CHAPTER 1

Purpose and Need

1.1 Introduction

United States Highway 93 (U.S. 93) is the major commercial corridor for interstate commerce among the states of Arizona, Nevada, and Utah. It is also a direct link between Phoenix and Las Vegas, which are two of the fastest growing areas in the United States. It carries a high volume of traffic from Interstate 40 to Las Vegas and Interstate 15 (I-15). Approximately 30 miles southeast of Las Vegas, U.S. 93 crosses the Colorado River over Hoover Dam. Traffic on Hoover Dam has become highly congested and hazardous vehicle/pedestrian conflicts have increased as a result of large traffic volumes from both private and commercial vehicles that use these routes from the south, southwest, and southeast. The traffic volumes, combined with the mountainous terrain, hairpin curves, inadequate sight distance, narrow dam crest roadway, and steep grades in the Hoover Dam vicinity, create a major bottleneck with high accident potential and substantial delays.

The U.S. 93 corridor, in combination with other highways, creates a continuous north to south corridor between Canada and Mexico, through the United States from Calgary, Alberta, to Nogales, Sonora (Figure 1-1). These highways, consisting generally of four-lane divided facilities with structural sections capable of supporting heavy vehicles, provide north-south linkages from the international border with Mexico via Interstate 19 (I-19) from Nogales to Tucson and Interstate 10 (I-10) from Tucson to Phoenix, in Arizona; and Interstate 15 (I-15) in Nevada, Utah, Idaho, and Montana to the Canadian border. U.S. 93 provides a north-south link between I-10 near Phoenix and I-15 in the Las Vegas metropolitan area. Much of U.S. 93, along with other roadway facilities in the corridor, consists of two-lane undivided highway.

Currently the Nogales, Mexico, border crossing handles more than 250,000 truck crossings annually and is the primary point of entry for produce shipped by truck into the United States from Mexico (*U.S. 93 Development Study*, ADOT, 1993). The U.S. 93 corridor has been recommended by the Arizona Department of Transportation (ADOT) to become Arizona's link in the international trade route proposed by the North American Free Trade Agreement (NAFTA). In addition to connecting Las Vegas and Phoenix, this corridor also links these cities with Tucson and Salt Lake City, Utah.

ADOT plans to improve U.S. 93 to a four-lane divided facility from the Phoenix area to north of Kingman, Arizona. In Nevada, U.S. 93 is a four-lane facility from Las Vegas to Boulder City. The Nevada Department of Transportation (NDOT) is currently evaluating transportation improvements in the Boulder City/U.S. 93 Corridor. After implementing ADOT and NDOT improvements, the only section of U.S. 93 between Phoenix and Las Vegas to remain a two-lane facility will be the 19-mile segment that includes Hoover Dam. While most of the corridor would consist of a high-speed divided facility, the segment in the Hoover Dam vicinity creates a traffic bottleneck between Nevada and Arizona, potentially interfering with interstate and international commerce.

Hoover Dam is the only Colorado River crossing near Las Vegas. The closest alternate crossings are at Davis Dam, 67 miles downstream or at Laughlin, Nevada, 70 miles downstream (Figure 1-2). Because shorter travel times and distances reduce accident exposure and transit costs, the shorter Hoover Dam crossing is preferred by the commercial trucking industry for travel in the Las Vegas-to-Phoenix corridor.

Alternatives to crossing the Colorado River at Hoover Dam are United States Highway 95 (U.S. 95) and State Route 163 (SR 163) in Nevada to Arizona State Route 68 (SR 68) (Figure 1-2), which would add 23 miles to the trip from Las Vegas to Kingman. Another route from Las Vegas to Kingman—U.S. 95 to Interstate 40 to Needles, California, and then east to Kingman—adds 70 miles to the trip.

If the existing bottleneck is eliminated at the dam, U.S. 93 across the Colorado River would be the shortest and fastest route for through traffic between Arizona and Nevada. Traffic flow is generally at speeds near posted limits except at the roadway approaches to Hoover Dam. Average speeds recorded on dam approaches and across the dam crest were as low as 8 miles per hour (mph) (*Traffic Study: Colorado River Bridge*, December 1991).

1.2 History

Hoover Dam, dedicated in 1935, is approximately 9 miles east of Boulder City and 80 miles northwest of Kingman (Figure 1-2). The dam is 1,244 feet long and is situated in the Black Canyon of the Colorado River at the southeastern border of Nevada and the northwestern border of Arizona.

In 1955, the American Society of Civil Engineers named Hoover Dam one of America's seven modern civil engineering wonders. In 1985, it was designated by the U.S. Department of the Interior (DOI) as a National Historic Landmark (NHL) and by the American Society of Civil Engineers as a National Historic Civil Engineering Landmark.

Hoover Dam is key to controlling and regulating the lower Colorado River. It controls floods; stores water for irrigation, municipal, and industrial uses; and provides hydroelectric power generation, recreation opportunities, and wildlife habitat. Except for the tourist facilities, the area surrounding Hoover Dam (known as the Hoover Dam Reservation) is designated as a security-restricted area and is not accessible to the public.

The original road from Boulder City to Hoover Dam was built to provide access for dam construction. From 1934 until the early 1940s, vehicular traffic to the dam came primarily from Las Vegas and Boulder City on U.S. 93. Because few vehicles crossed the dam at that time, there was no interference with dam operations and no traffic safety hazards for dam visitors.

Originally, the highway from Kingman to the dam was a lightly traveled primitive dirt road. Since the early 1940s, ADOT has been improving U.S. 93 between the dam and Kingman, the shortest travel route between Arizona and Nevada. As a result of these highway improvements and the shorter travel distances between Kingman and Las Vegas, through traffic over the dam has steadily increased. This increase, together with population growth in southern Nevada and increasing tourist traffic to Las Vegas, has resulted in serious traffic congestion on U.S. 93 on and near the dam.

As early as 1965, Reclamation recognized the U.S. 93 problems, including sharp turns; narrow roadways; inadequate shoulders; poor sight distances; low travel speeds; and the associated potential for loss of life, contamination of Lake Mead and the Colorado River from hazardous material spills, and effects to Hoover Dam because of these roadway deficiencies.

