formation that is not easily cut up, and, except across the 'dobe flats,' is improved rather than injured by rain."[1] But the state's large size and small population meant that the few tax dollars available for road building had to be spread over many miles of roadway.

Nevertheless, the state played a large role in the development of road paving techniques. For a brief period around 1920, Maricopa County's concrete paving program was one of the most ambitious in the country. A few years later, the Arizona Highway Department began experimenting with oiled roads. At first, plows and graders would scarify and level a section of road, then spray it with oil to make a smooth, dust-free, and moisture-resistant surface.[2]

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[1] Will C. Barnes, *Apaches and Longhorns* (Tucson: University of Arizona Press, 1982), 15.

[2] "The Era of Oil," *Arizona Highways*, May 1933, 5.

Before long, the state's highway engineers had developed a comprehensive methodology which included testing and mixing sub-grade stabilizer, refining the mineral aggregate, and mixing the aggregate with oil and spreading it over the base. Then a surface coat of oil was applied and the resulting surface finished by grading and rolling. During most of this process, traffic was allowed to drive over the section of road being prepared, to help in compacting the "oil cake."[3]

Because oil surfacing of roads cost less than paving with concrete or "hot mix" bituminous asphalt, Arizona was able to surface hundreds of miles of highway even with its limited road construction budget. By 1933, Arizona led the 10 mountain states in its mileage of paved and oil-surfaced highways.[4] Though engineers did not know if oiled roads would hold up as long as other types of paving, they understood the crucial role of maintenance to any paved surface. As one of them said, "Maintenance of an oil road begins the day that it is finished."[5]

Decades later, Arizona once again moved to the forefront in the development of paving methods. The city of Phoenix developed the use of rubberized asphalt in resurfacing city streets in the 1960s, and a local company created an asphalt binder made of recycled tires ground into crumbs. Tests showed that rubberized pavement reduced tire noise by up to 10 decibels.

In the 1990s, Phoenix resurfaced more than 200 miles of streets with rubberized asphalt, in the process using 1.1 million recycled tires. The Arizona Department of Transportation (ADOT) also became an enthusiastic user of rubberized asphalt. Between 1988 and 2008 it has applied more than 4.2 million tons of the material on Arizona highways.[6]

In 2003, ADOT adopted the Quiet Roads Program to overlay most of the Maricopa County freeway system with rubberized asphalt. As part of the Superstition Freeway improvements made in 2007, six miles of the expanded freeway received an "asphalt rubber friction course" which included 20 percent crumb rubber from recycled tires as the final surface. Another four miles of the existing freeway also received a top coat of rubberized asphalt.[7]

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[3] George B. Shaffer, "Oil Surfacing as Practiced in Arizona," *Arizona Highways*, May 1931, 6.

[4] "Arizona Leads the West in Oiled Roads," *Arizona Highways*, October 1933, 3.

[5] Shaffer, "Oil Surfacing," 7.

[6] "What Is Rubberized Asphalt?" Arizona Department of Transportation, http://www.azdot.gov/Highways/eeg/quietroads (accessed January 21, 2009).

[7] "Rubberized Asphalt Tops US 60 Widening Project," *Asphalt Contractor* 21.2. February 2007, 22.

"THERE IS TROUBLE TO BE HAD": DRIVING IN ARIZONA

As automobiles and highways improved in the 1920s, driving became America's passion. Although cars were swifter, more reliable, and more comfortable than in the past—and the roads they traveled on more suitable for automobiles—long trips remained an adventure.

Driving in Arizona had its own particular qualities due to the state's small population, the long distances between towns, and the limited state budget for highway construction and repair. "You may go all over that country without a bit of trouble," one travel writer advised, "but—I wouldn't fool you—there is trouble to be had."[1]

Travel guides did their best to prepare new drivers for the challenges of motoring in the desert state. "You can generally get into some kind of building for the night and buy a meal," a writer for *Travel* magazine advised in 1931. "Sometimes the accommodations are good and sometimes they are not."[2] Another author agreed that auto tourists in Arizona "may travel in relative luxury or rough it in any degree."[3]

Before the Arizona Highway Department adopted a uniform system of highway numbering and signing, simply finding the way could be difficult. To help drivers, the Arizona Good Roads Association published a "tour book" in 1913 that mapped the state's highways in detail. The maps gave mileages from point to point and noted the locations of steep grades, side roads, and washes crossing the road. Symbols indicated the location of fences, corrals, and gates near the highway, and photographs showed buildings and junctions as they would appear to the driver.[4]

Humorist Dick Wick Hall once wrote directions from Phoenix to Los Angeles as follows: "Leaving Buckeye, 35 miles west of Phoenix, you will come to the Hassayampa River (dry), bridge and Hassayampa Garage, 44 miles west of Phoenix. BE SURE and take the RIGHT HAND ROAD at the Hassayampa Garage. The left hand road will lead you off on the Yuma Route, about 100 miles out of your way and through the Drifting Sand Dunes, which look like Snow—but ain't."[5]

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[1] Harvey Fergusson, "Exploring the Southwest in Your Own Motor," *Travel* 57 (October 1931): 28.

[2] Fergusson, "Exploring the Southwest," 28.

[3] Hal G. Evarts, "The Lure of the Southwest," *World's Work* 59 (March 1930), 110.

[4] Arizona Good Roads Association, *Illustrated Road Maps and Tour Book* (1913; Phoenix: Arizona Highways, 1987).

[5] Frances D. McNutt, comp., *An Arizona Alibi: The Desert Humor of Dick Wick Hall, Sr.* (Phoenix: Arrowhead Press, 1990), 326.

Some of Arizona's highways were part of pioneer auto trails that had been devised by groups of businesses hoping to lure motorists to their locations. These "old trails" were known by colorful names and identified by striking symbols rather than numbers. The Atlantic Pacific Highway, from New York to Los Angeles, used signs featuring broad bands of yellow and black with a large AP in the center. The competing Robert E. Lee Highway, which ran through Safford, Phoenix, and Yuma, used signs with blue shields. Another such road, the Evergreen National Highway, with its Christmas tree signs, meandered across Arizona from southeast to northwest on the way to Washington state.

But sponsorship by one of the highway associations did not ensure the quality of the road. Even in the middle to late 1920s, the major routes across Arizona included long unpaved sections. A road designated as "highly improved" might be graded and leveled, but it was probably not paved beyond the larger towns. Roads generally followed the lay of the land, so they had many curves, dips, and bumps. One early traveler on the Bush Highway between Mesa and Payson swore that he shook the pickup bed off his truck while driving that road.[6]

Dick Wick Hall wrote, in his unique style, that one road had been laid out by a prospector over 60 years before, "and it has laid out a good many others since then, trying to follow his Tracks, which are now called a County Road, by the Supervisors—and a great many other Names by many other people."[7]

Roads that ran straight up hills might have grades approaching 20 percent. By comparison, grades on highways today rarely exceed 6 percent. This meant that a Model T had to back up such hills, or else the gravity-fed fuel would not reach the engine.[8]

Once off Arizona's major highways, the quality of the roads declined even further. Describing a trip he took in 1930 across an Indian reservation, Hal G. Evarts wrote, "Several years ago I set out from Winslow, Arizona, to drive a sedan across a hundred miles of intervening desert to view the Hopi snake dance. We made it in fourteen hours flat.… Returning at night we lost the alleged road and strayed across the desert until nearly dawn before the elusive highway crawled dimly up out of a sand wash and presented its faint traces for our eager inspection."[9]

For such adventures, it seemed prudent to prepare carefully before leaving home. A minimum equipment kit included a sleeping bag, emergency rations, frying pan and coffee pot, water jug, shovel, chains, and tow rope.[10]

Ernie Pyle, who later gained fame as a correspondent during the Second World War, spent the late 1930s writing a syndicated column about his travels all over the United

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[6] Stanley C. Brown, "Crossing the Mighty Mazatzals: From Indian Trade Route to Modern Highway, *Journal of Arizona History* 47, no. 4 (2006): 328.

[7] McNutt, *An Arizona Alibi,* 322.

[8] Brown, "Crossing the Mighty Mazatzals," 326.

[9] Evarts, "The Lure of the Southwest," 110.

[10] Fergusson, "Exploring the Southwest," 28.

States. When he crossed Arizona, Pyle prepared "as tho [sic] we were going from the Cape to Cairo. We replaced two worn tires with new ones. We brought a shovel. We carried a five-gallon can of water for the radiator and a gallon thermos jug for ourselves."

Pyle and his wife wore overalls and heavy shoes, and they also took equipment that included a tire pump and patches, an extra fan belt, 2 quarts of oil, a first aid kit, a snakebite kit, a funnel and tin cup, a small board on which to set the jack in the sand, gunny sacks to put under the wheels if stuck in the sand, two cans of sardines, a box of crackers, and a .22 rifle and a German Luger "just for fun."

At journey's end, Pyle reported that the only items they actually used were the tin cup, the funnel, and the water. "We never even saw a snake. We never saw anything to shoot at except some prairie dogs. We didn't eat our sardines and the fan belt didn't break. Yet if I were making this trip again, I wouldn't eliminate a single thing. For it is entirely possible to need all these things in the desert, and when you need them, you need them bad."[11]

After the Second World War, the state's roads became straighter and less arduous, and roadside services more available, yet, Arizona remained a huge, sparsely settled state. One writer warned visiting drivers to prepare for "the jolt that comes when a first-timer is exposed to the vastness of the country, the endless, uninhabited miles."[12]

But that jolt was precisely the effect desired by many of those who chose to drive across Arizona, with or without a checklist. Driving itself was the lure, and a road only had to be good enough to take you somewhere. Ernie Pyle figured that in his career on the road he crossed the country 35 times and stayed at 800 hotels. He also wore out two cars and five sets of tires. His favorite part of the experience always came when "'finally one morning we pack up, check out, fill up with gas, and light out into open country. Once in that car and under way, we don't have to talk to anybody, keep up with events…. [W]e are alone, and free.'"[13]

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[11] Ernie Pyle, *Ernie Pyle's Southwest* (N.p.: n.p., 2003), 45.

[12] L. M. Comstock, "Tips to Take You Southwest," *Better Homes and Gardens*, November 1946, 31.

[13] Janet F. Davidson and Michael S. Sweeney, *On the Move: Transportation and the American Story* (Washington, D.C.: National Geographic Society, 2003), 196.

RAILROAD TOWNS
TO HIGHWAY TOWNS

Transportation routes do not just affect how people travel from town to town; they also largely determine what people do when they get to town, and where they do it. Many of the cities in Arizona did not begin to really grow until a railroad or highway arrived, and they sometimes withered when bypassed by new routes. Sometimes, towns moved "Main Street" to be as convenient as possible to travelers on a new corridor.

The town of Ash Fork was born beside the new transcontinental railroad line built across northern Arizona in 1882. It boomed when a cross-country highway pushed through in the 1920s, and when that road was improved and renamed U.S. Route 66, tourism became the lifeblood of Ash Fork. But in the 1950s rail passenger traffic declined and the Santa Fe line was moved north of the town. In the 1970s, the new Interstate 40 also bypassed Ash Fork. The town did not die, but its historic function as a transportation center diminished greatly.

Any change in the style or routing of transportation could affect the look and feel of a town. The construction of the Southern Pacific Railroad in 1880 through a hamlet called Maley triggered the establishment of a cattle shipping center that became one of the nation's busiest; soon the town was renamed in honor of Civil War hero Orlando Willcox, who had come to Arizona to command the Army's Department of Arizona. At the time, the town's principal commercial street was Railroad Avenue, where hotels, shops, restaurants, and saloons catered to railroad travelers and shippers.

As the decades went by, the railroad remained the easiest way to reach Willcox. The main highway in southeastern Arizona, which would become U.S. Route 80, did not pass through Willcox; instead it cut south from Benson to pass through Bisbee and Douglas. As late as 1935, the best road out of Willcox ran south to Douglas. But soon after that State Route 86 was improved from Benson through Willcox to the New Mexico border, and this quickly became the preferred highway between Tucson and El Paso.

By then, railroad passenger traffic to Willcox had begun to diminish. Gradually, travel-oriented businesses moved from Railroad Avenue to Haskell Avenue, where the highway passed through town. The two streets were only a block apart, but many of the new motels and service stations ended up locating not in the center of town but on its outskirts, where land was cheaper and access easier. After the Second World War, these outlying areas catering to travelers grew in many towns, including Willcox, while the neglected railroad depots and downtowns went into decline.

In the 1970s, Interstate 10 was built across southern Arizona. Willcox succeeded in having the highway route pass near the town (an alternate route through Apache Pass had been considered). But the three interchanges serving Willcox were not particularly close to the existing tourist businesses, so once again, the shape of the town changed as motels,

service stations, and restaurants moved still farther away from the town center. Bowing to this trend, the town built its Cochise Visitor Center and Museum near Interstate 10. As one resident later said, the decision to locate the center next to the interstate was made "in self-defense by a community that feared a big part of its tourist trade would be lost."[1]

Larger cities also realized the value of tourism and the highways that brought the tourists. An economic study of Kingman found that in the 1950s, the only real economic growth came from highway users. From 1957 to 1961, tourist-related business in Kingman grew 26 percent. In the last year of that period, sales to travelers on U.S. Route 66 and U.S. Route 93 totaled $11 million, and sales to travelers stopping elsewhere in town brought in another $5.4 million.

Naturally, the routing of Interstate 40 near Kingman was of great concern to local business and government. The route preferred by the local community curved north of the city across a broad, easily developed plain, then dropped south near the west side of the city. It intersected U.S. Route 66, which it was replacing, at both ends of town, and it crossed U.S. Route 93 at an advantageous spot. It also provided a "notably scenic view of the city and the surrounding country, which created "a favorable public image of Kingman regardless of whether a traveler stops or not."[2]

To entice tourists who no longer drive directly though town, some communities have turned to buildings and services that were attractions for previous generations of travelers. In Winslow, the renovation of the Fred Harvey La Posada Hotel, which was originally built for railroad travelers, became the centerpiece of downtown redevelopment.

Williams also boasted a renovated Fred Harvey hotel, the Fray Marcos, and the town's revival as a tourist destination has been tied directly to its role as a railroad center. From 1901 to 1968, a spur of the Santa Fe Railroad at Williams carried tourists to the Grand Canyon. That service ended due to declining railroad passenger traffic, as most visitors to the national park now came by interstate via Flagstaff, where Interstate 40 and Interstate 17 intersected. But in 1989, the railroad from Williams to the Grand Canyon was revived, and it soon began to attract 200,000 passengers a year, most of whom now arrived in downtown Williams by car.

