National Park Service
U.S. Department of the Interior

Environmental Assessment

Rehabilitation and Reconstruction of Portions of Northshore Road (Milepost 27.5 to 48.0) and Rehabilitation of Echo Bay and Overton Beach Access Roads

June 2006

ENVIRONMENTAL ASSESSMENT

Rehabilitation and Reconstruction of Portions of Northshore Road (Milepost 27.5 to 48.0) and Rehabilitation of Echo Bay and Overton Beach Access Roads

Prepared For:
National Park Service

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Lake Mead National Recreation Area
Nevada

U.S. Department of the Interior
National Park Service

Rehabilitation and Reconstruction of Portions of Northshore Road (Milepost 27.5 to 48.0) and Rehabilitation of Echo Bay and Overton Beach Access Roads

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Summary

The National Park Service is proposing to rehabilitate and reconstruct portions of Northshore Road (milepost 27.5–48.0) and rehabilitate Echo Bay and Overton Beach access roads at Lake Mead National Recreation Area (NRA), Nevada.

This environmental assessment examines two alternatives in detail: the no-action alternative, and the National Park Service preferred alternative. The preferred alternative would expand the paved surface of Northshore Road from milepost 27.5 to milepost 48.0. The road surface in this segment would be pulverized, recycled, and paved to a 32-foot width (two 12-foot travel lanes and adjacent 4-foot-wide paved shoulders), with spot reconstruction of subgrade and shoulders, as required. The existing roadway has three sections that would be realigned to improve safety. The preferred alternative would replace an existing bridge at Echo Wash and would construct a new bridge to replace an existing culvert system at Valley of Fire Wash. The Northshore-Overton Beach spur road and Northshore-Echo Bay spur road intersections would be improved, including lengthening turn lanes and constructing a raised median. The paved surface of the 2.9-mile-long Overton Beach spur road and the 4.7-mile-long Echo Bay spur road would be pulverized, recycled, and paved to a 26-foot width (two 11-foot travel lanes and 2-foot paved shoulders), with spot reconstruction of subgrade and shoulders, as required. Culverts would be replaced or repaired, 10 existing turnouts would be lengthened, and one new turnout would be constructed. Additionally, a section of roadway along Las Vegas Wash would be straightened to improve driver safety and sight distance. This action is needed to improve poor pavement conditions, parking areas, inadequate drainage structures, pedestrian access, and traffic flow.

The preferred alternative would have negligible to minor adverse impacts on wetlands, prime and unique farmlands, ecologically critical areas, environmental justice, park operations, archeological resources, and natural soundscapes and lightscapes. Short-term, negligible to minor, adverse impacts to water quality and short-term, minor, adverse impacts to floodplains would result from localized erosion and sedimentation. Closures and traffic delays would result in short-term, minor to moderate, adverse impacts to visitor use and experience. Impacts to air quality would be localized, short term, minor, and adverse due to temporary increases in dust and vehicle emissions. Short- and long-term, negligible to minor, adverse impacts on biotic communities and threatened and endangered species would result from road reconstruction activities. Impacts to soils from the proposed action would be short and long term, minor, and adverse due to compaction. Impacts to historic structures would be limited to the road surface, culverts and headwalls. These impacts would be minor to moderate and adverse due to modifications of the road, and replacement of historic culverts and headwalls. There would be negligible, short-term, beneficial effects to health and safety due to the reduced speeds in the construction zone. Long-term, minor, beneficial impacts to historic structures would result from cleaning and repairing components of the road. The proposed action would result in long-term, minor to moderate, beneficial effects to maintenance operations. Long-term, moderate, beneficial impacts to visitor use and experience and health and safety would be realized from improvements to road conditions.

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ACRONYMS AND ABBREVIATIONS

CCC	Civilian Conservation Corps
CFR	Code of Federal Regulations
°F	Degrees Fahrenheit
HAER	Historic American Engineering Records
km/h	Kilometers per Hour
MOA	Memorandum of Agreement
mph	Miles per Hour
NEPA	National Environmental Policy Act of 1969, as amended
NPS	National Park Service
NRA	National Recreation Area
NRHP	National Register of Historic Places
PL	Public Law
SHPO	State Historic Preservation Office
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
UTM	Universal Transverse Mercator

INTRODUCTION

PURPOSE AND NEED

The National Park Service (NPS) is proposing to rehabilitate and reconstruct portions of Northshore Road (milepost 27.5–48.0) and rehabilitate Echo Bay and Overton Beach access roads at Lake Mead National Recreation Area (NRA), Clark County, Nevada. The proposed project would begin at approximately milepost 27.5, proceeding to the recreation area boundary (milepost 48.0); and would include 4.7 miles of Echo Bay spur road and 2.9 miles of Overton Beach spur road (figure 1). The purpose of the action is to correct deficiencies in existing road design and conditions including pavement deterioration; roadway alignments; road, shoulder, and bridge widths; and drainage facilities. The purpose of this action is also to upgrade this road segment for consistency (design speed and sight distance) with the other roads and road segments within the recreation area.

This action is needed to improve visitor enjoyment and safe use of the recreation area and its roadways, meet visitor expectation for similar travelways within the recreation area, and accommodate both the current and anticipated future mix of vehicle types and traffic volume.

During 1995, the National Park Service conducted a traffic safety program review for roads within Lake Mead NRA (Robert Peccia and Associates, Inc. 1995). From 1991 through 1993, the segment of Northshore Road between Callville Bay Road and Echo Bay Road had the second-highest number of accidents for a monitored road segment in Lake Mead NRA (Robert Peccia and Associates, Inc. 1995). The most apparent driver error on Northshore Road is that of excessive speed. Speeding is a particular problem for vehicles towing trailers as motorists may have difficulty negotiating curves on the route. Recommendations in the report include road reconstruction to 32-feet wide (two 12-foot travel lanes and two 4-foot shoulders) to increase safety for the driving public.

Paved shoulders were considered necessary because existing pavement edges were deteriorating from drivers passing wide-tracking vehicles such as boat trailers. The resulting condition includes structural damage to the pavement, need for constant maintenance, and hazard creation for motorists who could become stuck in the rut or ditch formed at the road edge. Paving the road shoulders would eliminate the frequent regrading that is required to temporarily smooth the current shoulder material. Other recommended improvements included improved wash crossings, minor realignments at dangerous curves, use of guardrails in hazardous areas, and installation of reflective delineators for night driving safety. Specific concerns include:

- Segments of the roads do not meet NPS *Park Road Standards* (1984) for width and stopping sight distance.

- The project intends to reduce accidents between mileposts 24.7 and 25.3, on what is considered one of the most dangerous roads in the national park system based on the number of accidents that occur annually.

- The road alignment and geometry between mileposts 42.0 and 45.0 are poor.

- The road shoulders are not wide enough to safely accommodate boat trailers.

- Unwary drivers may experience flowing water on sag curves over drainages, in addition to mud, sediment, and debris on the road surface. Ponded water on the may also occur, potentially causing fatal accidents on a roadway designed for 50 mph traffic.

- The current Overton Beach / Northshore Road intersection configuration has turning lanes that are too short, and the sharpness of the curve approaching the intersection limits sight distance resulting in a higher than acceptable accident history.

- The six large culverts currently in place at the road crossing for Valley of Fire Wash have a substandard vertical profile and they do not provide adequate capacity for hydraulic demand. They have been determined to be inadequate for a 50-year storm event. It is not feasible to add more corrugated metal pipe culverts adjacent to those now in place due to insufficient channel width.

- A section of the Echo Bay spur road curves too sharply creating a driving hazard along a narrow ridge with a long, steep drop-off to the south and a moderate drop-off to the north. This driving hazard is further exacerbated by an inadequate super elevation at the top (west end) of the curve/ridge.

- There is another dangerous curve north of Las Vegas Wash Bridge

- There is a hazard of scour at the Echo Wash Bridge site. The calculated scour elevation is judged to be six feet below the depth of the existing footings for the bridge.

An environmental assessment analyzes the preferred alternative and other alternatives and their impacts on the environment. This environmental assessment has been prepared in accordance with the National Environmental Policy Act of 1969, as amended (NEPA), and

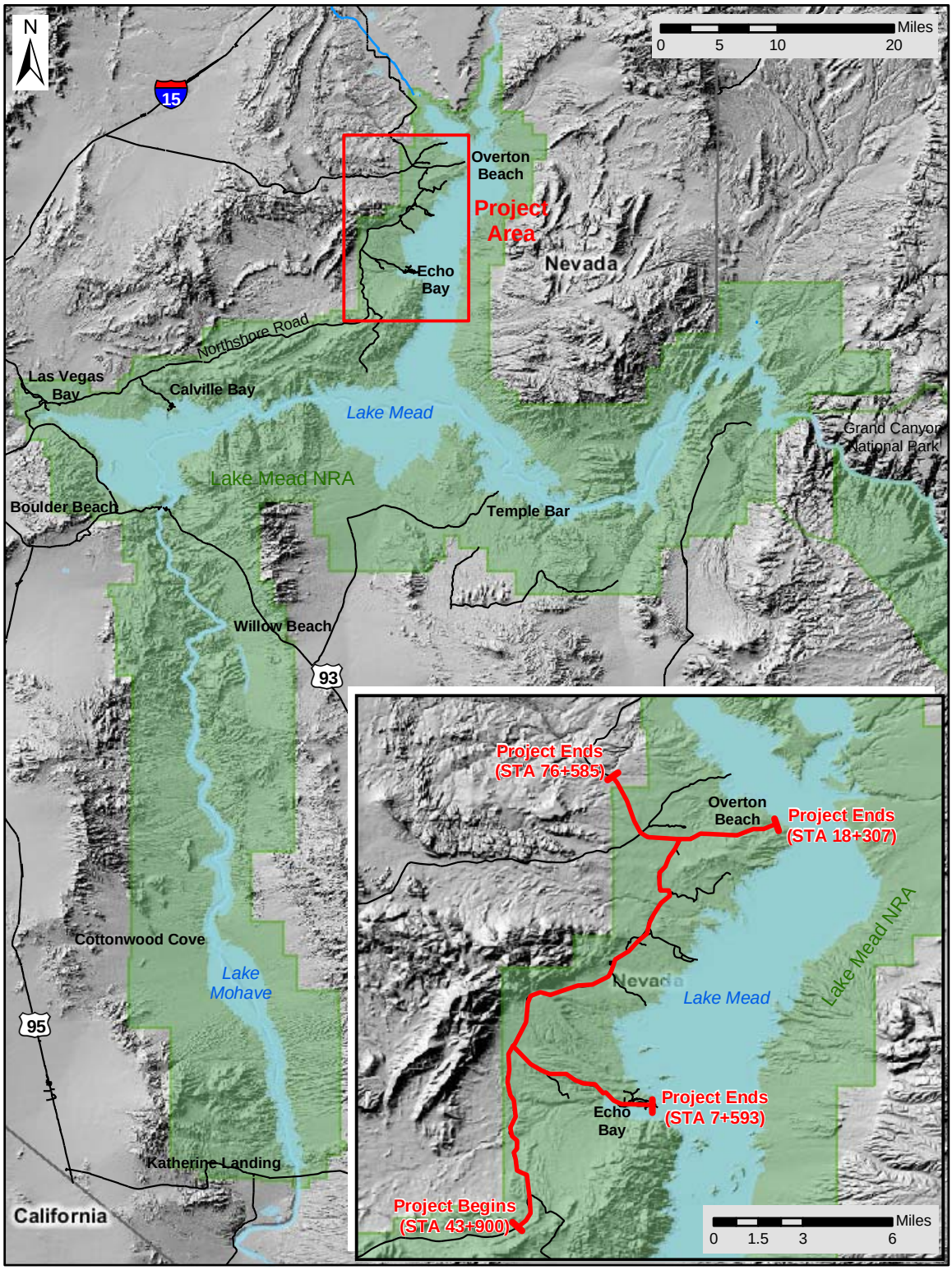

FIGURE 1. AREA MAP AND PROJECT LOCATION

regulations of the Council on Environmental Quality (40 *Code of Federal Regulations* [CFR] 1508.9); National Park Service Director's Order – 12: *Conservation Planning, Environmental Impact Analysis, and Decision-making*; and the National Historic Preservation Act of 1966 (as amended).

PURPOSE AND SIGNIFICANCE OF THE NATIONAL RECREATION AREA

An essential part of the planning process is to understand the purpose, significance, and mission of the recreation area for which this environmental assessment is prepared.

Recreation Area Purpose

Purpose statements are based on legislation, legislative history, and NPS policies. The statements reaffirm the reasons for which the recreation area was set aside as a unit of the national park system, and provide the foundation for the management and use of the recreation area.

The purpose of Lake Mead NRA is to:

> *Provide public recreation, benefit, and use in a manner that will preserve, develop, and enhance, so far as practicable, the recreation potential, and preserve the scenic, historic, scientific, and significant features of the area (NPS 2000a).*

Recreation Area Statement of Significance

Park significance statements capture the essence of the recreation area's importance to the natural and cultural heritage of the United States. Significance statements do not inventory recreation area resources; rather, they describe distinctiveness and help place the area within the regional, national, and international context. Defining significance helps park managers make decisions that preserve the resources and values necessary to accomplish the purpose of the recreation area.

The significance of Lake Mead NRA is as follows:

> *Lake Mead NRA is the premiere inland water recreation area in the West, totaling 1.5 million acres, including 700 miles of shoreline on Lakes Mead and Mohave. It represents superlative examples of the plants, animals, and physical geography of the Mojave Desert, Colorado Plateau, and Basin and Range geologic provinces. The park includes many regionally and nationally significant natural resource components, including populations of federally listed threatened and endangered species of animals, birds, fish, and plants. The area also represents a continuum of cultural resources from prehistoric to historic sites, including several culturally*

sensitive areas with sacred and traditional significance to contemporary American Indians.

Lake Mead NRA provides a wide variety of unique outdoor recreation opportunities ranging from warm-water recreation to exploration of rugged and isolated backcountry, making it a wilderness park in an urbanizing setting. The area generates over $500 million directly for the local economy. Lake Mead NRA serves as a major focus in the western United States for public outdoor water recreation, which is at a premium in this desert environment. The area is within a day's drive of 20 million people in the Los Angeles basin and 2.7 million people in the Phoenix metropolitan area. Lake Mead is also within a 20-minute drive of 1.1 million people in the Las Vegas valley, with up to 6,000 new residents per month and 30 million visitors per year, making Las Vegas one of the fastest growing communities and tourism destinations in the country (NPS 2000a).

Recreation Area Mission

The recreation area's purpose describes the specific reason that Lake Mead NRA was established. Recreation area significance is the distinctive features that make the recreation area unique from any other. Together, purpose and significance lead to a concise statement—the mission of the recreation area. The mission statement describes conditions that exist when the legislative intent for the recreation area is being met.

The mission of Lake Mead NRA is to:

Provide diverse inland water recreational opportunities in a spectacular desert setting for present and future generations (NPS 2000a).

PURPOSE OF PARK ROADS

The purpose of a national park road is summarized in the "Park Road Design" memorandum dated February 20, 1986, from then National Park Service Director Mott:

"The purpose of park roads remains in sharp contrast to that of the Federal and State highway systems. Park roads are not intended to provide fast and convenient transportation; they are intended to enhance visitor experience while providing safe and efficient accommodation of park visitors and to serve essential management access needs."

As stated in *National Park Service Park Roads Standards* (1984): among all public resources, those of the national park system are distinguished by their unique natural, cultural, scenic, and recreational qualities; values that are dedicated and set aside by public law to be preserved for the benefit and enjoyment of people in such manner as would leave them unimpaired for

future generations. Pragmatically, the protection, use, and enjoyment of park resources in a world of modern technology has necessitated the development of a system of public park roads. In most parks today, the basic means of providing visitor and park administrative access is the park road system. It enables visitors to stop and access the park resources for which the park was created or to simply enjoy the experience of driving the road and viewing the park. Park roads also provide essential management access. Roads in national parks are unique in that park roads serve a distinctly different purpose from most other road and highway systems. Therefore, national park system road standards must also be unique.

The purpose of national parks—bringing humankind and the environment into closer harmony while balancing resource values and preservation—dictates that the quality of the park experience must be a primary consideration. Full use and enjoyment of a national park visit provides a safe and leisurely experience. The distinctive character of park roads plays a basic role in setting this essential unhurried pace; generally, park roads are designed and planned for leisurely sightseeing. Additionally, park roads are designed with extreme care and sensitivity with respect to the natural, cultural, scenic, and recreational areas through which they pass. Unequivocally, sound planning and resource preservation practices dictate that park roads are laid lightly on the land. Where they exist, park roads are often narrow, winding, and hilly—but therein may lie their appeal.

Park roads are constructed only where necessary, and only as necessary, to provide the protection, use, and enjoyment of the natural, historical, cultural, scenic, and recreational resources, which constitute the national park system. Each road segment relates to the resource traversed in a meaningful way and constitutes an enjoyable and informative experience, while providing the visitor with inspiring views and driving comfort and safety. National park roads are designed to impart an overall sense of intimacy, while blending with the countryside through which they pass. Where terrain and safety conditions permit and where such uses are advocated by the park's approved general management plan, opportunities are also provided for random stopping to enable visitors to more completely experience park resources.

Park roads are not intended or designed as continuations of the state and federal high-speed highway network, nor are they designed or designated to serve as connecting links to those systems. As such, park roads cannot accommodate all types of vehicles nor can they accommodate all levels of speed. While the travel industry continues to develop new kinds of vehicles, the National Park Service is not obliged to construct roads or to manage traffic so that all forms of modern transportation technology can be accommodated. Recent transportation trends have significantly affected the use of NPS roads. There have been substantial increases in the numbers of recreational vehicles, bicycles, tour buses, and smaller less powerful automobiles using park roads within the past few decades. The growth in popularity of recreational vehicles (which are characterized by greater dimensions, unwieldy operation, and frequently, inexperienced drivers) is a relatively recent phenomenon. The recreational vehicle (to include tour buses) represents a significant element in the traffic service and road design requirements of park roads. Design of park roads should reflect, to the extent possible where such vehicles are permitted, the fact that recreational vehicles have very different operational and safety characteristics than automobiles.

The growth in the number of recreational vehicles and tour buses on park roads has serious safety implications resulting from large numbers of long, wide vehicles operating on relatively narrow roads. The resultant increase in the number of repeated heavy-axle loadings is also detrimental to the service life of road pavements that were not originally designed for continuous use by such large heavy vehicles.

When the condition of park roads is examined, a determination of the size and types of vehicles that can be safely accommodated is calculated, and vehicle sizes and limits are sometimes established. In some instances, it is desirable for vehicles exceeding these limits to be restricted from a particular road or road segment, rather than reconstruct roads to higher standards. Such reconstruction may result in unacceptable consequences to park resources. Where vehicle restrictions are encouraged, appropriate alternatives include, but are not limited to: restricting vehicle traffic beyond specific points, providing turnarounds and parking areas for larger vehicles, reducing speed limits, and/or providing alternate transportation means.

Safeguarding visitor safety, providing quality recreation opportunities, and conducting sound planning and resource protection and management are primary NPS goals. It is with these principles in mind that NPS road standards have been developed, providing definitive guidelines for those involved in making decisions affecting traffic flow and circulation of park visitors.

PREVIOUS PLANNING, SCOPING, AND VALUE ANALYSIS

Previous Planning

The proposed Northshore Road rehabilitation and reconstruction project complies with the primary management objectives for Lake Mead NRA as stated in the approved *General Management Plan* (1986). The *General Management Plan* management objectives include accommodation of increased visitor use while protecting Lake Mead NRA's most outstanding natural and cultural resources. The *General Management Plan* also calls for rehabilitation and other improvements to Northshore Road extending to the northern recreation area boundary.

The 2002 *Lake Management Plan / Final Environmental Impact Statement* for the management of water-based recreation within Lake Mead NRA describes and analyzes four alternatives for improving the management of Lakes Mead and Mohave to provide long-term protection of park resources, while allowing a range of recreational opportunities for park visitors. Under the preferred alternative of the management plan (alternative C), facility expansion could occur at Callville Bay, Echo Bay, Overton Beach, and Temple Bar on Lake Mead. Expansion of facilities would increase traffic to these lake destinations served by Northshore Road.

In July 2003, an environmental assessment was completed for the rehabilitation and reconstruction of a 9.5-mile segment (milepost 20.8 to 30.3) of Northshore Road and modification of an inadequate concrete box culvert carrying the intermittent flows of Box Car

Wash beneath Northshore Road. The project was needed to improve poor pavement conditions and inadequate drainage facilities. The one existing culvert had been proven to be undersized to carry past flood events without Northshore Road being damaged. The environmental assessment resulted in a finding of no significant impact and the recommendation was made to implement the selected alternative as soon as practical. That work has been completed.

The realignment of St. Thomas Road in the Overton Beach area was proposed in an environmental assessment completed by the National Park Service in 2002. The project would involve a realignment of St. Thomas Road, thereby permitting the collection of entrance and user fees for all visitors entering Lake Mead NRA from the north. St. Thomas Road would be realigned to connect into Northshore Road at a point south of the new entrance station (NPS 2002d). This project has not yet been undertaken.

Scoping

Scoping is an effort to involve agencies and the general public in determining issues to be given detailed analysis in the environmental assessment and eliminate issues not requiring detailed analysis. Scoping allocates assignments among the interdisciplinary team members and/or other participating agencies; identifies related projects and associated documents; identifies permits, surveys, consultations, etc., required by other agencies; and creates a schedule that allows adequate time to prepare and distribute the environmental assessment for public review and comment before a final decision is made. Scoping seeks to obtain early input from any interested agency or American Indian tribe, or any agency with jurisdiction by law or expertise, including the Nevada state historic preservation office (SHPO) and U.S. Fish and Wildlife Service (USFWS).

A press release initiating scoping and describing the proposed action was issued on April 15, 2004. Comments were solicited during a public scoping period that ended May 17, 2004. No comments were received. The USFWS was consulted by letter dated April 15, 2004. The public and American Indian groups traditionally associated with the lands of Lake Mead NRA will also have an opportunity to review and comment on this environmental assessment.

During early planning for the proposed rehabilitation of Northshore Road, Lake Mead NRA consulted with the Nevada SHPO and the Advisory Council on Historic Preservation in accordance with section 106 regulations. The result of that consultation was the execution of a memorandum of agreement (MOA) among Lake Mead NRA, the Nevada SHPO, and the Advisory Council in June 1997 (appendix D). The MOA acknowledged that proposed road repair and maintenance activities could have an adverse effect on historic drainage features along historic Route No.1, Overton-Lake Mead Road (portions of the current Northshore Road and Overton Beach access road), which was determined eligible for listing on the National Register of Historic Places (NRHP). The signed MOA and implementation of its terms is evidence that Lake Mead NRA has complied with section 106 requirements.

To resolve potential adverse effects to historic drainage features, the MOA states that Lake Mead NRA would prepare Historic American Engineering Records (HAER) documentation for a representative sample of the drainage features. Lake Mead NRA also agreed to record any

previously undocumented archeological resources adjacent to the road and determine NRHP eligibility of those resources in consultation with the Nevada SHPO.

During planning for the current rehabilitation and reconstruction project, Lake Mead NRA continued consultation with the Nevada SHPO and notified them that the HAER documentation for historic drainage features along Route No. 1 was in preparation. Lake Mead NRA also conducted an archeological survey of areas that would be affected by the current project and will consult with the Nevada SHPO on the survey results and on the determinations of NRHP eligibility in accordance with the terms of the MOA.

The staff of Lake Mead NRA, the Federal Highway Administration, and resource professionals of the National Park Service-Denver Service Center conducted internal scoping. This interdisciplinary process defined the purpose and need, identified potential actions to address the need, determined the likely issues and impact topics, and identified the relationship of the proposed action to other planning efforts at Lake Mead NRA.

Value Analysis

Value analysis is an organized team effort directed at analyzing the functions of facilities, processes, systems, equipment, services, and supplies for the purpose of achieving essential functions at the lowest life-cycle cost consistent with required performance, reliability, quality, safety, and achievement of NPS mission priorities (NPS 2006a).

A value analysis was performed for the following project components:

- Echo Wash Bridge widening/replacement
- roadway realignment (station 68+560 to 69+397) (see figure 2)
- Valley of Fire Wash crossing
- Overton Beach access road intersection with Northshore Road

The process began with alternatives development during the week of February 23 to February 25, 2004, with a follow-up planning meeting and field visit on May 24 and May 25, 2005. The objective of the value analysis study was to examine alternatives for the elements of the project; to ensure that a wide range of alternative proposals was considered; and to ensure that each element of the project satisfied the visitor's needs at the lowest life-cycle cost while maintaining quality, reliability, sustainability, and function in the context of criteria that relates directly to NPS servicewide goals and objectives.

Where possible, the project team tied their decisions back to the basic objectives and factors listed below to measure the differences between alternatives.

- Protect public and employee health, safety, and welfare.
- Protect natural and cultural resources.
- Provide for visitor enjoyment through improved educational and recreational opportunities.

- Improve operational efficiency, reliability, and sustainability.
- Provide other advantages to the national park system.

Other factors considered during this exercise included aesthetics, durability, ease of construction, ease of maintenance, and energy efficiency, etc.

Echo Wash Bridge Widening/Replacement

A *Bridge Selection Report* (Parsons Brinckerhoff 2005) was completed for FHWA detailing the selection of bridging alternatives for Echo Wash and Valley of Fire Wash. Several evaluation factors were chosen to assist in the determination of preferred bridge designs. The evaluation factors included scour, aesthetics, initial cost, remaining life, constructability, maintenance, roadway safety, and hydraulics. Three basic options were evaluated for the Echo Bay Bridge. The first option was to widen the existing bridge. The second option was to construct a parallel structure to be used in conjunction with the existing bridge. The third option was the construction of a new bridge to replace the existing structure. The third option was chosen based on its superior ratings for scour, aesthetics, remaining life, maintenance, roadway safety, and hydraulics.

Roadway Realignment (Station 68+560 to 69+397)

The consensus decision was to recommend realignment of road sections permitting an increase of the road design speed to a uniform 50 miles per hour (mph) (80 kilometers per hour [km/h]) (see figure 2). It was determined that the existing alignment, if left in place and repaved, would create new hazards due to new driver expectations. A small realignment with lower speeds would still create potential problems. With no significant cultural or environmental implications in the area, the proposal to realign the roadway and return the existing alignment to its natural state was decided to be the best alternative. The roadway realignment would begin at station 67+300 in order to meet the 50 mph design criteria.

Valley of Fire Wash Culvert Replacement

The desired alternative was to construct a new bridge to replace the existing culverts. It was determined this alternative would provide the necessary drainage capacity in an area that has been washed out in the past and would provide the safest and most visually pleasing solution. In addition, the existing roadway could be used as a detour during construction of the bridge and the new roadway alignment.

Overton Beach Access Road Intersection with Northshore Road

The consensus decision of the project team was to recommend curve realignment to 50 mph (80 km/h). It was determined this alternative would be preferable because there would be less likelihood of accidents while traffic flow and speeds could be maintained in both directions along Northshore Road (PBQ&D 2005). Other alternatives under consideration would have required that traffic come to a full stop at a “T” intersection. These alternative were

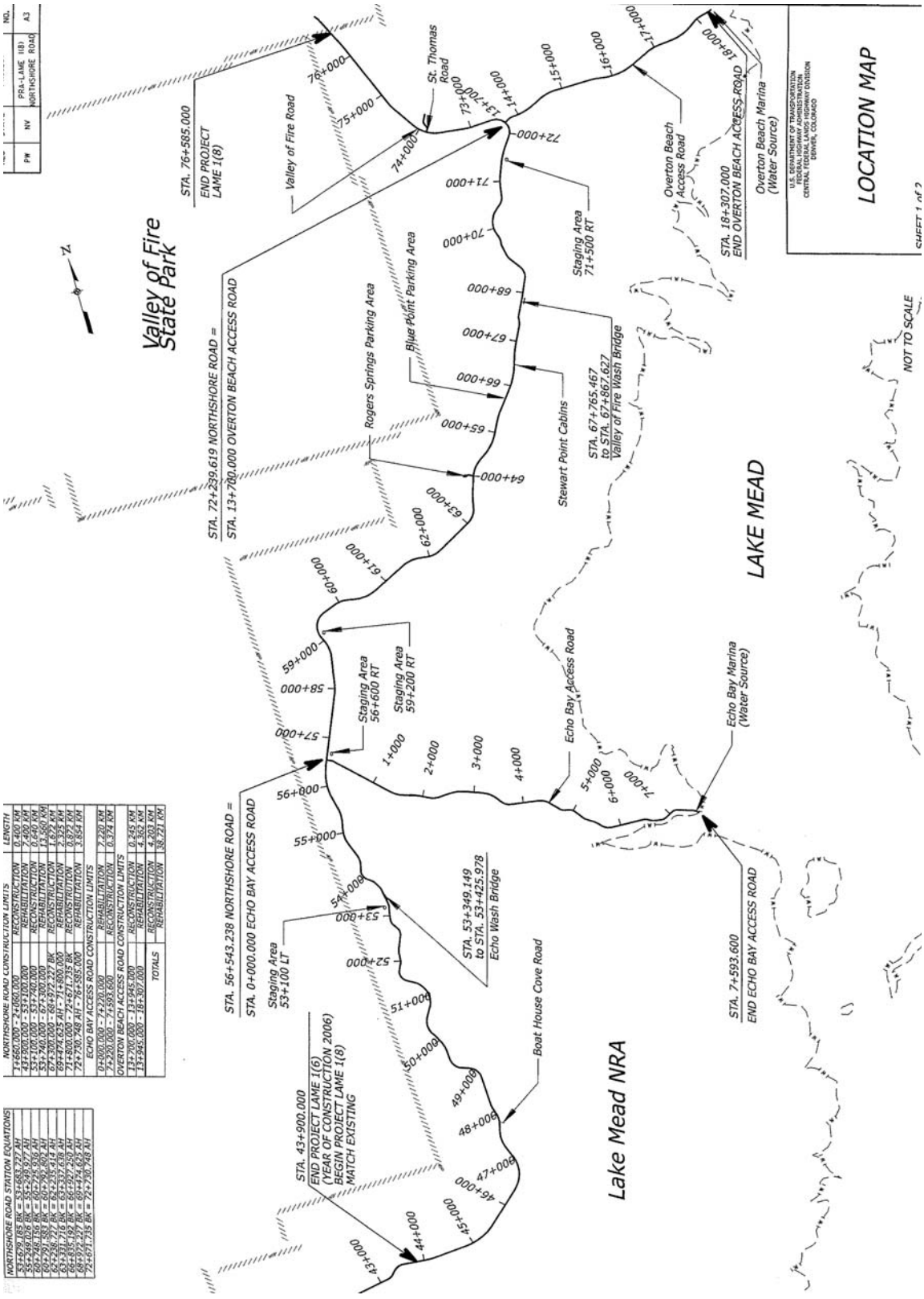

FIGURE 2. PROJECT LOCATION WITH STATION NUMBERS

determined to likely increase the potential for driver error. The "T" intersection would also continue to have the curvature outside of accepted limits and would likely result in continued accidents due to the driver inattention to the change in speeds going into the curve.