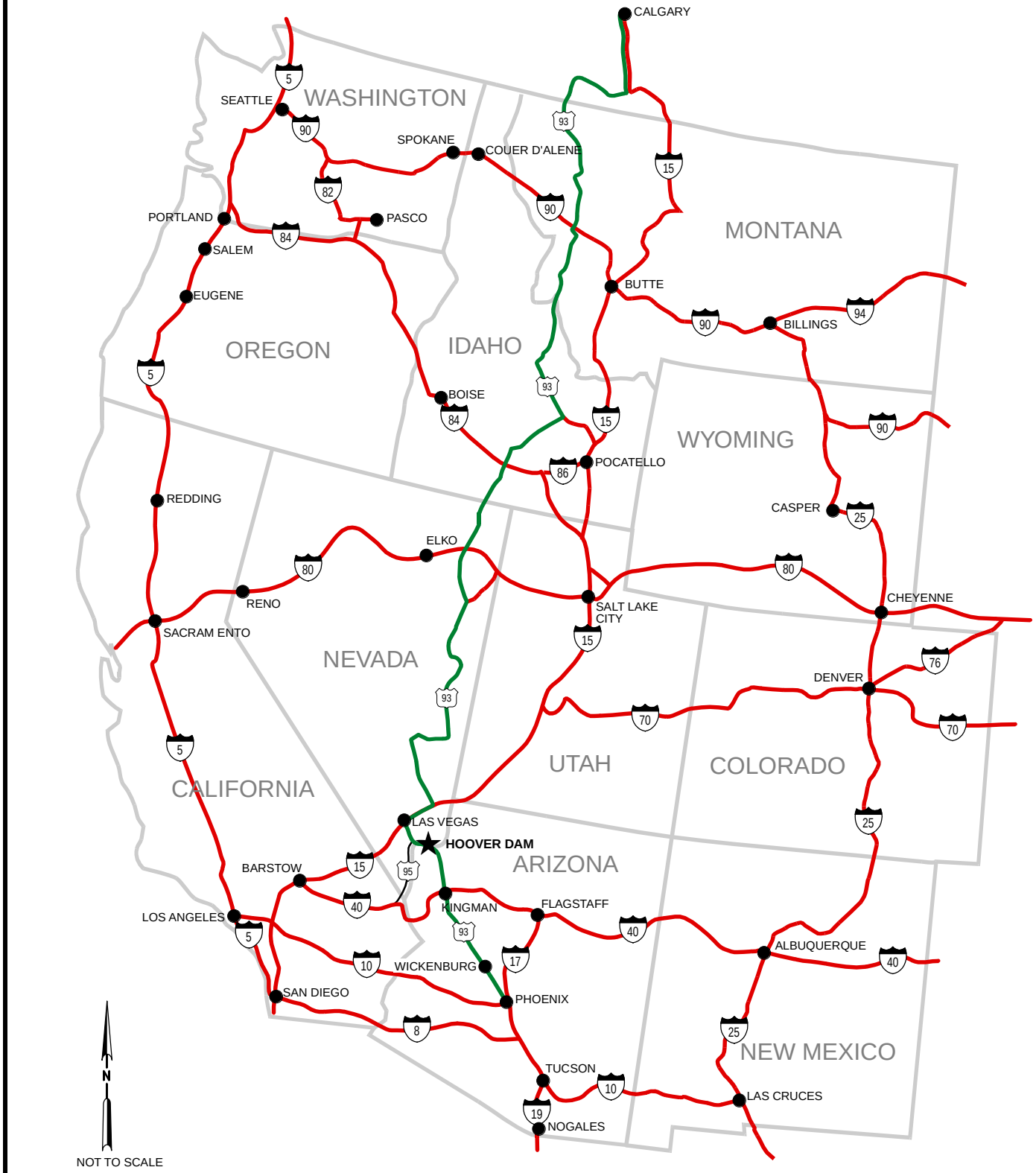

FIGURE 1-1
U.S. 93 TRANSPORTATION CORRIDOR
HOOVER DAM BYPASS PROJECT
ENVIRONMENTAL IMPACT STATEMENT

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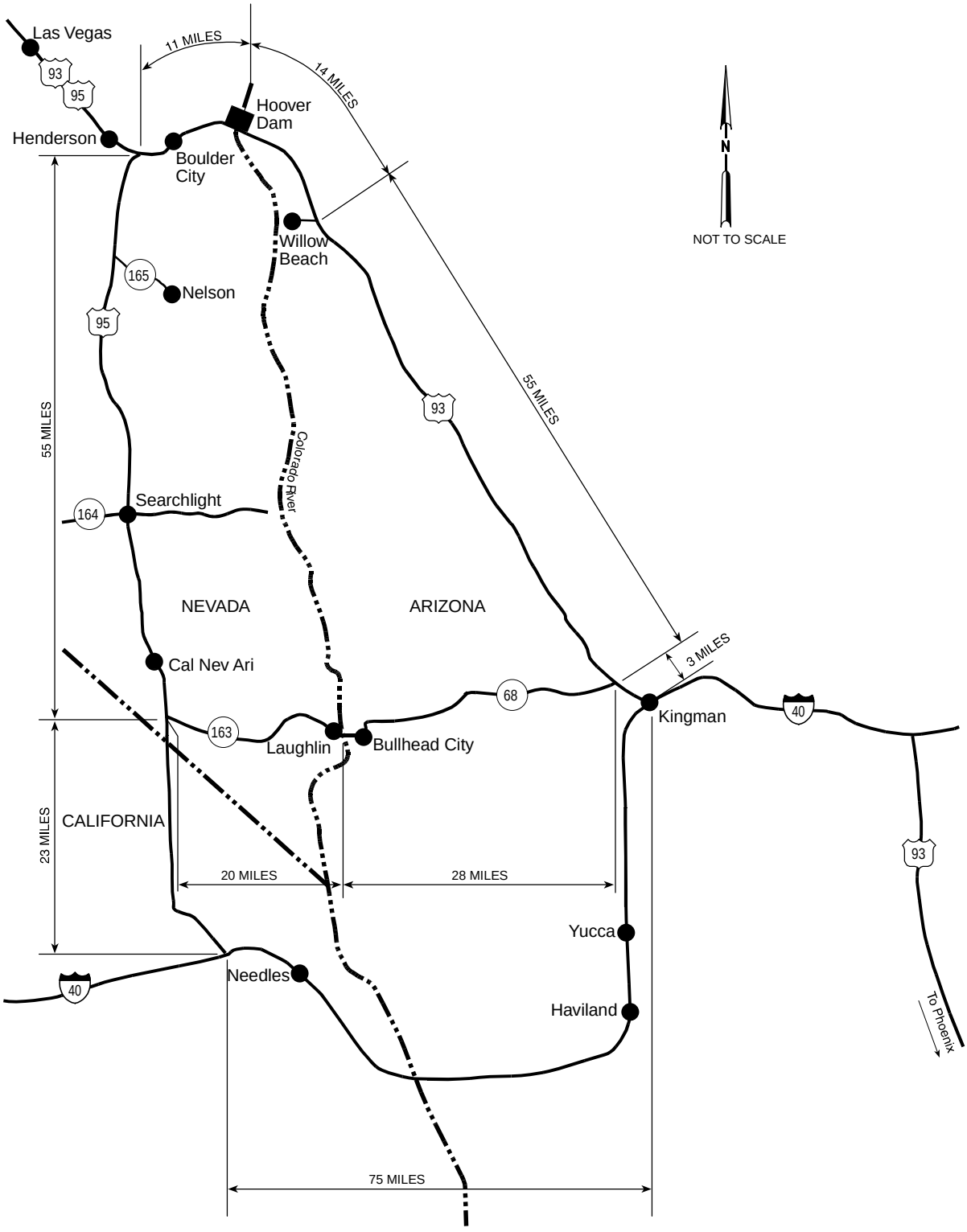