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[1] Vernon B. Schultz, *Southwestern Town: The Story of Willcox, Arizona* (Tucson: University of Arizona Press, 1980) 116.

[2] J. K. Kipp, *An Economic Study of Interstate 40 in the Kingman Area* (Phoenix: Arizona State Highway Commission, 1962), 9-14, 27.

A FACTORY FOR TRIPS: THE INTERSTATE HIGHWAY CONCEPT

Author Phil Patton describes a striking contrast evident in photographs of the Ford Motor Company assembly plant in the 1920s. The factory, designed by architect Albert Kahn, was built with sweeping beams and columns of steel-reinforced concrete. "Beside them," wrote Patton, the Model T cars being built at the factory "look almost medieval."[1]

If the cars of the 1920s seemed medieval, the roads they traveled on were positively prehistoric. Only when highway engineers began to employ the designs and materials of modern architecture, developed by pioneers like Kahn, Le Corbusier, and Horatio Greenough, and to think of highways in terms of both beauty and efficiency, did roadways enter the modern era.

It is fair to say that before 1920, American highways were not engineered at all; they were simply graded. Roads rose and dipped with the lay of the land, and they often detoured for dozens or hundreds of miles to avoid mountains and canyons. When highway departments began to take on the challenge of building mountain roads in the 1920s, the new highways they built showed how fast highway design was evolving. Curves now stretched out on a thousand-foot radius. If sharper curves were necessary, as they often were on hillsides "where anything else would be in space or under the mountain," the roadway was widened on the inside of the curve and "superelevated," or banked, on the outside to improve sightlines and safety.[2]

By the 1930s, the engineering of highways was largely standardized across the country, but the increasing number of cars and the higher speeds they traveled clearly signaled the need for further development. In Germany, the autobahns pioneered a new design approach: removing the highway from the "friction" of the surrounding area by building wide medians and shoulders, controlling access and egress on long ramps, using overpasses rather than intersections, and limiting visual distraction. The Germans also demonstrated that better highways, and the speed of travel they allowed, ought to be viewed as a long-term investment in economic development rather than merely a short-term cost of government.

By 1940, several projects had brought these concepts to the United States. The Merritt Parkway in southwest Connecticut, the Pennsylvania Turnpike, and the Arroyo Seco freeway between Los Angeles and Pasadena were wildly popular with motorists and public officials. At the 1939 New York World's Fair, General Motors' "Futurama"

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[1] Phil Patton, *Open Road: A Celebration of the American Highway* (New York: Simon and Schuster, 1986), 127.

[2] Percy Jones Jr., "What Relocation of Highways Means," *Arizona Highways*, December 1931, 3.

exhibit took crowds on a flight over a vision of America in 1960 that featured streamlined automobiles cruising swiftly and smoothly over the gracefully curved, multi-level ramps of a superhighway that bisected and connected city, suburb, and countryside.

After the Second World War, the automobile factories that had been making fighter planes and other military weaponry and vehicles began turning out powerful, streamlined cars. Americans bought them by the millions. The speed and weight of these vehicles destroyed the pavement of the old highways, and their numbers brought traffic to a standstill in towns and destinations where the cars overwhelmed the available lanes.

In 1939, the U.S. Bureau of Public Roads had produced a plan for a 40,000-mile national highway system. By the mid-1950s, the man in the White House had a strong interest in this plan. As a young Army officer, President Dwight D. Eisenhower had been a participant in a 1919 project that sent a convoy of Army trucks from coast to coast. It was an arduous journey on the primitive roads of the time, and it helped make Eisenhower a strong proponent of a national highway system that was safer and faster.

The Federal-Aid Highway Act of 1956 contained all the elements that Eisenhower wanted for a new Interstate highway system. It gave responsibility for developing uniform engineering standards for the system to a new agency, the Federal Highway Administration. The law overhauled the highway trust fund and increased federal gasoline taxes and transport fees, and it allowed the federal government to condemn land for the system.[3]

Now engineers had the means and a mandate to create the ideal highway. Finally the functionalism, flow, and space of modern architecture could be fully brought to bear on American highway design. Highway engineers saw the ultimate highway as a sort of factory whose product was an automobile trip orchestrated by the highway itself and composed, as one writer said, of a succession of events that unfolded in melodic order.[4]

For example, traditional road engineering strove to get from point to point by the straightest possible line over the shortest possible distance. When curves were necessary, the driver was expected to slow down to a speed appropriate for the radius of the curve. But on a superhighway, drivers were expected to travel at a constant speed, which required that the curves be stretched out to accommodate that speed.

At the same time, engineers began to pay more attention to the aesthetics of highway location. Long straight, stretches of highway had been studied and shown to be deadly dull in a literal sense; on such roads, drivers' attention often wandered from the road and some even fell asleep. An attractive blend of curves, rolling hills, and straightaways was both safer and more aesthetically pleasing to the driver.

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[3] William Kaszynski, *The American Highway: The History and Culture of Roads in the United States* (Jefferson, N.C.: McFarland, 2000), 166-67.

[4] Patton, *Open Road*, 127-29.

In designing the Interstate system, highway engineers took these principles and applied them over and over again. When completed, the Interstate highway system was standardized as much as possible across America, so that little more than the roadside landscaping identified the traveler's location. But the freeway, as designed, did not achieve utopian status. The enormous space required for the interstates, as much as 45 acres per mile (more for interchanges), created a new sort of land—literally a no man's land that was fenced off from pedestrians and all human activity unrelated to driving. Other developments accentuated the sameness. The fast-food restaurant, with its food and workflow engineering, became an indispensable part of the automobile travel experience. Many travelers found the sameness boring, and they longed for the more slowly unfolding pleasures of the old two-lane highways with their fondly remembered cafes and interesting scenery. Soon these roads, like the old Route 66 in Arizona, became tourist attractions in themselves.

SIC TRANSIT GLORIA:
URBAN TRANSIT IN ARIZONA

The first public conveyance in Arizona was the ferry that took travelers across the Colorado River at Yuma in the early 1850s; later other ferries and boats plied the river, and stagecoaches carried passengers from town to town across the Territory. Today, when most people think of public transportation, they think of urban transit systems in which buses, trains, trolleys, and trams carry large numbers of people on short trips.

In Arizona, the earliest forms of urban transit were horse-drawn jitneys and omnibuses (wagons fitted out for passengers), which combined elements of what would later be called buses and taxis. They might run on a route, and they might be shared by several passengers, but they all provided a service for a fare. Tucson had such a service in 1879, running from the center of town to Nine-Mile Water Hole to meet the Casa Grande stagecoach.

Just as railroads were the first reliable and comfortable means of inter-city travel, the streetcar was considered the most civilized way to get about in cities large enough to support one. Phoenix, Tucson, Prescott, Bisbee, and Douglas all had some sort of streetcar service. In some towns, railroads acted as commuter lines, carrying passengers between Phoenix, Glendale and Mesa, from Globe to Miami, and between Tucson and Sahuarita.

In the five streetcar cities, too, the lines were developed not so much to relieve urban congestion as to connect the town with new suburban developments and businesses on the outskirts of town. The Phoenix Railway Company was begun in 1887 by Moses Sherman, a subdivision developer. One of the first Tucson lines, established in 1898, carried passengers from downtown to the distant University of Arizona, dropping passengers at the school's main gate on Park Avenue.

The Douglas street railway, which ran 10 miles, connected residential districts, downtown, and the smelter and copper company offices located west of the city. The Warren-Bisbee Railway, which began operation in 1908, was actually an interurban line connecting three towns (Bisbee, Lowell, and Warren) with a combined population larger than either Phoenix or Tucson. Prescott christened its streetcar the Prescott and Mount Union Railway in 1904, indicating an intention to reach beyond city limits, although the one-mile line on Gurley Street never extended past Fort Whipple.

The oldest streetcar lines, those in Phoenix and Tucson, began with horse-drawn cars. By 1892, the Phoenix system included 8 miles of track, 5 cars, and 25 horses and mules. The following year the company began stringing overhead cables for a new technology: the electric trolley car. The Tucson Street Railway also began operation using horse and mule power, but by 1907, the company—now known as Tucson Rapid Transit after a

bankruptcy and reorganization (a common path for early transport companies)—was using electric cars.[1]

By 1914, the Phoenix streetcar line reached the Arizona State Asylum on 24th Street and also extended north to the Phoenix Indian School, the new Orangewood district near 15th Avenue and Myrtle, and Glendale.[2] Eventually the system's popularity and expense outgrew owner Moses Sherman's original vision, and he sold it to the city for a nominal price. The city, however, only reluctantly embraced streetcars, preferring the flexibility of buses. For several decades the city's system of streetcars and buses operated side-by-side with the privately owned Metropolitan Bus Line, which also served the suburbs of the eastern Salt River Valley. In 1948, the city shut down its streetcar lines, choosing to rely solely on buses for public transportation.

Tucson Rapid Transit began operating buses in 1925 and ceased streetcar operations altogether in 1930. The Warren-Bisbee line reached a peak of 2,500,000 passengers in 1916, but the growing popularity of automobiles and a decline in copper mining in the area meant that the railway was operating at a loss by 1925. Three years later, in 1928, the Bisbee streetcar line was closed and replaced by buses.[3] The subsequent development of the Lavender Pit mine not only obliterated traces of the old streetcar track, but also of several residential areas, like Jiggerville and Upper Lowell, that once were served by the line.

As cities rapidly grew and streets improved, governments and citizens seemed to prefer buses to trolleys, but in both Phoenix and Tucson they preferred automobiles even more. From the 1930s through the 1960s, each city tried private bus lines, city-owned lines with contracted operators, and city-owned or city-managed lines. This dabbling mainly indicated a lack of interest in public transportation.

During the 1960s, Phoenix was served by the city bus line, while its suburbs relied on Valley Transit, the successor to the Metropolitan Bus Line. But city planners, politicians, and many citizens, preferring an automobile-oriented city, refused any public support or subsidy for transit. As ridership declined, the bus lines responded by cutting routes and increasing fares, further eroding the customer base. By 1971, bus passenger traffic in Phoenix had dropped to a level last seen in 1931, even though the city was now 10 times larger.[4] In Tucson, ridership had dropped to one-third of its peak level during the Second World War.

Two factors brought a new appreciation for public transit in the cities. First, the "automobile-oriented" cities grew so fast that cars began to choke both streets and freeways. Second, the federal government began to fund urban transit, beginning with the

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[1] Cirino G. Scavone, *Please Step to the Rear* (Tucson: Tucson Corral of the Westerners, 1977), 23.

[2] Jerry Abbitt, *History of Transit in the Valley of the Sun, 1887-1989* (Phoenix: City of Phoenix Transit System, 1990), 14.

[3] Richard V. Francaviglia, *Mining Town Trolleys: A History of Arizona's Warren-Bisbee Railway* (Bisbee: Copper Queen Publishing Co., 1983), 33.

[4] Abbitt, *Transit in the Valley of the Sun*, 159.

Urban Mass Transportation Act of 1964. The U.S. Department of Transportation was created two years later, and soon all federal highway programs contained funds for "intermodal" forms of transportation. In addition, a host of laws on the environment, energy, economic development, and civil rights began to include either direct or indirect mandates for better public transportation.

Even more important was a revival of interest in good transit on the part of city residents. In 1974, a privately owned Phoenix bus called the Bug Line began offering free service from northwest Phoenix to Scottsdale and Arizona State University in Tempe. Revenue to support the line came from advertising on the buses. At the same time, ridership on Phoenix Transit buses was slowly increasing through the 1970s and early 1980s as service gradually improved.

In Tucson, the city acquired the Tucson Rapid Transit Company in 1969 and used federal funds to purchase new buses, allowing an expansion of routes and more frequent service. Ridership blossomed, and the name Sun Tran was adopted by the system in 1975.

Finally, both residents and the governments that served them recognized the need to support public transit with tax dollars. In 1985, the Arizona Legislature gave cities and counties the power to create regional public transit authorities. That same year, Maricopa County voters approved a sales tax increase for freeways that allocated a relatively miniscule amount of money for transit. These funds paid for increased service including express lines and dial-a-ride services for disabled and elderly citizens. In addition, Arizona cities began to receive state lottery revenue for public transportation. When the 1985 transportation tax was set to expire, a new tax was approved by county voters in 2004, providing a renewed funding source for freeway, surface street, and transit improvements.

Over the next 20 years, several Salt River Valley cities also levied additional sales taxes specifically to help fund transit operations. The first transit-only tax proposals, which were regional in scope, were turned down by Valley voters; these included the ValTrans light rail project in 1989 and a regional transit tax in 1994. At that point transit advocates shifted their focus toward enacting single-city transit taxes. The first local transit tax to be approved in the Valley came in Tempe in 1996. After voters in Phoenix, Scottsdale, and Chandler turned down tax proposals in 1997 and 1998, Phoenix voters approved a transit sales tax in 2000 and Glendale voters did the same in 2001.

Since 1993, the Maricopa County regional public transit system has been known as Valley Metro. In 2008 the Metro Light Rail—a modern streetcar—began operating on a 20-mile line that connected Mesa, Arizona State University, downtown Tempe and Phoenix, and part of the Central Avenue corridor in Phoenix. By then, extensions to the system were either being planned or studied for Glendale, west Phoenix, south Tempe, Chandler, and Paradise Valley.

In 2006, Pima County voters funded a 20-year transportation plan under a regional public transportation authority. Sun Tran used some of these funds to extend and expand bus

service. By then, Tucson also had a streetcar line known as the Old Pueblo Trolley, which operated restored historic streetcars along Fourth Avenue and University Avenue on a limited schedule. The streetcars were run on a nonprofit basis by a volunteer-staff organization that also had a transportation museum and hoped to expand service to downtown Tucson as part of an integrated area transit plan.

FREEWAY CONTROVERSIES

When freeways began to be built in large numbers after the Second World War, they were eagerly embraced by most Americans as the best way to quickly move large numbers of automobiles between and through cities. The negative aspects of freeways, especially in urban areas, took longer to become apparent.

The first objections to freeways focused on their destruction of well-established neighborhoods. A new freeway sometimes required the bulldozing of thousands of homes and businesses. Owners of destroyed properties at least received something for their loss and had the opportunity to move elsewhere, but those residents left along the edges of the new highway were left on their own to cope with the traffic, noise, and air pollution produced by the freeway. Possibly the most reviled aspect of freeways was that they cut off areas of a city from the surrounding neighborhoods. The Cross Bronx Expressway in New York was blamed for the decline of the South Bronx, and the Embarcadero Freeway in San Francisco was despised by local residents for separating the waterfront from the rest of the city.