ISSUES AND IMPACT TOPICS

Issues

Issues and concerns affecting this proposed action were identified from past NPS planning efforts, and input from scoping (see above). The major issues are the conformance of the proposed action with the *General Management Plan* (1986) and potential impacts to biotic communities, threatened and endangered species and other species of concern, floodplains and water quality, visitor use and experience, cultural resources, and health and safety.

Derivation of Impact Topics

Specific impact topics were developed to focus discussion and to allow comparison of the environmental consequences of each alternative. These impact topics were identified based on federal law, regulations, executive orders, NPS *Management Policies 2001*, and NPS knowledge of special or vulnerable resources. A brief rationale for the selection of each impact topic is given below, as well as the rationale for dismissing specific topics from further consideration.

Impact Topics Included in this Document

Soils

Under the preferred alternative, disturbances would occur through removal, stockpiling, windrowing, and redistribution of soils in areas where Northshore Road is being reconstructed or rehabilitated and culverts are replaced or repaired; increased compaction in some areas; and the potential for soil erosion. Because the proposed action does involve ground-disturbing activities, potentially on previously undisturbed desert soil, soils are addressed as an impact topic in this environmental assessment.

Biotic Communities

NEPA requires consideration of the impacts on affected ecosystems and requires federal agencies to use all practicable means to restore and enhance the quality of the human environment and to avoid and minimize any possible adverse effects of their actions on the environment. NPS policy is to protect the components and processes of naturally occurring biotic communities, including the natural abundance, diversity, and ecological integrity of plants and animals (NPS 2001a). The proposed action has the potential to affect biotic

communities; therefore, biotic communities are addressed as an impact topic in this environmental assessment.

Threatened and Endangered Species and Species of Concern

The Endangered Species Act (1973), as amended, requires an examination of impacts on all federally listed threatened or endangered species. NPS policy also requires examination of the impacts on federal candidate species, as well as state-listed threatened, endangered, candidate, rare, declining, and sensitive species. Such species could be affected by the proposed action; therefore, threatened and endangered species and species of concern are addressed as an impact topic in this environmental assessment.

Historic Structures

There are 137 historic Civilian Conservation Corps (CCC) -era headwalls along a portion of Northshore Road and Overton Beach Road. Of these, 78 are in good condition, 48 are in fair condition, and 17 are in poor condition. The proposed alternative would affect different headwalls in different ways, including removal; thus, historic structures is addressed as an impact topic in this environmental assessment.

Floodplains

Executive Order 11988 (*Floodplain Management*) requires federal agencies to avoid, to the extent possible, adverse impacts associated with the occupancy and modification of floodplains, and to avoid development in floodplains whenever there is a practical alternative. If a preferred alternative is found to be in the applicable regulatory floodplain, the agency shall prepare a floodplain assessment known as a "statement of findings." The National Park Service *Floodplain Management Guideline* (NPS 1993b) provides guidance for the protection of life and property in conjunction with natural floodplain values in the national park system. This guidance applies to both existing facilities and proposed facilities, and requires the National Park Service to avoid locating facilities in floodplains if alternative locations are feasible. The proposed alternative would cross four desert washes located in the 100-year floodplain. The possibility of crossing these washes outside of the 100-year floodplain does not exist, and thus, floodplains are addressed as an impact topic in this environmental assessment.

Water Quality

The 1972 Federal Water Pollution Control Act, as amended by the Clean Water Act of 1977, is a national policy to restore and maintain the chemical, physical, and biological integrity of the nation's waters; to enhance the quality of water resources; and to prevent, control, and abate water pollution. NPS *Management Policies 2001* provide direction for the preservation, use, and quality of water in national park units. Water quality could be affected by sedimentation resulting from the proposed action; therefore, water quality is addressed as an impact topic in this environmental assessment.

Visitor Use and Experience

Both alternatives have the potential to affect visitor use and experience; therefore, visitor use and experience is addressed as an impact topic in this environmental assessment.

Air Quality

The 1963 Clean Air Act, as amended (42 *United States Code* [USC] 7401 *et seq.*), requires land managers to protect air quality. Section 118 of the Clean Air Act requires parks to meet all federal, state, and local air pollution standards. NPS *Management Policies 2001* address the need to analyze potential impacts to air quality during park planning. Lake Mead NRA is classified as a class II air quality area under the Clean Air Act, as amended. The proposed action has the potential to affect air quality; therefore, air quality is addressed as an impact topic in this environmental assessment.

Health and Safety

The existing condition of this segment of Northshore Road contains narrow travel lanes and shoulders, and poorly designed intersections with short sight distances; conditions that could adversely impact public safety for those traveling the road. Public safety could potentially be affected by selection of either alternative; therefore, health and safety is addressed as an impact topic in this environmental assessment.

Maintenance Operations

Both alternatives have the potential to effect maintenance operations. Therefore, maintenance operations is addressed as an impact topic in this environmental assessment.

Impact Topics Dismissed from Further Analysis

Cultural Landscapes

Numerous legislative acts, regulations, and NPS policies provide direction for the protection, preservation, and management of cultural landscapes on public lands. Applicable laws and regulations include, but are not limited to, the NPS Organic Act (1916), the National Historic Preservation Act of 1966 (1992, as amended), NEPA, and the National Parks and Recreation Act of 1978. Applicable agency policies relevant to cultural resources include chapter 5 of NPS *Management Policies 2001*, and Director's Order – 28: *Cultural Resource Management*, as well as other related policy directives such as the NPS *Museum Handbook*, the NPS *Manual for Museums*, and *Interpretation and Visitor Services Guidelines* (NPS-26).

As described by the NPS *Cultural Resource Management Guideline* (Director's Order – 28), a cultural landscape is

> *. . . a reflection of human adaptation and use of natural resources and is often expressed in the way land is organized and divided, patterns of settlement, land use, systems of circulation, and the types of structures that are built. The character of a cultural landscape is defined both by physical materials such as roads, buildings, walls, and vegetation, and by use reflecting cultural values and traditions.*

There are no cultural landscape features identified in the immediate area of the Northshore Road corridor (NPS 2005) that could be affected by current project actions; therefore, there would be no impact under any alternatives. Thus, cultural landscapes are dismissed as an impact topic in this environmental assessment.

Ethnographic Resources

Numerous legislative acts, regulations, and NPS policies provide direction for the protection, preservation, and management of ethnographic resources on public lands. Applicable laws and regulations include the NPS Organic Act (1916), the Antiquities Act of 1906, the National Historic Preservation Act of 1966 (1992, as amended), NEPA, the National Parks and Recreation Act of 1978, the Archeological Resources Protection Act of 1979, the Native American Graves Protection and Repatriation Act of 1990, and the Curation of Federally Owned and Administered Archeological Collections (1991). Applicable agency policies relevant to cultural resources include chapter 5 of NPS *Management Policies 2001*, and Director's Order – 28: *Cultural Resource Management*, as well as other related policy directives.

The National Park Service defines ethnographic resources as any

> *. . . site, structure, object, landscape, or natural resource feature assigned traditional legendary, religious, subsistence, or other significance in the cultural system of a group traditionally associated with it* (Director's Order – 28: *Cultural Resource Management Guideline,* p. 191).

There are no ethnographic resources identified in the immediate area of the Northshore Road corridor that could be affected by current project actions; therefore, there would be no impact under any of the alternatives (NPS 2005). Thus, ethnographic resources is dismissed as an impact topic in this environmental assessment.

Indian Trust Resources

Secretarial Order 3175 requires that any anticipated impacts to Indian trust resources from a proposed project or action by Department of the Interior agencies be explicitly addressed in environmental documents. The federal Indian trust responsibility is a legally enforceable fiduciary obligation on the part of the United Sates to protect tribal lands, assets, resources, and treaty rights, and represents a duty to carry out the mandates of federal law with respect to American Indian and Alaska Native tribes. There are no Indian trust resources in Lake Mead NRA. The lands comprising the recreation area are not held in trust by the secretary of the interior for the benefit of Indians due to their status as Indians. Therefore, there would be no

impact to Indian trust resources under any of the alternatives, and Indian trust resources is dismissed as an impact topic in this environmental assessment.

Archeological Resources

Numerous legislative acts, regulations, and NPS policies provide direction for the protection, preservation, and management of archeological resources on public lands. Applicable laws and regulations include the NPS Organic Act (1916), the Antiquities Act of 1906, the National Historic Preservation Act of 1966 (1992, as amended), NEPA, the National Parks and Recreation Act of 1978, the Archeological Resources Protection Act of 1979, the Native American Graves Protection and Repatriation Act of 1990, and the Curation of Federally Owned and Administered Archeological Collections (1991). Applicable agency policies relevant to cultural resources include chapter 5 of NPS *Management Policies 2001*, and Director's Order – 28: *Cultural Resource Management*, as well as other related policy directives.

An archeological survey has been completed in the area of potential effect for this project, which includes Northshore Road, spur roads, parking areas, and turnouts. A 328-foot-wide corridor, 164 feet on each side of the centerline of the existing road, was surveyed from milepost 30.3 to the park boundary along Northshore Road, the entire length of the Echo Bay access road, and the Valley of Fire access road. A 229-foot-wide corridor, 114 feet on each side of the centerline of the existing road, was surveyed along the entire length of the Overton Beach access road. Block surveys were conducted north of Valley of Fire Wash, at the intersection of Northshore Road and the Overton Beach access road, and at the intersection of Northshore Road and St. Thomas Road where reroutes of existing alignments are planned. Nine archeological resources are located within or adjacent to the area of potential effect for this project.

For purposes of compliance with section 106 of the National Historic Preservation Act, the area of potential effect for the project was defined as a 78-foot-wide corridor, which includes the existing graded road bench and 20 additional feet on each side of the road to cover installation of a tortoise fence.

All nine sites would be avoided during project construction activities and the tortoise fence would be routed around the sites whenever needed to avoid impacting the sites. An archeological monitor would be on location whenever construction activity is occurring in the vicinity of archeological sites. Should unknown cultural resources be encountered during construction activities, work would be halted in the discovery area and the park would consult according to 36 CFR 800.13, and, as appropriate, provisions of the Native American Graves Protection and Repatriation Act of 1990.

Museum Objects

The National Park Service defines museum objects as "a material thing possessing functional, aesthetic, cultural, symbolic, and/or scientific value, usually moveable by nature or design associated with it" (Director's Order – 28). Museum objects include prehistoric and historic

artifacts, objects, works of art, natural specimens, and archival and manuscript material that constitute a museum collection.

There are no museum objects or collections in the areas affected by the proposed activities along Northshore Road (milepost 27.5 to 48.0) or the Overton Beach and Echo Bay access roads. Therefore, Lake Mead NRA museum objects would not be affected and are dismissed as an impact topic in this environmental assessment.

Wetlands

Executive Order 11990 (*Protection of Wetlands*) requires an examination of impacts to wetlands. There are NPS-defined wetlands associated with Blue Point Spring and Rogers Spring complexes within the project area. The project is designed to avoid any direct impacts to these wetland systems and to minimize and mitigate for any indirect impacts that may result, such as runoff and sedimentation. Appropriate mitigation measures for these wetlands are detailed in Table 1 – Mitigation Measures of the Preferred Alternative. Due to the likelihood of only short term, negligible to minor, adverse impacts to the wetland resources, wetlands are dismissed as an impact topic in this environmental assessment.

Prime and Unique Farmlands

In 1980, the Council on Environmental Quality directed federal agencies to assess the effects of their actions on farmland soils classified as prime or unique by the United States Department of Agriculture, Natural Resources Conservation Service. Prime or unique farmland is defined as soil, which particularly produces general crops such as common foods, forage, fiber, and oil seed; unique farmland produces specialty crops such as fruits, vegetables, and nuts. There are no prime or unique farmlands associated with the project area; therefore, this topic is dismissed from detailed analysis in this environmental assessment.

Ecologically Critical Areas, Wild and Scenic Rivers, Other Unique Natural Areas

No areas within Lake Mead NRA have been designated as ecologically critical, nor are there any existing or potential wild and scenic rivers within Lake Mead NRA. Three of America's four desert ecosystems—the Mojave, the Great Basin, and the Sonoran deserts—meet in Lake Mead NRA, and this seemingly barren area contains a surprising variety of plants and animals (NPS 2006b). Lake Mead is an important natural area; however, the proposed action would not threaten the associated qualities and resources that make Lake Mead NRA unique. This topic is, therefore, dismissed from detailed analysis in this environmental assessment.

Environmental Justice

Executive Order 12898 (*General Actions to Address Environmental Justice in Minority Populations and Low-Income Populations)*, requires all agencies to incorporate environmental justice into their missions by identifying and addressing disproportionately high and adverse human health or environmental effects of their programs and policies on minorities and low-income populations or communities. No alternative under consideration would have

disproportionately high and adverse health or environmental effects on minorities or low-income populations or communities as defined in the U.S. Environmental Protection Agency's *Draft Environmental Justice Guidance* (July 1996). Environmental justice is, therefore, dismissed from detailed analysis in this environmental assessment.

Scenic Resources

Preservation of the scenic features of the area is a component of the enabling legislation for Lake Mead NRA. In an evaluation of scenic quality, both the visual character and visual quality of a viewshed are considered. A viewshed comprises the limits of the visual environment associated with the proposed action. Although some views along the roadway are visually interesting, the road serves primarily as a vehicular corridor to recreational opportunities such as the lakeshore or trails. The proposed action would realign one segment of Northshore Road, between stations 67+300 and 69+400 that would alter scenic views for visitors traveling along this segment of roadway. Existing turnouts would be formalized and paved, but maintained. Only one small turnout near Valley of Fire Road would be removed; thus, scenic views along the roadway would remain relatively unchanged.

Northshore Road has been in place for decades. Therefore, this human-made element in the natural landscape already exists and, once road segment rehabilitation of the realignment areas is completed, the road would not add additional visual intrusion to the landscape. There would be negligible, long-term, adverse impacts to the visual landscape.

During the construction period, there would be effects due to the presence of construction equipment, but these effects would be short term and would occur within an existing developed road corridor and would have a negligible effect on park scenic values. Thus, scenic resources is dismissed as an impact topic in this environmental assessment.

Soundscapes

In accordance with NPS *Management Policies 2001* and Director's Order – 47: *Sound Preservation and Noise Management*, an important part of the NPS mission is preservation of natural soundscapes associated with national park units. Natural soundscapes exist in the absence of human-caused sound. The natural ambient soundscape is the aggregate of all the natural sounds that occur in park units, together with the physical capacity for transmitting natural sounds. Natural sounds occur within and beyond the range of sounds that humans can perceive and can be transmitted through air, water, or solid materials. The frequency, magnitude, and duration of human-caused sound considered acceptable varies among NPS units, as well as potentially throughout each park unit, being generally greater in developed areas and less in undeveloped areas. Requiring contractors to properly maintain equipment to minimize noise, and staging construction operations outside of high visitor use areas, in conjunction with limiting traffic delays on Northshore Road to 15 minutes in each direction, would minimize impacts of noise on visitor use and experience.

Northshore Road is a highly traveled, developed road. Traffic noise is an accepted part of the road and roadside experience. Implementation of the preferred alternative would not change the volume of traffic or the types of vehicles comprising the traffic mix. Implementation of the

preferred alternative would have short-term, localized, minor, adverse impacts to soundscapes on Northshore Road and the spur roads as a result of construction noise. There are no long-term adverse impacts anticipated. Therefore, soundscapes is dismissed as an impact topic in this environmental assessment.

Lightscapes

In accordance with NPS *Management Policies 2001*, the National Park Service strives to preserve natural ambient lightscapes, which are natural resources and values that exist in the absence of human-caused light. Lightscapes would not be affected by the proposed action because work would not be carried out during nighttime hours and there would be no artificial light sources utilized. For these reasons, lightscapes is dismissed as an impact topic in this environmental assessment.

Socioeconomics

The no-action and preferred alternatives would not change local or regional land use, transportation, or appreciably affect local businesses outside Lake Mead NRA. Implementation of the preferred alternative could provide a negligible beneficial impact to the economies of Boulder City, Henderson, or Las Vegas (e.g., increased employment opportunities for the construction work force and revenues for local businesses and government related to construction activity). The duration of each phase of construction activity for the preferred alternative is two years. Benefits to the local economy would be temporary, lasting only during construction, and negligible overall. Construction activities could result in delays, but would not close Northshore Road or the spur roads. Possible delays would not be expected to result in a reduction in park visitation, but could result in visitors going to other marinas temporarily during the construction. This would result in negligible to minor, short-term, adverse impacts to concessions. Because impacts to socioeconomic resources would be negligible to minor, socioeconomics is dismissed as an impact topic in this environmental analysis.

ALTERNATIVES

INTRODUCTION

The alternatives section describes two management alternatives for Northshore Road rehabilitation and its associated spur roads at Lake Mead NRA.

The no-action alternative would continue existing conditions without implementation of the proposed action. It does not imply or direct discontinuing present actions or removing existing uses, developments, or facilities. The no-action alternative provides a basis for comparing the management direction and environmental consequences of the preferred alternative. Should the no-action alternative be selected, the National Park Service would respond to future needs and conditions associated with Northshore Road without major actions or changes in management direction.

The preferred alternative presents the NPS proposed action and defines the rationale for the action in terms of resource protection and management, visitor and operational use, costs, and other applicable factors.

Additional alternatives considered and dismissed from detailed analysis are also discussed in this section. A summary table comparing the environmental consequences of each alternative is presented at the end of the alternatives section.

ALTERNATIVE A: NO-ACTION ALTERNATIVE

The no-action alternative would continue the existing conditions for Northshore Road and its associated spur roads in Lake Mead NRA. Should the no-action alternative be selected, the National Park Service would respond to future needs and conditions associated with Northshore Road without major actions or changes in the present course.

ALTERNATIVE B: PREFERRED ALTERNATIVE

Alternative B is the NPS preferred alternative. The preferred alternative presents the NPS proposed action and defines the rationale for the action in terms of resource protection and management, visitor and operational use, and costs. The preferred alternative meets the Lake Mead NRA planning objective of providing a safe and adequate transportation route through this portion of Lake Mead NRA.

Overview

The paved surface of approximately 19 miles of the existing 22- to 24-foot-wide Northshore Road from milepost 27.5 to milepost 48.0 would be pulverized, recycled, and paved to a 32-foot width (two 12-foot travel lanes and adjacent 4-foot-wide paved shoulders), with spot reconstruction of subgrade and shoulders as required. Three sections of the existing roadway would be realigned to improve safety. The Northshore-Overton Beach spur road and Northshore-Echo Bay spur road intersections would also be improved.

The current Northshore-Overton Beach intersection configuration has an accident history due to limited sight distance, turn lanes that are too short, and a sharp curve approaching the intersection. The preferred alternative calls for shifting the alignment to the west to straighten the curve and improve turn lanes. The curve widening would define Northshore Road as the main road and allow continuous movement on Northshore Road, while improving the sight distance and associated safety. Approximately 1,650 feet of the curve would be realigned to a softer contour. The realignment would also include lengthened turn lanes, construction of a raised median, placement of a turnout with a gutter and curb, and placement of culverts beneath the road to convey flow from the numerous washes in this area.

No curve realignment would take place along the spur roads. The paved surface of the 2.9-mile-long Overton Beach spur road and the 4.7-mile-long Echo Bay spur road would be pulverized, recycled, and paved to a 26-foot width (two 11-foot travel lanes and 2-foot paved shoulders), with spot reconstruction of subgrade and shoulders, as required (figure 3). The proposed action would result in new disturbance of approximately 19 acres of previously undisturbed lands.

Construction of a new entrance station and realignment of St. Thomas Road are planned for the northern boundary of the recreation area (these plans were analyzed under previous NPS NEPA documents). The realignment of St. Thomas Road and construction of new lanes for the entrance station may be accomplished concurrently with, or as part of, the proposed action.

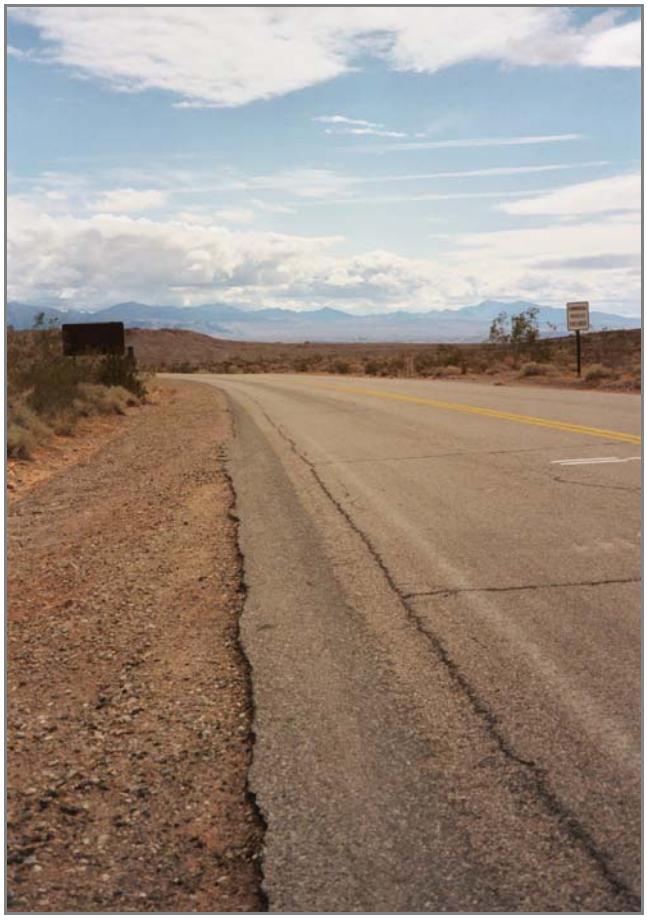

FIGURE 3. EXAMPLE OF PAVEMENT RAVELING

Drainage Improvements

Forty-nine pipe culverts would be removed and a total of approximately 50 culverts, including both pipe culverts and concrete box culverts, would be installed for the preferred alternative. The remaining culverts would be cleared of debris and the inlets and outlets repaired, as necessary. Culverts and headwalls built by the CCC would be retained, where possible.

Turnouts

Ten existing turnouts would be lengthened (up to 460 feet) and widened (up to 12 feet), and one turnout would be newly constructed (approximately 460-feet long and 12-feet wide) to permit slower-moving vehicles to pull over and allow faster-moving traffic to pass.

Improvements in the Area of the NRA Boundary (milepost 48.0)

The existing turnout for the entrance sign on the west side of the road would be paved and a new curb with colored concrete would be installed (figure 4). The paved portion of the turnout would be approximately 24-feet wide to provide both parallel parking and a pass-through lane. A raised median would be constructed to separate the parking area from the traffic of Northshore Road. On the east side of the road, a social turnout has been created by visitors pulling off the road and onto the shoulder. The majority of this turnout would be paved over as a result of road widening, and the remainder would be eliminated.

FIGURE 4. PARK BOUNDARY ENTRANCE SIGN TURNOUT

Overton Beach / Northshore Road Intersection Improvements

The road profile at the Overton Beach / Northshore Road intersection would be raised so that culverts could be installed to accommodate flows of the numerous washes in the area. The alignment would be shifted to the west to straighten the curve and improve turning lanes. Turning lanes would be extended and an additional lane added for traffic turning left onto Northshore Road from the Overton Beach access road. The Overton Beach access road would be extended to meet the new alignment. A raised median would be constructed to separate northbound and southbound lanes of Northshore Road and reduce motorist confusion. The pavement and aggregate base of the portion of the current road that lies outside the new alignment would be removed, the area would be reshaped to match surrounding contours, topsoil conserved from excavation for the realigned road sections would be spread over the area, and the area would be revegetated with native plants. Culverts and headwalls constructed by the CCC would be retained, where possible.

Overton Beach Marina Spur Road Improvements

The existing asphalt surface of the 2.9-mile-long Overton Beach spur road would be pulverized, recycled, and paved to a 26-foot width (two 11-foot travel lanes and 2-foot paved shoulders), with spot reconstruction of subgrade and shoulders, as required. Fourteen culverts would be replaced along the road (figure 5), while the remaining culverts would be cleaned and repaired, as needed. At the intersection of the access roads and Overton Beach spur road at stations 17+350 and 17+700, 10- to 15-foot aprons would be paved as part of this project. The pavement surface approaching the parking area would be re-striped to clarify traffic direction.

FIGURE 5. CULVERTS TO BE REPLACED AT OVERTON BEACH MARINA

Curve Realignment Between Stations 67+300 and 69+400

The proposed action in this area entails realigning the road to eliminate several curves (figure 2). The realignment would improve sight distance and increase driver safety in a historically dangerous section of Northshore Road. The road realignment would be approximately 3,937 feet in length, and 32-feet wide. The overall area of new disturbance in this section is estimated to be approximately 9 acres.

Substrate excavated for this realignment would be mixed with crushed aggregate and used as fill for the project. The portion of the current road that is to be eliminated would be excavated to remove pavement and aggregate base, recontoured to match surrounding contours, and covered with soil conserved from the realignment area or from other components of the proposed action where topsoil has been removed.

Improvements at the Intersection of Fire Cove Road with Northshore Road

A 10- to 15-foot apron that extends onto Fire Cove Road would be paved as part of the proposed action.

Valley of Fire Wash Improvements

The preferred alternative involves construction of a new bridge within the established construction limits. The bridge would be installed parallel to the current culvert system (figure 6), so the existing roadway would be used during construction, eliminating the need to construct a detour route. The bridge would provide improved horizontal and vertical alignment, would result in the removal of the roadway embankment and structures from the wash channel, and would improve drainage capacity. The design of the bridge will use colors and textures that are compatible with the surrounding landscape.

Improvements at the Intersection of Stewarts Point Road with Northshore Road

A 10- to 15-foot apron extending onto Stewarts Point Road would be paved as part of this project.

Blue Point Spring Improvements

The parking area would be resurfaced and the north and south approaches slightly expanded. This design element is intended to reduce the likelihood of parking area runoff entering into the spring-fed drainage that flows under Northshore Road north of the parking area. A drop inlet and culvert in the northeast corner of the parking area would direct runoff under Northshore Road and outlet on the south side of the roadway.

FIGURE 6. EXISTING VALLEY OF FIRE WASH CULVERTS

Rogers Spring Improvements

The Rogers Spring parking area would be paved and redesigned to provide larger parking spaces. A colored concrete sidewalk and wheelchair-accessible ramp would be constructed adjacent to the parking spaces to provide access to existing restrooms and pavilions. Raised islands would be constructed to direct traffic flow.

Runoff from the parking area would not flow directly in Rogers Spring. Runoff from the parking lot would be channeled from the northwest corner to an existing low spot southeast of the parking area. A settling basin would be installed and its contents monitored to collect data regarding possible presence of petroleum products in the runoff.

Improvements at the Intersection of an Access Road with Northshore Road at Station 61+750

The existing access road forms a "Y" within 98 feet (30 meters) of Northshore Road and intersects it at stations 61+550 and 61+800, approximately 820 feet (250 meters) apart. The western intersection of this access road would be removed leaving a single access point at station 61+800 (figure 2). The former 230 feet (70 meters) comprising the western intersection would be contoured to match the surrounding landscape. Topsoil conserved from excavating

the realigned road sections would be spread over the area and revegetated using native plant species.

Improvement of Parking Area at Station 59+650

The parking area would be resurfaced and the parking lot taper (the taper may be defined as a location where a feature, such as this parking area, begins to narrow) extended to the east. Curbs would be added along the west and east tapers and would connect to the existing curb along the north end of the parking area. A curb cut and underlying riprap would be placed in the east extremity of the taper to direct runoff to the east end of the parking area.

Echo Bay / Northshore Road Intersection Improvements

Turning lanes would be extended and an additional lane added for traffic turning left onto Northshore Road from Echo Bay access road. A raised median would be constructed to separate northbound and southbound lanes of Northshore Road. The total length of the new raised median section of Northshore Road, including new turn lanes, is approximately 1,237 feet (377.11 meters). The maximum width of the project envelope in this area is approximately 61 feet (18.6 meters) wide (PBQ&D 2006).

Echo Bay Spur Road Improvements

The paved surface of the 4.7-mile-long Echo Bay spur road would be pulverized, recycled, and paved to a 26-foot width (two 11-foot travel lanes and adjacent 2-foot-wide paved shoulders), with spot reconstruction of subgrade and shoulders, as required. In addition, 3,200 feet of curb and gutter would be installed to provide erosion control from runoff. Two paved turnouts would be installed to permit slower vehicles to pull off, thus maintaining traffic flow and easing congestion. At the intersection of the access roads and Echo Bay spur road at stations 6+100, 6+200, and 6+400, 10- to 15-foot aprons would be paved as part of the proposed action (figure 2). West of Echo Bay Marina, as the road descends a steep ridge between stations 6+650 and 6+850, guardrails would be installed on each side of the road.

Echo Bay Marina Improvements

A sidewalk of colored concrete (5-foot width to meet Americans with Disabilities Act standards) separating pedestrians from vehicle traffic would be constructed in the developed area of Echo Bay, from the water tank at the top of the hill, past the ranger station, and onto the sidewalk that currently runs along the south side of the boat ramp.

A wheelchair-accessible ramp would be constructed across the island between the parking area next to the restrooms and fish cleaning station and the road to the boat ramp. This ramp would be located between the palm trees in this island. Additional wheelchair-accessible parking spaces would be placed next to this ramp (figure 7).