LEGEND

STATE BOUNDARY

HIGHWAYS

FIGURE 1-2
EXISTING ALTERNATE ROUTES TO U.S. 93 AND HOOVER DAM CROSSING
HOOVER DAM BYPASS PROJECT
ENVIRONMENTAL IMPACT STATEMENT

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Reclamation took the lead in seeking a solution to the roadway problems at Hoover Dam. They conducted the following studies: an origin and destination analysis in 1966, a preliminary U.S. 93 relocation corridor study in 1990, and a detailed alignment and bridge type selection study for three bypass alternatives in 1992 (see Chapter 2, Alternatives).

In 1989, Reclamation created the "Colorado River Bridge Project Management Team" (PMT), which directed engineering and environmental studies, developed funding agreements, and managed the preliminary design of a new crossing. The PMT was made up of Reclamation, ADOT, NDOT, Federal Highway Administration (FHWA), and the National Park Service (NPS).

Before releasing the Draft Environmental Impact Statement (DEIS) for public review in 1993, Reclamation withdrew from the project as the lead agency because their mission emphasis changed from constructing major public works projects to water resource management. With no lead agency or funding to continue the environmental process for a new crossing, the project was officially put on hold in 1995.

In the spring of 1997, governors and Congressional representatives from Nevada and Arizona appealed to the U.S. Secretary of Transportation to help fund the completion of the environmental studies. A federal appropriation provided funds to resume studies to evaluate removing truck traffic from Hoover Dam. ADOT and NDOT agreed to contribute funds to complete the studies. In May 1997, the FHWA, Central Federal Lands Highway Division (CFLHD), was named lead agency to resume the Hoover Dam Bypass Project—the project being evaluated in this Environmental Impact Statement (EIS).

1.3 Previous Studies Conducted

As discussed above, U.S. 93 deficiencies in the Hoover Dam vicinity were identified as long ago as 1965. Recognition of these roadway deficiencies resulted in a series of studies that evaluated alternative methods to alleviate deficiencies. Table 1-1 lists the studies conducted to date and provides a brief description of study purposes and findings.

Table 1-1
Previous U.S. Highway 93 and Hoover Dam Studies

Study Name, Author, and Date Prepared	Summary of Study
U.S. 93 – 466 Hoover Dam Origin and Destination Study, prepared by State of Nevada Department of Highways and U.S. Department of Commerce, Bureau of Public Roads, November 1968.	Study determined the characteristics of traffic congestion at Hoover Dam. Determined that traffic near Hoover Dam can be divided into two categories: through traffic (defined as vehicles using the dam as a bridge to complete their trip), and Hoover Dam dead-end trips (defined as vehicles whose destination is Hoover Dam). Suggested four methods to alleviate traffic problems: (1) develop more parking areas and modify the dam to add two traffic lanes; (2) construct an upstream crossing; (3) construct a downstream crossing; and (4) construct a downstream crossing near Willow Beach (not considered economically justified in 1966 because of Davis Dam crossing downstream).

Table 1-1
Previous U.S. Highway 93 and Hoover Dam Studies

Study Name, Author, and Date Prepared	Summary of Study
A Study and Recommendations for Handling Traffic and Conducting Visitors at Hoover Dam, prepared by Perkins & Will Corporation for Reclamation, April 1971.	Study determined methods and facilities to handle vehicle traffic and conduct visitors on dam tour. Study assumed that through traffic would bypass the dam by relocating U.S. 93 to a new downstream bridge and that all other traffic would continue to travel across the dam. Recommended a highway bypass, parking structures, and minor highway improvements.
Resume of Studies on Colorado River Crossing Below Hoover Dam, prepared by Reclamation, January 1972.	Study requested Congressional authorization to construct an alternative Colorado River crossing near Hoover Dam.
Facilitating Traffic Flow, Alleviating Safety Hazards, and Expediting Access - Hoover Dam, prepared by Reclamation, September 1977.	Study requested Congressional authorization to increase the cost ceiling of the Boulder Canyon Project Act (authorized in 1928). Additional funds would have provided new facilities to improve traffic flow, alleviated safety hazards, and provided a safe experience for Hoover Dam visitors.
1983 Analysis of Colorado River Crossing Below Hoover Dam, prepared by Reclamation, June 1983.	Study described the project; explored potential hazards to the dam; updated traffic, visitor use, and construction cost data; recommended a portion of construction costs for a bridge be allocated to power revenues; and concluded that a bridge is needed to bypass the dam to provide safe conveyance of traffic on U.S. 93 for safe, efficient operation of Hoover Dam.
Black Canyon Bridge, Colorado River Crossing, Hoover Dam, prepared by Reclamation, January 1986.	Study described the project; provided a basis for seeking funding; explored potential dam hazards; updated traffic, visitor use, and construction cost data; and concluded that a bridge crossing could eliminate some future potential costs to government facilities at Hoover Dam by eliminating commercial vehicles from using the dam crest.
Preliminary Geologic Report for Colorado River Bridge Crossing, Nevada Approach, Clark County, Nevada, prepared by Reclamation, March 1988.	Contains text, photos, and geologic plan maps at a scale of 1 inch equals 200 feet of the Nevada side approach of the Gold Strike Canyon alignment.
Colorado River Bridge – Hoover Dam, Phase A Route Study, prepared by Reclamation, October 1990.	Study determined the preferred general corridor to relocate U.S. 93 crossing the Colorado River. The study considered nine routes. A January 14, 1991, memorandum recommended that six of the routes be eliminated because of increased environmental impacts, disturbance of large amounts of currently undisturbed NPS lands, and increased costs. Routes recommended for further study included Promontory Point, Sugarloaf Mountain, and Gold Strike Canyon.