The negative response to these aspects of freeways was so pervasive that a “freeway revolt” movement sprang up in cities all over the United States to stop the construction of unwanted projects. In San Francisco, protests succeeded in stopping the Embarcadero Freeway in mid-construction in 1966. While not every new urban freeway project was halted, it soon became clear that freeway planners and administrators could no longer take for granted the approval of either the public or politicians.

Both Phoenix and Tucson experienced long-running freeway construction dramas. These began with a controversy in the 1970s over the Papago Freeway through central Phoenix.

Since 1949, a plan had existed for some sort of multi-lane divided road on an east-west alignment along the northern edge of downtown Phoenix. By 1960, planners had developed a comprehensive freeway map for the Salt River Valley that showed Interstate 10 cutting through the heart of Phoenix along this alignment, which by then was known as the Moreland Corridor. At 20th Street, Interstate 10 would turn south toward the Salt River, which it would follow to Tempe, while the Moreland Corridor freeway would continue eastward through the middle of Papago Park to Scottsdale—the reason it became known as the Papago Freeway.

In 1971, an engineering firm submitted a plan for the downtown section of this freeway that proposed an elevated roadway located as high as a hundred feet above the ground. The designers suggested that elevating the roadway would frame the big buildings of downtown without visually cutting them off, while giving drivers a panoramic view of the city. They also claimed it would be less disruptive to the surrounding area than a surface or below-grade freeway, and they envisioned the area beneath the skyway being developed as a park.

The elevated freeway proposal ran into immediate opposition from Phoenix residents. These opponents received a major boost when *Arizona Republic* publisher Eugene Pulliam turned his paper's editorial pages against the freeway in April 1973. After 10 days of attacks in the newspaper, the Phoenix City Council, responding with alacrity, called an election to decide the issue.[1] The advisory vote rejected the Moreland route for a freeway, but the idea was revived and approved two years later as a below-grade route that would pass under a "deck park" between Third Avenue and Third Street—a distance of little more than a half mile.

However, plans for other freeways in the Salt River Valley withered, and by the early 1980s Phoenix had fewer miles of freeway than any other large city in the country. The first step toward changing that came in 1985, when Maricopa County voters approved a one-half-cent sales tax primarily devoted to freeway construction. Work soon began on a series of loop freeways that encircled what were then the outskirts of the metropolitan area.

Once again, though, proposals for a cross-town freeway became the source of controversy. In the 1960 freeway plan, the Paradise Parkway had been proposed for an east-west route situated between Camelback Road and Bethany Home Road; it was to connect with the Wickenburg Expressway that extended from the West Belt Expressway to the Black Canyon Highway and proceed through the Phoenix Mountains and Paradise Valley and ending at the East Belt Expressway in Scottsdale. But the long delays in construction made purchasing the right-of-way for this route extremely expensive due to development along its path, which ran through and past some of the most expensive residential, resort, and office properties in the Phoenix area.

Even when the Paradise Parkway was shortened to end at the Squaw Peak Parkway, it was estimated that it would cost a billion dollars and require the eviction of 6,800 residents and the destruction of over 3,000 homes. Nevertheless, the city and the Arizona State Transportation Board approved the plan and began buying properties in the right-of-way.

When it became clear that the cost of building the county's freeway system would exceed the revenue produced by the sales tax, several projects were dropped from the system, including the Paradise Parkway. "It's wishful thinking to think we could ever build a freeway there," said a member of the State Transportation Board. "It's controversial and incredibly expensive."[2]

In Tucson, meanwhile, freeway proposals fared no better. In 1960, the city anticipated strong growth on its east side, and planners mapped out two roadways to aid traffic in that area. The Butterfield Expressway and Rillito-Pantano Parkway would form a loop off Interstate 10 that would connect downtown Tucson with the city's east side. Critics

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[1] Earl Zarbin, *All the Time a Newspaper: The First 100 Years of the Arizona Republic* (Phoenix: Arizona Republic, 1990), 305.

[2] "Paradise Freeway May Be Called Off," *Kingman Daily Miner*, December 6, 1994.

did not argue that the parkways would speed up traffic, but they did claim that the roads would encourage even more growth in the area and thereby destroy the unique character of the neighborhoods through which they passed. In 1972, both routes were rejected and the projects put on hold.

Two other parkways were built, however. These were Kino Parkway, which ran south from Campbell Avenue and Broadway Boulevard to Interstate 10 and the Benson Highway, and Barraza-Aviation Parkway, which was an expansion and renovation of the existing Aviation Highway. This ran on the north side of the Southern Pacific tracks to Davis-Monthan Air Force Base.

In 1986, voters rejected a plan to extend Barraza-Aviation Parkway from its northern terminus at Broadway through downtown Tucson to Interstate 10 on the city's west side. Three years later, in 1989, the city took over the design of the project from ADOT and began a lengthy study of alternatives for what was called "the last mile." In 2005 a citizens' advisory committee was formed, and eventually it developed a plan called Downtown Links, which combined a four-lane extension of the parkway through downtown with a number of other features, including new underpasses beneath the railroad tracks at Fourth and Sixth avenues and a rerouting of Sixth Street.[3]

The Downtown Links plan also included several below-grade sections, bicycle and pedestrian paths, and provisions for the preservation of historic buildings and areas. In 2006, Pima County voters approved the creation and funding of a regional transportation authority that would be charged with carrying out the Downtown Links plan. By the time the "last mile" of Barraza-Aviation Parkway is completed, it will almost certainly stand as a model of multimodal transportation planning.

[3] "Downtown Links," Regional Transportation Authority, http://www.downtownlinks.info (accessed April 29, 2009).

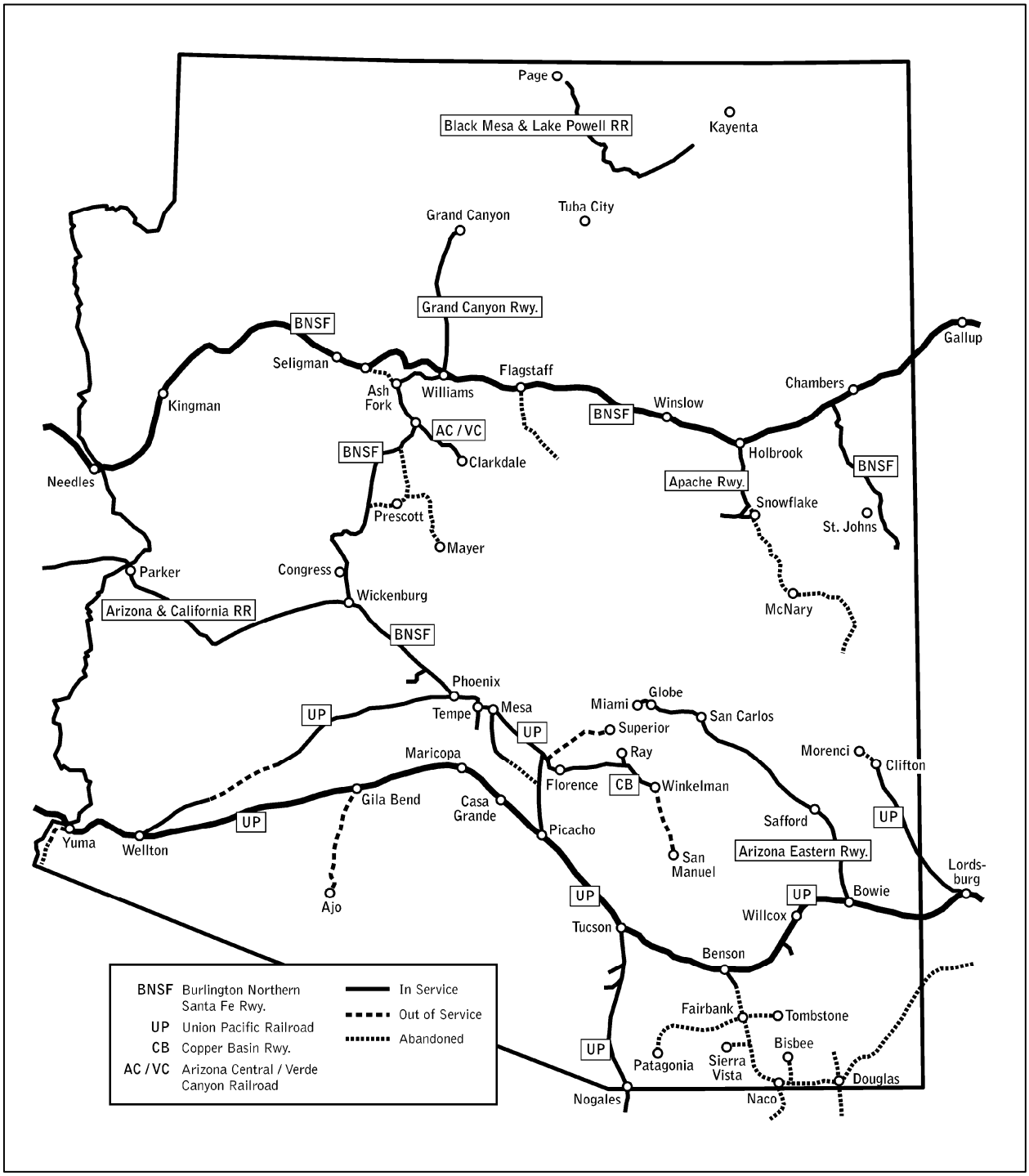

Figure 10. Arizona Railroads, 2007.

For clarity's sake, some spur lines and short lines have been omitted from the map. Adapted from "2007 Arizona Railroads Map (Service Status and Ownership)," *State of Arizona 2007 Railroad Inventory and Assessment: Final Report* (Phoenix: Arizona Department of Transportation, 2007).

ROADS ON RAILS:
RAILROADS IN ARIZONA

In an era when cars and trucks crowd the highways, and millions of people fly into and out of the state, it might seem surprising that Arizona now has more railroads doing more kinds of things than ever before. And, the level and variety of activities are almost certain to increase in coming decades.

The arrival of the railroad symbolized progress and civilization in the 19th century. By that measure, Arizona arrived at the modern age on January 8, 1879, when the Arizona Territory's first scheduled passenger train service began on a new track from Yuma to Adonde. The 30-mile trip took almost two hours at a brisk 17 miles per hour.

From Adonde the Southern Pacific Railroad, which had crossed the Colorado River only with some difficulty, slowly built east along the time-worn route known as Cooke's Wagon Road, arriving in Tucson in March 1880 (see Figure 3). The following May the railroad completed construction to El Paso, where it could connect with rail lines serving the rest of the country.[1] Chief among these was the Atchison, Topeka and Santa Fe Railway (ATSF), which reached Deming, New Mexico, from Albuquerque around the same time. Soon after the Southern Pacific (SP) completed its southern Arizona line, the SP allowed the ATSF to use the line as far west as Benson so it could connect with a subsidiary line that ran to Nogales and then into Mexico.

Northern Arizona had a smaller population and rougher terrain, but it lay in the path of the most direct railroad route between St. Louis and California. It was along this line that the Atlantic & Pacific (A&P) Railroad completed a line across Arizona in 1883, in the process creating towns like Holbrook, Winslow, and Kingman, all of which were named after executives of the company.

A notable feature of the A&P line was the bridges built for it. At Canyon Diablo, a bridge on spindly steel legs spanned a gorge 225 feet deep and 550 feet across. Raging waters foiled several attempts to bridge the Colorado River at Topock, a task that was finally accomplished in the summer of 1883. The Atlantic & Pacific nameplate did not long survive, though, and for almost all of its history northern Arizona's rail line has been part of the Atchison, Topeka and Santa Fe and its successor, the Burlington Northern Santa Fe (BNSF).

These two rail routes across the state, the southern and the northern, have remained part of the backbone infrastructure of the United States since their construction (see Figure 10). The Southern Pacific line, long known as the "Sunset Route," is now owned by the Union Pacific Railroad. By 2007, it was averaging 44 to 49 trains a day and carrying up

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[1] David F. Myrick, *A Brief Survey of the Histories of Pioneer Arizona Railroads* (Golden, Colo.: Colorado Railroad Museum, 1968), 7.

to 98 million gross tons of freight per year. Much of this freight consisted of through shipments, but the line connected to numerous branches (or divisions) that originated and received shipments in Arizona.

Two of the most important were the Phoenix and Nogales divisions. The Phoenix Division extended from the mainline north to the Salt River Valley and west to Arlington. The division included branches, or leads, to Litchfield and Goodyear, south Phoenix, Tempe, and Chandler. The Phoenix Division also connected to two Pinal County mining railroads. The Nogales Division connected to the Mexican railroad Ferromex, with eight through trains a day. This division also served several mining short lines.

The Santa Fe route across northern Arizona was the main railroad connection between Chicago and Los Angeles, and it carried two-thirds of BNSF traffic—up to 120 trains a day in 2006. This line has been double-tracked since 1913. The railroad had several divisions in Arizona. The Santa Fe, Prescott & Phoenix Railway, acquired from builder Frank M. Murphy in 1901, was nicknamed "The Peavine" and also connected to a line that ran from Wickenburg to Parker and Cadiz, California. The BNSF connected to the Southern Pacific at Union Station in Phoenix and had extensive yards in west Phoenix and Glendale. Another division delivered coal from the mainline to power plants located in St. Johns and Springerville.

The story of railroads in Arizona also includes the short lines dedicated to carrying freight, most of which has consisted of large shipments of a single item into or out of a mining or industrial site. According to one study, done in 1968, there have been 53 distinct railroads in the state's history.[2] A 2007 ADOT study listed 19 railroads operating that year.[3] Both these figures reflect the large number of short lines and industrial railroads set up to haul a single product such as copper ore, cattle feed, or coal.

While at least one railroad, the Apache Railway in the White Mountains, existed to haul timber and lumber, the greatest need for specialized lines has been in the mining industry. In the 19th century, short, steep, twisting tracks, many of them narrow gauge, were driven into the Bradshaw Mountains south of Prescott, into the jagged canyons of the Gila River in the eastern part of the state, and into the mountains of the southeast, from Tucson to Bisbee.

Where the mines being served produced gold or silver, the railroads, like the mines, have long since ceased operating, leaving only their scars on seldom-seen hillsides. The earliest of these efforts included branches of the Peavine built by Frank Murphy to Mayer, Big Bug Creek, Poland, and Crown King. These railroads operated only a short while before the silver mines they served were abandoned.

But where copper was the freight, the short lines became more or less permanent operations, their traffic rising and falling on the strength of the copper market. The short,

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[2] Myrick, *Pioneer Arizona Railroads*, 4.