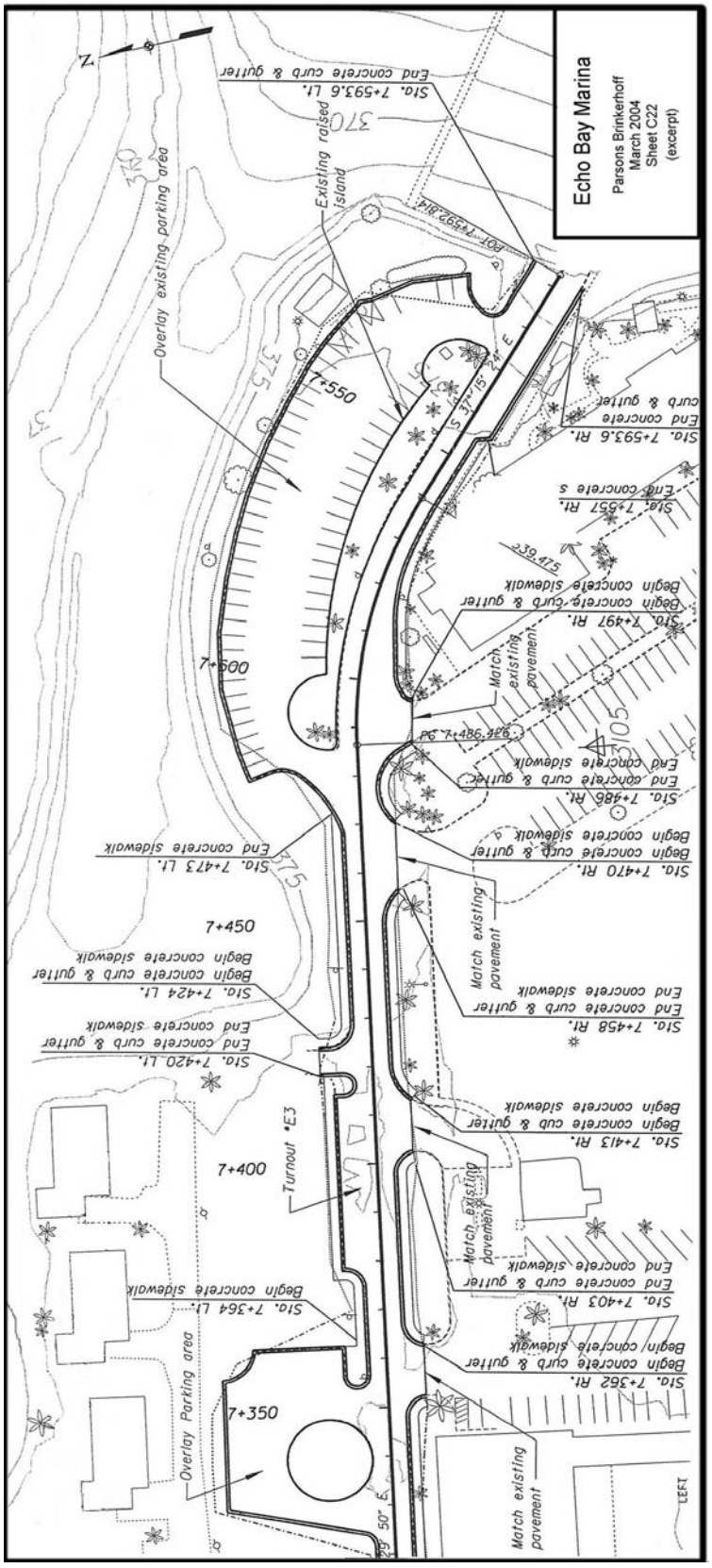

FIGURE 7. CONSTRUCTION SKETCH OF PROPOSED ECHO BAY MARINA IMPROVEMENTS

The surface of the mail delivery circle / helicopter landing area, located in front of staff housing, would require crack sealing followed by a fog seal. There are monitoring wells along the roadway that would be adjusted to the new road elevation. A turnout would be constructed between the mail delivery circle and parking area on the north side of the road to ease congestion. Storm water drainage improvements will be made to eliminate ponding in the roadway.

Echo Wash Bridge Improvements

Echo Wash Bridge is located on Northshore Road at station 53+400, approximately 2 miles (3 km) south of the Echo Bay access road. The proposed road rehabilitation would result in the existing Echo Wash Bridge lanes being narrower than the road and inconsistent with NPS *Park Roads Standards* (1984). After further analysis, it was determined that the current structure could not be widened due to its design (figure 8). The existing bridge also was determined to have insufficient freeboard clearance (0.33 meters [1.08 feet] for the 100-year flood event) and the current bridge piers are scour critical, with a scour depth of 5.04 meters [16.54 feet]. This scour is effectively six feet below the current pier footings (Parsons Brinckerhoff 2005). The new bridge would …Therefore, under the proposed action, a new bridge would be constructed parallel to the current bridge, and Northshore Road would be diverted to connect to the new bridge. The current bridge and road alignment would be used during construction of the new bridge, eliminating the need to create a temporary detour.

FIGURE 8. EXISTING ECHO WASH BRIDGE

Improvements at the Intersection of Boathouse Cove Road with Northshore Road

A 10- to 15-foot apron extending onto Boathouse Cove Road would be paved as part of this project.

Curve Realignment Between Stations 1+750 and 2+100)

On a section of Northshore Road outside of the 19-mile segment scheduled for rehabilitation, a curve along Las Vegas Wash would be straightened to increase driver safety and sight distance (figure 9). The portion of the current road that is to be eliminated would be excavated to remove pavement and aggregate base, recontoured to match surrounding contours, covered with 1 to 2 inches of topsoil from stockpiles of soil conserved from other components of the proposed action, and revegetated with native plants.

Sustainability

The National Park Service has adopted the concept of sustainable design as a guiding principle of facility planning and development. The objectives of sustainability are to design park facilities to minimize adverse effects on natural and cultural values, to reflect their environmental setting, and to maintain and encourage biodiversity; to construct and retrofit facilities using energy-efficient materials and building techniques; to operate and maintain facilities to promote their sustainability; and to illustrate and promote conservation principles and practices through sustainable design and ecologically sensitive use. Essentially, sustainability is living within the environment with the least impact on the environment. The preferred alternative subscribes to and supports the practice of sustainable planning, design, and use of Northshore Road.

ENVIRONMENTALLY PREFERRED ALTERNATIVE

In accordance with Director's Order 12, the National Park Service is required to identify the "environmentally preferred alternative" in all environmental documents, including environmental assessments. The environmentally preferred alternative is determined by applying the criteria suggested in NEPA, which is guided by the Council on Environmental Quality. The Council on Environmental Quality provides direction that "[t]he environmentally preferred alternative is the alternative that will promote the national environmental policy as expressed in Section 101 of NEPA, which considers:

1. fulfilling the responsibilities of each generation as trustee of the environment for succeeding generations
2. assuring for all generations safe, healthful, productive, and esthetically and culturally pleasing surroundings

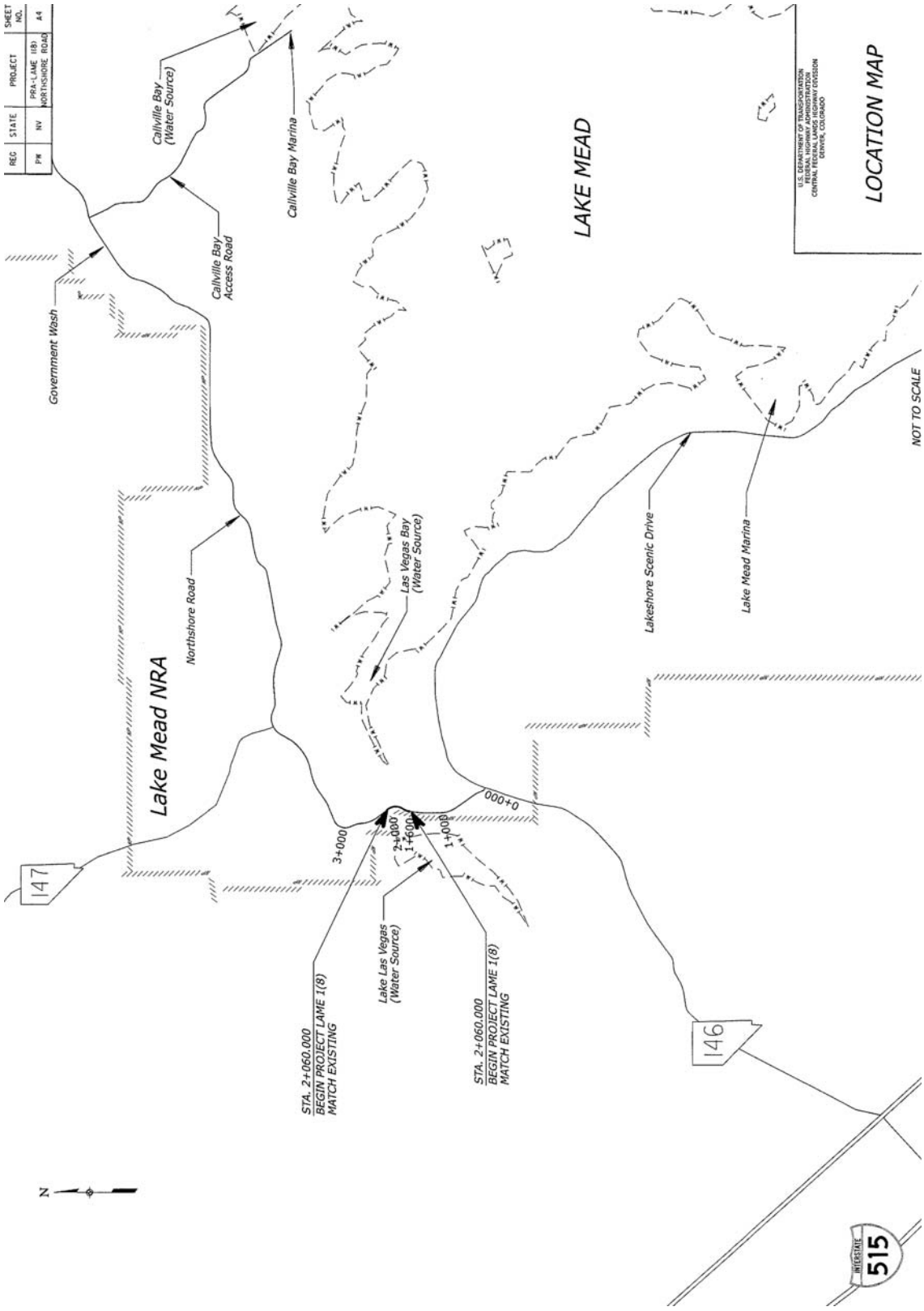

FIGURE 9. LAS VEGAS WASH LOCATION MAP WITH STATION NUMBERS

3. attaining the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences
4. preserving important historic, cultural, and natural aspects of our national heritage and maintaining, wherever possible, an environment that supports diversity and variety of individual choice
5. achieving a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities
6. enhancing the quality of renewable resources and approaching the maximum attainable recycling of depletable resources" (NEPA, section 101)

The environmentally preferred alternative in this environmental assessment is the NPS preferred alternative. This alternative was superior to the no-action alternative based on the following criteria:

- preventing loss of natural resources through improved control of floodwaters (criteria 1, 3, and 4)
- protecting CCC-constructed features in the vicinity of Northshore Road (criterion 4)
- protecting public health, safety, and welfare by providing improved roads, intersections, and parking (criteria 2 and 3)
- improving operations efficiency and sustainability by providing a new road surface that would require less maintenance (criteria 1, 3, and 6)
- protecting employee safety and welfare by providing safer driving conditions and reducing the number of accidents that require park staff investigation (criterion 3)

In short, this alternative would provide protection of visitor and employee health, safety, and welfare with minimal disturbance to natural and cultural resources.

Staging Area

Contractor staging areas would be limited to existing turnouts and parking areas and previously disturbed areas adjacent to the project areas, such as at stations 53+100, 59+200, and 71+550.

MITIGATION MEASURES OF THE PREFERRED ALTERNATIVE

Mitigation measures are presented as part of the preferred alternative. These actions have been developed to lessen the adverse effects of the preferred alternative.

TABLE 1. MITIGATION MEASURES OF THE PREFERRED ALTERNATIVE

Resource Area	Mitigation
General Considerations	The NPS project manager would ensure that the project remains confined within the parameters established in the compliance documents and that mitigation measures would be properly implemented.
	Construction zones would be identified and flagged before beginning the construction work and all disturbance would be confined to the flagged areas. Temporary construction fencing would be installed where deemed necessary by the Federal Highway Administration and NPS project coordinators. All project personnel would be instructed that their activities must be confined to locations within flagged areas and all equipment and materials must remain within these areas. Disturbance beyond the actual construction zone would be prohibited. This does not exclude necessary temporary structures such as erosion-control fencing.
	All tools, equipment, barricades, signs, surplus materials, and rubbish would be removed from the project work limits upon project completion. Any asphalt or concrete surfaces damaged due to work on the project would be repaired to original condition. All demolition debris would be removed from the project site, including all visible concrete and metal pieces.
	Construction activities would be coupled with water sprinkling or a palliative, as needed, to reduce fugitive dust plumes.
	Idling of construction vehicles would be limited to reduce construction equipment emissions.
	Best management practices to reduce spills would be utilized during refueling and other activities that may release petroleum products into the environment.
	A hazardous spill plan would be in place, stating what actions would be taken in the case of a spill and preventive measures to be implemented such as the placement of refueling facilities, storage, and handling of hazardous materials, etc.
	All fuel, transmission or brake fluid leaks, or other hazardous waste leaks, spills, or releases would be reported immediately to the designated environmental manager. The environmental manager would be responsible for spill material removal and disposal to an approved offsite landfill and, if necessary, would notify the appropriate federal agency.
	All equipment on the project would be maintained in a clean and well-functioning state to avoid or minimize contamination from automotive fluids; all equipment would be checked daily.
	Staging for construction vehicles and equipment would be located in previously disturbed areas, outside of high visitor use areas, and would be clearly identified in advance.
	Concrete and batch plants would be located outside Lake Mead NRA. It is expected that the project contractor would use existing commercial sources of concrete and asphalt.
	Contractors would be required to properly maintain construction equipment (i.e., mufflers) to minimize noise.
Soils	Impacts and potential compaction and erosion of bare soils would be minimized in all disturbed areas by salvaging the top 4 inches of topsoil before construction begins, storing that topsoil in a designated area with construction fence around it, then placing the salvaged topsoil on restoration areas. After topsoil is replaced, it would be given a fine spray of water to help settle the soil and uncover rock in the soil, and bring up the soil fines to create a crust to help prevent wind and water erosion. The salvaged material may be windrowed as well to assist with erosion prevention.

TABLE 1. MITIGATION MEASURES OF THE PREFERRED ALTERNATIVE

Resource Area	Mitigation
Soils	No vehicle or equipment tracks would be allowed to remain after construction is complete. At a minimum, all disturbed areas would be raked out prior to water sprinkling to reduce the appearance of vehicle tracks and discourage future redisturbance.
Vegetation	In an effort to avoid introduction of nonnative/noxious plant species, no imported topsoil or hay bales would be used. Certified weed-free rice straw bales are permissible
	For most of the road corridor, revegetation would not be necessary since construction would occur in areas previously disturbed by the roadway template. Revegetation work would require the contractor to place desert soil, conserved during construction, along the corridor. The NRA would be responsible for collecting seeds of native species in the project area for propagation purposes. The propagated plants can then potentially be used to revegetate disturbed areas.
	When necessary, desert soil replacement techniques would be used to re-establish desert crust surfaces and minimize impacts from invasive plant species, such as Russian-thistle (*Salsola iberica*), that often become established in disturbed soils along the roadway.
	Reclaimed areas would be monitored after construction to determine if reclamation efforts are successful or if additional remedial actions are necessary. Remedial actions could include installation of erosion-control structures and controlling nonnative plant species.
	Undesirable plant species would be controlled, as necessary. To prevent the introduction and minimize the spread of nonnative vegetation and noxious weeds, the following measures would be implemented during construction: ▪ Minimize soil disturbance. ▪ Pressure wash and/or steam clean all construction equipment to ensure that all equipment, machinery, rocks, gravel, or other materials are cleaned and weed free before entering Lake Mead NRA. ▪ Cover all haul trucks bringing asphalt or other fill materials from outside the NRA to prevent seed transport. ▪ Limit vehicle parking to existing disturbed areas. ▪ Obtain all fill, rock, riprap, or additional topsoil from the project area, if possible. If not possible, obtaining weed-free sources from NPS-approved sources outside the NRA would be required. ▪ Initiate restoration of disturbed sites immediately following construction activities. ▪ Monitor disturbed areas following construction to identify growth of noxious weeds or nonnative vegetation. Treatment of nonnative vegetation would be completed in accordance with NPS-13, *Integrated Pest Management Guidelines*. ▪ Salvaging and storing desert soils and gypsum soils separately, replacing them as close as possible to their original locations, and ensuring they are not dumped along the roadsides.
Wildlife	The contractor would be required to maintain strict garbage control so that scavengers (e.g., corvids) are not attracted to the project area. No food scraps would be discarded or fed to wildlife.

TABLE 1. MITIGATION MEASURES OF THE PREFERRED ALTERNATIVE

Resource Area	Mitigation
Threatened and Endangered Species and Species of Special Concern (Desert Tortoise [*Gopherus agassizii*])	A desert tortoise education program would be presented to all personnel onsite during construction. This program would contain information concerning the biology and distribution of the desert tortoise, its legal status, and potential occurrence near the proposed project area, the definition of "take" and associated penalties, measures designed to minimize the effects of construction activities, the means by which employees can facilitate this process, and reporting requirements to be implemented in the event that desert tortoises are encountered.
	All areas to be disturbed would have boundaries flagged before beginning construction activity and all disturbance would be confined to the flagged areas. All project personnel would be instructed that their activities must be confined to locations within flagged areas. Disturbance beyond the actual construction zone would be prohibited.
	Before surface-disturbing activities, a qualified desert tortoise biologist would conduct a clearance survey to locate and remove tortoises using techniques providing full coverage of all areas. All desert tortoise burrows, and other species' burrows that may be used by tortoises, would be examined to determine occupancy of each burrow by desert tortoises. In accordance with *Procedures for Endangered Species Act Compliance for the Mohave Desert Tortoise* (USFWS 1992), a qualified desert tortoise biologist shall possess a bachelor's degree in biology, ecology, wildlife biology, herpetology, or closely related fields. The biologist must have demonstrated prior field experience using accepted resource agency techniques to survey for desert tortoises and tortoise sign. In addition, the biologist shall have the ability to recognize and accurately record survey results.
	All burrows found within areas proposed for disturbance, whether occupied or vacant, would be excavated by a qualified biologist and collapsed or blocked to prevent desert tortoise re-entry. All burrows would be excavated with hand tools to allow removal of desert tortoises or desert tortoise eggs. All desert tortoise handling and excavations, including nests, would be conducted by a qualified desert tortoise biologist in accordance with USFWS-approved protocol *Desert Tortoise Council Guidelines for Handling Desert Tortoises During Construction Projects* 1994, revised 1999.
	All located desert tortoises and desert tortoise eggs would be relocated offsite 300 to 1,000 feet into adjacent undisturbed habitat. Tortoises found above-ground would be placed under a shrub in the shade. A tortoise located in a burrow would be placed inside an artificially constructed burrow of the same size and orientation as the one from which it was removed, using the protocol for burrow construction in section B.5.f. of the revised Desert Tortoise Council guidelines (1999).
	The onsite biologist would record each observed or handled desert tortoise. Information would include the following: location, date and time of observation, whether tortoise was handled, general health and whether it voided its bladder, location tortoise was moved from and location moved to, and unique physical characteristics of each tortoise. Reports documenting effectiveness and compliance with the tortoise protection measures would be prepared every six months during the proposed construction.
	Project activities that may endanger a tortoise would cease if a tortoise is found on a project site. Project activities would resume after the biologist removes the tortoise from danger or after the tortoise has moved to a safe area.

TABLE 1. MITIGATION MEASURES OF THE PREFERRED ALTERNATIVE

Resource Area	Mitigation
Threatened and Endangered Species and Species of Special Concern (Desert Tortoise *[Gopherus agassizii])*	During the tortoise active season (March 1 through October 31), all trenches and other excavations with side slopes steeper than a 1-foot rise to 3-foot length would be immediately backfilled prior to being left unattended, or: (1) fenced with tortoise-proof fencing, monitored by a qualified desert tortoise biologist, or a combination of both, (2) covered with tortoise-proof fencing, (3) covered with plywood or a similarly impassable material, or (4) constructed with escape ramps at each end of the trench and every 1,000 feet in between (at a minimum). All coverings and fences would have zero ground clearance. If alternative (4) is selected, the trench or other excavation would be inspected periodically and following periods of substantial rainfall to ensure structural integrity and that escape ramps are functional. An open trench or other excavation would be inspected for entrapped animals immediately prior to backfilling. If at any time a tortoise is discovered within a trench, all activity associated with that trench would cease until a qualified biologist has removed the tortoise in accordance with USFWS-approved guidelines (DTC 1999). Tortoise fencing may be permanent in certain locations. An archeological monitor would ensure that archaeological resources would be avoided during fence construction, and the fencing would be rerouted to avoid archeological sites, if necessary.
	Trash and food items would be disposed properly in predator-proof containers with resealing lids. Trash containers would be emptied daily and waste would be removed from the project area and disposed in an approved off-recreation area landfill. Trash removal would reduce the appeal of the area to opportunistic predators such as desert kit fox, coyotes, and common ravens. Construction waste would be removed from the site daily and disposed properly.
	Prior to surface disturbance activities within desert tortoise habitat, the National Park Service or the project proponent would pay a remuneration fee (per acre of proposed disturbance) into the Desert Tortoise Public Lands Conservation Fund Number 730-9999-2315 (section 7 account). This fund is administered by Clark County, and used for securing and enhancing desert tortoise habitat and desert tortoise research.
Threatened and Endangered Species and Species of Special Concern (Razorback Sucker [*Xyrauchen texanus*])	A razorback sucker spawning area educational program would be presented to all personnel present during construction. This program would contain information pertaining to the biology and distribution of the razorback sucker, its legal status and occurrence in the lake waters near the project areas, the definition of "take" and associated penalties, measures designed to minimize the effects of construction activities, the means by which individuals can facilitate this process, and reporting requirements, and corrective actions to be implemented in the unlikely event that breaches to these conservation measures should be observed.
	All construction personnel would be advised not to feed fish and to dispose all refuse properly. Trash and food items would be disposed properly in predator-proof containers with resealing lids. Trash containers would be emptied daily and waste would be removed from the project area and disposed in an approved off-recreation area landfill. These measures would be implemented to avoid attracting nonnative fish that interact negatively with razorback suckers.
	Best management practices to protect water quality from sedimentation would be implemented as conservation measures for the razorback sucker. Erosion-control measures would be implemented to minimize any potential for short-term impacts to water quality. Sediment traps, erosion check structures, and/or filters would be implemented, as needed, to prevent runoff and deposition in washes, springs, and lake waters. Fugitive dust plumes would be reduced to the extent possible using either water sprinkling or a palliative to settle the dust during earth-disturbing activities.

TABLE 1. MITIGATION MEASURES OF THE PREFERRED ALTERNATIVE

Resource Area	Mitigation
Threatened and Endangered Species and Species of Special Concern (Razorback Sucker [*Xyrauchen texanus*])	Project equipment operators would follow best management practices during refueling and other activities that may have the potential to release petroleum products into the environment. Contractors would be required to properly maintain equipment to avoid contamination of razorback sucker habitat.
Threatened and Endangered Species and Species of Special Concern (Relict Leopard Frog [*Rana onca*])	Conservation measures described above for protecting water and air quality, and for preventing establishment of nonnative plant species, are applicable to the protection of relict leopard frog habitat at Rogers Spring and Blue Point Spring.
Threatened and Endangered Species and Species of Special Concern (Las Vegas Bearpoppy [*Arctomecon californica*])	Survey areas of gypsiferous soils prior to disturbance. Salvage the gypsiferous soils where Las Vegas Poppy are found in order to preserve the seed bank. Replacement of these soils in appropriate areas of other disturbance along the project area is preferable.
Water Quality	Best management practices for drainage and sediment control would be implemented to prevent or reduce nonpoint source pollution and minimize soil loss and sedimentation in drainage areas. Use of best management practices in the project area for drainage area protection would include all or some of the following actions, depending on site-specific requirements: ▪ Keep disturbed areas as small as practical to minimize exposed soil and the potential for erosion. ▪ Locate waste and excess excavated materials outside drainages to avoid sedimentation. ▪ Install silt fences, temporary earthen berms, temporary water bars, sediment traps, stone check dams, or other equivalent measures (including installing erosion-control measures around the perimeter of stockpiled fill material) as necessary, prior to construction. ▪ Conduct regular site inspections during the construction period to ensure that erosion-control measures were properly installed and are functioning effectively. ▪ Store, use, and dispose chemicals, fuels, and other toxic materials in an appropriate manner. ▪ Revegetate disturbed areas as soon as possible after construction is completed.

TABLE 1. MITIGATION MEASURES OF THE PREFERRED ALTERNATIVE

Resource Area	Mitigation
Wetlands	Best management practices to prevent or reduce nonpoint source pollution and minimize soil loss and sedimentation into wetlands associated with Blue Point and Rogers Springs would include all or some of the following actions, depending on site-specific requirements: ▪ Keep disturbed areas as small as practical to minimize exposed soil and the potential for erosion. ▪ Locate waste and excess excavated materials outside drainages to avoid sedimentation. ▪ Install silt fences, temporary earthen berms, temporary water bars, sediment traps, stone check dams, or other equivalent measures (including installing erosion-control measures around the perimeter of stockpiled fill material) as necessary, prior to construction. ▪ Conduct regular site inspections during the construction period to ensure that erosion-control measures were properly installed and are functioning effectively. ▪ Store, use, and dispose chemicals, fuels, and other toxic materials in an appropriate manner. ▪ Revegetate disturbed areas as soon as possible after construction is completed.
Cultural Resources	Should unknown archeological resources be uncovered during construction, work would be halted in the discovery area, the site secured, and Lake Mead NRA would consult according to 36 CFR 800.13 and, as appropriate, provisions of the Native American Graves Protection and Repatriation Act of 1990. In compliance with the Native American Graves Protection and Repatriation Act of 1990, the National Park Service would also notify and consult representatives of American Indian tribes, likely to be culturally affiliated, for the proper treatment of human remains, funerary, and sacred objects should these be discovered during the project.
	All the headwalls built by the CCC have been recorded and documented to Historic American Engineering Records (HAER) standards to mitigate effects on the historic structures. Moreover, the removal of headwalls would be avoided to the greatest extent possible.
Visitor Use and Experience	During rehabilitation and restoration activities, Lake Mead NRA visitors would be routed around or away from construction areas. Barricades would be placed around construction areas to prevent visitor entry.
	Road closures would be limited to 15 minutes per work area. During certain phases of construction, lane closures may be required. As needed, pilot cars would be used for one-way traffic. Signs would be posted notifying visitors of delays.
	No work would be allowed from one day before a holiday weekend through one day after the weekend, except for work that would not impact visitor ingress/egress to recreation facilities; and no work would be allowed on the weekends.
Health and Safety	Construction in floodplains and washes would be avoided during the rainy season. If project work were to occur during this time period, a safety plan with provisions to reduce worker vulnerability to flash floods would be formulated and implemented. The contractor would be required to prepare a flash flood emergency plan.

TABLE 1. MITIGATION MEASURES OF THE PREFERRED ALTERNATIVE

Resource Area	Mitigation
Scenic Resources	Matching the design and color of construction materials with natural surroundings; and possibly treating rocks damaged during construction and exposed culvert ends or flared end sections with Permeon, or a similarly approved treatment method, may be required in order to match local soil colors and reduce disturbance visibility to visitors. If desert tortoise fencing is determined to be needed in a given location on a permanent basis, then appropriate mitigation measures would be undertaken to screen or blend this structure into the surroundings, so as to avoid long-term adverse impacts to scenic resources. To maintain the character of a park road, the perennial vegetation would be maintained as close as possible to the edge of the pavement.

General Construction Schedule and Cost

The Northshore Road / Echo Bay spur road / Overton Beach spur road project would be scheduled for work in two or more phases, based on program funding, each of which would take two years to complete. The first phase would begin in the spring of 2008 and extend through 2009, and the second phase would begin in the spring of 2010 and extend until 2011. If a third phase is necessary due to funding limitations it would most likely be in 2012. Costs have been estimated to be $10 to $15 million per construction phase, based on three phases. The realignment section of Las Vegas Wash could be constructed under the 2006 construction project if funding would become available and a contract modification was negotiated with the current contractor. The first phase would include Northshore Road from mile 26 up to mile 33, the replacement of the Echo Wash Bridge, and the realignment section at Las Vegas Wash, if not already completed. The second phase would include Northshore Road from mile 33 up to Valley of Fire Wash and the Echo Wash spur roads—the widening and realignment of Northshore Road from mile 42 to mile 45, including the new bridge over Valley of Fire Wash, and the rehabilitation of Northshore Road to the recreation area boundary, with Overton Beach spur road being the third phase based on current funding levels.

Alternatives Considered But Dismissed

Alternatives considered to replacing Echo Wash Bridge included widening the existing bridge and construction of a new bridge parallel to the existing bridge (the new bridge would carry southbound traffic and the existing bridge would carry northbound traffic). After a detailed structural analysis was performed on the existing structure, it was determined that the Echo Wash Bridge cannot be altered. Therefore, this alternative was eliminated from consideration because it could not be implemented for technical reasons. The alternative of constructing a parallel bridge was dismissed because the alternative of constructing a new bridge offered improved safety and aesthetics over this alternative.

Alternatives considered to realigning the roadway between stations 67+300 and 69+397 included no realignment and realignment that included the construction of a new bridge

parallel to the existing alignment through Valley of Fire Wash. It was determined that the existing alignment, if left in place and repaved, would create new hazards due to new driver expectations. A small realignment with lower speeds would still create potential problems; therefore, this alternative was dismissed because it did not meet the project's purpose and need.

Two alternatives to construction of a new bridge at Valley of Fire Wash were considered: (1) adding additional corrugated metal pipe culverts, and (2) construction of seven pre-cast box culverts to cross the Valley of Fire Wash. Neither of these alternatives provided the level of safety of construction of a new bridge, nor were they as aesthetically pleasing. These alternatives did not meet the project's purpose and need statement, which sought to widen Northshore Road, including this section at Echo Wash, and protect the crossing during flash flood events. Therefore, these two alternatives were dismissed.