Table 1-1
Previous U.S. Highway 93 and Hoover Dam Studies

Study Name, Author, and Date Prepared	Summary of Study
Reconnaissance Geologic Investigation Highway Relocation, prepared by Reclamation, November 5, 1991.	Provided the designers with geologic data including photos and rough geologic mapping for the Phase B Report. Geologic features are approximate as no stationing or surveying had been done along the proposed alignments.
Traffic Study: Colorado River Bridge – Hoover Dam, prepared by CH2M HILL for Reclamation, December 1991.	This traffic study analyzed U.S. 93 from the Gold Strike Casino (now the Hacienda Hotel) to the Arizona lookout south of the dam. Its purposes were to perform a Traffic Systems Management (TSM) study and to provide support to the Reclamation Phase B Corridor Study and EIS for the Colorado River Bridge project. Findings included the existing level of service to be LOS D; through trips represented 70 percent of the total traffic across the dam; average travel time from the Arizona lookout to the Nevada park-n-ride was between 8 minutes (off peak) and 13 minutes (during peak hours); and 30 percent of accidents on the dam involved semitrailer trucks.
Colorado River Bridge Crossing Phase B Corridor Study Developed Bridge Alternatives, prepared by Parsons, Brinkerhoff, Quade & Douglas and HDR Engineering for ADOT and NDOT, January 1992.	Reclamation conducted the Phase B Corridor Studies in conjunction with preparation of the project EIS. The studies identified initial bridge concepts, preliminary design parameters, and costs. This final phase of the bridge type studies began in August 1991 and developed the selected bridge alternatives and their estimated costs.
Movements and Habitat Use of Desert Bighorn in the Black Canyon Area, Arizona Game and Fish Department for Reclamation, March 1992.	The study involved collaring and 2-year monitoring of 49 desert bighorn in the Black Mountains adjacent to Hoover Dam to determine areas of importance, movement corridors, habitat use, and reactions to U.S. 93. Three separate ewe groups/areas were found with significantly different habitat use and home range size. All three of the build alternatives were found to bisect one or more of the ewe groups' home range. The Gold Strike alignment presented the greatest potential difficulties for bighorn.
Colorado River Bridge – Hoover Dam: Public Involvement Plan, prepared by CH2M HILL for Reclamation, May 15, 1992.	The goals of the plan are to: (1) identify issues of concern to the community; (2) provide a plan to address community concerns; and (3) inform the public about the NEPA procedures for selecting a preferred alternative. Formulation of the plan involved in-depth interviews with residents, community and civic leaders, business people, public officials, and members of environmental organizations.
Presence and Movements of Peregrine Falcons in the Area of the Proposed Black Canyon Bridge Project, prepared by Arizona Game and Fish Department for Reclamation and NPS, June 1992.	The purpose of the study was to assess impacts of proposed bridge and associated construction action on the peregrine falcon. Specific objectives of this study were: 1) to locate peregrine falcon breeding areas, 2) to identify important foraging habitats along the river corridor, and 3) to document

Table 1-1
Previous U.S. Highway 93 and Hoover Dam Studies

Study Name, Author, and Date Prepared	Summary of Study
	presence/ absence of peregrines during the nonbreeding season. The area covered in this study was Lake Mead from Fortification Hill to Hoover Dam, and the Black Canyon of the Colorado River from Hoover Dam downstream to Windy Cove. The report recommendations were: 1) continue to monitor all Black Canyon peregrines discovered during this study from 1992 through a minimum of at least 3 years after completion of the roadway and bridge, and 2) in the event that the preferred bridge corridor is possibly within 2 kilometers (km) of an active peregrine eyrie, monitor impacts of the construction.
Traffic and Revenue Study for Colorado River Crossing, prepared by CH2M HILL and Price Waterhouse for Reclamation, August 1992.	The purpose of the study was to support the new crossing EIS and prepare financial feasibility data to determine the maximum amount of revenue obtainable if the crossing were a toll facility. The study area included U.S. 93 from the U.S. 95 junction to the junction of Arizona Route 68; Arizona 68 west to the Colorado River; Nevada 163 west to U.S. 95; and U.S. 95 north to the junction with U.S. 93. It was concluded that the only feasible alternative route, the Colorado River crossing at Laughlin-Bullhead City, is sufficiently distant to discourage most traffic from diverting around the proposed toll bridge.
Colorado River Bridge – Hoover Dam, Phase B Corridor Studies, prepared by Bureau of Reclamation, August 1992. (Note: This includes the "Developed Bridge Alternatives" report listed above.)	Studies assessed Promontory Point, Sugarloaf Mountain, and Gold Strike Canyon alternatives. Included were a highway approach study and a bridge type study. Identified physical factors that would affect the design, cost estimates, or schedules; developed preliminary mitigation features; included preliminary designs; included a construction cost estimate; and included a final design schedule and construction schedule.

Table 1-1
Previous U.S. Highway 93 and Hoover Dam Studies

Study Name, Author, and Date Prepared	Summary of Study
Cultural Resource Report: Colorado Bridge Crossing/Hoover Dam Project Bridge Crossing and Highway Alignment Survey, prepared by Reclamation, 1992.	This study reports the results of a 145-acre cultural resource survey of the proposed bridge crossing locations and highway corridors. Forty-four features were identified within the area of potential effect. Eight features had been identified in previous cultural resource activities. The remaining 36 sites were identified during cultural resource surveys for this project. One feature, Hoover Dam, is listed on the National Register of Historic Places (NRHP) and is also a National Historic Landmark (NHL). Two features, the Old Government Railroad and the Old Boulder City Water System, have been determined eligible for listing in the NRHP. Most of the remaining features are associated with the construction, operation, or maintenance of Hoover Dam. These features are not individually eligible but may contribute to the NHL or a historic district focused on the dam. Reclamation determined that a World War II anti-aircraft bunker located on the Arizona side of the river is individually eligible for the NRHP. This study also determined that all alignment options would affect the historic and visual setting of Hoover Dam.
Arizona and Nevada Site Forms for Colorado Bridge Crossing/Hoover Dam Project Bridge Crossing and Highway Alignment Survey, prepared by Reclamation, 1992.	This volume was prepared as a stand-alone supplement to the report prepared by Reclamation. It includes site forms for all the cultural resource features investigated by Reclamation in connection with the survey.
Hoover Dam Bridge Crossing Cultural Resource Site Reassessment: Nevada Sites 26CK4698, 26CK4739, 26CK4750, 26CK4751, 26CK4752, and 26CK4763, prepared by Reclamation, 1993.	Reclamation determined that 23 of the 29 Nevada cultural resource sites originally identified were eligible for NRHP listing as contributing elements to a potential, undefined historic district associated with the construction and/or operation and maintenance of Hoover Dam. The remaining six sites were determined not eligible. The Nevada SHPO questioned Reclamation's determinations and asked for additional information and clarification. This report documents a survey to relocate and reassess the six sites which the SHPO expressed concern about. Reclamation determined that except for portions of the railroad grade (26CK4751), none of the reassessed cultural resource sites would be affected by any of the Hoover Dam bridge crossing alternative alignments.