[3] R. L. Banks & Associates, *State of Arizona 2007 Railroad Inventory and Assessment: Final Report* (Phoenix: Arizona Department of Transportation, 2007), 1-75.

narrow-gauge Coronado Railroad, which served mines in the Clifton-Morenci area, could be said to have been the first railway built in Arizona. Another line connected Clifton to the Southern Pacific mainline at Lordsburg, New Mexico, and in 1898 a line was completed from the SP mainline at Bowie to the Globe-Miami area. Trains still ran on both these routes in 2006.

As important if not as long-lived as the Clifton-Morenci and Globe-Miami copper deposits were those in and around Bisbee, which was served by a mining company railroad that ran from Benson to El Paso, carrying ore to the smelter at Douglas and raw copper eastward. This line and its connecting branch from Nacozari, Sonora, were the site of two of the most famous railroad-related incidents in the history of the U.S.-Mexico border region.

In 1907, engineer Jesus García pulled a burning car of dynamite from the center of Nacozari to the outskirts of town before it exploded, killing García, who became known as the Hero of Nacozari. In 1917, labor troubles in Bisbee led the county sheriff and a group of vigilantes to force 1,200 miners associated with the Industrial Workers of the World (IWW) onto a train. The men were taken across the New Mexico border before being forcibly dropped off in a desert area. This incident drew national attention and raised the profile of the IWW union.

In the first two decades of the 20th century, trains were the only easy means of long-distance overland travel and tourism in Arizona and the Southwest. Both the Southern Pacific and the Santa Fe promoted travel to the Southwest, especially to the Grand Canyon and the warm climates of Phoenix and Tucson. But passenger rail travel peaked in 1920, as competition from the automobile increased, and passenger railroads went into permanent decline after the Second World War.

A short but very successful passenger line began serving the Grand Canyon in 1901, when the Santa Fe bought a mining railroad and extended it from Williams to the canyon's south rim. This allowed tourists easy access to the area for the first time, and to accommodate them, the railroad company built the El Tovar Hotel and a number of other facilities. By the 1960s, rail passenger traffic to the Grand Canyon had declined severely, and the ATSF ceased passenger service to the park. New owners revived the line in 1989, though, and it has since become one of the most popular tourist railroads in the United States, with a 2006 ridership of 240,000. Another successful tourist railroad runs from Clarkdale through Verde Canyon.

In 1970, the federal government created Amtrak, a government-owned rail passenger service that uses the privately owned lines of the surviving freight railroads. The first Amtrak trains ran on the two main east-west routes through Arizona, and they continue to do so today. In 1996, the Southern Pacific closed its main line between Phoenix and Yuma, and direct Amtrak service to Phoenix ended that year.

Railroads are primarily regulated by the federal government. By the middle of the 20th century, regulation had grown cumbersome and ineffective, and the industry was near

collapse. The 1980 Staggers Rail Act changed the ground rules of rail regulation, allowing railroads to operate like other industries. In the following years many railroads merged, and their successor firms dropped unprofitable lines and increased shipments and profits. Meanwhile, small companies stepped in to operate short, specialized lines on existing or abandoned tracks that fed off the main lines or worked independently of them. But it was unclear whether many small railroads had the resources to make the large infrastructure improvements and capital investments necessary for long-term growth.

ADOT's regulation of railroads is limited to ensuring the safety of railroad grade crossings with streets and roads (a job shared with the Arizona Corporation Commission). But ADOT's Multimodal Planning Division has completed detailed studies of the state's existing railroads; these include plans for a passenger line from Globe to the San Carlos Apache Indian Reservation casino resort and a high-speed rail line between Phoenix and Tucson and possibly other destinations.

"THE ONLY WAY TO GET AROUND": AVIATION IN ARIZONA

Aviation in Arizona truly began after the First World War, when the Army released into the civilian market thousands of airplanes and pilots that were no longer needed for the war effort. This dispersal of aircraft and flyers to all corners of the country set the stage for the development of what came to be known as civil aviation: commercial airline service and private flying.

In 1919, Tucson became the first city in the United States to use municipal funds to build an airfield. Airplanes were still rare, and most landing fields at that time were makeshift affairs. In Phoenix, planes took off and landed on a local race track. In Nogales, pilots used a polo field from which the goals had to be removed.[1]

In 1926, with the Air Commerce Act, the federal government began organizing aviation nationally, developing navigational aids and safety standards. The following year the trans-Atlantic flight of Charles Lindbergh created intense national interest in flying. Commercial aviation began in 1927, when the U.S. Post Office contracted with private companies to deliver air mail. The independent carriers quickly consolidated into larger companies, several of which would eventually become major airlines. Carrying passengers was an afterthought at first; adventurous travelers were squeezed in next to sacks of mail.

Twenty-two Arizona towns had airfields by the end of the 1920s, most of them privately owned. In the Great Depression that followed, commercial aviation suffered and many private airports went broke. Although existing federal laws did not allow direct government aid to airports, New Deal construction funds were made available to publicly owned airports, which had the effect of strongly encouraging municipal ownership of airfields. Federal aid helped airports to build and improve runways, taxiways, lighting, and terminal buildings.

In 1938, the Civil Aeronautics Act gave the federal government regulatory power over airlines and air navigation. In 1940, the threat of war led the government to authorize the construction and improvement of hundreds of airports nationwide. Phoenix, Prescott, Nogales, and many other towns had runways paved, lights installed, and other improvements made. By the end of the Second World War, the Civil Aeronautics Administration had spent $362 million on this program, with the armed services spending even more money on airport development.

Many military airports were declared surplus after the war and turned over to cities and counties for civilian use. As a result of this program, Kingman, Bisbee-Douglas, and

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[1] Ruth M. Reinhold, *Sky Pioneering: Arizona in Aviation History* (Tucson: University of Arizona Press, 1982), 57, 72.

Florence all received new airports. Tucson's Davis-Monthan Airport, however, was kept and developed by the military, and Tucson had to build a new airport on the Nogales Highway south of town.

In 1946, the Federal Airports Act established continuous federal funding for airports, and Congress appropriated $500 million for such expenditures over the next seven years.[2] During the immediate postwar years, air travel and airports in Arizona experienced dramatic growth. Previously, flying had been largely limited to the wealthy and the adventurous. But as commercial airliners rapidly became larger, faster, safer, and more comfortable, proponents suggested that air travel would soon replace trains and automobiles as Americans' primary mode of long-distance travel. Airlines began offering lower fares that attracted a broader customer base, and by the end of the 1940s, airline mileage had tripled and the number of passengers had multiplied sixfold.

One of the first postwar airlines in the state was Arizona Airways, which flew war-surplus Douglas DC-3 aircraft between Phoenix, Globe-Miami, Safford, Morenci, Willcox, Benson, Tucson, Bisbee, and Nogales. Before long, Prescott, Flagstaff, the Grand Canyon, Kingman, and Yuma were added to the airline's routes. By 1947, TWA was flying from Phoenix Sky Harbor Airport to San Francisco, Los Angeles, Kansas City, Chicago, and New York.[3]

It appeared for a time that there would be similar growth in the ownership of private airplanes. Small aircraft sales did rise after the war, but the market was quickly saturated. Private aircraft remained popular in Arizona, however, helping to make Sky Harbor one of the busiest airports in the nation in the number of takeoffs and landings.

With the opening of Sky Harbor's new terminal in October 1952, the airport began a seemingly endless effort to keep up with the growth of Phoenix and local tourism, which was compounded by the flourishing growth in airline traffic. In 1952, 296,000 passengers used the airport; by the time the first jet airliner arrived in 1960, use of the airport had increased to 920,000 passengers per year and construction of the new Terminal 2 had already begun.

Four times larger than the old terminal building, Sky Harbor's Terminal 2 was part of a project that included new offices, a thousand-space parking lot, and new access roads and aprons. Demolition of the old terminal was delayed as passenger use continued to climb by as many as 100,000 travelers per year.[4]

On June 30, 1956, two airliners belonging to United Airlines and TWA collided over the Grand Canyon, killing 128 passengers and crew members. This event added urgency to an effort to modernize management of the nation's airways and airports. The Federal

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[2] Alexander T. Wells and Seth B. Young, *Airport Planning and Management* (New York: McGraw Hill Professional, 2004), 61-62.

[3] "Arizona Highways Presents: A Guide for the Air-Minded," *Arizona Highways*, May 1947, 6-8.

[4] *Phoenix Sky Harbor Airport, 1935-1985: The First 50 Years* (Phoenix: City of Phoenix Aviation Department, 1985).

Aviation Agency (FAA) was created in 1958 to regulate and coordinate all aspects of civilian aviation, including the use of American airspace by both civilian and military aircraft. The FAA also consolidated research and development in air navigation and air safety.

In Arizona, the state government initiated regulation of aviation in 1950 with the establishment of the Arizona Aviation Authority, which became the Arizona Department of Aeronautics in 1952. The responsibilities of this department included licensing aircraft, flying schools, and aircraft dealers, as well as providing expertise and funding to local airports. After 1964, the department also ran the Grand Canyon Airport, which quickly became the third busiest airport in the state. In 1974, the Aeronautics Department became a division of the new Arizona Department of Transportation.

Phoenix Sky Harbor Airport and Tucson International Airport dominated air travel in Arizona. In 1970, when almost 2 million passengers boarded planes in Arizona, 96 percent of them did so at these two airports. Smaller airports such as those in Page, Flagstaff, Kingman, Prescott, Lake Havasu City, and Yuma were served in a limited way by regional airlines, but the bulk of their traffic came from private aircraft. In 1970, there were 2,700 private aircraft in Arizona.

In 1978, the federal government deregulated the airline industry, with a huge impact on air travel. Within a few years, the number of airlines doubled and over the next 20 years, as fares dropped, the number of passengers grew from 250 million to 600 million annually. These changes put tremendous pressure on the major airports to expand. By 1986, Arizona's airports handled 9 million departures, the vast majority at Sky Harbor and Tucson International.

Sky Harbor opened Terminal 3 in 1979, expanded it five years later, and soon after that began work on Terminal 4. By 1997, a third runway had been built and the airport expanded again. By 2004, Sky Harbor was one of the busiest airports in the world, serving nearly 40 million passengers a year. Tucson remodeled its 1963 terminal in the 1980s and doubled its size. Another terminal expansion was completed in 2005, by which time Tucson's airport was regularly serving 4 million passengers per year.

At the same time, commercial airline service to smaller airports in Arizona declined, though some service was maintained under the government's Essential Air Service program, which subsidized the cost of such service. However, some small airports prospered with specialized uses. The Grand Canyon airport hosted over 100,000 operations (takeoffs and landings) in 2007-2008, mostly for sightseeing flights. Prescott's Ernest A. Love Field had 157,000 operations, most of them related to the activities of Embry-Riddle Aeronautical University, which was based at the airport. Scottsdale Airport became the home base of hundreds of private and corporate aircraft and was heavily used by out-of-state flyers.[5]

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[5] Information about an Arizona airport's operations can be found in the "Airport Master Record" for the facility. These records are available online from the Federal Aviation Administration at its website (http://www.gcr1.com/5010web/).

Arizona's large size has always made it attractive for air travel, which can produce significant time savings. During the 2008 presidential campaign, Cindy McCain, the wife of Republican candidate John McCain, told an interviewer that she had overcome her fear of flying and had even become a pilot herself. "In Arizona," she said, "the only way to get around the state is by small, private plane."[6]

[6] "Cindy McCain: 'In Arizona The Only Way To Get Around The State Is By Small Private Plane," Huffington Post, http://www.huffingtonpost.com/2008/07/14/cindy-mccain-in-arizona-t_n_112695.html (accessed November 23, 2009).

ORGANIZATIONAL EVOLUTION: THE HISTORY OF ADOT

Highways evolved starting in the early 20th century because a revolutionary new mode of transportation, the automobile, required a network of smooth, dry roads to fulfill its promise. At the time, the existing model of a nationwide transportation system was the partnership between government and capitalists that had built the railroads. But it soon became clear that the creation of better roads must be a governmental job. But which government? And how?

In Arizona's Territorial period, highway planning and construction were chiefly county functions. The Territorial Engineer's office created in 1909 had little authority and little funding. After passage of the 1916 Federal Aid Road Act, Arizona began to receive federal funds for an initial state system of three highways, but most highway funds still went to counties. The Arizona Highway Department gave technical assistance when requested, and the state and counties jointly planned new road routes. Both state and counties built most roads directly, using convict and day labor.

After the First World War, an influx of Army surplus trucks and equipment increased the power and efficiency of road building crews, and private construction companies working under state contracts took over most of the state's road construction. Although Arizona still did not have the resources to pave more than a tiny fraction of its state highways, the highway department made rapid progress in design and construction standards. A standard roadbed was developed that was 18 feet wide and covered with six inches of gravel.

After 1927, the pace of paving picked up. In the mid-1930s the highway department received a new influx of motorized equipment upon the completion of Hoover Dam. Larger dump trucks and tractor-drawn scrapers replaced the tiny Model TT trucks and horse-drawn Fresno scrapers that had been used up to that time. Another important new kind of equipment was the portable compressor, which made machine drilling possible.[1]

The first funding for highways in Arizona came from a 1909 property tax. The tax was continued after statehood, producing $250,000 annually for the State Road Tax Fund. Property taxes for roads were modified several times in the coming years, and in 1927 the first gasoline tax and the first common carrier tax were enacted. State taxes were used to match federal aid funds, which accounted for approximately two-thirds of the $31 million dollars spent on Arizona road construction in the years before the Great Depression.

In 1927, the Arizona Legislature also overhauled the state highway management system, putting control of all highway matters under the five-member Arizona State Highway Commission. This act also created the Division of Motor Vehicles. In 1931, the Highway

[1] Walt Gray, "Motorized Equipment Advanced Construction," *Newsbeat*, August 1995, 16.

Patrol Division was added to the highway department, with the superintendent of the highway patrol to be appointed by the governor. The revamped department also included divisions for locating, right-of-way acquisition, surveying, materials specification, bridge and dam certification, planning and estimating, construction, maintenance, and landscaping, as well as bureaucratic functions such as accounting and personnel.

The legislature also developed a new funding mechanism for highways that allowed more road construction in the less-populated counties. By 1938, the highway department had overseen the construction of 3,624 miles of highways, including 2,100 miles of paved and oiled roads.[2]

Early leaders of the Arizona Highway Department included Lamar Cobb, the first State Engineer, who planned the initial highway system with roads across northern and southern Arizona, and a north-south highway linking the major cities of Tucson, Phoenix, Prescott, and Flagstaff. Cobb oversaw construction of two of the most difficult and scenic roads built in Arizona up to that time: the Phoenix to Globe route through Queen Creek Canyon, and the highway over Mingus Mountain from Prescott to Jerome. Cobb was also a founding leader of the American Association of State Highway Officials (see Table 2).