ALTERNATIVES COMPARISON TABLE

TABLE 2. COMPARISON OF ALTERNATIVES

No-Action Alternative	Preferred Alternative
There would be no improvements to an approximately 19-mile section of Northshore Road, beginning at milepost 27.5 and the recreation area boundary (milepost 48.0), or to the Echo Bay and Overton Beach spur roads. Lake Mead NRA managers would respond to future roadway, bridge, parking, and drainage needs without implementing actions beyond normal maintenance or altering the present status of the roadways, bridges, parking areas, and drainage systems.	Approximately 19 miles of the existing road surface of Northshore Road from milepost 27.5 to milepost 48.0 would be pulverized, recycled, and paved, with spot reconstruction of subgrade and shoulders, as required. Existing vertical and horizontal sections would be straightened to provide a safer alignment. The Northshore-Overton Beach spur road and Northshore-Echo Bay spur road intersections would be improved, including lengthening turn lanes and constructing a raised median. The road surface of the 2.9-mile-long Overton Beach spur road and the 4.7-mile-long Echo Bay spur road would be pulverized, recycled, and paved to a 26-foot width, with spot reconstruction of subgrade and shoulders, as required. There will be a realignment of a curve in a section of Northshore Road along Las Vegas Wash, which is not contiguous with the rest of the project. Drainage systems would be repaired or replaced, parking areas rehabilitated, and Echo Wash Bridge would be replaced.
Meets project objectives? **No.** This alternative does not address design deficiencies or improve road conditions as defined in the purpose and need. Specifically, it does not address widening the road, safety improvements, short sight distances, and curve alignments.	Meets project objectives? **Yes.** The preferred alternative meets the Lake Mead planning objective of providing a safe and adequate transportation route through this section of the recreation area. The safety and enjoyment of visitors traveling Northshore Road would be improved through wider travel lanes, paved shoulders, improved sight distances at intersections, and extended turn lanes. The preferred alternative would also accommodate both the current and anticipated future mix of vehicle types and traffic volume, distances at intersections, and extended turn lanes.

SUMMARY OF ENVIRONMENTAL CONSEQUENCES / IMPACT COMPARISON MATRIX

TABLE 3. COMPARATIVE SUMMARY OF POTENTIAL ENVIRONMENTAL IMPACTS

Potential Environmental Impacts		
Impact Topic	**Alternative A: No-Action Alternative**	**Alternative B: Preferred Alternative**
Soils	Overall impacts to soils under the no-action alternative would be short and long term, negligible to minor, and adverse, resulting from compaction due to trampling and erosion associated with flood events. The no-action alternative would result in short- and long-term, moderate, adverse, cumulative impacts to soils. There would be no impairment of soils resources from implementation of alternative A.	Impacts to soils from the proposed action would be short and long term, minor, and adverse due to compaction that would temporarily decrease permeability, alter soil moisture content, diminish water storage capacity, and increase susceptibility to erosion during precipitation events. The preferred alternative would result in short-term, moderate, and long-term, minor, adverse, cumulative impacts to soils. There would be no impairment of soils resources from implementation of alternative B.
Biotic Communities	Overall impacts to biotic communities under the no-action alternative would be short and long term, negligible to minor, and adverse. There would be short- and long-term, negligible to minor, adverse impacts due to trampling, which could affect individual plants and/or cause soil compaction. There would be no construction-related impacts to wildlife. The no-action alternative would result in short- and long-term, minor to moderate, adverse cumulative impacts to biotic communities. There would be no impairment of biotic communities from implementation of alternative A.	Impacts to biotic communities from the proposed action would be short and long term, negligible to minor, and adverse due to destruction of plants in the construction zone, and temporary displacement or death of some wildlife. The preferred alternative would result in short- and long-term, moderate, adverse cumulative impacts to biotic communities. There would be no impairment of biotic communities from implementation of alternative B.

TABLE 3. COMPARATIVE SUMMARY OF POTENTIAL ENVIRONMENTAL IMPACTS

Potential Environmental Impacts		
Impact Topic	**Alternative A: No-Action Alternative**	**Alternative B: Preferred Alternative**
Threatened and Endangered Species	Continued maintenance of, and repairs to, Northshore Road and the Echo Bay and Overton Beach spur roads would not result in any construction-related impact to threatened and endangered species and species of concern. Continued use of the road would result in long-term, minor, adverse impacts to threatened and endangered species and species of concern. Cumulative impacts to threatened and endangered species would be short- and long-term, minor, and adverse as a result of the no-action alternative. There would be no impairment of threatened or endangered species from implementation of alternative A.	Impacts to threatened and endangered species and species of concern resulting from the proposed action would be short and long term, negligible to minor, and adverse, due to the potential for construction activities destroying habitat, or killing or injuring desert tortoises. The preferred alternative would result in short- and long-term, minor to moderate, adverse cumulative impacts to threatened and endangered species and species of concern. There would be no impairment of threatened or endangered species from implementation of alternative B.
Historic Structures	No action would be taken in this alternative and the culverts would be maintained in their current condition Impacts to historic structures from implementing the no-action alternative would be long-term, minor, and adverse. Cumulative impacts to historic structures as a result of the no-action alternative would be long term, minor, and adverse. There would be no impairment of historic structures from implementation of alternative A.	With mitigation there would be long-term, adverse, minor to moderate impacts, and long-term, minor, beneficial effects to historic structures under the proposed action. The preferred alternative would result in long-term, minor, adverse, cumulative impacts to historic structures. There would be no impairment of historic structures from implementation of alternative B.
Floodplains	Impacts to floodplains would be long term, localized, moderate, and adverse due to floodplain alterations from the culverts currently in place. The no-action alternative would result in long-term, moderate, adverse, cumulative effects to floodplains. There would be no impairment of floodplains from implementation of alternative A.	Impacts to floodplains from the proposed action would be short term, minor, and adverse due to minor, increased, localized erosion (particularly along desert wash margins) and sedimentation. Beneficial effects will be gained by removal of the roadway embankment and undersized culverts at Valley of Fire Wash crossing. This will eliminate overtopping and washout at this location. The preferred alternative would result in short-term, minor to moderate, adverse, cumulative impacts to floodplains. There would be no impairment of floodplains from implementation of alternative B.

TABLE 3. COMPARATIVE SUMMARY OF POTENTIAL ENVIRONMENTAL IMPACTS

Potential Environmental Impacts		
Impact Topic	**Alternative A: No-Action Alternative**	**Alternative B: Preferred Alternative**
Water Quality	Impacts to water quality would be long term, negligible to minor, and adverse resulting from flood-related sedimentation and deposition of debris into washes. The no-action alternative would result in short- and long-term, negligible to minor, adverse, cumulative effects to water quality. There would be no impairment of water quality from implementation of alternative A.	Impacts to water quality from the proposed action would be short term, negligible to minor, and adverse. As with impacts on floodplains described above, there will be beneficial effects to water quality from the removal of the roadway embankment and undersized culverts at Valley of Fire Wash crossing. The preferred alternative would result in short-term, negligible to minor, adverse, cumulative impacts to water quality. There would be no impairment of water quality from implementation of alternative B.
Visitor Use and Experience	Impacts to visitor use and experience under the no-action alternative would be long term, minor, and adverse due to road conditions that would cause frustration and anxiety to motorists. The no-action alternative would result in short-term, minor to moderate, adverse, cumulative impacts, and long-term, minor, beneficial, cumulative impacts to visitor use and experience.	Impacts to visitor use and experience from the proposed action would be short term, minor to moderate, and adverse due to delays along the roadway, partial closure of parking areas, and a reduced number of turnouts due to rehabilitation work; and long term, moderate, and beneficial due to increased sight distances and wider travel lanes and shoulders that would improve driving conditions. The preferred alternative would result in short-term, moderate, adverse, cumulative impacts, and long-term, moderate, beneficial, cumulative impacts to visitor use and experience.
Air Quality	Continued maintenance of, and repair to, Northshore Road and the Echo Bay and Overton Beach spur roads would not result in any new impact to air quality. Impacts would remain short and long term, minor, and adverse. Cumulative impacts to air quality would be short and long term, minor, and adverse as a result of the no-action alternative. There would be no impairment of air quality from implementation of alternative A.	Impacts to air quality from the proposed action would be localized, short term, minor, and adverse due to temporary increases in fugitive dust plumes and vehicle emissions. The preferred alternative would result in short-term, minor to moderate, adverse, cumulative impacts to air quality. There would be no impairment of air quality from implementation of alternative B.

TABLE 3. COMPARATIVE SUMMARY OF POTENTIAL ENVIRONMENTAL IMPACTS

Potential Environmental Impacts		
Impact Topic	**Alternative A: No-Action Alternative**	**Alternative B: Preferred Alternative**
Health and Safety	Impacts to health and safety from the no-action alternative would be long term, moderate, and adverse due to existing road conditions. The no-action alternative would result in short-term, negligible to minor, adverse, and long-term, negligible, adverse, cumulative impacts to health and safety.	Impacts to health and safety from the proposed action would be negligible and beneficial in the short term and moderately beneficial in the long term, due to improved road conditions. The preferred alternative would result in short-term, minor, adverse, cumulative impacts, and long-term, moderate, beneficial, cumulative impacts to health and safety.
Maintenance Operations	There would be no impacts to maintenance operations as a result of the no-action alternative. Maintenance operations would remain long term, minor to moderate, and adverse. The no-action alternative would result in long-term, minor, adverse, cumulative impacts to maintenance operations.	There would be long-term, minor to moderate, beneficial impacts to maintenance operations from the proposed action because more time could be spent in other areas of the park attending to maintenance. The preferred alternative would result in long-term, minor to moderate, beneficial, cumulative impacts to maintenance operations.

AFFECTED ENVIRONMENT

Detailed information on resources of Lake Mead NRA can be found in the Lake Mead NRA 1986 *General Management Plan* and in the 1999 *Resources Management Plan*. This section provides a description of Lake Mead NRA and identifies resources potentially affected by the Northshore Road rehabilitation project.

LOCATION AND GENERAL DESCRIPTION OF LAKE MEAD NATIONAL RECREATION AREA

Lake Mead NRA is located in southern Nevada and northwestern Arizona, approximately 20 miles southeast of Las Vegas, Nevada. Lake Mead NRA encompasses two large reservoirs (Lakes Mead and Mohave) formed by the Colorado River, which flows through Glen Canyon National Recreation Area and Grand Canyon National Park before reaching Lake Mead. The recreation area is about 1.5 million acres in size. About 60% of Lake Mead NRA is within the state of Arizona (Mohave County), and about 40% is within the state of Nevada (Clark County).

NORTHSHORE ROAD

The segment of Northshore Road considered for rehabilitation and reconstruction begins at milepost 27.5 and ends at milepost 48.0 (at the recreation area boundary). The proposed action represents one phase of a long-term rehabilitation project for the entire length of Northshore Road within the boundaries of Lake Mead NRA. Northshore Road is typically 24-feet wide and paved, with centerlines, shoulder lines, and 4-foot-wide gravel shoulders. The shoulder areas have been graded along both sides of the road to allow turnouts and to guide drainage. The posted speed limit on the route is 35 to 50 mph. Traffic volume data from NPS count station 1911 on Northshore Road show that average annual daily traffic on the route was approximately 350 vehicles per day in 1993 (Robert Peccia and Associates, Inc. 1995).

SOILS AND GEOLOGIC RESOURCES

Geologic formations exposed along the segment of Northshore Road proposed for rehabilitation are principally the Permian-age Esplanade, Coconino, Toroweap, and Kaibab. These formations were deposited/formed by rivers, dunes, and carbonate coastal plains of shallow seas, approximately 280 to 260 million years ago. The Esplanade and Coconino formations are part of the red bed geologic sequence, which was initially deposited as river sediments and then redistributed by wind into large dunes.

Lithosols (stony shallow soils) are the primary desert soils comprising the project area. These soils are typically shallow, gray in color, high in salt content, and underlain by caliche hardpans (NPS 1986). In portions of the project area, the soil surface consists of desert pavement. Desert

pavement is produced by the removal of surface fines (loose fine sand particles) by the action of wind and water. Rocks in desert soil often serve as surface "armor" limiting erosion.

Six soil series have been identified within Lake Mead NRA—Carrizo, Drygyp, Heleweiser, Cheme, Gypwash, and Huevi (NPS 2002a). The majority of the corridor consists of the shallow Cheme series soils that have developed over a durapan (caliche layer). They are well-drained soils formed in alluvium derived from mixed rocks over semi-consolidated gravelly sediments (NPS 2002a). Gypwash series soils are also present (very deep excessively drained soils formed in alluvium derived from limestone) (NPS 2002a). These fine-grained soils were sometimes topped by cryptobiotic crust within the highway corridor. Drygyp soils (formed from gypsum rock) occupied small areas; they are excessively drained and formed in alluvium. Minor drainages were comprised of the Carrizo series soils, which are deep, excessively drained, and formed in stratified alluvium on floodplains and alluvial fans (NPS 2002a). At the corridor terminus, small sand dunes from a few inches to more than 3-feet deep have been deposited by wind.

On the average, soil depths within the corridor are shallow, under 4-inches deep. Deeper gypsum soils are present in several small exposures along the corridor. Sites armored by desert pavement are subject to minor erosion by water, but are largely protected from wind erosion. Gypsum soils are subject to both wind and water erosion, e.g., some shrubs have extensive erosion at their base exposing tap roots and small rills and larger gullies present. The small sand dunes are well-vegetated, but are subject to minor wind erosion.

In areas previously disturbed by construction and grading, soil fines deposited on the surface during construction are subject to erosion and colonization by various weed species, such as Russian thistle. Loss of topsoil and fines occurs until wind and water erode the fines from the surface and the site is "re-armored." This process may take years, although periodic storms may remove large amounts of soil in a short period of time.

BIOTIC COMMUNITIES

This section describes the biotic environment adjacent to the Northshore Road corridor. The discussions include vegetation and the wildlife subsections of birds, mammals, reptiles, and amphibians. Threatened and endangered species and species of concern are addressed in the following section of this report.

Vegetation

The Northshore Road corridor was constructed through sparse desert shrub and small, narrow desert wash plant communities of the Mojave Desert section of the American Semi-desert and Desert Province. Generally, the erosion fans and small hills associated with the project corridor support the creosote bush (*Larrea tridentata*) – white bursage (*Ambrosia dumosa*) plant association (NatureServe 2002a), occupying a desert pavement of gravel-sized stones. Vegetative cover values for this type are relatively sparse, rarely exceeding 5% to 10%. Shrubs common to the corridor include creosote bush, white bursage, indigobush

(*Psorothamnus fremontii*), Pima rhatany (*Krameria erecta*), beavertail cactus (*Opuntia basilaris*), buckhorn cholla (*Opuntia acanthicarpa*), and brittlebush (*Encelia farinosa*). In the vicinity of the sections identified for potential realignment, the pygmy barrel cactus (*Sclerocactus johnsonii*) was also present within the type. Herbaceous species present within this association included desert trumpet (*Eriogonum inflatum*) and other buckwheat species, globemallow (*Sphaeralcea* sp.), fluffgrass (*Erioneuron pulchellum*), and an annual grass species, among others.

Small drainages occur alongside and cross the Northshore Road project corridor and contain a species composition similar to the larger washes. However, these drainages, only a few feet wide, have sparse vegetative cover values ranging from 5% to 10%, containing the dominants big galleta grass (*Hilaria rigida*), threeawn (*Aristida* sp.), white bursage, range rhatany (*Krameria parviflora*), and Nevada ephedra (*Ephedra nevadensis*).

A small slope covered by basalt rocks, from gravel- to boulder-sized, is present adjacent to Northshore Road. This habitat contains a desert holly (*Atriplex hymenelytra*) sparse shrub association. The cover value of this type is less than 5%. Species associated with desert holly include the sunray (*Enceliopsis argophylla*), desert trumpet, and other species of annual buckwheat, prickly poppy (*Argemone* sp.), and moss species.

Sandstone rock surfaces have some patches of mosses and lichens, particularly on north-facing exposures. The creosote bush – white bursage sparse shrub association surrounds the exposed bedrock formations, growing up to the base of these exposures. However, where sand has accumulated in small dunes, additional species are present and include snakeweed (*Gutierrezia sarothrae*), shrubby buckwheat (*Eriogonum* sp.), and goldenbush (*Machaeranthera* sp.). Drainages through this sandy area supported big galleta grass, cheesebush, rush bebbia, catclaw acacia, brittlebush, and Nevada ephedra.

Gypsiferous soils of the area are very fine-grained and are exposed on hills, ridges, and wash edges along the proposed rehabilitation segment of Northshore Road. The gypsum ranges in color from pinkish-white to greenish and is highly erosive. Gypsiferous soils adjacent to the road corridor support a few Las Vegas bearpoppy (*Arctomecon californica*), a species of concern described in the next section, but most sites are occupied by the sunray, a rare plant that is relatively uncommon in Lake Mead NRA, milkvetch (possibly *Astragalus preussii*), and by species of annual buckwheat (*Eriogonum inflatum, E. trichopes, or E. insigne*). Ringstem (*Anulocaulis leiosolenus*) is also an uncommon plant at Lake Mead NRA that is found on gypsiferous soils. Vegetative cover values for the gypsiferous soils are very sparse, typically less than 1% to 2%. The shrub spiny menodora (*Menodora spinescens*) was observed on one gypsiferous site, and the borage (*Tiquilia latior*) is present on another exposure. On the finer exposures of gypsiferous soils, cryptobiotic crust formations are evident.

Plant species of disturbed roadsides included mallow, purple threeawn (*Aristida purpurea*), snakeweed, and the nonnatives red brome (*Bromus madritensis*), a few sunray, filaree (*Erodium cicutarium*), and Mediterranean grass (*Schismus barbatus* and *S. arabicus*).

Wildlife

Mammals

Lake Mead NRA (NPS 2006c) lists 55 species of mammals as occurring within the recreation area. Of this total, bats comprised 26% of the mammal species present, while 37% of listed mammals are considered to be adapted to lower-elevation desert habitats (Schwartz et al. 1978). Habitat for bat species could occur at the Redstone turnout area (which is outside of the current project area) due to the many holes, small caves, and rock crevices that may be used for roosting.

Common mammals that would be expected along the Northshore Road corridor include the desert cottontail (*Sylvilagus audubonii*); black-tailed jackrabbit (*Lepus californicus*); Merriam's, Ord's, and desert kangaroo rats (*Dipodomys merriami, D. ordii,* and *D. deserti*); least chipmunk (*Eutamias minimus*); deer, cactus, and desert pocket mice (*Peromyscus maniculatus, P. eremicus,* and *Chaetodipus penicillatus*); badger (*Taxidea taxus*); kit fox (Vulpes macrotis); and coyote (*Canis latrans*). The desert bighorn sheep (*Ovis Canadensis nelsoni*) is relatively common within the Northshore Road corridor, utilizing the variety of habitats present.

Reptiles and Amphibians

Of the 54 species of reptiles and amphibians listed for Lake Mead NRA (NPS 2006d, Schwartz et al. 1978), species of lizards were the most commonly observed during a November walking survey of the Northshore Road corridor. Surveys for the rare desert tortoise were conducted and are reported in the following section, "Threatened and Endangered Species and Species of Concern." The lizard species most likely to occur in habitats along this corridor include the western banded gecko (*Coleonyx variegata*), desert iguana (*Dipsosaurus dorsalis*), zebra-tailed lizard (*Callisaurus draconoides*), collared lizard (*Crotaphytus collaris*), leopard lizard (*Crotophytus wislizenii*), side-blotched lizard (*Uta stansburiana*), desert horned lizard (*Phrynosoma platyrhinos*), and western whiptail (*Cnemidophorus tigris*). A variety of snakes may also be expected to occur here, including the speckled rattlesnake (*Crotalus mitchelli*), coachwhip (*Masticophis flagellum*), and gopher snake (*Pituophis melanoleucus*) (Schwartz et al. 1978). Amphibians that may be expected within the desert habitats surrounding the project corridor include the red-spotted toad (*Bufo punctatus*), Woodhouse's toad (*B. woodhouseii*), and the Arizona toad (*B. microscaphus*).

Birds

Due to the creation of Lakes Mead and Mohave and the associated aquatic, wetlands, and riparian habitats, over 360 species of birds have been listed for Lake Mead NRA (NPS 2006e). Within the Northshore Road corridor, bird species commonly expected to occur include the golden eagle (*Aquila chrysaetos*), red-tailed hawk (*Buteo jamaicensis*), turkey vulture (*Cathartes aura*), common raven (*Corvus corax*), mourning dove (*Zenaida macroura*), loggerhead shrike (*Lanius ludovicianus*), and white-crowned sparrow (*Zonotrichia*

leucophrys), among other species. The common raven is of interest because they forage on a variety of foods, including the eggs and young of reptiles such as those of the federally threatened desert tortoise.

THREATENED AND ENDANGERED SPECIES AND SPECIES OF CONCERN

The USFWS was contacted by letter dated April 15, 2004, to request a list of threatened and endangered species that may occur in or use the Northshore Road (mileposts 27.5 to 48.0), Echo Bay spur road and Overton Beach spur road areas for habitat. The USFWS responded with a letter dated May 17, 2004, indicating that the only listed species that may occur in, depend on, or be impacted by, activities in the Northshore Road project area are the federally threatened desert tortoise and the federally endangered razorback sucker, for which Lake Mead is designated critical habitat. The relict leopard frog, a candidate species for listing under the Endangered Species Act, was not included in the USFWS response, but is addressed in this environmental assessment due to its current status. The project area does not include any designated critical habitat for the desert tortoise (USFWS 1994a); however, the project does traverse approximately 19 miles of potentially suitable desert tortoise habitat based on plant communities present and on sightings of tortoises within that portion of the project area. Lake Mead, in its entirety, is designated critical habitat for the razorback sucker. The relict leopard frog has been previously documented at the two springs adjacent to this section of road—Blue Point Spring and Rogers Spring.

As described in the biological assessment for "Rehabilitation of Northshore Road to Park Boundary, Echo Bay spur road, and Overton Beach spur road" (appendix B), the Northshore Road corridor provides potential habitat for all of the above-listed species of concern.

Reptiles

The threatened desert tortoise and all species of concern have been addressed fully in the appended biological assessment, prepared by Lake Mead NRA for the USFWS in December 2005. The biological assessment is included in appendix B. Brief descriptions of threatened species and species of concern are presented below.

Desert tortoises (figure 10) are distributed from southeastern California, southern Nevada, and extreme southwestern Utah, through western and southern Arizona and northern Mexico (NatureServe 2004). The desert tortoise is predominantly herbivorous and a semifossorial inhabitant of warm upland plateaus and mountain slopes in the Mojave Desert. In the Mojave Desert, the desert tortoise occupies creosote bush scrub and the creosote bush – white bursage community. The native grass, big galleta, is often present where the desert tortoise is most abundant. In general, desert tortoises forage primarily on native winter and summer annual plants (dicots and grasses), perennial grasses, cacti, and perennial shrubs, in descending order of preference. Insects, caterpillars, and other insect larvae may also be eaten, and desert tortoises have been observed biting road-killed anurans and lizards (Brown 1968, Okamoto 1995 in NatureServe 2004). It has been suggested that an active adult desert tortoise requires about 45 pounds of herbaceous forage per month (NatureServe 2004).

FIGURE 10. DESERT TORTOISE

During the 1970s, it was apparent that desert tortoise populations were declining throughout a significant portion of the range. Many factors have been implicated, including:

- land development
- off-road vehicle travel
- poaching and vandalism (including shooting)
- disease (especially upper respiratory tract disease caused by a form of mycoplasma)
- livestock, wild horse, and wild burro grazing
- habitat degradation due to nonnative plant invasion
- range fires fueled by nonnative annual grasses and forbs
- energy and mineral development
- road and highway traffic / collisions
- trail construction
- collecting
- predation by the common raven, coyote, feral dogs and cats (associated with human refuse dumps and backyard feedings)
- release of nonnative desert tortoises into areas occupied by native populations
- natural droughts (resulting in poor nutrition and immunocompromise) (Oldemyer 1994, USFWS 1990, Jacobson 1995, Berry 1992 in NatureServe 2004)

The USFWS listed the Mojave population of the desert tortoise (north and west of the Colorado River) as endangered under emergency listing procedures enacted in August 1989. In 1990, the desert tortoise was listed as threatened under normal listing procedures.

Desert tortoises were observed historically in the area of Northshore Road during inventory and research efforts, and observations were routinely submitted by recreation area staff (Schwartz et al. 1978, LeNoue and Van Inwagen 1993). Schwartz et al. (1978) considered the

desert tortoise to be widespread, but in small numbers throughout the NRA below about 4,000 feet in elevation.

Biologists surveyed the Northshore area of Lake Mead NRA during the period from 1995 through 1997, and determined it to have higher densities of the desert tortoise than many other areas of the park (Boyles 1998). Although suitable habitat occurs in areas throughout the NRA, and the southern part of the NRA contains designated critical habitat, there is no designated critical habitat in the proposed project corridor or the surrounding Overton Arm area of the NRA.

A complete sensitive species survey was conducted along the Northshore Road corridor from July 23 to August 8, of 2003. A zone of impact wildlife survey was conducted for threatened, endangered, and sensitive species for a 17.7-mile segment of Northshore Road, between mileposts 30.0 and 48.0, using protocols approved by the USFWS and Bureau of Land Management. The Echo Bay access road (5.0 miles), Overton Beach access road (3.0 miles), and Valley of Fire access road (1.0 mile) were also included in this survey (SNEI 2003).

The presence of desert tortoise was documented throughout this survey. Desert tortoise sign observed included adult female tortoises, burrows, scat, and two scattered and dismembered carcasses. On July 27, 2003, a portion of one dismembered tortoise carcass (class 5 carcass) was observed within the mouth of an active tortoise burrow, but the Southern Nevada Environmental, Inc. (2003) report did not identify the milepost adjacent to which this carcass was found. On August 7, 2003, one adult female desert tortoise was observed approximately 5,774 feet (1,760 meters) north of the Echo Bay launch ramp and 82 feet (25 meters) south of Echo Bay Road, along a caliche knob with several active caliche dens. A second class 5 carcass was observed west of the cattle guard located on the Echo Bay access road.

The report for this survey concluded that presence of desert tortoise activity is apparent. The plant community along this segment of Northshore Road and associated access roads was characterized as Mojave Desert creosote scrub community, representing the preferred habitat of desert tortoises.

The area surrounding station 1+900 (a small detached portion of the overall road improvement project) was surveyed, revealing the presence of one desert tortoise burrow at Universal Transverse Mercator (UTM) coordinates 688639E, 3999858N. The occupancy of this burrow could not be determined. If this burrow was determined to be active immediately prior to ground-disturbing activities, the burrow would be hand-excavated, and any occupants handled according to *Guidelines for Handling Desert Tortoises* (DTC 1999).

Fish

Razorback suckers (figure 11) formerly occurred throughout the Colorado River basin, from Wyoming and Colorado to Sonora and Baja California. This species is now much reduced in range and abundance. The largest existing population of razorback sucker occurs in Lake Mohave. Small numbers of razorback suckers occur in Lake Mead and the Grand Canyon, although the Grand Canyon records are thought to represent transient individuals (Douglas and Marsh 1998).

Habitats used by razorback suckers include slow areas, backwaters, and eddies of medium to large rivers, and impoundments (three of the four remaining populations of greater than 100 individuals occur in reservoirs; NatureServe 2004). These fish are often associated with sand, mud, and rock substrate in areas with sparse aquatic vegetation and temperatures that are moderate to warm (Sigler and Miller 1963).

FIGURE 11. RAZORBACK SUCKER

Historically, adults apparently underwent spring migrations upstream in main-stem rivers and major tributaries. Recent studies have not demonstrated directed seasonal movements. Razorback suckers have been documented to move considerable distances (18–66 miles) to specific areas to spawn (NatureServe 2004). In reservoirs, razorback suckers spawn on gravel bars swept clean by wave action, as well as along shorelines over mixed substrates ranging from silt to cobble (USFWS 1994b). The larvae appear to remain in the substrate for a period; apparently preferring a shallow littoral zone for a few weeks after hatching, then dispersing to deeper waters (USFWS 1994b). Razorback suckers spawn from late January to April (rarely to May or June) in the lower Colorado River basin reservoirs, including Lake Mead, when temperatures range between approximately 52 degrees Fahrenheit (°F) to 70°F (USFWS 1994b). Attainment of sexual maturity varies between genders, with males maturing sooner than females.

In March 1994, the USFWS published its determination of critical habitat for the razorback sucker, Colorado squawfish, humpback chub, and bonytail chub (USFWS 1994b). Designated critical habitat units for the razorback sucker in Lake Mead NRA include the Colorado River and its 100-year floodplain as it flows through Mohave County, Arizona, and Clark County, Nevada, above Hoover Dam, including Lake Mead to the full pool elevation; and the Colorado River and its 100-year floodplain as it flows through Mohave County, Arizona, and Clark County, Nevada, from Hoover Dam to Davis Dam, including Lake Mohave to the full pool elevation.

Wild populations of razorback suckers continue to decline due to insufficient recruitment, such that the loss of all but one of the remaining wild populations is expected within the decade. The sole exception is the Lake Mead population made up of young to middle-aged razorback suckers comprising a second post-impoundment generation (USFWS 2002). As with many other threatened and endangered fish species, nonnative fish may be the greatest threat to the continued survival and potential recovery of the razorback sucker (USFWS 2002).

The two known spawning areas for razorback suckers in Lake Mead are at Blackbird Point and Echo Bay. Adult razorback suckers have been documented through telemetry studies to use the spawning areas intensively during the spawning period (January to May), but may also be found in the area during the non-spawning period. During the non-spawning period, adults may also be found along the western shores of the Overton Arm and the north shore of Las

Vegas Bay. While use of these areas is consistent across years, it is influenced by water levels. As the lake level has declined since 2000, use of the lower reach of Las Vegas Wash and the upper end of Echo Bay has not been possible (USFWS 2002).

Amphibians

The relict leopard frog (figure 12) is a medium-sized brownish gray frog in the family Ranidae. Historical records of this species exist for more than 12 sites along the Virgin and Colorado rivers in Utah, Nevada, and Arizona. Considered extinct since the 1950s, the species was rediscovered in the 1990s, during which time populations were known from only seven sites in three relatively small areas (Jaeger et al. 2001). By 2001, populations had disappeared from two of these sites, leaving only two areas inhabited by a total of five small populations of relict leopard frogs—all in Lake Mead NRA (Bradford et al. 2004). Two of the five sites that are believed to still support this species are Rogers Spring and Blue Point Spring (Bradford et al. 2004), both of which are along the western edge of the proposed project corridor. Primary threats to the relict leopard frog include decreased water availability due to dam construction for power management, conversion of wetlands habitat to agriculture and urbanization, and habitat degradation through recreational use.

FIGURE 12. RELICT LEOPARD FROG

Bradford et al. (2004) conducted relict leopard frog population studies at Blue Point Spring between 1991 and 2001, and made intermittent observations at Rogers Spring during the same time period.

Numbers of relict leopard frogs observed at the Blue Point Spring study area varied from 4 to 32 individuals along the upper stream segment that was observed consistently between 1991 and 2001. Numbers of relict leopard frogs observed appeared to increase in 1996, after an embankment around a culvert approximately 394 feet downstream from the stream source eroded, potentially providing easier access to the upper section for frogs from below. Most individuals captured were adults, regardless of season. At the other segments of Blue Point and Rogers springs, relict leopard frogs were observed throughout the period 1993 through 2001 (Bradford et al. 2004).