Table 1-1
Previous U.S. Highway 93 and Hoover Dam Studies

Study Name, Author, and Date Prepared	Summary of Study
Hoover Dam Bridge Crossing Cultural Resource Site Reassessment: Arizona Sites DD:14:15, DD:14:16, DD:14:17, and DD:14:19, prepared by Reclamation, 1993.	Reclamation determined that four of the eight Arizona cultural resource sites originally identified were NRHP eligible as contributing elements to a potential, undefined historic district associated with the construction and/or operation and maintenance of Hoover Dam. The remaining four were not eligible. The Arizona SHPO questioned Reclamation's determinations and asked for additional information. This report documents a survey to relocate and reassess the four sites which the SHPO expressed concerns about. Reclamation determined that none of the reassessed cultural resource sites would be affected by any of the Hoover Dam bridge crossing alternative alignments.
Desert Bighorn Movements and Habitat Use in Relation to the Proposed Black Canyon Bridge Project: Nevada, Cooperative National Park Resources Studies Unit, University of Nevada for Reclamation, May 1993.	This study characterized bighorn sheep habitat quality and information on movements of radio-collared bighorn to estimate home range size and patterns of movement. Total home range size was determined. It was found that bighorn sheep heavily use the area of the proposed alignments on a year round (ewes) and seasonal basis (rams in fall). The Sugarloaf Mountain Alternative was found to intrude the least on high-use areas and that habitat loss will be greatest for the Gold Strike Canyon Alternative. Big game fencing is recommended along the new highway to reduce bighorn sheep/motor vehicle collisions.
U.S. 93 Colorado River Crossing Corridor Study, prepared by Parsons Brinkerhoff Quade & Douglas for NDOT, December 1994.	A continuation of Reclamation studies, this report analyzed two longer alternatives: Willow Beach South (26 miles) and Hoover Dam/Boulder City Bypass (31 miles). Study purpose was to determine the relative feasibility of these corridors. Feasibility was determined by relative cost, technical engineering difficulty, major impacts, and user benefits.
Biological Assessment for the Hoover Dam Bypass Project, prepared by CH2M HILL for Federal Highway Administration, Central Federal Lands Highway Division, February 1999.	Determined that the preferred alternative may affect the desert tortoise but will not affect any of the other listed species in the project area. Impacts to the desert tortoise would be avoided or minimized with conservation measures.
U.S. 93 Hoover Dam Bypass Project, Sugarloaf Mountain Alternative, Historic Resources Survey, prepared by Kurt P. Schweigert, Associated Cultural Resource Experts for Federal Highway Administration, Central Federal Lands Highway Division, and CH2M HILL, August 1999.	This survey recorded 14 historic features within the area of potential effects (APE) of the preferred alternative, including the Hoover Dam National Historic Landmark. The report evaluated the 13 other historic features for eligibility to the National Register of Historic Places as elements relating/ contributing to the construction and operation of the Hoover Dam. The report also analyzed the affect of the preferred alternative on these historic sites.

Table 1-1
Previous U.S. Highway 93 and Hoover Dam Studies

Study Name, Author, and Date Prepared	Summary of Study
U.S. 93 Hoover Dam Bypass Project Archaeological Resources Survey Report, prepared by CH2M HILL for Federal Highway Administration, Central Federal Lands Highway Division, April 2000.	This report documents the results of a Class III (intensive) archaeological survey of the three alternative alignments of the proposed bypass. It documents a field survey conducted for all alignments in March 1998 and an intensive archaeological site mapping and recording investigation on two sites in June 1999. The survey and mapping recorded a total of five prehistoric archaeological sites, all located in Arizona, within the APE of the Promontory Point and Sugarloaf Mountain Alternatives. The report concluded that none of the five sites had sufficient research value for prehistoric archaeology, and all were thus found ineligible for the National Register.
Hoover Dam Bypass Bridge Financial Feasibility Study, prepared by Hagler Bailly Services, Inc. for Arizona Department of Transportation and Nevada Department of Transportation, June 2000.	This study outlines options available to meet the financial demands of constructing the Hoover Dam Bypass Project, to aid policymakers in their selection of alternate strategies. The study analyzed the following funding options: federal funding, existing state program funding, new state funding sources (statewide taxes, transportation taxes and fees, tourism-related taxes and fees, and value-capture programs), and tolls or other user charges.
Ha'tata (The Backbone of the River): American Indian Ethnographic Studies Regarding the Hoover Dam Bypass Project, prepared by Richard W. Stoffle et al., University of Arizona for Federal Highway Administration, Central Federal Lands Highway Division, and CH2M HILL, October 2000a.	This study recorded and evaluated the results of field visits conducted by University of Arizona anthropologists with Native American tribal elders. Interviews were conducted in May/June 1998 and May 2000 with representatives from 13 tribes. The report documents feelings of the tribal representatives about the cultural values of the lands in the project area, tribal concerns about the impact of the bypass project, and tribal recommendations for minimizing the impacts.
Hoover Dam Bypass Project: Ethnohistoric Overview and Assessment, prepared by David S. Whitley and Peter Nabokov, W&S Consultants, for Federal Highway Administration, Central Federal Lands Highway Division, and CH2M HILL, October 2000b.	Examined ethnohistoric data from archaeological, historical, and ethnographic sources from the general region of the Hoover Dam Bypass Project study area. Identified traditional Native American land use practices, values, and beliefs. It provided a context for the contemporary ethnographic (FHWA, October 2000) and archaeological (FHWA, April 2000) studies conducted for the project, with the goal of aiding the determination of whether National Register-eligible traditional cultural properties (TCPs) are present in the project area.