Charles C. Small, sometimes called "The Father of Arizona's Highways," started with the highway department in 1919 as its chief location engineer. When he died in 1932 at the age of 60, he was Chief Deputy State Engineer, but one former employee described him as "the guy who ran the place." He helped locate and build U.S. Route 66, U.S. Route 89, and the new U.S. Route 60 between Globe and Show Low via the Salt River Canyon. He is honored by a plaque at Lookout Point on Yarnell Hill, on the road now known as State Route 89.[3]

Ralph Hoffman served as a bridge engineer for the highway department for decades before retiring in 1954, but his most spectacular job was one of his first: the bridge across Marble Canyon that he helped design and build in 1929. Originally called the Grand Canyon Bridge, and later the Navajo Bridge, this graceful 800-foot steel-arch bridge soars 460 feet above the Colorado River between sheer cliffs. It has been judged the most significant bridge in Arizona. Late in his career, Hoffman designed the Burro Creek Bridge on U.S. Route 93.[4]

After the Second World War, Arizona was transformed from a sparsely populated land of scenic wonders to an urbanized growth and tourism center, and thousands of miles of narrow, curving mountain roads had to be rebuilt and relocated. The biggest impetus for road construction was the inauguration of the Interstate Highway System. In 1957, the Arizona highway construction budget suddenly increased from $28 million to $48

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[2] Melissa Keane, J. Simon Bruder, et al., *Good Roads Everywhere: A History of Road Building in Arizona* (Phoenix: Arizona Department of Transportation, 2004), 50.

[3] Walt Gray, "C. C. Small Had Big Dreams for State Roads," *Newsbeat*, August 1995, 3.

[4] *Distinguished Arizona Civil Engineers* (N.p.: Arizona Society of Civil Engineers, 2002). Available online at http://www.azsce.org/downloads/history-150thAnniversaryBooklet.pdf.

million. That year the highway department moved its offices into a new building in Phoenix and began a rapid expansion program.

A symbol of the new opportunities available in the department was the hiring of Mrs. Francis Sprawls Walker, the first woman engineer.[5] State Engineer William E. Willey also unveiled a "secret weapon:" a seven-foot by four-foot production control wall display that used colored tabs and pegs to show the status of every highway job. This device was modeled on an Air Force technique for keeping track of plane and crew readiness during the Cold War. Around the same time, the highway department purchased a new tool for the accounting department, a Univac, and invited the public to come view the strange new computing machine in operation.[6]

In 1974, the Arizona Department of Transportation (ADOT) was created and given authority over highway planning, construction and maintenance, aviation and airport development, motor vehicle and motor carrier regulation, and coordination and funding of other transit and public transportation modes. Construction on the Interstate system in Arizona peaked in 1978, with the completion of the major portions of Interstate 8, Interstate 10, Interstate 17, and Interstate 19. As interstate construction wound down, freeway construction in Maricopa County went into full swing, and new freeway segments continued to be opened throughout the 1990s.

Through this period of unprecedented state growth and highway construction, other leaders emerged. Oscar T. Lyon, Jr., grew up in highway department road camps. His father worked for the department from 1912 to 1924 before going to work as the roads superintendent for Gila County. Oscar Jr. went to work for the highway department after the Second World War and served as the district engineer for three districts. He led the construction of a major part of the Interstate Highway System in Arizona and headed the Flagstaff District during the construction of the challenging Virgin River section of Interstate 15 in northwest Arizona, eventually becoming assistant director of the agency.

A homegrown talent of a different sort was Mary Peters, who started at ADOT in 1985 as a secretary. While working her way up through a series of administrative positions, Peters obtained a college degree. Eventually, she was promoted to deputy director by ADOT chief Larry Bonine and became an adherent of Bonine's "total quality management" philosophy. Peters succeeded Bonine in 1998, becoming the first woman, and one of the few non-engineers, to head ADOT. She coordinated an accelerated freeway building program for the Phoenix area, which allowed most existing projects to be completed by 2007, years ahead of the original schedule. In 2001, Peters was appointed Administrator of the Federal Highway Administration, and in 2006 she became the U.S. Secretary of Transportation.[7]

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[5] "Arizona Girl Is First Woman Engineer Ever Employed by Highway Department," *Highway Spotlight* 2, no. 23 (June 19, 1956), 3.

[6] "New 'Secret Weapon' Unveiled at Highway Department," *Highway Spotlight* 3, no. 30 (August 13, 1957), 3; "Electronic Brain Arrives," *Highway Spotlight* 1, no. 30 (October 18, 1955), 1.

[7] Mary Jo Pitzl, "Secretary to U.S. Highways Chief Mary Peters Called Strong Administrator," *Arizona Republic*, July 15, 2001, B-3.

Table 2
Arizona State Engineers and Department of Transportation Directors, 1909-2009

State Engineers

Name	Term of Service	Notes
J. B. Girand	1909-1912	Territorial Engineer
Lamar Cobb	1912-1916	First State Engineer
Thomas Maddock	1917-1922	
F. R. Goodwin	1923-1924	
W. C. Lefebvre	1925-1927	
W. W. Lane	1928-1931	
T. S. O'Connell	1931-1937	
Howard S. Reed	1938-1939	
W. R. Hutchins	1939-1942	
Bernard Touhey	1943-1947	
W. C. Lefebvre	1947-1951	
R. C. Perkins	1951-1954	
C. B. Browning	1954	
R. D. Canfield	1954	
George E. Lang	1954-1955	
William E. Willey	1955-1961	
James R. Van Horn	1961-1963	
William Price	1963-1977	
Oscar T. Lyon Jr.	1977-1980	
Thomas Lammers	1980-1984	
Charles L. Miller	1984-1985	
Walter Owen Ford	1985-1988	
Thomas Bryant	1988-1991	
Gary K. Robinson	1991-1995	
Thomas G. Schmitt	1995-1999	
Dick Wright	1999-2002	
William Higgins	2002-2004	
Michael Ortega	2004-2005	
Sam Elters	2005-2008	
Floyd P. Roehrich, Jr.	2008-present	

Highway Department / Department of Transportation Directors

Name	Term of Service	Notes
Justin Herman	1956-1973	Highway Department Director
William A. Ordway	1974-1985	First ADOT Director
Charles L. Miller	1985-1990	
Charles E. Cowan	1991-1992	
Larry S. Bonine	1993-1998	
Mary E. Peters	1998-2001	
Victor M. Mendez	2001-2009	
John S. Halikowski	2009-present	

PART 3

TIMELINE

TIMELINE

3500 B.C.E.	Wheeled carts are invented in Mesopotamia.
2000 B.C.E.	Horses are domesticated for riding and pulling wheeled carts.
600 B.C.E.	Kharon, the boatman of Hades in Greek mythology, charges souls to carry them across the River Styx to the land of the dead—possibly the first public transit system.
312 B.C.E.	The Appian Way, built by the Romans, is one of the world's first paved roads and the start of a 50,000-mile system of paved Roman roads.
214 B.C.E.	The Lingqu Canal is built in China. It is just under 23 miles long and used for water transport.
750 A.D.	The iron horseshoe is invented, solving the centuries-old problem of damage and wear to horses' hooves.
800	Tar-paved streets are introduced in the new Abbasid Muslim capital of Baghdad.
1492	Residents of the island of Hispaniola (Haiti) greet the first Spanish flotilla to sail to the New World under Christopher Columbus.
1492	Leonardo da Vinci begins his studies of flying machines, penning the first of his hundred drawings that illustrate his theories of flight.
1539	Marcos de Niza enters Arizona near Nogales, seeking the Seven Cities of Cibola.
1620	Cornelius Drebbel of Holland invents the first submarine for the British Royal Navy. The craft, covered in leather and powered by oars, could travel at a depth of 12 to 15 feet for up to three hours.
1620	English colonists land in America at Plymouth, Massachusetts.
1660	Philosopher and mathematician Blaise Pascal helps design the first urban public transit system, using horse-drawn carriages, in Paris.
1775	Tucson Presidio is established by Spaniards on the Santa Cruz River in Arizona.
1783	The Montgolfier brothers launch the world's first hot air balloon.
1783	Claude du Jouffrey invents the first practical steamboat.
1789	A wheeled cart called a tumbrel is used to carry prisoners to the guillotine during the French Revolution.
1792	The Philadelphia and Lancaster Turnpike is chartered by the state of Pennsylvania to build a hard-surfaced road. The company charges tolls to use the road, which proves to be a profitable business.
1806	Congress approves the construction of the Cumberland (National) Road, connecting the Potomac and Ohio rivers.

1807 The first commercially successful steamboat, the *Clermont*, is introduced by Robert Fulton. It takes about 62 hours to make the 300-mile round trip between New York City and Albany on the Hudson River.

1814 The first practical steam railroad locomotive is demonstrated.

1820 Scotsman John McAdam invents a simplified paving system for roads. Unlike earlier methods, the "macadam" road does not require a heavy foundation but uses broken stones that lock together when compacted by a roller or traffic. Later a variation in which the stones are bound together by tar will be known as "tarmac."

1825 The Erie Canal opens. The 40-foot–wide canal uses locks to raise boats 570 feet from the Hudson River to Lake Erie. The boats are pulled through the canal by horses, mules, and oxen.

1827 The Baltimore & Ohio Railroad is chartered, becoming one of the first commercial railroads in the United States. At first railroads stimulate traffic on connecting toll roads, but eventually their growth forces most American toll roads out of business.

1835 Horse-drawn streetcars begin service in New Orleans. The service will run uninterrupted up to the present day, making the Crescent City's trolley system the world's longest-running.

1840 The U.S. railroad system consists of 3,000 miles of track, all of it on the Eastern Seaboard.

1846 A detachment of soldiers known as the Mormon Battalion under Col. Philip St. George Cooke cuts a trail across southern Arizona from New Mexico to California that will be known as Cooke's Wagon Road.

1848 The United States acquires control of the American Southwest—California, Arizona, and New Mexico—after war with Mexico.

1850 The U.S. government makes its first land grants to railroads to encourage them to extend their routes into unsettled areas (it was already subsidizing improvements to rivers and harbors). At the time railroads and steamboats are the dominant means of commercial transport.

1853 A glider designed by Sir George Cayley is flown by one of his employees across Brompton Dale in England. An earlier glider had been piloted by a 10-year-old boy.

1857 Work on Arizona's first road construction project, Beale's Road across northern Arizona, begins. A year later construction will be started on Arizona's first southern road, the El Paso–Fort Yuma Road.

1860 The United States has 27,000 miles of railroad track after a railroad building boom has tripled the nation's track mileage in just a decade.

1861 The Civil War begins. Railroads will be used extensively in the war, turning rail facilities into strategic targets. The Union's dominance in building rail lines will be a major factor in its eventual victory.

1863	Arizona Territory is created out of the western half of New Mexico Territory and its first capital established at the new mining town of Prescott.
1864	The Arizona Territorial Legislature designates the Woolsey Road, from Prescott to the Gila River, as the territory's first public road.
1865	The Mojave and Prescott Toll Road, which runs from Prescott to Fort Mojave on the Colorado River, opens to traffic.
1869	The "Golden Spike" is driven at Promontory Point, Utah, completing the nation's first transcontinental railroad.
1870	The residents of a small Arizona farm village known as Pumpkinville establish a townsite that they name "Phoenix."
1872	U.S. Army soldiers began building a rough wagon road along the Mogollon Rim in Arizona between Fort Apache and Prescott. It is named the General Crook Trail, after the Army's commander in the territory.
1877	Arizona's first Territorial wagon road is constructed between Phoenix and Globe. The cost of building the road is $10,000.
1877	On September 30 the first passenger train to reach Arizona arrives at the new Southern Pacific Railroad station in Yuma.
1880	The first electric streetcar line is tested in St. Petersburg, Russia. The same year, an American invents the "trolley pole," a device used to connect a streetcar to its overhead electric wire.
1880	The Southern Pacific Railroad is completed across Arizona. A year later the line will reach El Paso, Texas, where it connects to other railroads serving the rest of the country.
1883	The Atchison, Topeka and Santa Fe Railroad completes its line across northern Arizona.
1884	The "safety bicycle" becomes popular, sparking a national craze for cycling that will briefly make the bicycle an important mode of transportation.
1885	Karl Benz invents the first practical automobile powered by an internal combustion engine.
1885	Four transcontinental railroads now cross the United States. Two of them, the Southern Pacific and Santa Fe, run through Arizona.
1885	Arizona's Territorial government builds its first wagon bridge, which crosses the Gila River near Florence. It is 965 feet long and constructed of redwood timbers.
1892	The magazine *Good Roads* begins publishing. Intended mainly for bicyclists, it will become an important advocate for improved roads and state highways.
1896	Rudolf Diesel perfects his pressure-ignited, high-efficiency internal combustion engine. It is designed primarily to take the place of the steam engine in small applications.

1896	The Duryea brothers begin production of the first gasoline-powered vehicle to be built in the United States. Two months later, the first automobile accident will take place in New York City when a Duryea car hits a bicyclist, breaking his leg.
1909	The Arizona Territorial Legislature creates the office of Territorial Engineer to oversee the establishment of the Territory's first highway system, which at its inception includes just one east-west road and one north-south road.
1908	Henry Ford develops the assembly-line method of automobile production.
1912	On February 14, Arizona becomes the nation's 48th state.
1913	Plans are announced for Arizona's first transcontinental highway, the National Old Trails Highway, which is being set up by a private association of state and local business interests.
1914	The Panama Canal opens, reducing the sailing distance from New York to San Francisco from 14,000 miles to 6,000 miles.
1915	The Ocean-to-Ocean Highway bridge in Yuma opens. It is the first highway bridge across the Colorado River.
1916	Congress enacts the Federal Aid Road Act, which for the first time commits the federal government to financing the construction of state highways. The act also provides money for postal delivery roads and national forest roads.
1917	On April 6, the United States declares war on Germany. The war will help create the nation's trucking industry, and the movement of war materiel across the country will demonstrate the inefficiency of the nation's railroads and highways.
1919	Tucson establishes the first municipal airport in the nation.
1920	Arizona receives federal highway aid totaling $274,000, which is more than the annual state appropriation for the Arizona Highway Department.
1920	Maricopa County begins a program to pave 312 miles of county roads with concrete. It will be described as "the most ambitious county paving undertaking in the United States."
1921	The decade of the automobile begins. In 10 years car sales will more than triple, rising to 5.3 million vehicles annually. A huge industry devoted to the building, servicing, sale, and pampering of automobiles, drivers and passengers is rapidly created.
1922	The Arizona Highway Department announces the creation of the state's "seven-percent system"—1,460 miles of state and federal highways that will be eligible for federal highway aid. It represents 7 percent of the state's 21,400 miles of highways, most of which are county roads.
1925	All federal highways are assigned numbers. In Arizona the new federal highways include U.S. Route 80, which crosses southern Arizona from Rodeo, New Mexico, to Yuma, and U.S. Route 66, which crosses the northern part of the state.