Plants

The Las Vegas bearpoppy (figure 13) is typically found on gypsiferous soils in desert shrub communities. The habitat consists of open, dry, spongy, or powdery, often dissected badlands; hummocked soils with high gypsum content, often with a well-developed soil crust; in areas of generally low relief on all aspects and slopes; and in association with a sparse cover of creosote bush, saltbush, and blackbrush (*Coleogyne ramosissima*) (NNHP 2001). The bearpoppy is a perennial forb that forms rounded clumps and produces a yellow flower (NNHP 2001).

FIGURE 13. LAS VEGAS BEARPOPPY

Sticky ringstem (*Anulocaulis leiosolenus*) grows in undisturbed gypsum soils along Northshore Road. It is a perennial forb that persists as an underground rhizome, emerging to flower during the spring and summer. Sticky ringstem has pale pink flowers that may be present from June to November.

Threecorner milkvetch (*Astragalus geyeri* var. *triquetrus*) occupy sandy to fine-textured soil in mixed desert shrub communities. Specifically, the habitat is described as open, deep, sandy soil or dunes, generally stabilized by vegetation and/or a gravel veneer (NNHP 2001). It is an annual forb with white flowers that bloom in the spring.

Sticky buckwheat (*Eriogonum viscidulum*) occupies desert wash, sand flats, roadsides, and deep sands with mesquite, creosote bush, white bursage, and indigobush, among several other shrub species (NatureServe 2002b, NNHP 2001). Sticky buckwheat has been reported as growing with saltcedar (*Tamarix ramosissima*) and arrowweed (*Pluchea sericea*) in some sandy desert washes. It is an annual forb with small yellow flowers that bloom in April and May. The stems and branches are slightly sticky and often covered with adhering sand particles. This species has not been relocated in the area and may not actually occur.

Portions of the corridor may provide habitat for three species of moss listed by the state of Nevada (NNHP 2002). Sweet trichostomum (*Trichostomum sweetie*), seriate crossidium (*Crossidium seriatum*), and Gold Butte moss (*Didymodon nevadensis*) are sensitive mosses that may occur in habitats along Northshore Road. Sweet trichostomum occupies sandstone bluffs and sandstone-derived soils, often shaded by rocks, in the creosote bush – white bursage plant association. This species is only known from the Redstone parking area (which is outside of the current project vicinity), but may not be present in the construction zone. Seriate crossidium are also present in the creosote bush – white bursage plant association, occupying sandstone and gypsiferous bluffs, outcrops, rock piles, and soils. The habitat is often found on the north or east sides of rocks or shrubs, or at the base of bluffs (NNHP 2001). Gold Butte moss is present on or near gypsiferuos deposits and outcrops or on limestone boulders, especially on east- to north-facing slopes of loose, uncompacted soil. It is often associated with other mosses and lichens, forms a dense turf, and is blackish-green above and reddish-brown below (NNHP 2001). No occurrence of seriate crossidium or Gold Butte moss in the project area has been recorded.

The sunray is a Clark County evaluation plant species under the Multiple Species Habitat Conservation Plan. It grows at the edge of Northshore Road on gypsiferuos soils exposed within the road corridor. This plant is considered uncommon at Lake Mead NRA. It is likely that sunray plants would grow at the road edge following the reconstruction project.

HISTORIC STRUCTURES

The historic Overton-Lake Mead Road consists of the Overton Beach access road and 6 miles of Northshore Road south of Overton. Construction plans for Route No. 1 were prepared by the Bureau of Public Roads. The road was designed to be constructed in two sections. Construction began on April 22, 1938, at the east end of the project, so that the eastern end would be completed before the rising of the lake. After rough grading was completed, pipe culverts were set in place, and headwall and gutter construction was completed. Two local quarries (borrow pits) supplied stone for culvert headwalls. Construction of the road was completed on October 8, 1938 (ACRE 2005).

Overton-Lake Mead Road postdates an unpaved road constructed by the CCC. This road was constructed in 1933 as an unpaved road: the Overton-Valley of Fire Road. Built in 1938, Overton-Lake Mead Road only roughly followed the route of the older road. In fact, Route No. 1 deviated several hundred yards from the earlier route in some locations. Other changes included the construction of additional corrugated steel culverts and many earthen dikes and ditches to control flooding and erosion. However, 1937 drawings for Overton-Lake Mead Road indicate that many of the culvert pipes and some of the dikes and ditches of the earlier road were re-utilized in the construction of Overton-Lake Mead Road in 1938 (ACRE 2005). Construction of Route No. 1 also included removal of other roads, so that few vestiges of the CCC-constructed road remain other than dikes and ditches.

The Overton-Lake Mead Road was determined eligible for the NRHP in 1997, but has been subjected to numerous changes over the years. The driving surface of the road was originally 20-feet wide, but the road has been resurfaced and was widened to 22 feet at an unknown date. The original plans called for a 30-foot-wide road section, with 10-foot course lanes, and 5-foot shoulders. The plans also included the design of several drainage structures consisting mostly of single-pipe culverts with stone masonry headwalls (figure 14).

The road grade has also been widened in some locations. The intersection of Overton Beach access road and North Shore Road was originally a wide curve; this was changed to a T-intersection at an unknown date. The parking area at the eastern extremity of the road was substantially expanded, a store and visitor facilities constructed, and a housing area constructed following the inundation of original visitor facilities in 1983. The second parking area along the north side of the road has also been substantially expanded by deposition of earth on the north, east, and south sides of the original turnout parking area.

Due to the changes discussed above, the surface of Overton-Lake Mead Road is not eligible for the NRHP; however, the general roadway alignment and its relationship to the surrounding landscape is eligible for listing in the NRHP. There are also four associated feature types of note: culverts and headwalls, gutters, diversion dikes and ditches, low-water crossings, and station markers (ACRE 2005).

FIGURE 14. CIVILIAN CONSERVATION CORPS-CONSTRUCTED HEADWALL AND CULVERT

Culverts and Headwalls

Seventy-six pipe culverts exist along Overton-Lake Mead Road, at least 72 of which date from the 1938 construction of the highway, and 138 associated headwalls are known to exist along Overton-Lake Mead Road. Structurally, the culverts usually have reinforcing headwalls at the inlet and outlet ends. The headwalls are semi-dressed local stone with concrete mortar. The headwalls on the road are in straight, winged, and special configurations. Culvert pipes are typically single steel pipes, but 7 culverts have vitrified clay tile pipes. These culverts and headwalls vary in condition and integrity, with 57 considered to be in fair condition and 5 in poor condition. Many of these culverts are not functioning properly due to design or related factors, including, most often, inadequate culvert size and deterioration (ACRE 2005).

Several of the original culvert headwalls have been replaced with concrete headwalls, concrete gathering structures, or bare culvert pipes without headwalls. The most recent replacement and removal of headwalls and culverts occurred in February 2005, following heavy rains and substantial erosion damage to portions of the road. At least one culvert headwall has been entirely buried (ACRE 2005).

Gutters

Thirty-three gutters or remnants of gutters were originally constructed along the roadway embankments. Historic gutters were constructed of flat stones, mainly sandstone, set in wet

concrete. Gutters are 3-, 4-, or 5-feet wide, shallow U-shaped in cross section, less than 1-foot deep, and from 6- to 50-feet long.

Many gutters have deteriorated due to erosional under-cutting and collapse. Only 17 gutters retain integrity for NRHP eligibility, and only 11 are considered to be in good condition (ACRE 2005).

Diversion Dikes and Ditches

Twenty-eight earthen diversion dikes are along the Overton-Lake Mead Road. At least 16 of these dikes were built by the CCC prior to construction of Overton-Lake Mead Road. They were, however, incorporated into the road. The diversion dikes typically rise 1 to 3 feet above the surrounding natural ground surface, are 6- to 10-feet wide at the base, and have adjacent ditches on the upslope sides. Diversion dikes and ditches vary in length from 17 feet to 991 feet. Many of the dikes are severely eroded or partially buried. Only 13 are considered to be in good condition (ACRE 2005).

Low-Water Crossings

The Overton-Lake Mead Road has two historic low-water crossings. The low-water crossing structures consist of a stone and concrete curb wall along the downstream side of the paved roadway, a second stone and concrete wall downstream and at lower elevation from the road top, and an inclined spillway area of dry-laid sandstone rubble between the two curb walls. One low-water crossing (118) is considered to be entirely intact. The other low-water crossing (146) has been extensively affected by road realignment and associated modifications (ACRE 2005).

Station Markers

Thirteen survey-control monuments established by the Bureau of Public Roads in 1938 are located along the Overton-Lake Mead Road (ACRE 2005).

FLOODPLAINS

This segment of Northshore Road crosses predominantly small desert washes (figure 15). Four of the larger washes encountered are mapped within the 100-year floodplain: Thomas Wash, Valley of Fire Wash, Echo Wash, and Las Vegas Wash (FEMA 2005). Washes eventually drain into Lake Mead at Boulder and Virgin basins. They are typically dry, but occasionally experience flash flooding during thunderstorms in July, August, and early September. Where Northshore Road crosses a wash, medium-to-large diameter culverts are installed beneath the road surface to allow the continuous flow of water. Echo Wash is currently traversed by a bridge.

FIGURE 15. WASH AT OVERTON BEACH ROAD INTERSECTION

Flash flooding washes sediment down intermittent drainages typically resulting in channel aggradation upstream of roadway culverts where the flow velocity decreases and sediments deposit and channel incision or down-cutting below the culverts where flow velocity increases. Formation of plunge-pools downstream of the culverts can cause eddying that erodes the roadway fill at its toeslope. Sediments are delivered to the washes due to erosion of soils and gravel from uplands and sloughing of drainage banks. A combination of sediment and debris (annual vegetation such as Russian-thistle, shrubs, cobble, etc.) can obstruct culverts and further restrict or even block flows. When flows are sufficiently restricted at culvert openings, the water overtops the roadway and erodes the downstream fill-slope.

WATER QUALITY

Lake Mead is the source of drinking water for millions of people living in Arizona, Nevada, and California. The lake also provides an environment for aquatic life and for human recreation uses such as swimming, water skiing, windsurfing, fishing, and boating. The water of Lake Mead typically meets state drinking quality standards, although there is occasional degradation near harbors, high-use coves, and where perennial streams enter the lake.

The *Lake Mead National Recreation Area Resource Management Plan* (1999) identifies a number of internal threats to water quality at the lake(s), including heavy recreation use in coves (producing pollution from human waste and litter), and boat use in harbors (producing pollution from illegal sewage discharge and petrochemical spills). External threats to water

quality in the lake(s) include an assortment of substances transported to the lake by tributaries such as Las Vegas Wash and the Colorado River, deposition of air pollutants into lake water, and impacts from adjacent land uses and from increasing development.

The primary water concern for Lake Mead NRA is reduction of quality due to chemical and biological pollutants in lake water, including petrochemicals and bacteria associated with human waste. Turbidity (water cloudiness) and sedimentation have not been major concerns thus far. Washes in the project area are ephemeral, and water quality data are not yet available.

AIR QUALITY

Lake Mead NRA is designated a class II air quality area under the Clean Air Act. Air quality within the region is generally good, but some degradation of air quality occurs in lower elevations of the recreation area. Air pollutants primarily originate from outside Lake Mead NRA and tend to concentrate during periods of atmospheric inversion. Major sources of air pollutants within or adjacent to the recreation area include the Mohave power generating plant near Laughlin, Nevada, as well as other power generating plants in the region; emissions from motor vehicles from the Las Vegas valley and other urban areas; particulates from gravel and gypsum quarries; and fugitive dust from disturbed lands and construction activities. Air quality regulations within the project area, including Clean Air Act regulations, are administered by the Clark County (Nevada) Air Pollution Control Division (NPS 2001d).

Lake Mead NRA offers spectacular vistas and scenic views in the vicinity of Lakes Mead and Mohave. However, degraded air quality sometimes causes visible smog, which tends to reduce the scenic value of the area. Preserving air quality is integral to providing a high quality visitor experience.

VISITOR USE AND EXPERIENCE

Lake Mead NRA is considered one of the premier water-based recreation areas in the nation with approximately eight to nine million visitors annually. Providing water-based recreational opportunities, while protecting NRA resources, is an important component of the *General Management Plan* (NPS 1986) and the *Lake Mead National Recreation Area Strategic Plan* (2001b). There are six marinas and nine paved launch ramps on Lake Mead. The marinas include Lake Mead, Las Vegas Bay, Callville Bay, Echo Bay, Overton Beach (figure 16), and Temple Bar (NPS 2003).

Many of the eight to nine million yearly visitors to Lake Mead NRA are involved in water-based recreational activities between May and September, which are supported at the marina and launch ramp areas. These activities consist of motor boating, houseboating, sail boarding and sailing, canoeing, kayaking, rafting, waterskiing, wakeboarding, fishing, swimming, SCUBA, use of personal watercraft, picnicking, boat touring, nature study, and camping along the lakeshore. NRA visitors also participate in land-based activities such as driving tours, hiking, and camping in NPS-managed or concession-operated campgrounds (NPS 2003).

FIGURE 16. OVERTON BEACH MARINA

Visitor use on this road segment is primarily an access corridor for people going to Echo Bay, Overton Beach, or other areas of the lake. Traffic volume data from NPS count station 1911 on Northshore Road showed that average annual daily traffic on the route was approximately 350 vehicles per day in 1993 (Robert Peccia and Associates, Inc. 1995). Traffic counter data compiled by the NPS indicates approximately 333 vehicles per day on Northshore Road for 2005. Turnouts provide opportunities to view geological formations. Blue Point Spring and Rogers Spring provide parking and picnicking areas—a trail is available for hiking at Rogers Spring.

Impacts on visitor experience monitored by the National Park Service throughout Lake Mead NRA include visitor satisfaction, boating accidents, traffic circulation, waiting time to launch, launch ramp parking lot capacity, empty slips in the marinas, boat distribution, quality of recreational facilities, and visitor exposure to flood hazards.

HEALTH AND SAFETY

In 1995, the National Park Service conducted a traffic safety program review for roads within Lake Mead NRA (Robert Peccia and Associates, Inc. 1995). As the primary means of analyzing accident data, overall accident rates for major road segments were developed. Accident rates were expressed as the number of accidents per million vehicle miles traveled. For Northshore Road, between Callville Bay Road and Echo Bay Road, the number of accidents between January 1, 1990 through December 31, 1993, was 54, and the million-vehicle-miles traveled was

11.9, resulting in an accident rating of 4.53. This rating was the fifth-highest of the 15 Lake Mead NRA road segments that were rated.

The most apparent problem on Northshore Road is the number of motorists traveling at excessive speeds. Excessive speed presents a unique problem for motorists driving vehicles with trailers, as the trailers tend to slide off the side of the road. In some areas, short sight distances add to problems when combined with excessive speeds. Recommendations in the traffic safety report for Northshore Road include reconstruction to a 32-foot-wide roadway with travel lanes and paved shoulders (Robert Peccia and Associates, Inc. 1995).

Another aspect of safety in the project area is flash flooding in desert washes. Most annual precipitation falls during intense thunderstorms from July through early September. A hydrological study conducted by PBS&J (2003) concluded that all but three of the culverts are under-designed for a 50-year storm event. Under-designed culverts could lead to road failure due to embankment erosion and floodwaters overtopping roadways.

MAINTENANCE OPERATIONS

National recreation area staff includes enforcement officers, maintenance crews, restoration crews, and other recreation area personnel that protect resources and facilitate a safe and enjoyable experience for Lake Mead NRA visitors. The current staff responsibilities, as they relate to the proposed action for maintenance and protection along Northshore Road and the spur roads, includes pothole repair, minor repairs to drainage and safety structures, replacing culverts, repairing minor road failures due to embankment erosion and floodwaters overtopping roadways, responding to accidents, and indirectly, resource and habitat restoration.

At one time, there was a staff of 15, but currently there is a staff of four personnel including the Lake Mead civil engineer. The principal maintenance activity along Northshore Road is grading material into ruts along the sides of the road. Ruts are formed when boat trailers trail off the road surface and onto the soft shoulders. As a result, ruts form making it difficult to get the trailers back onto the road surface. This may contribute to accidents. The accident rate for Northshore Road, between Callville Bay Road and Echo Bay Road, is 11.9 per million-vehicle-miles traveled (Robert Peccia and Associates, Inc. 1995). Due to the shortage of maintenance personnel, asphalt cannot routinely be used to patch the ruts. There is typically only enough time and personnel to grade surrounding material into the ruts to temporarily fill them (Melville 2006)

Other routine maintenance procedures include repairing erosion damage from summer rainstorms, filling potholes along the roadway, and replacing collapsed culverts. Summer thunderstorms often cause runoff and flash floods that erode the road shoulders and can cause dangerous driving conditions. The high volume of vehicles towing boats also causes wear on the roads resulting in potholes. Lastly, settling caused by long-term use and time results in culvert collapse that must be repaired. The maintenance activities take place mainly during the spring through fall when traffic to the recreation area is the heaviest. The maintenance staff spends approximately 25% of their time along Northshore Road (Melville 2006).

ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

This section describes the potential environmental consequences associated with the no-action and preferred alternatives. The methodologies and assumptions for assessing environmental consequences are discussed, including consideration of context, intensity, and duration of impacts; cumulative impacts; and measures to mitigate impacts. As mandated by NPS policy, resource impairment is explained and then assessed for each alternative. Subsequent sections in this section are organized by impact topic—first for the no-action alternative, and then for the NPS preferred alternative.

METHODOLOGY

Overall, the National Park Service based these impact analyses and conclusions on the review of existing literature and Lake Mead NRA studies, information provided by experts at the recreation area and in other agencies, professional judgments and recreation area staff insights, the Nevada SHPO, and public input.

CONTEXT, DURATION AND INTENSITY, AND TYPE OF IMPACT

The following definitions were used to evaluate the context, intensity, duration, and cumulative nature of impacts associated with project alternatives.

Context

Context is the setting within which an impact is analyzed such as local, recreation area-wide, or regional. The Council on Environmental Quality requires that impact analyses include discussions of context. For this environmental assessment, local impacts would occur within the general vicinity of Northshore Road while recreation area-wide impacts would affect a greater portion of the NRA and regional impacts would extend outside the limits of the NRA.

Duration

The duration of an impact is the time period for which the impacts are evident and are expressed in the short term or in the long term. A short-term impact would be temporary in duration and would be associated with road improvements, as well as the period of site restoration. Depending on the resource, impacts may last as long as construction takes place, or a single year or growing season, or longer. Impact duration for each resource is unique to that

resource. Impact duration for each resource is presented in association with impact intensities in the following "Methodologies" section.

Intensity

Impact intensity is the degree to which a resource would be beneficially or adversely affected. The criteria that were used to rate the intensity of the impacts for each resource topic are presented later in this section under each topic heading.

Type of Impact

Impacts can be beneficial or adverse. Beneficial impacts would improve resource conditions, while adverse impacts would deplete or negatively alter resources.

IMPACT INTENSITY THRESHOLDS

Soils

Information on soils potentially impacted in the NRA was compiled from previous environmental assessments for Northshore Road. Predictions about short- and long-term site impacts were based on previous projects with similar soils and recent studies. The thresholds of change for the intensity of an impact to soils are defined as follows:

Impact Intensity	Intensity Definition
Negligible	Soils would not be affected or the effects to soils would be below or at the lower levels of detection. Any effects to soils would be slight.
Minor	The effects to soils would be detectable. Effects to soil area would be small and localized. Mitigation may be needed to offset adverse effects and would be relatively simple to implement and likely be successful.
Moderate	The effect on soils would be readily apparent and result in a change to the soil character over a relatively wide area. Mitigation measures would be necessary to offset adverse effects and likely be successful.
Major	The effect on soils would be readily apparent and substantially change the character of the soils over a large area. Mitigation measures to offset adverse effects would be needed, extensive, and their success could not be guaranteed.
Impairment	Impairment of park soils can be defined as: a substantial deterioration of park soils to the extent that they would no longer function as a natural system; soil impacts would contribute to deterioration of park resources and values to the extent that the park 's purpose could not be fulfilled as established in its enabling legislation; would affect resources key to the park's natural or cultural integrity or opportunities for enjoyment; or would affect the resource whose conservation is identified as a goal in the park's general management plan or other park planning documents.

Soil impacts would be considered short term if the soils recover in less than three years and long term if the recovery takes longer than three years.

Biotic Communities

Information on biotic communities potentially impacted in the NRA was compiled from previous environmental assessments for projects within the NRA. Predictions about short- and long-term site impacts were based on previous projects and recent studies. The thresholds of change for the intensity of an impact to soils are defined as follows:

Impact Intensity	Intensity Definition
Negligible	An action that could affect biotic communities, but the change would be so small that it would not be of any measurable or perceptible consequence.
Minor	An action that could affect biotic communities, but the change would be slight and localized with few measurable consequences.
Moderate	An action that would result in readily apparent changes to affect biotic communities with measurable consequences.
Major	A severely adverse or exceptionally beneficial effect to biotic communities would result.
Impairment	Impairment of biotic communities can be defined as: adverse impacts whose severity, duration and timing result in elimination of native species or native species habitat, or preclude the park from meeting recovery objectives for listed species. Additionally, impairment of biotic communities can be defined as: a major, adverse impact to the resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation proclamation of Lake Mead National Recreation Area; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's general management plan or other relevant NPS planning documents.

Biotic community impacts would be considered short term if the community recovers in less than one year and long term if the recovery takes longer than one year.

Threatened and Endangered Species and Species of Concern

The Endangered Species Act of 1973 (16 USC 1531 *et seq.*), as amended, mandates that all federal agencies consider the potential effects of their actions on species listed as threatened or endangered. If the National Park Service determines that an action may adversely affect a federally listed species, consultation with the USFWS is required to ensure that the action would not jeopardize the species' continued existence or result in the destruction or adverse modification of critical habitat. NPS *Management Policies 2001* state that potential effects of agency actions would also be considered for state or locally listed species.

It is the policy of the National Park Service to manage critical habitat of such species and to perpetuate the natural distribution and abundance of these species, as well as the ecosystems upon which they depend. The USFWS was contacted for a list of special-status species and designated critical habitats that may be within the project area or affected by any of the

alternatives (appendix C). Information on possible threatened, endangered, and candidate species, as well as species of special concern, was also gathered from published sources. Information from prior research at Lake Mead NRA was also incorporated. Known impacts caused by development and human use were also considered. The thresholds of change for the intensity of an impact are defined as follows:

Impact Intensity	Intensity Definition
Negligible	The action could result in a change to a population or individuals of a species or designated critical habitat, but the change would be so small that it would not be of any measurable or perceptible consequence and would be well within natural variability. This impact intensity equates to a USFWS "may affect, not likely to adversely affect" determination.
Minor	The action could result in a change to a population or individuals of a species or designated critical habitat. The change would be measurable, but small and localized and of little consequence. Mitigation measures, if needed to offset the adverse effects, would be simple and successful. This impact intensity equates to a USFWS "may affect, likely to adversely affect" determination.
Moderate	Impacts on special-status species, their habitats, or the natural processes sustaining them would be detectable and occur over a large area. Mitigation measures, if needed to offset adverse effects, would be extensive and likely successful. This impact intensity equates to a USFWS "may affect, likely to adversely affect" determination.
Major	The action would result in a noticeable effect to the viability of a population or individuals of a species or resource or designated critical habitat. Impacts on a special-status species, critical habitat, or the natural processes sustaining them would be detectable, both in and out of the NRA. Loss of habitat might affect the viability of at least some special-status species. Extensive mitigation measures would be needed to offset any adverse effects and their success would not be guaranteed. This impact intensity equates to a USFWS "may affect, likely to jeopardize the continued existence of a species or adversely modify critical habitat for a species" determination.
Impairment	Impairment to threatened and Endangered Species can be defined as: a major, adverse impact to the resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation proclamation of Lake Mead National Recreation Area; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's general management plan or other relevant National Park Service planning documents.

Special-status species impacts are considered short term if the species recovers in less than one year and long term if it takes longer than one year for the species to recover.

Historic Structures

In order for a structure, building, or district to be listed in the NRHP, it must meet one or more of the following criteria of significance: (1) associated with events that have made a significant contribution to the broad patterns of our history; (2) associated with the lives of persons significant in our past; (3) embody the distinctive characteristics of a type, period, or method of construction, or represent the work of a master, or possess high artistic value, or represent a significant and distinguishable entity whose components may lack individual distinction; (4) have yielded, or may be likely to yield, information important in prehistory or history. In addition, the structure or building must possess integrity of location, design, setting, materials,

workmanship, feeling, and association (*National Register Bulletin, How to Apply the National Register Criteria for Evaluation*).

Under 36 CFR 800, *Protection of Historic and Cultural Properties*, "an undertaking is considered to have an adverse effect when the effect on a historic property may diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association." For purposes of analyzing potential impacts to historic structures/buildings, the thresholds of change for the intensity of an impact are defined as follows:

Impact Intensity	Impact Type	Intensity Description
Negligible	Adverse or Beneficial	Impact is at the lowest levels of detection with neither adverse or beneficial consequences. The determination of effect for section 106 would be *no adverse effect*.
Minor	Adverse	Alteration of a feature(s) would not diminish the overall integrity of the resource. The determination of effect for section 106 would be *no adverse effect*.
	Beneficial	Stabilization/preservation of features in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties, with Guidelines for Preserving, Rehabilitating, Restoring, and Reconstructing Historic Buildings* (1995). The determination of effect for section 106 would be *no adverse effect*.
Moderate	Adverse	Alteration of a feature(s) would diminish the overall integrity of the resource. The determination of effect for section 106 would be *adverse effect*. A MOA is executed among the National Park Service and applicable state or tribal historic preservation officer and, if necessary, the Advisory Council on Historic Preservation in accordance with 36 CFR 800.6(b). Measures identified in the MOA to minimize or mitigate adverse impacts reduce the intensity of impact under NEPA from major to moderate.
	Beneficial	Rehabilitation of a structure in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties, with Guidelines for Preserving, Rehabilitating, Restoring, and Reconstructing Historic Buildings* (1995). The determination of effect for section 106 would be *no adverse effect*.
Major	Adverse	Alteration of a feature(s) would diminish the overall integrity of the resource. The determination of effect for section 106 would be *adverse effect*. Measures to minimize or mitigate adverse impacts cannot be agreed upon and the National Park Service and applicable state or tribal historic preservation officer and/or Advisory Council are unable to negotiate and execute a MOA in accordance with 36 CFR 800.6(b).
	Beneficial	Restoration of a structure in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties, with Guidelines for Preserving, Rehabilitating, Restoring, and Reconstructing Historic Buildings* (1995). The determination of effect for section 106 would be *no adverse effect*.
Impairment		Impairment of historic structures can be defined as: a major, adverse impact to the resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation proclamation of Lake Mead National Recreation Area; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's general management plan or other relevant National Park Service planning documents.

Short-term effects are those lasting less than one year. Long-term effects are those lasting greater than one year or are permanent.

Floodplains

Floodplains are defined by the NPS *Floodplain Management Guideline* (1993) as "the lowland and relatively flat areas adjoining inland and costal waters, including flood-prone areas offshore islands, and including, at a minimum, that area subject to temporary inundation by a regulatory flood." The National Park Service has adopted the policy of preserving floodplain values and minimizing potentially hazardous conditions associated with flooding (NPS *Floodplain Management Guideline*, July 1, 1993). The planning team based the impact analysis and the conclusions for possible impacts to 100- and 500-year floodplains on the onsite inspection of known and potential 100- and 500-year floodplains within the recreation area, review of existing literature and studies, information provided by experts in the National Park Service and other agencies, and Lake Mead NRA staff insights and professional judgment. Where possible, map locations of 100- and 500-year floodplains were compared with locations of proposed modifications to the existing roadway. Predictions about short- and long-term site impacts were based on previous studies of impacts to 100- and 500-year floodplains from similar projects and recent scientific data. The thresholds of change for the intensity of an impact are defined as follows:

Impact Intensity	Intensity Definition
Negligible	There would be no change in the ability of a floodplain to convey floodwaters, or its values and functions. Project would not contribute to the flood.
Minor	Changes in the ability of a floodplain to convey floodwaters, or its values and functions, would be measurable and local, although the changes would be only just measurable. Project would not contribute to the flood. No mitigation would be needed.
Moderate	Changes in the ability of a floodplain to convey floodwaters, or its values and functions, would be measurable and local. Project could contribute to the flood. The impact could be mitigated by modification of proposed facilities in floodplains.
Major	Changes in the ability of a floodplain to convey floodwaters, or its values and functions, would be measurable and widespread. Project would contribute to the flood. The impact could not be mitigated by modification of proposed facilities in floodplains.
Impairment	Impairment of floodplains can be defined as: a major, adverse impact to the resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation proclamation of Lake Mead National Recreation Area; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's general management plan or other relevant National Park Service planning documents.

The effects to floodplains are considered short term if the effects last less than one year. Impacts would not be measurable, or would be measurable only during the life of construction. Impacts would be long term if the effects last beyond one year, or would be measurable during and after project construction.

Water Quality

NPS *Management Policies 2001* state that the National Park Service would "take all necessary actions to maintain or restore the quality of surface waters and ground waters within the parks consistent with the Clean Water Act and all other applicable federal, state, and local laws and regulations" (sec. 4.6.3).

A water quality standard defines the water quality goals of a water body by designating uses to be made of the water, by setting minimum criteria to protect the uses, and by preventing degradation of water quality through antidegradation provisions. The antidegradation policy is only one portion of a water quality standard. Part of this policy (40 CFR 131.12(a)(2)) strives to maintain water quality at existing levels if it is already better than the minimum criteria. Antidegradation should not be interpreted to mean that "no degradation" can or would occur, as even in the most pristine waters, degradation may be allowed for certain pollutants as long as it is temporary and short term.

Other considerations in assessing the magnitude of water quality impacts is the effect on those resources dependent on a certain quality or condition of water. Sensitive aquatic organisms, submerged aquatic vegetation, riparian areas, and wetlands are affected by changes in water quality from direct and indirect sources.

Given the above water quality issues and methodology and assumptions, the following impact thresholds were established in order to describe the relative changes in water quality (overall, localized, short and long term, cumulatively, adverse, and beneficial) under the management alternatives.

Impact Intensity	Intensity Definition
Negligible	Impacts are chemical, physical, or biological effects that would not be detectable, would be well below water quality standards or criteria, and would be within historical or desired water quality conditions.
Minor	Impacts (chemical, physical, or biological effects) would be detectable, but would be well below water quality standards or criteria and within historical or desired water quality conditions.
Moderate	Impacts (chemical, physical, or biological effects) would be detectable, but would be at or below water quality standards or criteria in general; however, water quality standards, historical baseline, or desired water quality conditions would be altered on a periodic basis.
Major	Impacts (chemical, physical, or biological effects) would be detectable and would be frequently altered from the historical baseline or desired water quality conditions and/or chemical, physical, or biological water quality standards or criteria would be slightly and singularly exceeded on a regular basis.