Table 1-1
Previous U.S. Highway 93 and Hoover Dam Studies

Study Name, Author, and Date Prepared	Summary of Study
The Land Still Speaks: Traditional Cultural Property Eligibility Statement, prepared by University of Arizona and the American Indian Core Consultation Work Group for Federal Highway Administration, Central Federal Lands Highway Division, October 2000c.	Summarized and evaluated the findings from the ethnographic (FHWA, October 2000a) and ethnohistoric (FHWA, October 2000b) studies conducted for the project. This report identified the Gold Strike Canyon and Sugarloaf Mountain TCP, and determined it to be eligible for the National Register of Historic Places.

1.4 Need for the Project

Several deficiencies on U.S. 93 from the Gold Strike Inn (recently rebuilt as the Hacienda Hotel), Nevada, to Milepost 1 (MP 1) in Arizona have been identified, both from a highway operational standpoint and from a dam operational standpoint. These deficiencies not only create travel delays, but also contribute to accidents and vehicle conflicts.

1.4.1 Highway Deficiencies

The U.S. 93 roadway approaches to Hoover Dam include numerous substandard geometric elements. These elements include horizontal curves with radii too short to provide adequate turning room and that are bounded by rock walls that limit sight distance along the road. The existing roadway cross section does not provide adequate width for disabled vehicles or passage by emergency vehicles; and, at several locations, the roadway width is not adequate for turning.

The highway speed limit is reduced from 55 to 15 mph before the dam from each direction. The primary reasons for the speed reduction are the numerous hairpin curves required for the highway to reach the dam crest roadway and the steep grade. Three curves are of particular concern: one on the Nevada side, referred to as the Nevada Hairpin Curve; and the other two on the Arizona side, referred to as the Arizona Hairpin Curve and the Arizona Horseshoe Curve (see Figure 2-3).

Each of these curves provides less than a 20-mph design speed, and each is located less than 1 mile from the dam. The extreme hairpin curves do not allow adequate width for commercial trucks to pass in opposite directions. Trucks meeting at these locations usually must come to a complete stop, and one truck often must back up to allow the other room to negotiate the curve. The overall impact of these highway deficiencies on the traffic level of service at the dam is discussed in Section 1.4.2 below.

1.4.2 Inadequate Roadway Capacity

The Hoover Dam section of U.S. 93 has reached its capacity during peak periods and cannot provide additional capacity with the current roadway alignment. In 1991, average travel speeds of the 2 miles of roadway on either side of Hoover Dam were 8 to 18 mph. The crest road at Hoover Dam has reached its maximum traffic-carrying capacity and has been at that level since at least 1991. Table 1-2 compares 1997 traffic on the dam with that projected for the years 2017 and 2027.

Table 1-2
Traffic Volumes and Level of Service at Hoover Dam

	1997	2017	2027
Traffic Volumes (Average Annual Daily Traffic)[a]	11,500	21,100	26,000
Level of Service	F	F	F

[a] Actual Reclamation 2000 traffic counts indicate a somewhat greater growth rate than that used for these projections.
Source: Appendix A, Traffic Analysis.

The method used to describe and determine capacity and traffic operating conditions in this study is outlined in the Highway Research Board's *Highway Capacity Manual - Special Report 209* (3rd Edition, 1994), which expresses levels of service (LOS). The LOS concept is a qualitative measure to describe traffic operational conditions and motorist perceptions; it describes speed, convenience, and safety. Six LOSs are used to define operating conditions, designated by the letters A through F. LOS A represents the best operating conditions, while LOS F represents heavily congested flow with traffic demand exceeding highway capacity (Figure 1-3).

Considering the existing highway configuration, speed limit, pedestrians, and vehicle mix (passenger vehicles, semitrucks, and recreational vehicles) of through traffic, highway capacity is 1,200 vehicles per hour. This calculation is based on average operating speeds between 15 and 20 mph and does not consider peak periods such as weekends, holidays, or special events that further exacerbate traffic conditions. The 1991 peak volume of 1,168 vehicles per hour was 97 percent of highway capacity, resulting in traffic congestion (traffic count, August 8, 1991). Traffic counts taken in 1996 indicated peak volumes at or exceeding the total highway capacity. Traffic congestion is increased when vehicles have mechanical difficulties because the shoulders are too narrow to pull off the road.

Primary factors that limit capacity through this section of U.S. 93 are tight curves and steep grades associated with the approach roadways on both sides of the dam; and a single lane in each direction. On the dam crest, conditions are degraded by numerous conflicts with pedestrians crossing the roadway. Neither the improvement of these geometric constraints nor widening of the corridor is feasible with the current alignment over the dam.

1.4.3 Travel Times

Based on current posted speeds along U.S. 93 from the Hacienda Hotel, Nevada, to MP 3 in Arizona (6.3 miles), the estimated average travel time for the existing alignment is 16.5 minutes. A bypass roadway could be estimated to operate at 55 mph. The Sugarloaf Mountain and Gold Strike Alternatives would reduce the distance to 5.5 miles, resulting in a travel time of 6 minutes. This estimate represents a 10.5-minute reduction for each through-vehicle. The Promontory Point Alternative would reduce the distance to 6.1 miles, with a time savings of approximately 10 minutes.

Based on projections that 26,000 vehicles will cross the dam in the year 2027, the peak-hour traffic volume is estimated at 2,340 vehicles. This projection indicates that more than 1,170 hours of travel time delay during the 3 peak hours could be eliminated (see Appendix A, Traffic Analysis).

1.4.4 Interference in Dam Operation

The high volume of vehicles crossing the dam interferes with the vehicle movements needed for operating and maintaining the dam and its facilities.

Vehicular traffic affects most highway and dam maintenance activities. These activities include repairing and replacing turbines and generators, replacing lights along the highway on the dam, maintaining the highway approaches, repairing the spillway, and using the overhead cable that transports heavy equipment and material to the power house. The traffic interference results in additional time and higher costs to complete these activities.

1.4.5 Accident Rate and Potential for Pedestrian-Vehicular Accidents on Hoover Dam

The number of tourists to the Lake Mead National Recreation Area (LMNRA) and Hoover Dam is increasing. Visitors taking the guided tour at the dam have more than tripled (300,000 per year in 1937 to 1.03 million in 1997). This increase is partially due to the opening of the new Hoover Dam Visitor Center in 1996. In addition to pedestrian traffic, about 11,500 vehicles per day cross Hoover Dam; this volume is projected to be about 26,000 vehicles daily in the year 2027.