1927	The U. S. Post Office begins awarding contracts for airmail service. Some of the pioneer airmail carriers will become the nation's first airlines.
1927	Charles Lindbergh flies solo across the Atlantic Ocean, creating a surge of popular interest in air travel.
1927	The Arizona Highway Department is reorganized and placed under the control of the newly established Arizona State Highway Commission.
1928	Arizona builds its first oil-surfaced highway. In five years, Arizona will be the leading state in the Rocky Mountain West in the mileage of roads that are treated with oil.
1929	A spectacular steel arch bridge is completed across the Colorado River at Marble Canyon, allowing traffic on U.S. Route 89 to easily travel between Arizona and Utah. It will later be named the Navajo Bridge.
1929	A collapse of stock prices in October signals the beginning of the Great Depression, a period of worldwide economic failure and human misery. Government recovery programs under the New Deal, however, will bring major improvements to American highways and airports.
1930	The United States has 430,000 miles of railroad track. Passenger traffic on the railroads has already begun to decline as automobiles become more popular.
1931	The Arizona Highway Patrol becomes part of the highway department.
1935	The Douglas DC-3 makes its first flight. It will become one of the most significant transport and passenger airplanes ever made.
1936	The first practical helicopter is developed in Germany.
1938	Construction is completed on U.S. Route 60, a new federal highway across the Salt River Canyon between Globe and Springerville. By now Arizona's highway system comprises 3,500 miles of roads.
1941	In December, the United States enters the Second World War after Pearl Harbor is attacked by Japan. Automobile assembly lines will be converted to build tanks and bombers, and gasoline and tires will be rationed.
1945	There are 154,000 motor vehicles registered in Arizona. In less than a decade, that number will grow to 413,000, creating serious traffic congestion problems on the state's streets and highways.
1950	Construction begins on Arizona's first freeway, the Black Canyon. Seven years later, in 1957, the state's first freeway interchange will open at Grand Avenue.
1952	A bypass for U.S. Route 66 is completed around the town of Oatman. The bypass eliminates a twisty, hazardous section of roadway on U.S. Route 66, which is Arizona's most heavily traveled highway.
1955	For the first time, more Americans travel by air than by train.
1956	President Dwight D. Eisenhower signs the Federal-Aid Highway Act of 1956, which appropriates $25 billion to build the National System of Interstate and Defense Highways—the Interstate highway system.

1956	On June 30 two airliners collide over the Grand Canyon. This accident leads to the modernization of air traffic control in the United States and the creation of the Federal Aviation Agency (FAA).
1957	The Soviet Union launches the world's first intercontinental ballistic missile. Later that year the USSR will also launch the first spacecraft, Sputnik 1, and send the first animal into space—a dog named Laika—aboard Sputnik 2.
1957	The Beeline Highway from Phoenix to Payson opens. This road, State Route 87, is among the first of a group of modern highways opened between Phoenix and northern Arizona during the decade. The others are the Black Canyon Highway, between Phoenix and Flagstaff, and U.S. Route 60, between Phoenix and Show Low (see Figure 8).
1957	The first construction project specifically designed for Arizona's Interstate system begins. The seven-mile section of highway begins at Alvernon Road west of Tucson, along U.S. Route 80.
1958	The jet age in travel begins with the production of the Boeing 707 and Douglas DC-8 airliners.
1961	On April 12, Soviet cosmonaut Yuri Gagarin is launched on the first orbital flight around the earth. A month later American astronaut Alan Shepherd will make his country's first manned space flight, a suborbital trip over the Atlantic Ocean.
1962	John Glenn, riding in a Mercury spacecraft, becomes the first American to orbit the Earth.
1969	On July 20, the Apollo spacecraft's lunar excursion module lands on the moon and astronaut Neil Armstrong becomes the first human to step on the moon's surface.
1969	The National Environmental Policy Act is enacted. From now on, federally funded highway projects will be subject to assessment of their "environmental impact."
1971	Amtrak, the national rail passenger system, begins operation.
1973	The Organization of the Petroleum Exporting Countries (OPEC) begins an embargo of oil shipments to the United States, leading to the nation's first energy crisis. The resulting gasoline shortage forces prices up and gasoline tax revenues down.
1974	The Arizona Department of Transportation (ADOT) is created, replacing the Arizona Highway Department. In addition to building and maintaining the state's highways, the new agency will oversee aviation, mass transit, and transportation planning in Arizona.
1978	A record number of miles in Arizona's Interstate system is opened to traffic, as major portions of Interstate 8, Interstate 10, Interstate 17, and Interstate 19 are completed.
1980	The Staggers Rail Act and the Motor Carrier Act sharply decrease federal regulation of the railroad and trucking industries.

1985	Maricopa County voters approve a sales tax increase to fund the construction of freeways in metropolitan Phoenix.
1985	U.S. Route 66 through Arizona is officially abandoned, as most of the highway has been replaced by Interstate 40. The remaining sections of the highway are renamed State Route 66 and will continue to attract tourists from around the world.
1990	The dedication of the Papago Freeway in Phoenix marks the completion of Interstate 10 through Arizona. The construction of Interstate 10 through the state has taken more than three decades and cost more than any other highway project in Arizona history.
1991	In December, the Union of Soviet Socialist Republics is dissolved.
1994	Plans to build the Paradise Freeway through north Phoenix are abandoned after years of controversy over the route. It will be the only major freeway project in the Phoenix area to be defeated by public opposition.
1997	The first hybrid car, the Toyota Prius, is introduced in Japan.
2001	The September 11 attack on the World Trade Center in New York results in the grounding of all civilian aircraft in the United States and Canada—the first time such an action has ever been taken.
2004	40 million passengers take off or land at Phoenix Sky Harbor Airport, making it one of the busiest commercial airports in the world.
2005	Arizona's population reaches 5.8 million and the number of motor vehicles registered in the state climbs to 4.6 million.
2006	The Burlington Northern Santa Fe tracks across northern Arizona carry an average of 120 trains a day.
2008	In December, Arizona's first light rail cars begin service as the 20-mile Metro Light Rail system opens between Mesa, Tempe, and Phoenix.

PART 4

RESOURCES

HISTORICAL PHOTOGRAPH COLLECTIONS

Although it is certainly true that historical photographs that depict some aspect of transportation history can be found in just about every Arizona archive or library, most of the state's archival repositories do not have collections large enough to justify the time and expense required to search them.

This problem is amplified by the fact that very few of Arizona's historical photograph collections are accessible online. Even with archives that do have historic images online, no archive in Arizona has completely digitized its photograph collection; for example, the History and Archives Division of the Arizona State Library, Archives and Public Records has digitized only about a fourth of its images, while the Sharlot Hall Museum in Prescott has digitized only a tenth of its photograph collection.

Nevertheless, there are four archives in Arizona that have substantial collections of transportation-related historical photographs: the History and Archives Division in Phoenix, the Arizona Historical Society in Tucson, Arizona State University's Archives and Special Collections in Tempe, and the Sharlot Hall Museum Archives in Prescott. They are listed here in decreasing order of usefulness, along with a general description of their holdings, suggestions for how to search in their collections, and a summary of their reproduction and use fees.

In addition, there are two collections of historical photographs that, while not holding an especially large number of transportation-related images, can be worth consulting because they are easily searchable online: the Arizona Memory Project (an online venture of the Arizona State Library, Archives and Public Records) and the Colorado Plateau Digital Archives.

HISTORY AND ARCHIVES DIVISION, ARIZONA STATE LIBRARY, ARCHIVES AND PUBLIC RECORDS

The photograph collection at the state archives includes the largest single collection of historical images from the Arizona Highway Department and Arizona Department of Transportation. Indeed, this is the only official repository of photographs from the department that has been catalogued.

The archives' photograph collection includes over 130,000 images, of which about 33,000 have been digitized. They are not organized into subcollections or subdivided by agency or topic. The digitized images can be searched online at http://photos.lib.az.us/ using an efficient database search form that returns a thumbnail of the image along with whatever identifying information is available.

The collection includes a good number of images related to transportation, with most of them concentrated in the period from the 1930s to the early 1970s. It is an especially good source for photographs of New Deal highway construction activities and construction of the Interstate system in Arizona. For example, a simple search using the keyword "highway"

yields 3,857 images; one using the keyword “road” turns up 1,541 images. A search for “Highway 66” yields 217 images, and one for “bridge” returns 1,274 image records.

Of all the photograph collections described in this section, this is the easiest to search for photographs of specific highways. By using the keyword “Highway __,” it is possible to isolate all of the images that have been identified as portraying that specific road.

How many of the collection’s images are usable for publication is unclear; the quality of the images varies considerably and many require extensive retouching to be usable. The quality of the identifying information is also uneven; it is generally true that the more recent a photograph, the better the identification.

There is a charge for digital duplication of each image, plus a handling fee for each set of images. The archives do not charge a use fee for its photographs if the user is a state agency.

ARIZONA HISTORICAL SOCIETY, TUCSON

The library at the Arizona Historical Society in Tucson is the home of the Norman G. Wallace Photograph Collection (call number PC 0180). Wallace, who was the chief locating engineer for the Arizona Highway Department from 1934 to 1955, was an avid photographer who documented not only the department’s work but also dams, cities, towns, and railroads in Arizona and Mexico.

Of particular interest is the Highway Photographs Subgroup, which covers the period from 1932 to 1953 (most of the images are from the 1930s). It includes 16 boxes of photographs of Arizona highways, underpasses, tunnels, bridges, and dams including scenic views, construction, and completed roads. Many highways are represented but U.S. Routes 60, 70, 66, 89, and 666 predominate. Views of construction projects, especially of bridges and dams, often show a sequence of work from start to finish. Included are mules, heavy machinery, automobiles, and buses. There are also views of flooded roadways and automobile accidents.

Also of interest is the Railroad Photographs Subgroup, which covers the period from 1907 to 1949. It includes 11 boxes of photographs of the El Paso and Southwestern Railroad (1912-1922), the Santa Fe Railroad (1936-1949), the Southern Pacific Railroad (mostly 1910-1928), and the Southern Pacific Railroad of Mexico. Images include workers laying track and building bridges, diesel and steam engines, depots, and wrecks.

Unfortunately the society has not made any of its photographs available for viewing online, nor does the library have any kind of online or electronic search capability that can be used to find individual photographs. Researchers in the Wallace Collection must visit the library and use its card catalog, along with other printed finding aids.

There is a charge for duplication of each image, either digitally or as an 8 x 10 print. The AHS charges use fees that vary depending on whether it is used in a publication of fewer than 10,000 copies (the fee is higher for larger print runs), on a Web site or CD/DVD, or in a film or video. If more than five images are obtained, the society offers discounts from 10 percent to 20 percent on the use fees (but not the duplication charges).

ARIZONA STATE UNIVERSITY ARCHIVES AND SPECIAL COLLECTIONS

The ASU Archives and Special Collections, which is located at Hayden Library on the university's Tempe campus, does not have any named photograph collections specifically related to transportation in Arizona. However, because it holds one of the largest collections of historical photographs in the state, it nevertheless includes enough historical images related to highways and other transportation topics to justify searching the collection if a desired image cannot be located elsewhere.

The photograph collection in Archives and Special Collections can be searched online at http://knet.asu.edu/archives/?searchSPMI. The search form allows searching through multiple indexes; for transportation topics, the search should be conducted in two indexes, the "Arizona Historical Foundation Index (AHFI)" and the "Arizona and Southwestern Index (AZSI)." Searches can be limited to photographs by including the keyword "photograph." For example, a search using the keywords "highway" and "photograph" found 191 images, while one for "road" and "photograph" found 303 images. Unfortunately it is not possible to use highway numbers as search keywords.

Although a very large proportion of the photographs in Archives and Special Collections has been indexed and can be found using the online search form, only a few can actually be seen online. To view most of the collection's images, it is necessary to visit the Luhrs Reading Room at Hayden Library, whose hours vary depending on the time of year. For current hours and information on parking, call the Luhrs Reading Room at 480-965-6490.

Archives and Special Collection charges a fee for digital reproduction, plus a handling fee for each order. There are no use fees if the user is a government agency.

SHARLOT HALL MUSEUM ARCHIVES

The Sharlot Hall Museum Archives in Prescott preserves and makes available roughly 120,000 photographs representing Prescott, Yavapai County, and Arizona. Of these, over 10,000 images have been digitized and can be viewed online.

The archives have several "scrapbooks" of historical photographs that can be viewed online at http://sharlot.org/archives/photographs/index.html. These are organized topically and include collections of images related to transportation such as railroads, bridges, and streets. Using the same Web address, it is also possible to search for photographs in the archives' collection.

Much of the historical photograph collection at Sharlot Hall has not yet been indexed for online searching or viewing. Research at the archives is by appointment only during the hours of noon to 4 p.m. on Tuesday, Wednesday, and Friday, and 10 a.m. to 2 p.m. on Saturday.

Sharlot Hall Museum charges a fee for digital reproduction, plus a handling fee for each reproduction order. If a desired image has not yet been digitized, there is an additional charge for scanning the image that varies depending on the desired resolution.

COLLECTIONS OF SECONDARY IMPORTANCE

Arizona Memory Project

The Arizona Memory Project is an online collaboration of Arizona libraries, archives, museums, and other cultural institutions. Sponsored by the Arizona State Library, Archives and Public Records, it provides researchers and the general public with an opportunity to view a range of documents, photographs, maps, and objects that chronicle Arizona's past.

To search for historical photographs at the project Web site, use the search form found at http://azmemory.lib.az.us/cdm4/search.php. To limit the search just to images, you must perform a "Selected fields" search and specify "image" for the "Type" field (you must also specify a topic or subject under the "Description" field).

The items in the Arizona Memory Project represent only a small percentage of the materials held by the contributing institutions. Also, some of the state's largest archives are not contributors to the project; these noncontributors include Arizona State University, the University of Arizona, and the Arizona Historical Society.

The project is simply a Web portal that provides access to the collections of institutions across the state; it is not possible to download copies of images directly from the project Web site. Copies of photographs, and permission to use them, must be obtained directly from the institutions that hold them.

Colorado Plateau Digital Archives

The Colorado Plateau Digital Archives is a project of Special Collections at the Cline Library on the campus of Northern Arizona University in Flagstaff. It contains all of the historical photographs in Special Collections that have been digitized—a substantial portion of the library's historical photograph collection, but not all of it.