Impact Intensity	Intensity Definition
Impairment	Impairment of water quality can be defined as: chemical, physical, or biological effects that would be detectable and that would be substantially and frequently altered from the historical baseline or desired water quality conditions and/or water quality standards, or criteria would be exceeded several times on a short-term and temporary basis. In addition, these adverse, major impacts to park resources and values would contribute to deterioration of the park's water quality and aquatic resources to the extent that the park's purpose could not be fulfilled as established in its enabling legislation; affect resources key to the park's natural or cultural integrity or opportunities for enjoyment; or affect the resource whose conservation is identified as a goal in the park's general management plan or other park planning documents.

For water quality, if following treatment, water quality recovers in less than one year, the impacts are considered short term. If recovery takes longer then one year following treatment, the impacts are long term.

Visitor Use and Experience

NPS *Management Policies 2001* state that the enjoyment of Lake Mead NRA resources and values by the people of the United States is part of the fundamental purpose of all parks and that the National Park Service is committed to providing appropriate, high-quality opportunities for people to enjoy the parks.

Part of the purpose of Lake Mead NRA is to offer opportunities for recreation, education, inspiration, and enjoyment. Consequently, one of the NRA's management goals is to ensure that visitors safely enjoy and are satisfied with the availability, accessibility, diversity, and quality of NRA facilities, services, and appropriate recreational opportunities.

Public scoping input and observation of visitation patterns, combined with an assessment of what is available to visitors under current management, were used to estimate the effects of the actions in the various alternatives of this document. The impact on the ability of the visitor to experience a full range of Lake Mead NRA resources was analyzed by examining resources and objectives presented in the NRA significance statement. The potential for change in visitor use and experience proposed by the alternatives was evaluated by identifying projected increases or decreases in use of the roads impacted by the Northshore Road rehabilitation, and other visitor uses, and determining how these projected changes would affect the desired visitor experience (to what degree, and for how long). The thresholds of change for the intensity of an impact to visitor experience are defined as follows:

Impact Intensity	Intensity Definition
Negligible	The visitor would not be affected or changes in visitor experience would be below or at the level of detection. The visitor would not likely be aware of the effects associated with the alternative.
Minor	Changes in visitor experience would be detectable, although the changes would be slight. Some visitors would be aware of the effects associated with the alternative, but the effects would be slight and not noticeable by most visitors.
Moderate	Changes in visitor experience would be readily apparent to most visitors. Visitors would be aware of the effects associated with the alternative and might express an opinion about the changes.
Major	Changes in visitor experience would be readily apparent to all visitors; severely adverse or exceptionally beneficial. Visitors would be aware of the effects associated with the alternative and would likely express a strong opinion about the changes.

Impacts to visitor experience are considered short term if the effects last only as long as the duration of the treatment action (i.e., repair or construction period). Impacts are considered long term if the effects last longer than the duration of the treatment action.

Air Quality

NPS *Management Policies 2001* direct recreation areas to seek to perpetuate the best possible air quality to preserve natural and cultural resources, sustain visitor enjoyment, human health, and preserve scenic vistas. Recreation areas are directed to comply with all federal, state, and local air quality regulations and permitting requirements. In cases of doubt as to the impacts of existing or potential air pollution on recreation area resources, the National Park Service "will err on the side of protecting air quality and related values for future generations." Lake Mead NRA is designated as a class II air quality area under the Clean Air Act. The main purpose of this act is to protect and enhance the nation's air quality to promote the public health and welfare. The act establishes specific programs to provide protection for air resources and values, including the program to prevent serious deterioration of air quality in clean air regions of the country. Although Lake Mead NRA is designated as a class II air quality area, the NRA strives to maintain the highest air quality standards, and project work within the boundaries is completed in accordance with regional standards. However, Lake Mead NRA does not possess sufficient autonomous authority to address issues of air quality improvements when air pollution originates outside NRA boundaries. The thresholds of change for the intensity of an impact to air quality are defined as follows:

Impact Intensity	Intensity Definition
Negligible	There is no exhaust odors and no visible smoke. Dust from construction activities can be controlled by mitigation.
Minor	There is a slight exhaust odor and smoke is visible during brief periods of time. Dust from use of the dirt roads is visible during brief periods. Dust from construction activities is visible only during the work period, but most can be controlled by mitigation.

Impact Intensity	Intensity Definition
Moderate	There are gasoline fumes and exhaust in high-use areas. Smoke is visible during periods of increased use. Dust from the use of dirt roads is visible for an extended area. Dust from construction activities is visible for an extended area for an extended period, but is reduced by mitigation.
Major	Smoke and gasoline fumes are easily detectable for extended periods of time in a large area. Dust from the use of dirt roads and construction activities are visible for an extended area for an extended amount of time, and mitigation is unable to alleviate the conditions.
Impairment	Impairment of air quality can be defined as: impacts that would have a major adverse effect on park resources and values; contribute to deterioration of the park's air quality to the extent the park's purpose could not be fulfilled as established in its enabling legislation; affect resources key to the park's natural or cultural integrity or opportunities for enjoyment; and/or affect the resource whose conservation is identified as a goal in the park's general management plan or other park planning documents.

The duration of air quality impacts is considered short term if the recovery is less than one year and long term if the recovery is longer than one year.

Health and Safety

The impact assessment for health and safety focused on the number of potential individuals impacted and the severity of the impact. The thresholds of change for the intensity of an impact are defined as follows:

Impact Intensity	Intensity Definition
Negligible	Health and safety would not be affected, or the effects would be at low levels of detection and would not have an appreciable effect on visitor or employee health and safety.
Minor	The effect would be detectable, but would not have an appreciable effect on health and safety. If mitigation were needed, it would be relatively simple and would likely be successful.
Moderate	The effects would be readily apparent and would result in substantial, noticeable effects to health and safety on a local scale. Mitigation measures would probably be necessary and would likely be successful.
Major	The effects would be readily apparent and would result in substantial, noticeable effects to health and safety on a regional scale. Extensive mitigation measures would be needed, and their success would not be guaranteed.

The effects to safety are considered short term if the effects last only for the duration of the treatment action (i.e., the repair, work, or construction is completed) and long term if the effects last beyond the duration of the treatment action.

Maintenance Operations

The impact assessment for maintenance operations focused on the most prevalent types of repairs, the main causes necessitating repairs, and the number of individuals used to maintain the road. The thresholds of change for the intensity of an impact are defined as follows:

Impact Intensity	Intensity Definition
Negligible	Maintenance operations would not be affected, or the effects would be at low levels of detection and would not have an appreciable effect on park maintenance.
Minor	The effect would be detectable, but would not have an appreciable effect on maintenance operations. If mitigation were needed, it would be relatively simple and would likely be successful.
Moderate	The effects would be readily apparent and would result in substantial, noticeable effects to maintenance operations on a local scale. Mitigation measures would probably be necessary and would likely be successful.
Major	The effects would be readily apparent and would result in substantial, noticeable effects to maintenance operations on a regional scale. Extensive mitigation measures would be needed, and their success would not be guaranteed.

Impacts to maintenance operations are considered short term if the effects to operations last less than one year. Impacts are considered long term if the effects to operations last longer than one year.

Direct Versus Indirect

The following definitions of direct and indirect impacts are considered:

> *Direct* – an effect that is caused by an action and occurs at the same time and in the same place
>
> *Indirect* – an effect that is caused by an action that is later in time or farther removed in distance, but is still reasonably foreseeable

Cumulative Effects

The Council on Environmental Quality regulations, which implement NEPA, require assessment of cumulative impacts in the decision-making process for federal projects. Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or nonfederal) or person undertakes such other actions (40 CFR 1508.7). Cumulative effects can result from individually minor, but collectively significant, actions taking place over a period of time.

Cumulative impacts are considered for all alternatives and are presented at the end of each impact topic discussion analysis.

Projects that Make Up the Cumulative Impact Scenario

To determine potential cumulative impacts, projects within the area surrounding Lake Mead NRA were identified. Potential projects identified as cumulative actions included any planning or development activity that was completed, that is currently being implemented, or that would be implemented in the reasonably foreseeable future.

These cumulative actions are evaluated in the cumulative impact analysis in conjunction with the impacts of each alternative to determine if they would have any additive effects on a particular natural resource, cultural resource, visitor use and experience, or the socioeconomic environment. Because some of these cumulative actions are in the early planning stages, the evaluation of cumulative effects was based on a general description of the project.

Past Actions

The following past actions could contribute to cumulative effects:

- Rehabilitation of the first 4 miles of Northshore Road and rehabilitation of Lake Mead Boulevard from the intersection of Northshore Road to the recreation area boundary.

- Rehabilitation of Callville Bay Road and southern portions of Northshore Road. This work included resurfacing the road, reconstruction of shoulders, replacement of culverts, and minor realignment.

- Willow Beach – Replaced sewer collection and treatment system with a new system that utilizes septic tanks, a recirculating sand filter, and subsurface disposal.

Current and Future Actions

Current actions and those projected for the future could also contribute to cumulative effects. These include:

- Redevelopment work at Willow Beach and the future modernization of campgrounds potentially eligible for listing on the NRHP in the Cottonwood Cove, Temple Bar, and Katherine Landing developed areas. The Willow Beach developed area would be completely redeveloped, enhancing flood protection and improving visitor services. The planned modernization of potentially NRHP-eligible campgrounds would include improving accessibility and updating features such as comfort stations and camp sites.

- Construction of the River Mountain Loop Trail, which would consist of 17 to 18 miles of trail that would parallel Lakeshore Road. This project is anticipated to begin in the fall of 2006.

- Water and sewer systems rehabilitation in eight developed areas within the recreation area to include replacement of mains, lines, valves, manholes, fire hydrants, and additional water storage.

- Rehabilitation of Northshore Road, mile 1 to 4, and the intersection with Lake Mead Boulevard is ongoing.

- Trailhead and picnic ground construction is planned at Rogers Spring, Blue Point Spring, Redstone, and at the wetlands. These projects would tie into the Northshore Road project area.

- Construction of a new entrance station and realignment of St. Thomas Road are planned for the northern boundary of the recreation area. The realignment of St. Thomas Road and the laying out of new lanes for the entrance station may be accomplished concurrently with or as part of this proposed project.

Population growth and associated land-use changes for the region, recreational development within the Lake Mead NRA, improvements to other Lake Mead NRA road segments, threatened and endangered species protection initiatives and programs, and reduced lake levels could also contribute to cumulative effects. A *General Management Plan* amendment is being prepared to address changes in lake access and associated facilities such as launch ramps as water levels decrease. Changes associated with the amendment would occur primarily below the high-water line for Lake Mead and have negligible impacts to natural and cultural resources as a result.

IMPAIRMENT OF LAKE MEAD NRA RESOURCES OR VALUES

In addition to determining the environmental consequences of the preferred and other alternatives, NPS *Management Policies 2001* and Director's Order − 12 require analysis of potential effects to determine if actions would impair Lake Mead NRA resources.

The fundamental purpose of the national park system, established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values, which is also applied to national recreation areas and national monuments. NPS managers must always seek ways to avoid or minimize, to the greatest degree practicable, adverse impacts on recreation area and monument resources and values. However, the laws do give NPS management discretion to allow impacts to recreation area resources and values when necessary and appropriate to fulfill the purposes of a recreation area, as long as the impact does not constitute impairment of the affected resources and values. Although Congress has given NPS management discretion to allow certain impacts within

national recreation areas, that discretion is limited by statutory requirements that the National Park Service must leave recreation area resources and values unimpaired, unless a particular law directly and specifically provides otherwise. The prohibited impairment is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of recreation area resources or values, including opportunities that otherwise would be present for the enjoyment of those resources or values. An impact to any recreation area resource or value may constitute impairment. However, an impact would more likely constitute an impairment to the extent that it affects a resource or value whose conservation is:

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the recreation area
- key to the natural or cultural integrity of the recreation area or to opportunities for enjoyment of the recreation area
- identified as a goal in the Lake Mead NRA *General Management Plan* or other relevant National Park Service planning documents

Impairment may result from National Park Service activities in managing the recreation area, visitor activities, or activities undertaken by concessioners, contractors, and others operating in the recreation area. In this "Environmental Consequences" section, a determination on impairment is made in the conclusion statement of the appropriate impact topics for each alternative. The National Park Service does not analyze recreational values / visitor experience (unless impacts are resource based), socioeconomic values, health and safety, or recreation area operations for impairment.

ENVIRONMENTAL CONSEQUENCES—ALTERNATIVE A: NO ACTION

Soils

The no-action alternative would result in no change to existing impacts to soils along the Northshore Road segment between milepost 27.5 and 48.0, and the Overton Beach and Echo Bay spur roads because no construction activities would occur. Routine road maintenance activities would continue, but would be carried out within the existing road disturbance template. Soils along Echo Bay spur road from the water tank at the top of the hill, past the ranger station, would continue to receive adverse impacts due to trampling, which could cause soil compaction. Soils in the vicinity of obstructed culverts would be disturbed if the culverts were to be flushed out periodically. New areas would be eroded as floodwaters travel new routes when obstructed culverts prevent discharge of floodwaters. Erosion in these areas could be intensified should flooding overtop the road and equipment be required to clear sediment from the roadway and surrounding areas. There would be short-term, negligible to minor, adverse impacts from trampling. Long-term, negligible to minor, adverse impacts may be realized from heavy equipment compaction, or from erosion of soils under the no-action alternative.

Cumulative Impacts. All of the past, present, and reasonably foreseeable future projects listed above have the potential to affect soils. All of the projects would involve ground-disturbing activities involving equipment excavating and compacting soils in the construction areas. These activities would cause soil compaction and erosion and would have short-term, moderate, adverse impacts. Long-term impacts would be moderate, requiring mitigation measures such as stockpiling and replacement of topsoil, windrowing shoulder material, revegetation, and collection and reestablishment of desert crust surfaces in disturbed areas. These impacts, when combined with the short- and long-term, negligible to minor, adverse impacts of the no-action alternative, would result in short- and long-term, moderate, adverse, cumulative impacts to soils.

Conclusion. Overall impacts to soils under the no-action alternative would be short and long term, negligible to minor, and adverse. The no-action alternative, in conjunction with past, present, and reasonably foreseeable future projects, would result in short- and long-term, moderate, adverse impacts to soils. There would be no impairment to soils under this alternative.

Biotic Communities

The no-action alternative would result in no change to existing impacts along the Northshore Road segment between milepost 27.5 and 48.0, and the Overton Beach and Echo Bay spur roads. Routine maintenance activities would continue, but would be carried out within the existing road disturbance template. Vegetation along Echo Bay spur road from the water tank at the top of the hill, past the ranger station, would continue to receive short- and long-term, negligible to minor, adverse impacts due to trampling, which could affect individual plants. There would be negligible impacts to wildlife under the no-action alternative based on the assumption that future repairs and maintenance to the project area would be within the current project's footprint. Overall impacts to biotic communities under the no-action alternative would be short and long term, negligible to minor, and adverse.

Cumulative Impacts. All of the past, present, and reasonably foreseeable future projects listed above have the potential to affect biotic communities. All of the projects involve ground-disturbing activities that would destroy individual plants (long term, minor to moderate, and adverse), disturb wildlife habitat (long term, minor to moderate, adverse), and likely result in the death of some wildlife via animal-vehicle collisions and other means (long term, minor to moderate, adverse). Mitigation measures such as temporary fencing and covering open trenches to keep wildlife out of construction areas, stockpiling and replacement of topsoil, windrowing of shoulder material, revegetation, and collection and reestablishment of desert crust surfaces in disturbed areas would reduce short- and long-term impacts. The no-action alternative, in combination with the effects of past, present, and reasonably foreseeable future projects, would result in short- and long-term, minor to moderate, adverse impacts to biotic communities.

Conclusion. Impacts to biotic communities under the no-action alternative would be short and long term, negligible to minor, and adverse. The no-action alternative, in combination with the effects of past, present, and reasonably foreseeable future projects, would result in short- and

long-term, minor to moderate, adverse impacts to biotic communities. There would be no impairment to biotic communities under this alternative.

Threatened and Endangered Species and Species of Concern

The continued use of Northshore Road and the Echo Bay and Overton Beach spur roads may result in long-term, minor, adverse impacts to threatened and endangered species and species of concern under the no-action alternative. These adverse impacts could include animal-vehicle collisions in the case of the desert tortoise and relict leopard frog. Continued use of these roads would represent a long-term, minor, adverse impact on the desert tortoise population of the project area.

Cumulative Impacts. All of the past, present, and reasonably foreseeable future projects listed above have the potential to affect threatened and endangered species and species of concern. All of the projects involve ground-disturbing activities that could destroy individual plants such as the bearpoppy and disturb desert tortoise habitat. Mitigation measures including temporary desert tortoise fencing and covering open trenches to keep tortoises out of construction areas would protect individuals and populations. Stockpiling and replacing topsoil, windrowing shoulder material, revegetation, and collecting and reestablishing desert crust surfaces in disturbed areas would reduce impacts to habitat. Detailed mitigation measures are presented in table 1. These impacts, when combined with the long-term, minor, adverse impacts of the no-action alternative, would constitute short- and long-term, minor, adverse, cumulative impacts to threatened and endangered species and species of concern.

Conclusion. The continued use of Northshore Road and the Echo Bay and Overton Beach spur roads, in conjunction with maintenance and repairs to these roads, would result in short- and long-term, minor, adverse impacts to threatened and endangered species and species of concern under the no-action alternative. Cumulative impacts would be short and long term, minor, and adverse. There would be no impairment to threatened or endangered species or species of special concern under this alternative.

Historic Structures

The no-action alternative would not involve new construction. The culverts would continue to be maintained in their current condition. They would continue to be inadequate for handling flood events and would continue to be damaged and lost to erosion. Other features of the Overton-Lake Mead Road would also continue to deteriorate, including ditches, headwalls, gutters, and diversion dikes. Current periodic maintenance and rehabilitation of these features would not protect them in perpetuity. Therefore, there would be long-term, minor, adverse impacts to the Overton-Lake Mead Road due to natural forces and inadequate design of the historic features.

Cumulative Impacts. Various past, present, and reasonably foreseeable future projects, particularly the replacement of water distribution systems and sewer collection systems parkwide and the construction of the River Mountain Loop Trail, have the potential to affect historic structures. The impacts of these projects stem from construction activities, structural

repairs, and some limited modifications of historic resources. Maintenance and repair activities and the inadequate design of the historic features could result in further degradation of these features over time, especially during flood events. These impacts, when combined with the long-term, minor, adverse impacts of the no-action alternative, would result in long-term, minor, adverse, cumulative effects to historic structures.

Conclusion. No action would be taken in this alternative and the culverts and other features of the Overton-Lake Mead portion of Northshore Road would be maintained in their current condition and be subject to continued long-term deterioration. Therefore, there would be long-term, minor, adverse impacts to historic structures from implementing the no-action alternative. Cumulative impacts would also be long-term, minor, and adverse. There would be no impairment to historic structures under this alternative.

Floodplains

With the no-action alternative, there would continue to be the potential for the desert washes crossed by Northshore Road to aggrade above the current improperly sized culverts, and to suffer incision or downcutting downstream of the culverts. Northshore Road would continue to be vulnerable to washouts. These impacts would be long term, localized, moderate, and adverse.

Cumulative Impacts. Past, present, and reasonably foreseeable future projects listed above may have the potential to affect floodplains when the construction work is conducted within or in close proximity to desert washes, or along the shoreline of Lake Mead. The work on Callville Bay Road and on the southern portions of Northshore Road is planned to involve work with culverts in washes. This could cause disturbance to sediments, increasing the potential for sedimentation in the washes. The Willow Beach redevelopment project would occur in close proximity to Lake Mead's shoreline, thus potentially causing sedimentation to the lake. These cumulative projects would have a short-term, negligible to minor, adverse impact on floodplains. These cumulative impacts should be limited to the construction phase. The no-action alternative, in combination with the effects of past, present, and reasonably foreseeable future projects, would result in long-term, moderate, adverse effects to floodplains.

Conclusion. Impacts to floodplains would be long term, moderate, and adverse. The no-action alternative, in combination with the effects of past, present, and reasonably foreseeable future projects, would result in long-term, moderate, adverse effects to floodplains. There would be no impairment to floodplains under this alternative.

Water Quality

With the no-action alternative, no change to impacts relative to water quality would result. Eroding road shoulders and cut-and-fill slopes within the project area would continue to have localized effects on water quality as a result of sedimentation and deposition of debris into washes, resulting in a long-term, negligible to minor, adverse effect.

Cumulative Impacts. All of the past, present, and reasonably foreseeable future projects listed above have the potential to affect water quality. All of the projects would involve ground-disturbing activities that would leave soils susceptible to erosion of particulate matter that would impact water quality. The work on Callville Bay Road and on the southern portions of Northshore Road are planned to involve work with culverts in washes. This could cause disturbance to sediments, increasing the potential for sedimentation in the washes. The Willow Beach redevelopment project will occur in close proximity to Lake Mead's shoreline, thus potentially causing sedimentation to the lake. These cumulative projects would have short-term, negligible to minor, adverse impacts on water quality. These cumulative impacts should be limited to the construction phase. Mitigation measures such as silt fences, revegetation, and reestablishment of desert crust surfaces would reduce the level of adverse impacts. The no-action alternative, in combination with the effects of past, present, and reasonably foreseeable future projects, would result in short- and long-term, negligible to minor, adverse effects to water quality.

Conclusion. Impacts to water quality would be long term, negligible to minor, and adverse. The no-action alternative, in combination with the effects of past, present, and reasonably foreseeable future projects, would result in short- and long-term, negligible to minor, adverse effects to water quality. There would be no impairment to water quality under this alternative.

Visitor Use and Experience

The existing 22- to 24-foot-wide Northshore Road section has relatively narrow travel lanes and shoulders, making it difficult for drivers to pass slower vehicles, particularly those towing trailers. Because the road shoulders are narrow, slower vehicles attempting to stay to the right to allow faster vehicles to pass contribute to raveling pavement edges. In places, road alignment and geometry are poor. Intersections where other roads meet Northshore Road (such as the Echo Bay and Overton Beach spur roads) are poorly designed, having short sight distances.

The no-action alternative would leave the roads in their present condition, with tight curves, narrow lanes, and gravel shoulders. There would be no change in parking areas or intersections. Although it is not anticipated that road conditions would affect visitation numbers, the experience of driving a narrow road while towing a trailer could cause frustration and anxiety to motorists. Despite routine maintenance that would continue to take place under the no-action alternative, the overall condition of this segment of Northshore Road and the Echo Bay and Overton Beach spur roads would deteriorate over time, adversely impacting visitor use and experience. These conditions would constitute long-term, minor, adverse impacts to visitor use and experience.

Cumulative Impacts. All of the past, present, and reasonably foreseeable future projects listed above have the potential to affect visitor use and experience. Construction work on other sections of Northshore Road and Las Vegas Boulevard would result in traffic delays. Rehabilitation of water and sewer systems, redevelopment work at Willow Beach, and modernization of campgrounds would all be projects carried out in current visitor-use areas that may result in temporary closures and unavailability of some amenities. Construction of River Mountain Loop Trail would likely have the least effect on visitor use and experience because the trail parallels Lakeshore Road where visitors are driving their vehicles. The

cumulative projects would have a short-term, minor to moderate, adverse impact on visitor use and experience as visitors may be inconvenienced during the construction period. However, long-term, moderate, beneficial impacts to visitor use and experience would be expected on completion of improvements. The no-action alternative, in combination with the effects of past, present, and reasonably foreseeable future projects, would result in short-term, minor to moderate, adverse impacts, and long-term, minor, beneficial impacts to visitor use and experience.

Conclusion. Impacts to visitor use and experience under the no-action alternative would be long term, minor, and adverse. The no-action alternative, in combination with the effects of past, present, and reasonably foreseeable future projects, would result in short-term, minor to moderate, adverse impacts, and long-term, minor, beneficial impacts to visitor use and experience.

Air Quality

Continued maintenance of and repair to Northshore Road and the Echo Bay and Overton Beach spur roads would continue to result in short- and long-term, minor, adverse impacts to air quality under the no-action alternative.

Cumulative Impacts. All of the past, present, and reasonably foreseeable future projects listed above have the potential to affect air quality. All of the projects would involve ground-disturbing activities with the potential to release particles into the air, affecting air quality. Mitigation measures, such as water sprinkling or a palliative, would help settle the dust and reduce impacts to air quality. These impacts, when combined with the short- and long-term, minor, adverse impacts of the no-action alternative, would result in short- and long-term, minor, adverse, cumulative impacts to air quality.

Conclusion. Continued maintenance of and repair to Northshore Road and the Echo Bay and Overton Beach spur roads would result in short- and long-term, minor, adverse impacts to air quality under the no-action alternative. Cumulative impacts would be short and long term, minor, and adverse. There would be no impairment to air quality under this alternative.

Health and Safety

The no-action alternative would leave the road in its present condition with tight curves, narrow lanes, and gravel shoulders. There would be no change to health and safety impacts from implementing the no-action alternative. However, the existing condition of the road, including narrow width and tight curves, constitutes a long-term, moderate, adverse impact on health and safety. The results of a 1995 traffic safety program review (Robert Peccia and Associates, Inc. 1995) documented 640 accidents within Lake Mead NRA in a four-year period (1990–1993), including 8 fatalities and 266 injuries. There were a total of 54 accidents on Northshore Road between Callville Bay Road and Echo Bay Road, including two fatalities. There were an additional 17 accidents on Northshore Road between Echo Bay Road and the north NRA boundary. Fourteen accidents occurred on the Echo Bay access road. Primary accident characteristics were listed as inadequate light conditions, animal-vehicle collisions,

road conditions (wet roads), and collisions with fixed objects such as guardrails, poles, signs, drainage structures, and ditches.

Cumulative Impacts. Several of the past, present, and reasonably foreseeable future projects listed above have the potential to affect health and safety. Construction work on other segments of Northshore Road would widen travel lanes and improve safety for those traveling the road. Rehabilitation of water and sewer systems would eliminate breaks and reduce the likelihood of contamination of potable water or exposure of the public and NRA employees to raw sewage. Redevelopment work at Willow Beach would include enhancement of flood protection and improving visitor safety in that area. The cumulative projects would have short-term, negligible to minor, adverse impacts, and long-term, moderate, beneficial impacts to health and safety. The no-action alternative, in combination with the effects of past, present, and reasonably foreseeable future projects, would result in short-term, negligible to minor, adverse, and long-term, negligible, adverse impacts to health and safety.

Conclusion. Impacts to health and safety from the no-action alternative would be long term, moderate, and adverse. The no-action alternative, in combination with the effects of past, present, and reasonably foreseeable future projects, would result in short-term, negligible to minor, adverse, and long-term, negligible, adverse impacts to health and safety.

Maintenance Operations

The no-action alternative could gradually change the current level of impacts on maintenance operations for Northshore Road and the spur roads. These impacts would be the result of incremental deterioration of the road surfaces and associated structures, including culvert integrity. Maintenance is likely to increase for the project area over time. The specific rate of increase in maintenance required has not been determined at this time. Impact intensity for the no-action alternative would be judged to be long term, minor to moderate, and adverse.

Cumulative Impacts. Road rehabilitation projects on portions of Northshore Road and Callville Bay Road provide negligible effects to park operations because even with rehabilitation, the roads require comparable maintenance in these areas. However, the replacement of water distribution systems and sewer collection systems parkwide benefits park operations because replacement of deteriorated components and elimination of water leaks results in less time and money spent in maintaining the system. The beneficial effect is long term and moderate. These impacts, when combined with the long-term, minor to moderate, adverse impacts of the preferred alternative, would result in long-term, minor, adverse, cumulative impacts to park operations.

Conclusion. Impacts to recreation area maintenance operations from the no-action alternative would be long term, minor to moderate, and adverse. The no-action alternative, in combination with past, present, and reasonably foreseeable future actions, would result in long-term, minor, adverse impacts to maintenance operations.

ENVIRONMENTAL CONSEQUENCES—ALTERNATIVE B: PREFERRED ALTERNATIVE

Soils

Soils of the project corridor consist of sand and gravel stabilized by desert pavement, eolian sands, and fine-grained, gypsiferous clays. Trampling and soil compaction by equipment and workers within the construction zone is expected. Soils occupying much of the construction zone have been previously disturbed by road-related activities. In addition to work in the existing roadbed, 19 acres of previously undisturbed land would be disturbed, primarily due to road realignments. A breakdown of this total for soil disturbance is estimated as follows: Echo Wash − 2.5 acres, Las Vegas Wash − 1.5 acres, Valley of Fire Wash − 9.0 acres, St. Thomas Road − 1.0 acre, Overton intersection − 4.0 acres, and miscellaneous curve widening − 1.0 acre. Local soil compaction would temporarily decrease permeability, alter soil moisture content, and diminish the water storage capacity of these generally xeric soils. Surface disturbance to desert soils would also increase susceptibility to erosion during precipitation events. Mitigation measures such as stockpiling topsoil from project areas and using them to revegetate and reestablish desert crusts, and revegetation would reduce the level of impacts to soils. Detailed mitigation measures are presented in table 1. Because the 19 acres of new disturbance would take place at several locations along the 19-mile segment of Northshore Road, and because the total of 19 acres represents a small fraction of the approximately 1.5 million acres of Lake Mead NRA, the effects in each location can be defined as relatively small and localized. Therefore, construction activities associated with the preferred alternative would have short- and long-term, minor, adverse impacts on desert soils.

Cumulative Impacts. All of the past, present, and reasonably foreseeable future projects listed above have the potential to affect soils. All of the projects would involve ground-disturbing activities involving equipment excavating and compacting soils in the construction areas. These activities would cause soil compaction and erosion and would have short-term, minor, adverse impacts. Long-term impacts would be negligible with mitigation measures such as windrowing shoulder materials, and replacing topsoil, revegetation, and collecting and reestablishing desert crust surfaces in disturbed areas. The cumulative projects would have short-term, minor to moderate, adverse impacts, and long-term, negligible to minor, adverse impacts on soils. The preferred alternative, in combination with the effects of past, present, and reasonably foreseeable future projects, would result in short-term, moderate, and long-term, minor, adverse impacts to soils.

Conclusion. Impacts to soils from the proposed action would be short and long term, minor, and adverse. The preferred alternative, in combination with the effects of past, present, and reasonably foreseeable future projects, would result in short-term, moderate, and long-term, minor, adverse impacts to soils. There would be no impairment to the soils resource under this alternative.