Since 1964, more than 500 accidents have occurred between Nevada MP 2.2 and Arizona MP 1.2 (a 3.4-mile stretch of highway including the dam). Forty-three accidents between 1985 and 1991 involved one or more personal injuries, including two fatalities. Commercial trucks were involved in 96 of the accidents. In every accident, the cause was partially attributable to existing highway conditions, such as sharp curves, narrow highway width, insufficient shoulder width, poor sight distances, and slow travel speeds. Accident causes that are aggravated by the existing U.S. 93 configuration can be classified as either mechanical failure (engine problems, tire blowouts, or brake failure) or human error resulting from fatigue, intoxication, or judgment errors. As the average annual daily traffic (AADT) across the dam continues to increase, the number of accidents continues to increase accordingly.

Detailed accident data were obtained from both NDOT and ADOT for the years 1994 through 1997 (Table 1-3). The following data are for the section of U.S. 93 from the Hacienda Hotel in Nevada to MP 3 in Arizona.

Table 1-3
Accident Data for 1994 to 1997

Accident Type	Arizona	Nevada	Total	Percent of Total
Opposing Direction	11	34	45	34
Rear-end	7	21	28	21
Sideswipe	5	9	14	11
Hit Fixed Object	5	3	8	6
Overturned/Off-Road	7	6	13	10
Other	10	13	23	18
Total	**45**	**86**	**131**	**100**

Level of Service A.

Level of Service B.

Level of Service C.

Level of Service D.

Level of Service E.

Level of Service F.

FIGURE 1-3
LEVEL OF SERVICE CLASSIFICATIONS
HOOVER DAM BYPASS PROJECT
ENVIRONMENTAL IMPACT STATEMENT

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Table 1-3 shows a high percentage of multiple-vehicle accident types (opposing direction, rear end, and sideswipes) indicating heavy congestion in the study area. The accident rate along this 6.38-mile section of U.S. 93 is 1.35 per million vehicle miles traveled. This rate is slightly higher than the Nevada average of 1.15 accidents per million vehicle miles traveled. Analysis of the same data for the U.S. 93 within 1 mile of Hoover Dam shows a much higher accident rate than the 3-mile approaches. The 0.5-mile segments of U.S. 93 approaching Hoover Dam have an accident rate of 3.97 per million vehicle miles traveled. This rate is over three times the Nevada average of 1.15 per million vehicle miles traveled for rural principal arterials. Similar to the conclusion that can be drawn from the types of accidents, this high rate near Hoover Dam also indicates high levels of congestion.

1.4.6 Safeguarding Hoover Dam Power Plant, Lake Mead, and Colorado River from Hazardous Spills or Explosions

Hoover Dam is a major power supplier for Southern California industry (generating about 4 billion kilowatt-hours of electricity annually); and Lake Mead is an essential storage facility for the water supply for Southwest industries, municipalities, and farmlands.

Many vehicles currently crossing the dam carry volatile fuels, chemicals, or hazardous materials (including explosives, flammable fuels, radioactive materials, acids, and caustic chemicals). Potential hazards resulting from these materials include ignition of combustible materials, contamination of Lake Mead or the Colorado River, and damage to the power house and associated equipment if the materials entered the dam power plant and outlet works. A reasonable worst-case scenario would be the release of gasoline (the flammable liquid most commonly transported across the dam), followed by delayed ignition, resulting in loss of life, severe injuries, and long-term interruption of power generation.

Of particular concern is the highway drainage system in the area near the dam on the Nevada side of the river. Currently, the drainage flows off the edge of the road, down the canyon face, onto the Nevada power house roof, and into the Colorado River. In addition to potential water pollution issues, materials spilled onto the road would drain off the road onto the Nevada power house, possibly resulting in power house damage or destruction. The proposed project may not specifically remedy these conditions, but will remove vehicles transporting large volumes of hazardous materials from the dam crest and provide them a straight, four-lane highway crossing, which will result in a corresponding reduction in potential spill risks.

1.4.7 Quality of Visitors' Experiences at Hoover Dam

There were 9.7 million visitors to the LMNRA in 1997 (personal communication, Bill Burke of the NPS, 1998). Hoover Dam is a popular national and international tourist destination. Tourists enter the visitor center, take the tour, patronize the snack bar, and walk across the dam crest to photograph the facilities from various upstream and downstream vantage points. These activities contribute to traffic congestion and can result in vehicle and pedestrian conflicts. Through-vehicle and truck traffic also emit noise and vehicle exhaust, which diminishes the visitors' experiences at the dam.

1.5 Purpose of Project

The purpose of the project is to reduce or eliminate through traffic over Hoover Dam to accomplish the following objectives:

- Minimize the potential for pedestrian-vehicle accidents on the dam crest and on the Nevada and Arizona approaches to the dam
- Remove a major bottleneck to interstate and international commerce and travel in the west by reducing traffic congestion and accidents in this segment of the major commercial route between Phoenix and Las Vegas
- Replace an inadequate federally owned highway river crossing with a new crossing that meets current roadway design criteria, and improves through-vehicle and truck traffic capacity on U.S. 93 at the dam
- Reduce travel time in the dam vicinity
- Protect Hoover Dam employees, visitors, equipment, power generation capabilities, and Colorado River waters while enhancing the visitors' experience at Hoover Dam by:
  - Safeguarding dam and power plant facilities and the waters of Lake Mead and the Colorado River from hazardous spills or explosions
  - Protecting the dam and power plant facilities from interruptions in electricity and water delivery
  - Providing improved conditions for operating and maintaining Hoover Dam facilities

1.6 Relationship of the Proposed Project to the Statewide Plan or Urban Transportation Plan

This section describes travel demand in relation to the Nevada and Arizona plans and pertinent legislation.

1.6.1 Nevada

The NDOT's Statewide Transportation Improvement Program (STIP) was developed through coordinated efforts of the NDOT; federal, state, local, and tribal governments; and with agencies, planning organizations, transportation providers, and the general public (NDOT, 1997). Evaluating a Hoover Dam bypass is included in the STIP (1998). Constructing a bypass at Hoover Dam is one of six projects listed in NDOT's billion dollar Highway Superproject Program and is shown in NDOT's Work Program—Long Range Element (1998 through 2007).