The digitized archives can be searched online using the form found at http://www.nau.edu/library/speccoll/. Searches can be limited to "visual materials," and it is also possible to limit searches to specific highways; for example, to find photographs of U.S. Route 66, the search keywords "highway" and "66" would be used. Unlike other library Web sites, this one allows downloading of low-resolution copies that can be used as work prints.

As noted above, not all of the historical photographs at the Cline Library's Special Collections have been digitized and made available online. To search the remainder of the images at Special Collections, it is necessary to visit the library and use the printed finding aids available for that purpose.

There is a charge for digital reproductions, with the amount of the charge depending on the size of the original photograph. Special Collections does not charge use fees for its images when the user is a government agency.

BIBLIOGRAPHY OF SOURCES FOR THE HISTORY OF ARIZONA'S HIGHWAYS

The bibliography that follows is a compilation of the *published* sources that were used to prepare the narrative history in this report; with a few exceptions, unpublished archival sources (few of which were consulted during the research) are not included. To aid in locating the government document materials, the name of the library and the call number where the materials were found are given in brackets after the entries; most are from Arizona State University's Hayden Library. Some of these materials are doubtless available at other libraries, especially the Law and Research Division of the Arizona State Library, Archives and Public Records at the State Capitol. Also, some of the entries are annotated to provide additional information about the source and its usefulness.

ARIZONA ROADS AND HIGHWAYS

Books, Journal Articles, and Theses

Bowman, Ellen G., and Jack Smith. *Beale's Road Through Arizona*. Flagstaff: Flagstaff Corral of Westerners, 1979.

Brown, Stanley C. "Crossing the Mighty Mazatzals: From Indian Trade Route to Modern Highway." *Journal of Arizona History* 47, no. 4 (2006): 323-46.

Campbell, A. H. *Report upon the Pacific Wagon Roads*. 1859. Fairfield, Wash.: Ye Galleon Press, 1969.

Includes a description of the work done on Arizona's early federal wagon roads.

Housley, Harold Ray. "A History of United States Highway 66 in Arizona." M.A. thesis, Arizona State University, 1996.

Jackson, W. Turrentine. *Wagon Roads West: A Study of Federal Road Surveys and Construction in the Trans-Mississippi West, 1846-1869.* Berkeley: University of California Press, 1952.

In addition to providing background information on road building nationally and in the West, this book also describes the construction of Arizona's earliest federal roads.

Kendall, Charles P. "Planks Across the Dunes." *Journal of Arizona History* 21, no. 4 (1980): 391-400.

Describes construction of the plank road from Yuma to San Diego.

Rosebrook, Jeb Stuart. "The Black Canyon Highway: Highway to History, 1863-1948." M.A. thesis, Arizona State University, 1994.

Rozum, Fred A. "Buckboards and Stagecoaches: Establishing Public Transportation on the Black Canyon Route." *Journal of Arizona History* 30, no. 2 (Summer 1989): 165-80.

Taylor, Peter Mark. "If You Build It, They Will Come: The Story of the Catalina Highway." M.A. thesis, University of Arizona, 2006.

Stein, Pat. *Historic Trails in Arizona from Coronado to 1940.* Phoenix: Arizona State Historic Preservation Office, 1994.

Vyne, Ray N. "A Great North and South Highway, U.S. 89." Arizona Collection CE EPH XH-9, Department of Archives and Special Collections, Hayden Library, Arizona State University.

Magazines

Arizona Highways. [ASU Arizona Collection: F 806 .A87]

From 1925, when the magazine was established, until about 1942, *Arizona Highways* was a highway planning, engineering, and construction bulletin. From 1925 to 1939 it included advertisements by road contractors, and for most of the 1925-1942 period it announced new highway construction contracts and reported on their progress. From 1925 to 1937 it included a monthly report on the condition of state highways. An index for 1925-1966 is available [ASU Arizona Collection: F 806 .A87 Index]. For a history of the magazine, see Tom C. Cooper, "*Arizona Highways*: From Engineering Pamphlet to Prestige Magazine," M.A. thesis, University of Arizona, 1973 [ASU Arizona Collection: PN 4900 .A66 C66x].

Government Documents

Annual Report of the Arizona Department of Transportation. Phoenix: Arizona Department of Transportation. [ASU: TRT 1.1]

This may have been succeeded by the *Progress Report* (see below). ASU has reports for 1974 and 1975, and no additional copies were found in a search of the state library catalog.

Annual Report of the Arizona State Highway Commission. Phoenix: Arizona Highway Department. [ASU: HGY 1.1]

The complete dates of publication are not known, but reports for 1971-1973 are available at ASU. This may have been intended as a successor to the *Factual Review* but then was discontinued and briefly replaced by a new run of the *Factual Review*.

Arizona Roads and Streets Conference. *Papers Presented at the Arizona Roads and Streets Conference* (exact title varies with the year). Tucson: University of Arizona. [ASU: TRT 1.9:R 51]

Most of the papers are on technical subjects, but there are a few on the history of Arizona's highways and of the Highway Department/ADOT. ASU has most years between 1940 and 1992, plus 1996.

Arizona State Highway System Plan. Phoenix: Arizona Department of Transportation. [ASU: TRT 5.2:H 45]

ASU has copies of plans for 1978 and 1990. It was succeeded by the *Arizona State Transportation Plan*.

Arizona State Transportation Plan. Phoenix: Arizona Department of Transportation, 1994. [ASU: TRT 5.2:T 61/6/F].

Arizona Transportation in Review / Arizona Transportation Factbook. Phoenix: Arizona Department of Transportation. [ASU: TRT 5.3:A 64]

The complete dates of publication are not known, but so far copies for 1985-1987 and 1991-1998 have been located at ASU. It was somewhat similar in character to the earlier *Factual Review* and was published by the Transportation Planning Division of ADOT.

Factual Review. Phoenix: Arizona Highway Department/Arizona Department of Transportation. [ASU: HGY 3.3:F 12 and TRT 5.3:F 12]

Published every two years by the Highway Department and then ADOT, its complete dates of publication are not known (ASU has 1950-1968 and 1975-1977). It was an

annual statistical summary of the highway system and Department activities. Until 1976, when ADOT began publishing the *Progress Report*, this was the only annual report published by the Highway Department. After 1976 and until the discontinuation of this publication, there were two annual reports being issued.

Highway Spotlight. Phoenix: Arizona Highway Department, 1955-1974. [ASU: HGY 1.3:S 65]

This was a series of news bulletins or newsletters issued by the department that, among other things, announced the decisions of the Arizona Highway Commission and reported on contracts and construction projects. It was replaced by *Transportation Spotlight*.

History of the Arizona State Highway Department. Phoenix: Arizona Highway Department, Highway Planning Survey, 1939. [ASU: HGY 3.2:H 47]

Keane, Melissa, J. Simon Bruder, et. al. *Good Roads Everywhere: A History of Road Building in Arizona.* Phoenix: Arizona Department of Transportation, 2004.

Log of the Arizona Highway System. Phoenix: Arizona Highway Department / Arizona Department of Transportation. [ASU: HGY 3.3:L 53 through 1974 and TRT 5.3:L 53 for later years]

Though far too detailed for casual research, this record of the condition of every mile of the state's highway system can be useful for determining when construction work was done on specific sections of roadway. ASU library has logs for 1944-45, 1948-74, 1975-83, 1986-87, and 1992. In 1978 the title was changed to *State Highway System Log.*

"News from the Arizona Highway Department / News Release" (title varies with year). Phoenix: Arizona Highway Department/Arizona Department of Transportation. [ASU: HGY 1.7:N 38 and TRT 1.3:N 38]

This is a series of bound press releases issued by the Department, most of which reported the decisions of the Highway Commission/Transportation Board. The actual years of publication are not known, but volumes for January 1970 to February 1979 are available at ASU.

News Hotline. Phoenix: Arizona Department of Transportation. [ASU: TRT 39.3:N 38]

A newsletter published by the Department. The complete years of publication are not known, but issues for 1991 through 1994 are available at ASU.

Pfalzer, James, et. al. *Historical Notes, Existing Road System, and Current Regulation of Highway Transportation in Arizona.* Phoenix: Arizona Department of Transportation Planning Division, Travel and Facilities Section, 1977. [ASU: TRT 5.2:H 47]

Progress on the State Highway System. Phoenix: Arizona Department of Transportation. [ASU: TRT 5.3:P 65]

It was first published in 1984-85 but the final date of publication is not known; reports running through 2000-01 have been located at ASU. According to the first issue, this was produced at the request of the Arizona Legislature, which meant that during the latter half of the 1980s, there were two and at times even three annual reports of some kind being published by ADOT.

Progress Report. Phoenix: Arizona Department of Transportation. [ASU: TRT 1.3:P 54]

The complete dates of publication not known, but reports for 1976 through 1992 (albeit with a few missing years) have been located at ASU.

Report of the State Engineer (title varies with year). Phoenix: Arizona Highway Department, 1909-1926. [ASU: EN 1.1]

Includes a report on the activities of the Territorial Engineer, whose position was created in 1909. These provide a thorough accounting of the early years of the Arizona Highway Department.

"Road Condition Bulletin." Phoenix: Arizona Highway Department, Planning Survey Division, September 1959. [ASU: HGY 3.4:R 51/959]

Useful as a snapshot of the highway system at that time. There may be other editions/years of this bulletin, but only this one is listed at the ASU library. Possibly they may be included in one of the series of press releases put out by the Highway Department or Highway Commission.

Transportation Spotlight. Phoenix: Arizona Department of Transportation, 1974-1980. [ASU: TRT 1.3:S 65]

The successor to *Highway Spotlight*, it was discontinued in 1980 as a budget-cutting measure.

Archives

Grace Sparkes Collection, MSS 12, Arizona Historical Foundation, Hayden Library, Arizona State University.

Though mostly devoted to Sparkes' work to promote Prescott and tourism in central Arizona, it does contain four boxes of material relating to roads in the 1920s and 1930s, some of which focuses on the controversy over the initial location of US 89. See Box 11, folders 1-4, highways and bridges; Box 12, two notebooks related to the State Highway 79 Association; Box 13, three notebooks; and Box 14, three notebooks related to the Blythe bridge and US 60.

Meeting packets, agendas, and minutes for the Arizona Highway Commission and Arizona Board of Transportation, 1927-2005. RG 53, Department of Transportation, Arizona State Archives.

This large collection (80 volumes) constitutes the only surviving record of the policies and decisions made by the Commission/Board, which throughout its history has been responsible for not only approving the department's road construction and maintenance budgets but also approving highway alignments, awarding construction contracts, and establishing major highway-related policies.

ARIZONA BRIDGES

Books and Journal Articles

Jackson, Donald C. *Great American Bridges and Dams*. Washington, D.C.: Preservation Press, 1988.

Includes a discussion of the steel suspension bridge built in 1911 at Cameron.

Kendall, Charles P. "Engineer's Nightmare: Bridging the Colorado River at Yuma in 1915." *Journal of Arizona History* 19, no. 3 (1978): 283-96.

Government documents

Arizona Bridge Record (exact title varies with the year). Phoenix: Arizona Highway Department / Arizona Department of Transportation, 1950-1997. [State Library: HGY 3.3:B 64 1972]

Analogous to the *Log of the Arizona Highway System*. It lists every bridge and culvert in the state, including the date built. The State Library has copies for 1950, 1956, 1959, 1962, 1963, 1965-1977, 1980, 1987, 1993, and 1997.

Fraser Design. *Arizona Bridge Inventory.* Report prepared for the Arizona Department of Transportation, October 1987.

This inventory of 610 historic Arizona bridges built before 1945 was done in cooperation with the Historic American Engineering Record (HAER); it did not include bridges that are in private ownership or no longer used for vehicle traffic. No public library has a copy of this report; the State Historic Preservation Office has a draft copy of this report.

ARIZONA TRAVEL ACCOUNTS AND GUIDES

Books and Journal Articles

Bowman, Eldon, and Elaine Cassey. *A Guide to the General Crook Trail.* N.p.: Museum of Northern Arizona and Boy Scouts of America, 1978.

Cantor, George. *Where the Old Roads Go: Southwest*. New York: Harper Perennial, 1992.

Dixon, Winifred. *Westward Hoboes: Ups and Downs of Frontier Motoring.* New York: Charles Scribner's Sons, 1922.

Kitt, Edith Stratton. "Motoring in Arizona in 1914." *Journal of Arizona History* 11, no. 1 (1970): 32-65.

Knowles, Gerald M. *Route 66 Chronicles.* Volume 1. Winfield, Kans.: Central Plains Book Manufacturing, 2002.

Nolan, William F. "First to the Phoenix Line." *Westways* 71, no. 6 (1979): 51-54.

Describes the California-Arizona Desert Road Race held annually from 1908 to 1915.

Peterson, Thomas H., Jr. "Danger, Sound Claxon: The Automobile Comes to Territorial Arizona." *Journal of Arizona History* 15, no. 3 (1974): 249-68.

Pyle, Ernie. *Ernie Pyle's Southwest.* Palm Desert, Calif.: n.p., 1965.

Rodda, Jeanette. "Chug Wagons and Benzene Buggies: Arizona's Automotive Pioneers." *Journal of Arizona History* 34, no. 4 (1993): 391-418.

Scharff, Virginia. "The Lady Takes the Wheel: Arizona Women on the Road." *Journal of Arizona History* 34, no. 4 (1993): 419-32.

Historic Guidebooks

Arizona Good Roads Association. *Illustrated Road Maps and Tour Book.* 1913. Phoenix: Arizona Highways, 1976.

Clason's Guide to Arizona, with Map of Auto Routes. Denver: Clason Map Co., 1918.

Hinton, Richard J. *Handbook to Arizona: Its Resources, History, Towns, Mines, Ruins, and Scenery*. 1877. Tucson: Arizona Silhouettes, 1954.

This guidebook includes a lengthy appendix describing the common routes of travel to and around Arizona.

Writers' Program of the Work Projects Administration. *Arizona: A State Guide.* New York: Hastings House, 1940.

Magazine Articles

Comstock, L. M. "Tips to Take You Southwest." *Better Homes and Gardens* 25 (November 1946): 31.

Evarts, Hal G. "The Lure of the Southwest." *World's Work* 59 (March 1930): 110.

Fergusson, Harvey. “Exploring the Southwest in Your Own Motor.” *Travel* 57 (October 1931): 26-28.

Goodman, David M. *Arizona Odyssey: Bibliographic Adventures in Nineteenth-Century Magazines.* Tempe: Arizona Historical Foundation, 1969.

Bibliography of magazine articles from the 1800s; see especially the sections “Travel and Description” (pp. 69-101) and “Transportation and Communication” (pp. 116-33).