Biotic Communities

Aspects of this project with the potential to impact biotic communities include realignment of some roadway sections, repair and replacement of culverts, lengthening and widening of turnouts, creation of new turnouts, and bridge and sidewalk construction. Generally, rehabilitation activities such as asphalt removal, sub-excavation of bed material, placement of new bed material, paving the road surface and shoulders, paving the turnouts and adding concrete curbs and gutters would disturb currently paved or graveled surface areas that do not support vegetation and are of no habitat value to wildlife.

Several measures would be taken to mitigate impacts, including equipment staging and material storage in previously disturbed areas, defining construction zones and construction perimeters in the field, saving and storing desert soil (and the soil seed bank) for restoration/revegetation of disturbed areas, and minimizing the spread of invasive species, including Asian mustard (*Brassica tournefortii*) and cheatgrass (*Anisantha tectorum*), to the greatest extent possible. Refer to the "Mitigation Measures of the Preferred alternative" section of the alternatives chapter for a detailed discussion. As a result of implementing this alternative and the mitigation measures discussed, short- and long-term, negligible to minor, adverse impacts on plant communities would be expected.

During construction, some wildlife (particularly small mammals, reptiles, and insects) would be temporarily displaced. Some individuals would be killed outright or would be dispersed outside the construction limits and be susceptible to predation or competitive stress. This displacement would result in a slight population depression adjacent to the corridor, but following project completion and successful restoration, wildlife would again reoccupy restored portions of the project area. It is likely that certain larger species, such as the desert bighorn sheep and golden eagle, would avoid the road corridor during construction. Other large species (i.e., coyote and common raven) may be more visible as prey species are flushed or uncovered during ground disturbance or are made available as carrion. Implementing this alternative is expected to have short-term (duration of the project and revegetation/habitat restoration), negligible to minor, adverse impacts on wildlife.

Cumulative Impacts. All of the past, present, and reasonably foreseeable future projects listed above have the potential to affect biotic communities. All of the projects involve ground-disturbing activities that would destroy individual plants, disturb wildlife habitat, may result in the death of some wildlife, and would be measurable. Mitigation measures such as temporary fencing and covering open trenches to keep wildlife out of construction areas, stockpiling and replacing topsoil, windrowing shoulder materials, revegetation, and collection and reestablishment of desert crust surfaces in disturbed areas would reduce short- and long-term impacts. The cumulative projects would have short- and long-term, minor to moderate, adverse impacts to biotic communities. The preferred alternative, in combination with the effects of past, present, and reasonably foreseeable future projects, would result in short- and long-term, moderate, adverse impacts to biotic communities.

Conclusion. Impacts to biotic communities from the proposed action would be short and long term, negligible to minor, and adverse. The preferred alternative, in combination with the effects of past, present, and reasonably foreseeable future projects, would result in short- and

long-term, moderate, adverse impacts to biotic communities. There would be no impairment to biotic communities under this alternative.

Threatened and Endangered Species and Species of Concern

Desert Tortoise

The proposed actions would result in disturbance of a *total* of approximately 19 previously undisturbed acres of upland habitat. Desert tortoise density varies throughout the recreation area, ranging from zero to as high as 100 individuals per square mile (Boyles 1998). Surveys of the Northshore area of Lake Mead NRA during the period from 1995 through 1997 indicated higher densities of the desert tortoise than in most other areas of Lake Mead NRA (Boyles 1998). The proposed project corridor is not within or adjacent to the boundaries of a designated critical habitat for the desert tortoise.

Construction projects in high-density desert tortoise habitat do have the potential to impact individual desert tortoises. Desert tortoises could be crushed or entombed in their burrows by earth-moving equipment. Project vehicles and equipment could move into areas outside the project areas, destroying habitat, or killing or injuring desert tortoises. The potential for such incidents to occur would be minimized through implementation of the conservation measures described in table 1. Project areas would be clearly flagged and activity beyond flagged boundaries prohibited. Clearance surveys and monitoring for desert tortoises would be conducted according to USFWS and Desert Tortoise Council guidelines. All project personnel would be educated about the biology, legal status, and conservation measures essential for desert tortoises.

Potential effects could include impacts to food resources through introduction of nonnative/invasive plant species, and continued use of the roads. Activities of the proposed project are not anticipated to measurably impact food resources for desert tortoises due to their proximity to the preexisting road. Monitoring and controlling any attempted establishment by undesirable plant species would further reduce the potential for any impact to desert tortoise food resources. The proposed activities are not anticipated to increase visitor numbers that could result in greater human disturbance of individuals or their habitat. Because the rehabilitated road would bring most of Northshore Road up to a uniform design speed of 50 mph (80 km/h), the proposed project is anticipated to result in a slight increase of these impacts above those currently experienced.

The potential short-term and long-term, minor, adverse impacts to desert tortoises and their habitat from the preferred alternative would be reduced to a negligible level by implementation of the mitigation measures previously described.

Critical Habitat. No designated critical habitat for the desert tortoise would be impacted by the proposed action.

Razorback Sucker

Neither past road construction activities or current levels of existing road use at Lake Mead have been documented to affect razorback sucker populations. Recent, intensive monitoring of the spawning areas used by this species indicates that razorback sucker use has remained consistent over several years. Spawning, during which these areas receive the highest concentration of use by individual razorback suckers, is during the decreased visitor-use periods; reducing the overall impact of human disturbance during this critical period. During the non-spawning period, razorback suckers in Lake Mead are more dispersed along the western shorelines, away from the marinas (USFWS 2002).

The proposed project is not anticipated to result in increased or otherwise changed recreational and commercial use of marina areas. The proposed project would have minimal potential to increase sediment reaching the lake waters. Diligent use of appropriate erosion barriers and controls, along with measures to minimize suspension of fugitive dust plumes during construction activities and appropriate timing of activities in desert washes, would ameliorate this potential. As such, the potential for short-term or long-term, adverse impacts due to increased levels of sediment reaching the lake waters is minor.

Critical Habitat. Designated critical habitat for the razorback sucker occurs in both Lake Mead and Lake Mohave and includes the 100-year floodplain of the Colorado River. Four of the desert washes in which construction activities would occur are mapped within the 100-year floodplain (FEMA 2005). Razorback suckers cannot occupy these washes at any time other than a 100-year flood event, which is unlikely during the proposed project, given past modifications to the hydrology of the Colorado River system. However, disturbances in these washes have a higher potential to result in increased sediments reaching the lake waters. Conservation measures to preserve air and water quality would reduce the potential for any increased sedimentation due to the project. Finally, project-related activities in these washes are designed to maintain their natural condition and function. Therefore, the resulting potential for adverse impacts to critical habitat for the razorback sucker is considered negligible.

Relict Leopard Frog

The current existence or viability of relict leopard frogs in the Rogers Spring and Blue Point Spring areas is unknown. Best available data for these populations are based on work completed in 2001 (Bradford et al. 2004). At that time, the estimated total number of adult relict leopard frogs in the Overton Arm of Lake Mead NRA was approximately 330 adults; a likely overestimate, skewed by the relatively high concentration of adult relict leopard frogs in the Blue Point Spring area (Bradford et al. 2004). Recent extinctions of other small populations of relict leopard frogs indicate that periodic disturbance of the habitat to prevent encroachment by emergent vegetation into the open water habitats is needed. Adequate water quality (although specific requirements/limits are currently unknown) and an absence of predatory species (e.g., American bullfrog, predatory game fishes) are also prerequisites for continued existence of the few remaining small, isolated populations of this species. Although not tested to date, the genetic diversity of these small populations is likely diminished. This, combined

with low numbers and high geographic isolation, suggests that the survivability of this species is questionable.

The potential for short-term and long-term, adverse impacts to this species would be minimized to the extent practicable through the conservation measures previously described for protection of air and water quality, and prevention of invasive species establishment. Given the lack of information on the specific habitat requirements for this species, the potential still exists that the proposed project would have some adverse impacts on the species. Beneficial impacts are anticipated from redesign of the parking areas associated with the two springs. Surface drainage would be redirected away from relict leopard frog habitat at Blue Spring. At Roger's Spring, parking area design would include the use of settlement basins to trap potential contaminants before they reach frog habitat.

Critical Habitat. No critical habitat for the relict leopard frog has been designated.

In summary, the determination of effect on the desert tortoise and relict leopard frog for the proposed action at Lake Mead NRA is "*may affect, likely to adversely affect,*" which equates to short- and long-term, minor, adverse impacts. The determination of effect for the razorback sucker and its designated critical habitat is "*may affect, not likely to adversely affect,"* which equates to short- and long-term, negligible, adverse impacts.

Las Vegas Bearpoppy

In addition to work in the existing roadbed, 19 acres of previously undisturbed land would be disturbed, primarily due to road realignments. A breakdown of this total for soil disturbance is estimated as follows: Echo Wash – 2.5 acres, Las Vegas Wash – 1.5 acres, Valley of Fire Wash – 9.0 acres, St. Thomas Road – 1.0 acre, Overton intersection – 4.0 acres, and miscellaneous curve widening – 1.0 acre. Some portion of these soils may be gypsiferous, and thus offer adequate habitat for the Las Vegas bearpoppy (Special Status Species in Nevada). There would be short term, minor and adverse impact to the Las Vegas bearpoppy population, as a result of any construction disturbance in gypsiferous soils. Implementation of the preferred alternative could result in local soil compaction, a temporary decrease in permeability, alteration of soil moisture content, and diminishment of the water storage capacity of these generally xeric soils. Surface disturbance to desert soils would also increase susceptibility to erosion during precipitation events.

The primary means of preserving Las Vegas bearpoppy would be through the salvage and replacement of desert soil to preserve seeds that may be present in the gypsiferous soil seed bank. This will result in relatively rapid replacement of those individual plants lost in the construction process, thus maintaining overall population levels in the NRA in the long term.

Cumulative Impacts. All of the past, present, and reasonably foreseeable future projects listed above have the potential to affect threatened and endangered species and species of concern. All of the projects involve ground-disturbing activities that could destroy individual plants such as the bearpoppy, and disturb desert tortoise habitat. Mitigation measures, including temporary desert tortoise fencing and covering open trenches to keep tortoises out of construction areas, would protect individuals and populations. Stockpiling and replacing

topsoil, windrowing shoulder materials, revegetation, and collecting and reestablishing desert crust surfaces in disturbed areas would reduce impacts to habitat. The cumulative projects would have short- and long-term, minor, adverse impacts to threatened and endangered species and species of concern. The preferred alternative, in combination with the effects of past, present, and reasonably foreseeable future projects, would result in short- and long-term, minor, adverse impacts to threatened and endangered species and species of concern.

Conclusion. Impacts to threatened and endangered species and species of concern resulting from the proposed action would be short and long term, negligible to minor, and adverse. The preferred alternative, in combination with the effects of past, present, and reasonably foreseeable future projects, would result in short- and long-term, minor to moderate, adverse impacts to threatened and endangered species and species of concern. There would be no impairment to threatened or endangered species or species of special concern under this alternative.

Historic Structures

Segments of the Overton-Lake Mead Road would be widened and realigned, but the overall layout of the road would remain essentially the same. Changes that would occur would constitute a long-term, minor, adverse impact to the Overton-Lake Mead Road.

The majority of the historic headwalls (70) and culverts in the project area would not be affected by the preferred alternative. Some headwalls (48) and culverts would be affected by activities such as cleaning, re-grading, and scour protection. Such activities would improve culvert performance, reduce the risk of damage from flood events, and protect the integrity of the structures. Therefore, this activity would result in a long-term, minor, beneficial effect to these culverts and headwalls.

Twenty culverts would be replaced in the proposed alternative because they do not have enough hydraulic capacity to function adequately. The existing metal pipes would be replaced by metal or concrete pipes. One culvert would be impacted on its inlet side because of its proximity to the existing and future edge of the pavement. Fifteen headwalls would be replaced because they are either in poor condition or would not accommodate new culverts. All headwall replacement would be designed to be compatible with the current design and materials as much as possible. Also, a number of headwalls would be repaired. Existing headwall stones would be salvaged and used in the replacement and repair of headwalls when practicable. The replacement of the culverts and headwalls would constitute a long-term, moderate, adverse impact to historic structures.

Gutters, diversion dikes, and ditches associated with the culverts would be regraded and scour protection would be added. In some locations, where these features are considered inadequate, they would be reconstructed. The widening of the road would bring the road edge out to the intact low-water crossing where there are two historic parallel walls constructed of sandstone blocks and concrete mortar, potentially indirectly causing damage to the crossing through sedimentation or debris from the road and potentially modifying drainage patterns. These activities would constitute a long-term, minor, beneficial effect from scouring and

regarding; a minor adverse effect from road widening at the low-water crossing; and a long-term, moderate, adverse effect due to ditch reconstruction.

The 13 survey control monuments would not be affected under alternative B.

Cumulative Impacts. Various past, present, and reasonably foreseeable future projects, particularly the replacement of water distribution systems and sewer collection systems parkwide and the construction of the River Mountain Loop Trail, have the potential to affect historic structures. The impacts of these projects stem from construction activities, structural repairs, and some limited modifications of historic resources. These impacts, when combined with the long-term, minor to moderate, adverse impacts, and long-term, minor, beneficial effects of the preferred alternative, would result in long-term, minor, adverse, cumulative effects to historic structures.

Conclusion. There would be both beneficial and adverse impacts to historic structures under the proposed action. There would be a long-term, minor, adverse impact to the Overton-Lake Mead Road. Specific structures associated with the road would be affected differently. Cleaning, re-grading, scour protection, and scouring activities would result in long-term, minor, beneficial effects. The replacement of the culverts and headwalls would constitute a long-term, moderate, adverse impact. There would be a long-term, minor, adverse effect from road widening at the low-water crossing, and a long-term, moderate, adverse effect due to ditch reconstruction. Cumulative impacts would be long term, minor, and adverse. There would be no impairment to historic structures under this alternative.

Floodplains

The rehabilitated Northshore Road, Echo Bay spur road, and Overton Beach spur road all intersect washes at several locations. In most cases, new or repaired culverts would allow water to flow under the roads within the washes during precipitation events, resulting in runoff, but the form and flow dynamics of the channel would be altered by the fill material. Assuming correct installation and sizing of the culverts, there would be no continuing adverse impacts to the floodplain. In the case of Valley of Fire Wash, a bridge would replace the existing culverts to accommodate 100-year flood events. In the short term, there would be minor, increased, localized erosion (particularly along desert wash margins), and sedimentation—a short-term, minor, adverse impact. A floodplains statement of findings and floodplain maps for the project area are included as appendix E of this environmental assessment.

Cumulative Impacts. All of the past, present, and reasonably foreseeable future projects listed above have the potential to affect floodplains. The cumulative projects would have short-term, minor, adverse impacts on floodplains. The preferred alternative, in combination with the effects of past, present, and reasonably foreseeable future projects, would result in short-term, minor to moderate, adverse impacts on floodplains.

Conclusion. Impacts to floodplains from the proposed action would be short term, minor, and adverse. Cumulative impacts would be short term, minor to moderate, and adverse. There would be no impairment to floodplains under this alternative.

Water Quality

Erosion and sedimentation are the most important processes related to water quality impacts of the proposed road rehabilitation project. Erosion occurs when sediment (i.e., soil particles, gravel, small rocks, etc.) is picked up and carried by moving water during and immediately following precipitation events. Depending on the amount of water present, the sediment carried by runoff and floodwaters would eventually be deposited farther along the desert wash, or may be carried all the way to Lake Mead. In these arid environs, some degree of erosion and sedimentation is normal, but the amount increases and the process accelerates when desert soils are loosened or otherwise disturbed due to construction activities, and recreational activities such as illegal off-road driving. Minor sedimentation also results from eolian action, when wind transports dust and sand to waterways or directly into receiving water bodies such as Lake Mead.

The project corridor would be most vulnerable to sedimentation and erosion during construction due to exposure to natural elements of cut slopes, topsoil, fill material, and disturbed and compacted surfaces. Following construction, road surfaces would be paved and slopes and fill stabilized.

Using best management practices for controlling non-point source pollution during construction would control sedimentation and erosion during small storm events. Should a major precipitation event occur during construction, however, sediment could be carried to Lake Mead and contribute to water turbidity (cloudiness) in the lake. Turbidity, if severe, can reduce light penetration, visibility, and dissolved oxygen levels, affect aquatic organisms, and reduce the ability of predatory fish and birds to see prey, and can fill reservoirs and block water intakes. The waters would also be less appealing for recreation. Depending on the extent to which storm events occur during road construction, short-term, negligible to minor, adverse impacts on water quality from increased erosion, sedimentation, and turbidity would result.

Under the proposed action, there would be no change in the road culvert or flow from Rogers Spring to avoid potential adverse effects to the water quality of the spring.

Cumulative Impacts. All of the past, present, and reasonably foreseeable future projects listed above have the potential to affect water quality. All of the projects would involve ground-disturbing activities that would leave soils susceptible to erosion of particulate matter that would impact water quality. Mitigation measures such as silt fences, revegetation, and reestablishment of desert crust surfaces would reduce the level of adverse impacts. The cumulative projects would have short-term, negligible to minor, adverse impacts on water quality. The preferred alternative, in combination with the effects of past, present, and reasonably foreseeable future projects, would result in short-term, negligible to minor, adverse impacts on water quality.

Conclusion. Impacts to water quality from the proposed action would be short term, negligible to minor, and adverse. The preferred alternative, in combination with the effects of past, present, and reasonably foreseeable future projects, would result in short-term, negligible to

minor, adverse impacts on water quality. There would be no impairment to water quality under this alternative.

Visitor Use and Experience

During construction work on Northshore Road, Echo Bay spur road, and Overton Beach spur road, visitors would experience up to 15-minute delays along the roadway, partial closure of some parking areas, and a reduced number of turnouts due to rehabilitation work. Mitigation measures would be specified in the construction contract that work would cease from one day before a holiday weekend through one day after the weekend, except for work that would not impact visitor ingress/egress to recreation facilities; and there would be no work on the weekends. These measures would reduce impacts during visitor high-use periods. Short-term impacts would be minor and adverse in nature because construction would take place during decreased visitation periods. If the project extends into peak season or into weekends or holidays, the impacts would be short term, moderate, and adverse. This moderate intensity level is based on the potential for readily apparent changes to visitor use and experience. Visitors would be aware of the effects associated with the alternative, and they might express an opinion about these changes.

Upon completion of the preferred alternative, increased sight distances and wider travel lanes would improve driving conditions. Existing turnouts would be lengthened and widened, the number of turnouts along Northshore Road would be increased by one, and sight distances would be increased. Although it is not anticipated that the improved road condition would have any impact on visitation numbers, there would be a long-term, minor, beneficial impact to visitor use and experience.

Cumulative Impacts. All of the past, present, and reasonably foreseeable future projects listed above have the potential to affect visitor use and experience. Construction work on other sections of Northshore Road and Las Vegas Boulevard would result in traffic delays. Rehabilitation of water and sewer systems, redevelopment work at Willow Beach, and modernization of campgrounds would all be carried out in current visitor-use areas that may result in temporary closures and unavailability of some amenities. Construction of River Mountain Loop Trail would likely have the least effect on visitor use and experience because the trail parallels Northshore Road where visitors are driving their vehicles. The cumulative projects would have short-term, minor to moderate, adverse impacts, and long-term, moderate, beneficial impacts. The preferred alternative, in combination with the effects of past, present, and reasonably foreseeable future projects, would result in short-term, moderate, adverse impacts, and long-term, minor, beneficial impacts.

Conclusion. Impacts to visitor use and experience from the proposed action would be short term, minor to moderate, and adverse, and long term, moderate, and beneficial. The preferred alternative, in combination with the effects of past, present, and reasonably foreseeable future projects, would result in short-term, moderate, adverse impacts, and long-term, moderate, beneficial impacts.

Air Quality

The preferred alternative would temporarily affect local air quality through increased dust and vehicle emissions. Hydrocarbons, nitrous oxide, and sulfur dioxide emissions would be largely dispersed by prevailing winds in the project area. Dust stirred up by construction equipment would increase airborne particulates intermittently, but this phenomenon is not expected to be appreciable. Mitigating measures such as water sprinkling to reduce dust, and limiting idling of construction equipment would be used, as appropriate, to mitigate effects. Impacts from dust and construction equipment emissions would be localized, short term, minor, and adverse.

Cumulative Impacts. All of the past, present, and reasonably foreseeable future projects listed above have the potential to affect air quality. All of the projects would involve ground-disturbing activities with the potential to disburse particles into the air, affecting air quality. Mitigation measures, such as water sprinkling or a palliative, would settle the dust and reduce impacts to air quality. The cumulative projects would have short-term, minor, adverse impacts on air quality. The preferred alternative, in combination with the effects of past, present, and reasonably foreseeable future projects, would result in short-term, minor to moderate, adverse impacts to air quality.

Conclusion. Impacts to air quality from the proposed action would be localized, short term, minor, and adverse. The preferred alternative, in combination with the effects of past, present, and reasonably foreseeable future projects, would result in short-term, minor to moderate, adverse impacts to air quality. There would be no impairment to air quality under this alternative.

Health and Safety

During the rehabilitation of Northshore Road, vehicle speeds would be reduced in construction zones, resulting in fewer and less severe accidents. This would result in a short-term, negligible, beneficial effect to health and safety.

Upon completion of the preferred alternative, increased sight distances and wider travel lanes on Northshore Road would improve driving conditions. Drivers would be able to anticipate road conditions and would be less likely to allow their vehicle to drop off the road edge, thereby maintaining control of their vehicle and reducing accidents. Intersection improvements, such as lengthening turn lanes and increasing the length of roadside turnouts, would reduce the accident potential. A 1995 traffic safety study found that similar project work on the southern portions of Northshore Road resulted in a 68% reduction in the number of accidents. The paving of road shoulders, as well as adding rumble strips, is believed to be the primary reason for the reduced accident rate. The road improvements would have a long-term, moderately beneficial effect to health and safety.

Cumulative Impacts. All of the past, present, and reasonably foreseeable future projects listed above have the potential to affect health and safety. Construction work on other segments of Northshore Road would widen travel lanes and improve safety for those traveling the road. Rehabilitation of water and sewer systems would eliminate breaks and reduce the likelihood of

contamination of potable water or exposure of the public and employees to raw sewage. Redevelopment work at Willow Beach would include enhancement of flood protection, improving the safety for visitors in that area. The cumulative projects would have short-term, negligible to minor, adverse impacts, and long-term, minor to moderate, beneficial impacts. The preferred alternative, in combination with the effects of past, present, and reasonably foreseeable future projects, would result in short-term, minor, adverse impacts, and long-term, moderate, beneficial impacts to health and safety.

Conclusion. Impacts to health and safety from the proposed action would be negligible and beneficial in the short term, and moderately beneficial in the long term. The preferred alternative, in combination with the effects of past, present, and reasonably foreseeable future projects, would result in short-term, minor, adverse impacts, and long-term, moderate, beneficial impacts to health and safety.

Maintenance Operations

There would be beneficial, long-term, minor to moderate impacts to recreation area maintenance operations under the preferred alternative. Maintenance crews would spend less time along Northshore Road and the spur roads making repairs and doing other routine maintenance. This would allow time to attend to other areas of the NRA that may require maintenance. In addition, fewer traffic accidents would occur as a result of this alternative; thus, there would be less time spent responding to or repairing the damage resulting from these accidents. These are all long-term beneficial impacts to recreation area maintenance operations.

Cumulative Impacts. Other past, present, and reasonably foreseeable future projects, in addition to this project, would result in long-term, minor to moderate, beneficial, cumulative impacts. Road rehabilitation projects on portions of Northshore Road and Callville Bay Road provide negligible effects to park operations because, even with rehabilitation, the roads require comparable maintenance in these areas. However, the replacement of water distribution systems and sewer collection systems parkwide benefits park operations because replacement of deteriorated components and elimination of water leaks results in less time and money spent in maintaining the system. The beneficial effect is long term and moderate. These impacts, when combined with the long-term, minor to moderate, beneficial impacts of the preferred alternative, would result in long-term, minor to moderate, beneficial, cumulative impacts to park operations.

Conclusion. There would be long-term, minor to moderate, beneficial impacts to recreation area operations under the preferred alternative because less time would be required along the road due to improved maintenance. Cumulative impacts would be long-term, minor to moderate, and beneficial.

CONSULTATION AND COORDINATION

SCOPING

Scoping is the effort to involve agencies and the general public in determining the scope of issues to be addressed in an environmental document. Among other tasks, scoping determines important issues and eliminates issues not important; allocates assignments among the interdisciplinary team members and/or other participating agencies; identifies related projects and associated documents; identifies other permits, surveys, consultations, etc., required by other agencies; and creates a schedule that allows adequate time to prepare and distribute the environmental document for public review and comment before a final decision is made. Scoping includes any interested agency or any agency with jurisdiction by law or expertise to obtain early input.

Staff of Lake Mead NRA, the Federal Highway Administration, and resource professionals of the National Park Service-Denver Service Center and Pacific West Region, conducted internal scoping. This interdisciplinary process defined the purpose and need, identified potential actions to address the need, determined the likely issues and impact topics, and identified the relationship of the proposed action to other planning efforts at the recreation area.

A press release initiating public scoping and describing the proposed action was issued April 15, 2004 (appendix A). Comments were solicited during a public scoping period. No comments were received. During early planning for the proposed rehabilitation of Northshore Road, Lake Mead NRA consulted with the Nevada SHPO and the Advisory Council on Historic Preservation, in accordance with section 106 regulations. The result of that consultation was the execution of a MOA among Lake Mead NRA, the Nevada SHPO, and the Advisory Council in June 1997 (appendix C). The MOA acknowledged that proposed road repair and maintenance activities could have an adverse effect on historic drainage features along historic Route No. 1, Overton-Lake Mead Road (portions of the current Northshore Road and Overton Beach access road), which was determined eligible for listing on the NRHP. The signed MOA and implementation of its terms is evidence that Lake Mead NRA has complied with section 106 requirements.

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APPENDIX A

NATIONAL PARK SERVICE PRESS RELEASE

National Park Service
U.S. Department of the Interior

Lake Mead
National Recreation Area

601 Nevada Highway
Boulder City, NV 89005

702 293-8907
702 293-8936

Lake Mead NRA News Release

April 15, 2004
For Immediate Release
Roxanne Dey, (702) 293-8947
roxanne_dey@nps.gov
Release #: 27-04

Environmental Assessment Being Prepared for the Third Phase of the Northshore Road Rehabilitation Project at Lake Mead National Recreation Area

Officials at Lake Mead National Recreation Area are soliciting public comments related to the third phase of the rehabilitation of Northshore Road, in the northern section of Lake Mead National Recreation Area.

The third phase of the Northshore Road project includes rehabilitation of the entire remaining 17-mile stretch of Northshore Road from mile 30 to the park boundary near Overton. The existing 22' to 24' paved road would be recycled and overlaid to a 28' width road (12' lanes and 4' paved shoulders) with spot reconstruction of subgrades and shoulders as required. Culverts and low-water crossings would be re-evaluated for reconstruction or replacement. The access roads to Overton Beach and Echo Bay would be rehabilitated with 11' travel lanes and 2' shoulders. Sidewalks in the developed Echo Bay and Overton Beach areas would be installed alongside the road. Adjacent parking areas and pullouts would be repaved and all areas disturbed by construction would be re-vegetated.

This project seeks to improve poor-condition pavement, to rehabilitate deteriorated and inadequate drainage infrastructure, and to widen the existing paved surface to safely accommodate both the current and anticipated future mix of vehicle types and traffic counts.

The National Park Service is in the process of preparing an environmental assessment to identify and evaluate feasible alternatives, including no action, for this proposal. As a result, Lake Mead National Recreation Area is seeking public feedback on the issues and potential alternatives. Written comments should be sent by May 17, 2004 to: Superintendent, Lake Mead National Recreation Area, Attention: Compliance Office, 601 Nevada Way, Boulder City, Nevada 89005.

Lake Mead National Recreation Area is a unit of the National Park Service.

• -NPS-

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APPENDIX B

BIOLOGICAL ASSESSMENT

Lake Mead National Recreation Area

National Park Service
U.S. Department of the Interior

Lake Mead National Recreation Area
Nevada and Arizona

Biological Assessment

Rehabilitate Northshore Road to Park Boundary, Echo Bay Spur Road and Overton Beach Spur Road

January 2006

BIOLOGICAL ASSESSMENT

Rehabilitate Northshore Road to Park Boundary, Echo Bay Spur Road and Overton Beach Spur Road

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National Park Service

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LAKE MEAD NATIONAL RECREATION AREA
Nevada and Arizona

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ACRONYMS AND ABBREVIATIONS

CCC	Civilian Conservation Corps
cm	Centimeter
°F	Degrees Fahrenheit
DTC	Desert Tortoise Council
DWMA	Desert Wildlife Management Area
NPS	National Park Service
NRA	National Recreation Area
USC	United States Code
USFWS	U.S. Fish and Wildlife Service

INTRODUCTION

In accordance with section 7(c) of the Endangered Species Act of 1973, as amended (16 *United States Code* (USC) 1531 *et seq.*), the National Park Service (NPS) requested from the U.S. Fish and Wildlife Service (USFWS) a list of threatened and endangered species, species of concern, and designated critical habitats that may be affected by the NPS proposed action to rehabilitate portions of Northshore Road, the Echo Bay Spur Road, and the Overton Beach Spur Road. It is the responsibility of the federal agency proposing the action, in this case the National Park Service, to determine whether the proposed action would adversely affect any listed species or designated critical habitat. This determination is accomplished by, and documented in, a biological assessment.

This biological assessment addresses the threatened desert tortoise (*Gopherus agassizii*), and the endangered razorback sucker (*Xyrauchen texanus*), both listed by the USFWS under section 7(c) of the Endangered Species Act of 1973, as amended. It also addresses the relict leopard frog (*Rana onca*) which is listed as a candidate species by the USFWS under the same authority. Potential impacts to these species are considered relative to the Rehabilitate Northshore Road to Park Boundary, Rehabilitate Echo Bay and Overton Beach Spur Roads project in Lake Mead National Recreation Area (NRA), Nevada. Northshore Road, Echo Bay Spur Road, and Overton Beach Spur Road, all in the Overton Arm of the NRA, are proposed for rehabilitation, restoration, and resurfacing to enhance visitor safety and to protect natural resources.

Rehabilitation would occur along approximately 19 miles of the 56-mile-long Northshore Road from near milepost 27.5 to the park boundary (mile post 48) and would include pulverizing, recycling, repaving, and widening the road; shifting alignments; widening curves; installing curb and gutter with drainageways; repairing and possibly installing new guardrails; adding and adjusting drainageways to fit site conditions; and redesigning road turnouts and the parking areas at Blue Point Springs, and Rogers Springs. The Northshore-Echo Bay and Northshore-Overton Beach intersections would be redesigned to improve turn lanes and alignment. Both spur roads (Echo Bay – 4.7 miles, and Overton Beach – 2.9 miles) would be pulverized, recycled, and widened. The developed areas at Echo Bay and Overton Beach would be redesigned to accommodate pedestrian traffic with a pathway running along the spur road that safely separates foot traffic from vehicle traffic. In addition, a short (less than 0.25 mile in length) section of Northshore Road (located in the vicinity of station 1+900 and thus discontinuous with the rest of the project) would be realigned.