1.6.2 Boulder City/U.S. 93 Corridor

NDOT, in cooperation with FHWA, began the Boulder City/U.S. 93 Corridor Study and EIS in November 1999. The proposed project involves traffic improvements to U.S. 93 in the Boulder City area, referred to as the U.S. 93 Corridor. The EIS will study the corridor between a western boundary on U.S. 93 in Henderson, Nevada, approximately 1 mile north of the Railroad Pass Hotel Casino, and an eastern boundary on U.S. 93 approximately 4.7 miles east of downtown Boulder City. The eastern boundary is coincident with the planned western end point of the Hoover Dam Bypass project. The project covers a total distance of approximately 10.4 miles on the present route of U.S. 93. The purpose of the project includes reducing traffic congestion and accidents in the corridor, accommodating current and

projected traffic demand, and improving system linkage and route continuity on U.S. 93 for interstate commerce. The planned completion date for the EIS process is June 2002.

NDOT is pursuing development of Boulder City/U.S. 93 Corridor improvements primarily to reduce traffic congestion and accidents in the corridor (see Chapter 2, Alternatives). Previously, NDOT evaluated the feasibility of two alternative Colorado River crossings associated with a bypass (NDOT, 1994). The options were the Willow Beach South Crossing and the Hoover Dam/Boulder City Bypass. To ensure uniformity in the analyses and to provide a more meaningful comparison between the two routes, it was assumed that the two alternatives had the same starting and ending points, and the longer of the two routes (Willow Beach) was used to establish the termini. The western terminus was located at Railroad Pass west of Boulder City near the U.S. 93/U.S. 95 interchange in Nevada. In Arizona, the eastern terminus was approximately 1 mile south of the LMNRA boundary where the existing road narrows from a four-lane divided facility to two lanes before reaching Hoover Dam along U.S. 93.

The Boulder City/U.S. 93 Corridor improvements and the Hoover Dam Bypass are separate projects with independent utilities conceived to meet separate needs; each could be constructed without the other, and each would still fulfill its own objectives. The Boulder City Corridor improvement objective is to reduce traffic congestion and accidents in Boulder City and on U.S. 93; constructing a Hoover Dam Bypass will not reduce or eliminate traffic in Boulder City. The objectives described in the purpose and need for the Hoover Dam Bypass—reducing travel time, eliminating substandard design geometry at the dam and approaches, increasing public safety at the dam, and enhancing visitor experience at the dam—would not be achieved by routing traffic around Boulder City or making other improvements in the Boulder City/U.S. 93 Corridor.

1.6.3 Arizona

The *Arizona State Transportation Improvement Plan* (ASTIP) (ADOT, December 1994) has identified the Phoenix to Nevada (U.S. 93) corridor as one of the top priority corridors within Arizona. The document states:

> *"Existing concerns within the Phoenix to Nevada corridor include the levels of recreation travel and trucking usage with the resulting conflicts and safety concerns. Long-term economic opportunities exist in this corridor, particularly as it relates to completion of a Mexico-Canada link and improvements of access and travel opportunities in Northwest Arizona."*

The U.S. 93 corridor connects Phoenix to I-15 in southern Nevada and has been designated by ADOT to become Arizona's link in the international trade route proposed by NAFTA. ADOT has programmed over $160 million to improve U.S. 93 as a four-lane divided facility from the Phoenix area to north of Kingman, Arizona, within the next several years. ADOT has also programmed $300,000 to begin studies for improving U.S. 93 from MP 0 to MP 15 in the LMNRA.

1.7 Legislation Regarding the Proposed Project

The following sections summarize legislation regarding the proposed project.

1.7.1 Hoover Powerplant Act (Public Law 98-381)

The Hoover Powerplant Act was passed in 1984, and it authorized Reclamation to construct this bridge project. The authorizing legislation specifically prohibits construction of the project through reimbursement from power generation at the dam.

1.7.2 Nevada Senate Joint Resolution 26

This Resolution, dated June 19, 1995, urges Congress to take necessary actions to alleviate problems caused by heavy commercial traffic over Hoover Dam. This remedy includes constructing a highway bypass around Hoover Dam to:

- Divert the heavy flow of trucks transporting highly flammable or hazardous materials, or both, and the heavy flow of regular traffic from traveling over Hoover Dam
- Prevent further air pollution of the area
- Reduce traffic accidents in the area
- Reserve the portion of U.S. 93 over Hoover Dam to accommodate dam tourists
- Prevent Colorado River pollution resulting from potential spills resulting from heavy traffic flow

1.7.3 Nevada Senate Concurrent Resolution 60

This Resolution, dated June 19, 1995, directed the Nevada Department of Motor Vehicles and Public Safety and the Public Service Commission of Nevada to jointly study current regulations governing the transportation of hazardous materials from Arizona to Nevada via U.S. 93 over Hoover Dam; it further directed NDOT to study the feasibility of prohibiting commercial traffic over Hoover Dam, and to study methods of financing road and highway construction projects to divert commercial traffic from traveling over Hoover Dam (see Section 2.5).

1.7.4 Transportation Equity Act for the 21st Century (TEA-21)

This legislation was approved with broad congressional support and was signed into law by President Clinton on June 9, 1998. It reauthorizes the Federal transportation program for years 1998 through 2003.

The legislation authorizes $10 million specifically for the Hoover Dam Bypass project under Arizona High Priority Project 383 and another $31 million under Arizona High Priority Project 1814. In Fiscal Year (FY) 1999, two FHWA discretionary programs allocated additional funds—$4 million from the Public Lands Highway program and $2 million from the National Corridor and Development Program. In FY 2000, the project received $6 million from the Public Lands Highway program and $2 million from the National Corridor and Development Program. An additional $3 million was appropriated in FY 2001 as an add-on to a Defense Bill. In addition, an FY 2001 DOT appropriation included $20 million for the project. The legislation also makes the Hoover Dam Bypass project eligible for additional Federal funding on a year-by-year basis under the Federal Lands Highway Program and the National Corridor Planning and Development Program.

1.8 Relationship of the Proposed Project to Other Modes of Transportation

U.S. 93 does not currently serve airports, rail or port facilities, bike routes, or mass transit services near Hoover Dam. The NPS, in partnership with Reclamation, is planning to establish a bicycle/pedestrian trail that will extend from Boulder City, Nevada, to Hoover Dam. This approved trail will parallel U.S. 93 along the Old Government Railroad grade. As discussed previously, a high-volume mix of passenger, freight, and recreational vehicles in addition to many pedestrian tourists on the dam crest crosses Hoover Dam daily.

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