“Great Southwest.” *Better Homes and Gardens* 41 (April 1963): 107-10.

Lesure, T. B. “Southwestern Side Trips.” *Travel* 126 (September 1966): 28-32.

Nickerson, Roy W. “Heart of the Southwest.” *Travel* 116 (August 1961): 24-26.

Archival Materials

Forrest E. Doucette Collection, MS CP SPC 94, Arizona Collection, Department of Archives and Manuscripts, Hayden Library, Arizona State University.

This collection contains photographs and other materials related to an automobile trip through Arizona that Doucette took in 1928 on behalf of the *Arizona Republican* to inspect and report on road conditions in the state.

ARIZONA TRANSPORTATION HISTORY

Books and Journal Articles

Abbitt, Jerry. *History of Transit in the Valley of the Sun, 1887-1989.* Phoenix: City of Phoenix Transit System, 1990.

Francaviglia, Richard V. *Mining Town Trolleys: A History of Arizona’s Warren-Bisbee Railway.* Bisbee: Copper Queen Publishing Co., 1983.

Janus Associates. *Transcontinental Railroading in Arizona, 1878-1940.* Phoenix: Arizona State Historic Preservation Office, 1989.

Lingenfelter, Richard E. *Steamboats on the Colorado River, 1852-1916.* Tucson: University of Arizona Press, 1978.

Myrick, David F. *A Brief Survey of the Histories of Pioneer Arizona Railroads.* Golden, Colo.: Colorado Railroad Museum, 1968.

Myrick, David F. *Railroads of Arizona.* 5 vols. Berkeley, Calif.: Howell-North Books, 1975.

The five volumes of this indispensable reference book were published by three different publishers—the other two were Trans-Anglo Books and Signature Press—over a period of several years.

Reinhold, Ruth M. *Sky Pioneering: Arizona in Aviation History.* Tucson: University of Arizona Press, 1982.

Scavone, Cirino G. *Please Step to the Rear.* Tucson: Tucson Corral of the Westerners, 1977.

Smith, Dean, ed. *Arizona Pathways: Trails of History.* Phoenix: Arizona Highways Books, 1989.

Trimble, Marshall. *Roadside History of Arizona.* Phoenix: Mountain Press Publishing, 1986.

Wagoner, Jay J. *Early Arizona: Prehistory to Civil War.* Tucson: University of Arizona Press, 1975.

Information on early road building is scattered throughout the book, though it is somewhat fragmented.

Wagoner, Jay J. *Territorial Arizona, 1863-1912: A Political History.* Tucson: University of Arizona Press, 1970.

Has information on transportation developments, including railroads and highways, scattered throughout the book.

Walker, Henry P., and Don Bufkin. *Historical Atlas of Arizona.* 2d ed. Norman: University of Oklahoma Press, 1986.

Government Documents

Report of the Governor of Arizona to the Secretary of the Interior. Washington, D.C.: Government Printing Office, 1879-1910. [ASU GV 1.1]

Although an examination of reports for 1879 through 1900 found little information that was not of a general nature, this is the only available published source reporting the activities of the Territorial government.

GENERAL HISTORIES: ROADS, HIGHWAYS, AND AUTOMOBILES

America's Highways, 1776-1976: A History of the Federal-Aid Program. Washington, D.C.: Department of Transportation, Federal Highway Administration, 1976.

Belasco, Warren J. *Americans on the Road: From Autocamp to Motel, 1910-1945.* Cambridge: MIT Press, 1979.

Berger, Michael L. *The Automobile in American History and Culture: A Reference Guide.* Westport, Conn.: Greenwood Press, 2001.

Brouws, Jeffrey; Bernd Polster, and Phil Patton. *Highway: America's Endless Dream.* New York: Stewart, Tobori and Chang, 1997.

Bruno, Leonard C. *On the Move: A Chronology of Advances in Transportation.* Detroit: Gale Research, 1993.

Butler, John L. *First Highways of America.* Iola, Wis.: Krause Publications, 1994.

Good source for early history of road building, automobiles, and highway travel and services.

Davidson, Janet F., and Michael S. Sweeney. *On the Move: Transportation and the American Story.* Washington, D.C.: National Geographic Society, 2003.

Federal Highway Administration. "Highway History." www.fhwa.dot.gov/infrastructure/history.cfm.

This Web site has a wealth of information on the history of highways nationally, with some material specific to regions, states, and individual highways. There is little related to Arizona, though.

Goetzmann, William H., and Glyndwr Williams. *The Atlas of North American Exploration.* New York: Prentice Hall, 1992.

Jakle, John A., and Keith A. Sculle. *Motoring: The Highway Experience in America.* Athens: University of Georgia Press, 2008.

Kaszynski, William. *The American Highway: The History and Culture of Roads in the United States.* Jefferson, N.C.: McFarland & Co., 2000.

Lewis, Tom. *Divided Highways: Building the Interstate Highways, Transforming American Life.* New York: Viking, 1997.

Rose, Mark H. *Interstate: Express Highway Politics, 1939-1989.* Rev. ed. Knoxville: University of Tennessee Press, 1990.

Schwantes, Carlos A. *Going Places: Transportation Redefines the Twentieth-Century West.* Bloomington: Indiana University Press, 2003.

Weingroff, Richard F. "Federal Aid Road Act of 1916: Building the Foundation," Federal Highway Administration, http://www.fhwa.dot.gov/infrastructure/rw96a.cfm (accessed April 23, 2009).

PRESENTING ARIZONA'S TRANSPORTATION HISTORY TO THE PUBLIC

According to the solicitation for this project prepared by the Arizona Department of Transportation, the primary purpose of the Arizona Transportation History is to "provide the Department with the basis for producing a variety of products highlighting the development of the state's multimodal transportation system." The solicitation also asked that the author(s) of the history "suggest creative ways of presenting Arizona's transportation history" to the public. This section addresses that last concern.

Beyond a doubt, the most effective medium for educating the public about history today is the Web, and the suggestions presented below reflect this fact. Nowadays, when people want to obtain information about any topic, including history, they turn not to published encyclopedias or books but to Web sites that they locate using Google and other Web search engines. This is especially true for students at every level of our educational system—from grade school to graduate school—who increasingly consider a Web search to be the first step in any research project.

The Web has many advantages as a medium for presenting history to the public. It is available at any location to anyone with a computer and an Internet connection—no visit to the library is needed. It allows rapid searching and linking of information. The production costs of placing material on the Web are lower than the costs of printing and distributing books, magazines, and other published materials. And, because Web content is electronic, it can easily be revised and updated.

Of course, the Web does not reach all audiences or serve every purpose. People who do not own computers, or who lack good Internet access, cannot be reached so easily through Web sites. Web-based materials are not portable in the way that printed matter is, which means they cannot be distributed at public events and festivals, museums, places of business, tourist bureaus, and the like. As a result, printed materials like booklets and brochures remain useful for reaching the largest public audience.

WEB-BASED PRESENTATION

The historical narrative and topical essays are, to a large degree, already Web-ready. With the addition of a few images and maps, and perhaps some light editing (to break up paragraphs or adjust the overall length), both could be placed on a Web site without having to do any substantial research or writing.

Ideally this Web site would be a top-level section of the ADOT Web site, which would be reached via a "History" button on the main menu in the left-hand navigation column of the Web site. In this way the transportation history would be easily and instantly

located. (Too many institutions bury their histories in sub-menus or sub-pages of their Web site, making it frustratingly difficult for Web users to locate them.)

The same material should also be formatted as a printable document that can be downloaded as a PDF file from the ADOT Web site. (The existing report, stripped of its footnotes, could be used for this purpose, either with or without illustrations.)

Once this "History" page is set up, ADOT can begin to drive Web traffic to the page by linking it with the Web sites of museums, libraries, archives, and historical organizations in Arizona and the Southwest. If ADOT also decides to produce printed materials related to Arizona's transportation history, the Web address of the "History" page could be placed on those materials.

A "History" section at the ADOT Web site will probably find its most appreciative audience among the state's history teachers and students. By presenting this history on the Web, and then also making it available in an easily downloadable format, the department will be performing a real service for students at every level who need to do research on some aspect of Arizona's transportation history.

PARTNERING WITH OTHER AGENCIES

Both the historical narrative and topical essays include a substantial amount of information on specific Arizona highways that would be useful to anyone preparing a travel guide to the state's roads, especially its scenic and historic roadways.

Although there is no index for either the historical narrative or topical essays, it is possible using an electronic version of the report to produce the equivalent of an index. By searching for certain terms ("State Route 89," for example), Acrobat Reader can quickly extract every mention of the search term, which can then be used to compile information on specific highways and bridges.

Working on its own, or in partnership with other entities such as the Arizona Office of Tourism or the Arizona Heritage Traveler (a joint effort of the Office of Tourism and the Arizona Humanities Council), the department can use material from this history to develop guides to Arizona's historic roads and highways.

Using the historical information contained in this report, the department would provide a brief history of each road's location, construction, and development, and possibly also some historical background on driving in Arizona—comparing road conditions then and now, for example. The partnering agency would provide information on tourist attractions and traveler's facilities along the road.

These guides could be made available online, as printed brochures, or as posters to be displayed by businesses and attractions along the highway covered by the guide.

BOOK-LENGTH PUBLICATIONS

The historical narrative and topical essays are also substantial enough to be used as the basis for full-length illustrated book on the history of Arizona's highway system. With the work of researching the nuts and bolts of the state's highway history now done and presented in this report, the creators of the illustrated book can concentrate on searching out images (guided by the photograph collection information in this report) and collecting the colorful stories and anecdotes that the department would no doubt want to see included in such a publication.

BROCHURES

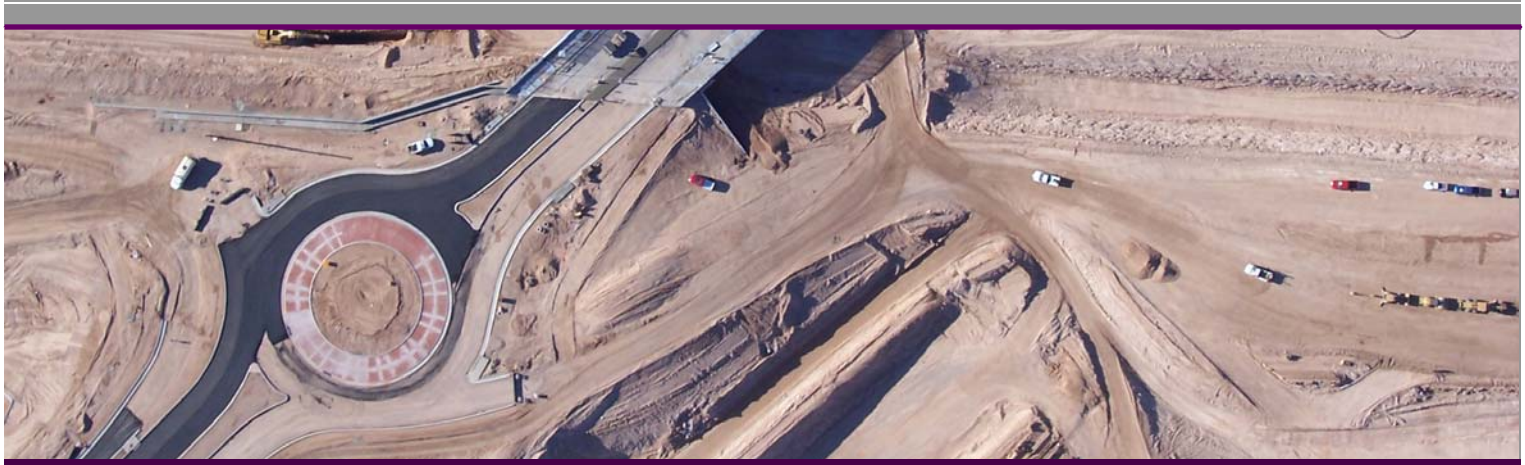
There are certain occasions and locations at which printed matter is clearly superior to Web-based materials: highway and bridge dedications, public festivals, fairs, conferences, chamber of commerce and tourism offices, welcome bureaus, and the like. At all of these places, what works best for disseminating information are brochures, booklets, and one-page handouts, all of which are simple to display and easily carried away by patrons and visitors.

Using the information contained in the historical narrative and topical essays, the department could prepare brochures on several aspects of Arizona's transportation and highway history that would have broad appeal. If they are prepared with an eye to statewide coverage, they could be used in a wide variety of settings and locations. Suggested topics for such brochures are:

"Bridges." This brochure would describe the long and arduous process of conquering the state's most difficult river and canyon crossings, demonstrating how the modernization of the state's highway system was largely dependent on progress in bridge construction. It might discuss the ferries and steamboats on the Colorado River, the Ocean-to-Ocean Highway bridge at Yuma, the bridges for U.S. Route 66 at Topock, Navajo Bridge, Gillespie Dam Bridge, the Mill Avenue Bridge in Tempe, the Salt River Canyon bridge, and the footbridges over the Colorado River in Grand Canyon National Park. Newer bridges include the Roosevelt Dam bridge over the Salt River, the new Navajo Bridge, and the new Tillman-O'Callahan bridge over the Colorado River at Hoover Dam.

"Canyon and Mountain Passages." This would describe the location and construction of some of Arizona's more celebrated and scenic roadways, many of which were engineering achievements when they were built. Included would be the Miami-Superior Highway, the Coronado Trail, U.S. Route 60 through the Salt River Canyon, U.S. Route 89A through Oak Creek Canyon, the Black Canyon Highway, Interstate 15 along the Virgin River, the White Spar Highway over Yarnell Hill, the Beeline Highway, and the Apache Trail.

"Arizona's Interstate System." It was the longest-running and costliest highway program in state history, and it transformed the state's highway system. This brochure would provide some background on the development of the superhighway concept, relate some of the controversies that flared over interstate construction in Arizona, and describe how the interstates transformed Arizona's highway system, replacing many of the state's

pioneer highways. Special emphasis would be placed on how the design innovations of the Interstate system made long-distance travel safer, faster, and easier, in the process transforming how Arizonans viewed automobile travel.

"Driving Then and Now." Based largely on several of the topical essays ("From Gravel to Oil Cake to Rubber Crumbs," "There Is Trouble to Be Had," and "A Factory for Trips"), this brochure would take a light-hearted look at the experience of driving on Arizona's roads. In particular it would draw sharp and entertaining contrasts between the conditions that prevail today, when drivers can travel at high speed over smooth pavements, and those that prevailed in the early years of the automobile. When Arizonans first took to the road in their cars, in the 1910s and 1920s, they could take nothing for granted. Road surfaces were rough and sometimes impassable, signs and accurate directions were hard to find, and even the simplest trip could be an adventure.