The determination of effect on the desert tortoise and relict leopard frog for the proposed action in Lake Mead NRA is "*may affect, likely to adversely affect*" while that for the razorback sucker and its designated critical habitat is "*may affect, not likely to adversely affect.*"

CONSULTATION HISTORY

The USFWS was contacted by letter dated April 15, 2004 to request a list of threatened and endangered species that may occur in or use the Northshore Road (mileposts 28 to 47), Echo Bay Spur Road and Overton Beach Spur Road areas for habitat. The USFWS responded with a letter dated May 17, 2004 indicating that the only listed species that may occur in, depend upon, or be impacted by activities in the Northshore Road project area are the federally threatened desert tortoise (*Gopherus agassizii*) and the federally endangered razorback sucker (*Xyrauchen texanus*) for which Lake Mead is designated critical habitat. The relict leopard frog (*Rana onca*), a candidate species for listing under the Endangered Species Act was not included in the USFWS response, but is addressed in this biological assessment due to its current status. The project area does not include any designated critical habitat for the desert tortoise (USFWS 1994a); however, it does traverse approximately 19 miles of potentially suitable desert tortoise habitat based on plant communities present and on sightings of tortoises within that portion of the project area. Lake Mead, in its entirety, is designated critical habitat for the razorback sucker. The relict leopard frog has been previously documented at the two springs in close proximity to this section of road—Blue Point Spring and Rogers Spring.

DESCRIPTION OF THE PROPOSED ACTION

The National Park Service is considering rehabilitation, restoration, resurfacing, and reconstruction of portions of Northshore Road, Echo Bay Spur Road, and Overton Beach Spur Road in Lake Mead NRA, Nevada. The approximately 19-mile section of Northshore Road identified for improvement begins at approximately milepost 27.5 and proceeds to the park boundary (milepost 48). In addition, rehabilitation of the Overton Beach (2.9 miles) and Echo Bay (4.7 miles) spur roads is considered (figure 1).

GENERAL DESCRIPTION OF ROAD WORK

Approximately 19 miles of the existing 22- to 24-foot-wide paved Northshore Road from milepost 27.5 to milepost 48.0 would be pulverized, recycled, and paved to a 32-foot width (two 12-foot travel lanes and adjacent 4-foot-wide paved shoulders), with spot reconstruction of subgrade and shoulders as required. The existing roadway has many vertical and horizontal sections that would be straightened to provide a safer alignment and complete Northshore Road to the uniform design speed of 50 miles per hour. The Northshore-Overton Beach spur road and Northshore-Echo Bay spur road intersections would be improved, including lengthening turn lanes and constructing a raised median. The 2.9-mile-long Overton Beach spur road and the 4.7-mile-long Echo Bay spur road would be pulverized, recycled, and paved to a 26-foot width (two 11-foot travel lanes and 2-foot paved shoulders), with spot reconstruction of subgrade and shoulders, as required. The contractor staging areas would be at stations 53+100, 59+200, and 71+550; all sites previously disturbed from the original road construction.

The Northshore Road / Overton Beach Spur Road / Echo Bay Spur Road project would be scheduled for work in two phases, each of which would take 2 years to complete. The first phase would begin in the spring of 2008, and extend through 2009. The second phase would begin in the spring of 2010, and extend until 2011. The work under the first phase would include rehabilitation of Northshore Road from mile 26 to mile 33 and from mile 33 to mile 40. The second phase would include widening and realignment of Northshore Road from mile 42 to mile 45 and rehabilitation of Northshore Road from mile 40 to mile 42 and from mile 45 to mile 47. The second phase would also include rehabilitation of the Echo Bay and Overton Beach spur roads.

Drainage Improvements

Twenty culverts would be removed and replaced with new culvert pipes. The remaining culverts would be cleared of debris and the inlets and outlets repaired, as necessary. Historic Civilian Conservation Corps (CCC) culverts and headwalls would be retained where possible.

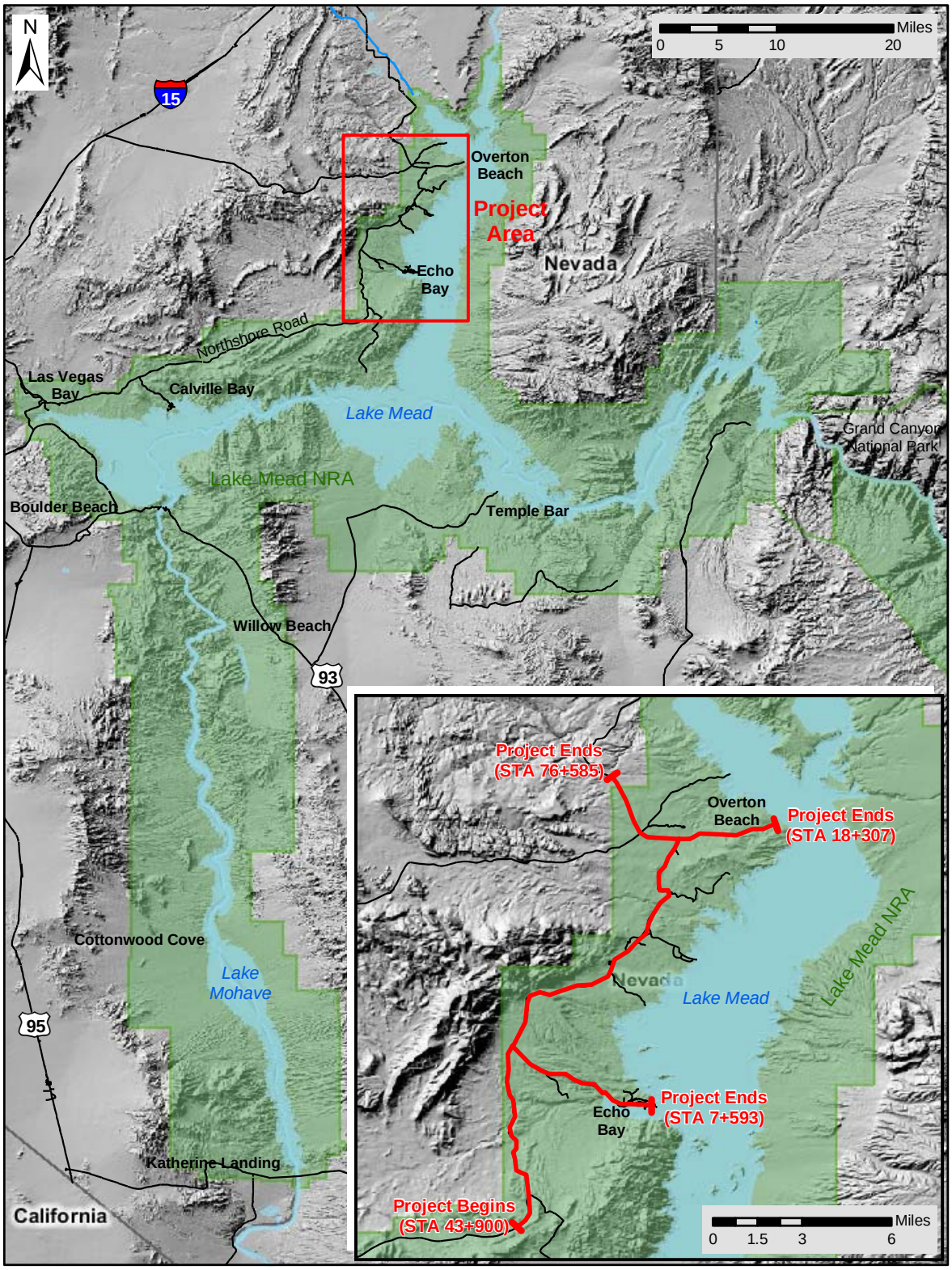

FIGURE 1. VICINITY MAP AND PROJECT LOCATION

Turnouts

Ten existing turnouts would be lengthened (up to 460 feet) and widened (up to 12 feet) and one turnout would be newly constructed approximately 460 feet long and 12 feet wide to allow slower-moving vehicles to pull over and allow faster traffic to pass.

Improvements in the Area of the Park Boundary (Mile Post 48.0)

The existing turnout at the entrance sign on the west side of the road would be paved and curbed with colored concrete. The paved portion of the turnout would be approximately 24-feet wide to provide both parallel parking and a pass-through lane. A raised median would be constructed to separate the parking area from the traffic of Northshore Road. The remaining, lateral portion of the existing turnout would be excavated to remove packed aggregate and would be revegetated. Most of the unofficial turnouts on the east side of the road would be paved over during widening and the remainder would be removed.

Overton Beach/Northshore Road Intersection Improvements

The road profile at the Overton Beach/Northshore Road intersection would be raised so that culverts could be installed to carry flows of the numerous washes in the area. The alignment would be shifted to the west to straighten the curve and improve turning lanes. Turning lanes would be extended and an additional lane added for traffic turning left onto Northshore Road from Overton Beach access road. Overton Beach access road would be extended to meet the new alignment. A raised median would be constructed to separate northbound and southbound lanes of Northshore Road and reduce motorist confusion. The portion of the current road that lies outside the new alignment would be excavated to remove packed aggregate, then revegetated. Historic CCC culverts and headwalls would be retained where possible.

Overton Beach Marina Spur Road Improvements

The 2.9-mile-long Overton Beach spur road would be pulverized, recycled, and paved to a 26-foot width (two 11-foot travel lanes and 2-foot paved shoulders), with spot reconstruction of subgrade and shoulders, as required. Three culverts would be replaced along the road while the remaining culverts would be cleaned and repaired as needed. At the intersection of access roads and Overton Beach spur road at stations 17+350 and 17+700, 10- to 15-foot pads would be paved as a part of this project. The pavement surface approaching the parking area would be re-striped to clarify traffic direction.

Curve Realignment Between Stations 67+300 and 69+400

The main action of realignment would be to straighten three sections bringing Northshore Road, in its entirety, up to the uniform design speed of 50 miles per hour. The realignment

would improve sight distance and increase driver safety in a historically dangerous section of Northshore Road. Substrate excavated for this realignment would be mixed with crushed aggregate and used as fill for the project. The portion of the current road that is to be removed would be excavated to remove packed aggregate, recontoured to match surrounding contours, and covered with 1 to 2 inches of topsoil previously removed and stored for the realignment project.

Improvements at the Intersection of Fire Cove Road with Northshore Road

A 10- to 15-foot pad that extends onto Fire Cove Road would be paved as part of this project.

Valley of Fire Wash Improvements

The existing culverts are not large enough to accommodate a 50-year storm event and need to be replaced. The preferred alternative is new bridge construction within the new curve realignment. Since the bridge would be installed parallel to the current culvert system, the existing roadway would be used during construction eliminating the need to construct a detour route.

Improvements at the Intersection of Stewarts Point Road with Northshore Road

A 10 to 15-foot pad that extends onto Stewarts Point Road would be paved as part of this project.

Blue Point Spring Improvements

The parking lot would be resurfaced and the curbed parking lot taper extended to the north. A curb cut and underlying riprap would be placed in the north end of this taper to direct runoff from the parking lot through the first culvert north of the parking lot. This design element should reduce the likelihood of parking lot runoff entering into the spring-fed drainage that flows under Northshore Road north of the parking lot. A curb cut and underlying riprap would also be placed in the northwest corner of the parking lot.

Rogers Spring Improvements

There would be no change in the road culvert or flow from the spring to avoid potential adverse effects to the spring. The Rogers Spring parking lot would be paved and redesigned to provide larger parking stalls. A colored concrete sidewalk and wheelchair ramp would be constructed adjacent to the parking stalls to provide access to existing restrooms and pavilions. Raised islands would be constructed to direct traffic flow. Runoff from the parking lot would be channeled from the northwest corner of the parking lot to an existing low spot southeast of the parking lot. The low spot would act to settle solids from runoff, but would not allow

elimination of any petroleum products. Additional research would occur prior to project activities to determine the best solution for eliminating petroleum products in the runoff.

Improvements at the Intersection of an Access Road with Northshore Road at Station 61+750

The west section of this access road would be excavated to remove packed aggregate, then revegetated using native plant species. The only access to the road would be from the east.

Improvement of Parking Area at Station 59+650

The parking lot would be resurfaced and the parking lot taper extended to the east. Curbs would be added along the west and east tapers and would connect to the existing curb along the north end of the parking area. A curb cut and underlying riprap would be placed in the east end of the taper to direct runoff to the east end of the parking area.

Echo Bay / Northshore Road Intersection Improvements

Turning lanes would be extended and an additional lane added for traffic turning left onto Northshore Road from Echo Bay access road. A raised median would be constructed to separate northbound and southbound lanes of Northshore Road.

Echo Bay Spur Road Improvements

The 4.7-mile-long Echo Bay spur road would be pulverized, recycled, and paved to a 26-foot width (two 11-foot travel lanes and adjacent 2-foot-wide paved shoulders), with spot reconstruction of subgrade and shoulders, as required, including 3,200 feet of curb and gutter installation to provide erosion control from runoff. Two paved turnouts would be installed to allow slower vehicles to pull off the road, thus maintaining traffic flow and easing congestion. At the intersection of the access roads and Echo Bay spur road at stations 6+100, 6+200, and 6+400, 10- to 15-foot pads would be paved as a part of this project. West of Echo Bay Marina, as the road descends a steep ridge between stations 6+650 and 6+850, guardrails would be installed on each side of the road.

Echo Bay Marina Improvements

A sidewalk of colored concrete (4-foot width with occasional 5-foot sections to meet Americans with Disabilities Act standards) by separating pedestrians from vehicular traffic would be constructed in the developed area of Echo Bay, from the water tank at the top of the hill, past the ranger station, and on to the sidewalk, which currently runs along the south side of the boat ramp.

A wheelchair access ramp would be constructed across the island between the parking lot next to the restrooms and fish cleaning station and the road to the boat ramp. This ramp would be located between the palm trees in this island. Additional wheelchair accessible parking spaces would be placed next to the wheelchair access ramp.

The surface of the mail delivery circle/helicopter landing area located in front of staff housing would require crack sealing followed by a fog seal. There are monitoring wells along the roadway that would be adjusted to the new road elevation. A turnout would be constructed between the mail delivery circle and parking area on the north side of the road to ease congestion.

Echo Wash Bridge Improvements

The existing bridge over Echo wash would not be sufficient in terms of safety once Northshore Road is widened, and must be replaced. A new bridge would be constructed parallel to the current bridge and Northshore Road would be diverted to connect to the new bridge. The current bridge and road alignment would be used during the construction of the new bridge, eliminating the need to construct a temporary detour.

Improvements at the Intersection of Boathouse Cove Road with Northshore Road

A 10- to 15-foot pad that extends onto Boathouse Cove Road would be paved as part of this project.

Curve Realignment Between Stations 1+750 and 2+100

On a section of Northshore Road outside of the 19-mile stretch scheduled for rehabilitation, a curve along the Las Vegas wash would be straightened to increase driver safety and sight distance. The portion of the current road that is to be removed would be excavated to eliminate packed aggregate, recontoured to match surrounding contours, and covered with 1 to 2 inches of topsoil from stockpiles previously removed from the realignment project.

CONSTRUCTION PLANS

Detailed preliminary construction plans (50% complete) have been prepared and are attached for reference, to fully elucidate the scale of the proposed action (appendix A).

DESCRIPTION OF THE PROJECT AREA

Lake Mead NRA is in southern Nevada and northwestern Arizona. It comprises 1,482,476 acres of federal land and 28,212 acres of nonfederal land, mostly in the arid Mojave Desert. The NRA encompasses two reservoirs formed on the Colorado River, which flows through Glen Canyon National Recreation Area and Grand Canyon National Park before reaching the recreation area. The first reservoir is Lake Mead, 100 miles long and formed above Hoover Dam. This reservoir, at normal capacity, contains 162, 766 acres of water surface (247 square miles at an elevation of 1,229 feet) and over 822 miles of shoreline. The surface level of Lake Mead has receded 70 feet over the last few years, in response to the drought that has affected this portion of Nevada and Arizona and the Colorado River watershed for several years. As of December 13, 2005, the surface elevation of Lake Mead is 1,136 feet. The second reservoir is Lake Mohave, 67 miles long and formed above Davis Dam. This reservoir has 28,800 acres of water surface (45 square miles at an elevation of 647 feet) and over 254 miles of shoreline.

The following sections describe the existing environment along the proposed project corridor in what is referred to as the Overton Arm of the NRA. Only the natural resource elements relevant to desert tortoise, razorback sucker, and relict leopard frog population establishment and maintenance are addressed within this biological assessment. Other elements are addressed in a broader environmental assessment.

CLIMATE

Most of Lake Mead NRA is arid and lies within the Mojave Desert, averaging from 3 to 5 inches of precipitation annually. Most precipitation falls during intense thunderstorms from July through September, when warm, moist air dominates the weather pattern. These late summer and early fall thunderstorms create extreme flash-flood hazards. In the region of Northshore Road, daily summer temperatures are typically over 100 degrees Fahrenheit (^{o}F), while winter high temperatures average about 50^{o}F. Only rarely do the night time low temperatures fall below freezing or 32^{o}F (NPS 1986, 2003).

GEOLOGY, SOILS AND TOPOGRAPHY

The soils of this area are typically shallow and were developed on gray alluvium, generally having high salt contents that often form caliche hardpans (NPS 1994). The majority of the soil surface along Northshore Road consists of desert pavement where surface materials have been removed by wind and water and the rocks that remain armor the surface, preventing further erosion. Red desert soils formed in the alluvial outwash areas are slightly leached and rich in lime and mineral nutrients valuable to plants (NPS 1994).

HYDROLOGY AND FLOODPLAINS

Northshore Road crosses numerous small and narrow desert washes and broad alluvial fans and plains. Four of the larger washes encountered are mapped within the 100-year floodplain: Thomas wash, Valley of Fire wash, Echo wash, and Las Vegas wash (FEMA 2005). The desert washes are typically dry, but are subject to flash flooding during thunderstorm events occurring in the late summer and early fall. Drainage crossings typically consist of large-diameter corrugated metal pipe culverts and at-grade crossings. Echo wash is currently traversed by a bridge. Blue Point and Rogers springs are both on the western edge of the project corridor, and each is associated with a parking area that is scheduled for redesign.

VEGETATION

The existing Northshore Road was constructed through sparse desert shrub, desert wash, and badland plant communities of the Mojave Desert section of the American Semi-desert and Desert Province (NatureServe 2002a). Generally, the erosion fans and small hills associated with the project corridor support the creosote bush – white bursage (*Larrea tridentata – Ambrosia dumosa*) sparse shrubland association, occupying a desert pavement of gravel-sized stones.

Vegetative (foliar) cover values for this type are sparse, rarely exceeding 5% to 10%. The common shrubs include creosote bush, white bursage, indigobush (*Psorothamnus fremontii*), Pima rhatany (*Krameria erecta*), beavertail cactus (*Opuntia basilaris*), silver cholla (*Opuntia echinocarpa*), and brittlebush (*Encelia farinosa*). Herbaceous species present within this association include desert trumpet (*Eriogonum inflatum*) and other buckwheat species including the state-listed sticky buckwheat (*E. viscidulum*), an annual grass species, mallow (*Sphaeralcea* sp.), and fluffgrass (*Erioneuron pulchellum*), among others. Creosote bush and creosote bush-white bursage communities have been identified as providing habitat for desert tortoises (NatureServe 2004).

STATUS OF LISTED SPECIES / CRITICAL HABITAT WITHIN THE PROJECT VICINITY

DESERT TORTOISE

Background and Biology

Desert tortoises (figure 2) are distributed from southeastern California, southern Nevada, and extreme southwestern Utah, through western and southern Arizona and northern Mexico (NatureServe 2004). They generally occupy habitat receiving an average annual rainfall in excess of 4 inches (10.0 cm) and below 12 inches (30.0 centimeters [cm]). In the northern periphery of their range, they typically occur at elevations between 2,000 and 5,000 feet, and occupy a variety of habitats (USFWS 1994a; NatureServe 2004). The desert tortoise exhibits significant morphological and genetic variation throughout the range (NatureServe 2004). Populations occurring west of the Colorado River are thought to be distinct from those east of the river in morphology, genetics, behavior, and ecology (Lamb et al. 1989 and Lamb et al. 1995 in NatureServe 2004). Populations of the desert tortoise are federally listed as threatened within the United States.

During the 1970s, it was apparent that desert tortoise populations were declining throughout a significant portion of the range. Many factors have been implicated, including:

- land development
- off-road vehicle travel
- poaching and vandalism (including shooting)
- disease (especially upper respiratory tract disease caused by a form of mycoplasma)
- livestock, wild horse, and wild burro grazing
- habitat degradation due to nonnative plant invasion
- range fires fueled by nonnative annual grasses and forbs
- energy and mineral development
- road and highway traffic/collisions
- trail construction
- collecting
- predation by the common raven, coyote, feral dogs and cats (associated with human garbage dumps and backyard feedings)
- release of nonnative desert tortoises into areas occupied by native populations
- natural droughts (resulting in poor nutrition and immunocompromise) (Oldemyer 1994, USFWS 1990, Jacobson et al. 1995, CDF&G 1990, Berry 1992 in NatureServe 2004)

The USFWS listed the Mojave population of the desert tortoise (north and west of the Colorado River) as endangered under emergency listing procedures enacted in August 1989. In 1990, the desert tortoise was listed as threatened under normal listing procedures.

The desert tortoise is predominantly herbivorous and a semifossorial inhabitant of warm upland plateaus and mountain slopes in the Mojave Desert. In the Mojave Desert, the desert

tortoise occupies creosote bush scrub and the creosote bush – white bursage community. The native grass, big galleta (*Hilaria (Plueraphis) rigida),* is often present where the desert tortoise is most abundant. In general, desert tortoises forage primarily on native winter and summer annual plants (dicots and grasses), perennial grasses, cacti, and perennial shrubs, in descending order of preference. Insects, caterpillars, and other insect larvae may also be eaten, and desert tortoises have been observed biting road-killed anurans and lizards (Brown 1968, Okamoto 1995 in NatureServe 2004). It has been suggested that an active adult desert tortoise requires about 45 pounds of herbaceous forage per month (NatureServe 2004).

Desert tortoises may sometimes ingest high-calcium materials such as limestone pebbles, caliche from layers along embankments, soil, and bones. The ingestion of calcium is most frequently observed in adult females and possibly in growing juveniles (Esque and Peters 1994, Marlow and Tollestrup 1982 in NatureServe 2004).

Desert tortoise habitat is most often associated with well-drained sandy loam soils of plains, alluvial fans, and bajadas, although they may also occur along the edges of basaltic flow and other rock outcrops. In the Mojave Desert the sandy loam soils may be obscured by a veneer of desert pavement and burrows are most often proximate to washes and arroyos under these conditions. The desert tortoise has a tendency to excavate and utilize more than one burrow and juveniles are particularly prone to excavate multiple burrows (mostly under large shrubs) and also use abandoned rodent burrows (Woodbury and Hardy 1948, Luckenbach 1982 in NatureServe 2004). Burrows often extend from 1- to 8-feet in length and have a single opening. In the Mojave Desert, burrows most often open under a creosote bush (59%–77% of the time) or a white bursage shrub (21% of the time).

Winter burrows are more properly called dens and are extensive, up to 30-feet in length. These dens open to southern exposures and, in some portions of the species' range, may be subject to communal use by several individuals. In the northeastern portion of the range (i.e., at Lake Mead), two or more desert tortoises often den together in caliche caves located in bajadas and washes (USFWS 1994a).

Adult desert tortoises in the Mojave Desert are typically active from March through September, with a total active period of about 4 to 5 months per year. During the spring season in the Mojave Desert, tortoises were observed to be active for about three hours every fourth day, and some tortoises did not feed for several weeks following spring emergence from dens (Behler and King 1979 in NatureServe 2004). Desert tortoises were found to operate within the 77–95°F range of body temperatures.

Mating occurs from August through October and again in April and May. The females may store sperm from the prior fall mating or even from prior years of mating. However, fertility declines as time since mating increases. Desert tortoise eggs are laid mainly from May to early July in shallow depressions, often 3 to 4 inches deep. Clutch sizes are normally three to seven eggs, but up to 15 eggs have been observed in a nest. Most commonly, Mojave Desert tortoises construct egg nests inside the first 2 feet of the burrow floor, in the soil apron surrounding the burrow entrance, or in the shade of a shrub adjacent to the burrow. Newly hatched desert tortoises emerge from the nests in September and 83% of neonatal tortoises excavate new burrows or enlarge pre-existing rodent burrows in their first weeks (Niblick et al. 1994, Turner et al. 1984, Turner et al. 1986, USFWS 1994a in NatureServe 2004).

Habitat Assessment

Under the Natural Resources Preservation Program, the National Park Service funded desert tortoise management programs to meet the goals and objectives of the *Desert Tortoise Recovery Plan* published in 1994 (Boyles 1998). The *Desert Tortoise Recovery Plan* recommended establishment of a system of desert wildlife management areas (DWMAs) and the inventory and monitoring of desert tortoise populations over time, habitat enhancement and restoration of disturbed areas, and implementation of interpretive outreach and environmental education programs. Within the NRA, the following specific actions were taken:

- Cursory habitat surveys using 1.5-mile-long triangular transects distributed within 850,000 acres of potential desert tortoise habitat (600,000 acres in Arizona; 50,000 acres in the Gold Butte-Pakoon DWMA; 12,000 acres of critical habitat in Nevada; and an additional 175,000 acres of habitat in Nevada). Lake Mead exceeded the goal of one transect per 2,500 acres and completed over 400 transects.

- Fourteen 1.0-km^2 square plots were established at diverse locations throughout the NRA. Plot locations varied considerably in the terrain, remoteness, and degree of disturbance from human influences. Some plot locations were chosen based on previous knowledge of desert tortoise habitation in the area, others were selected following cursory examination of habitat suitability, and some were influenced by results of the previous year's triangular transects.

- Twenty miles of burro exclusion fence were proposed for construction, eliminating burros from critical desert tortoise habitat in the Gold Butte-Pakoon DWMA.

- Ten miles of nonsystem roads were proposed for closure and rehabilitation in desert tortoise habitat.

- Interpretive outreach and environmental education in the form of brochures and educational programs for park employees and contract workers has occurred.

These actions not only contribute to recovery plan objectives, but also increase the effectiveness of NRA management of the desert tortoise population (Boyles 1998). Detailed methods for plot establishment, plot survey, triangular transect survey, data collection, and use of staff and volunteers are discussed in Boyles (1998). Figure 2 provides the triangular transect and plot locations within Lake Mead NRA.

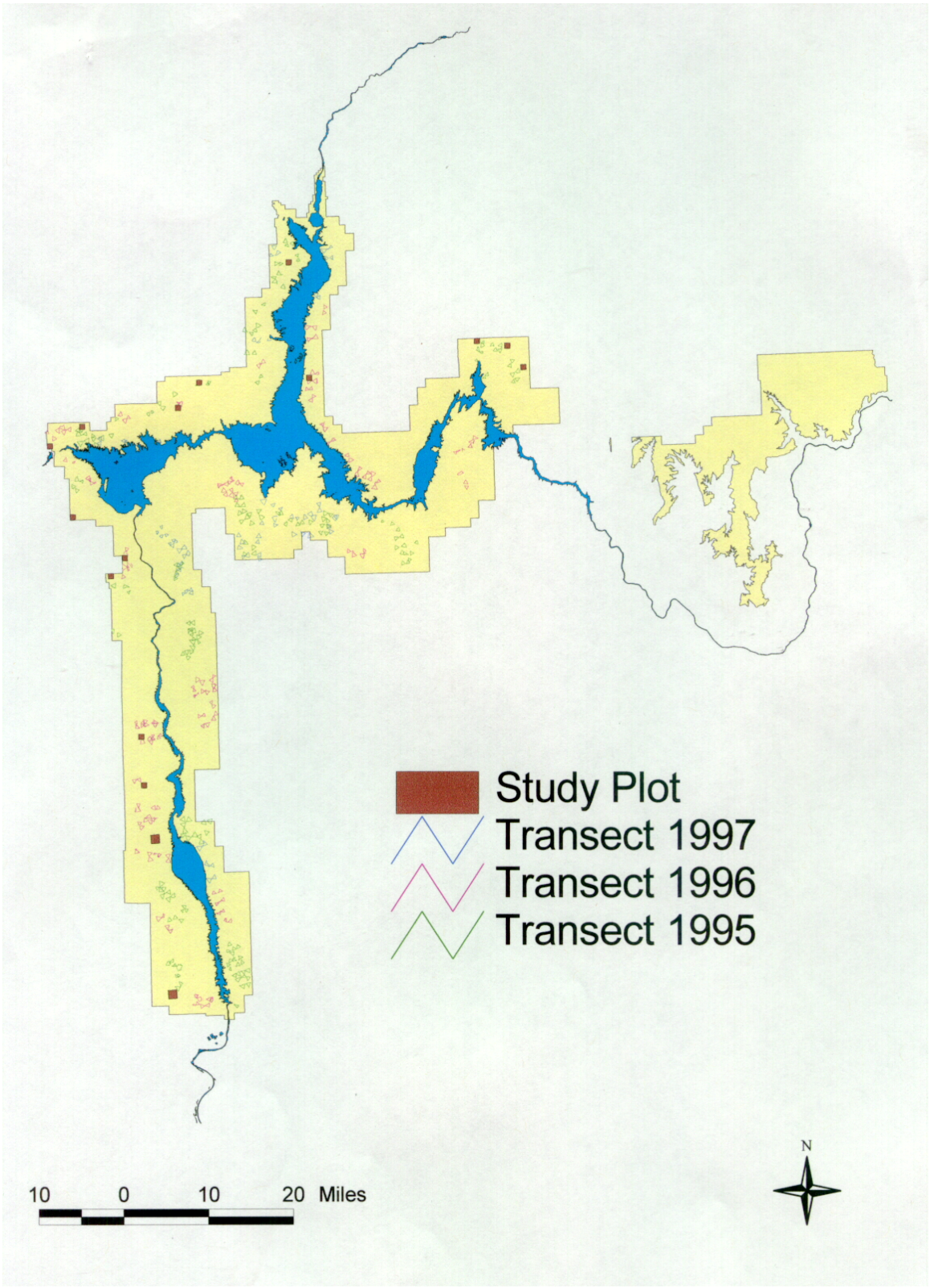

FIGURE 2. DESERT TORTOISE STUDY PLOT AND TRIANGULAR TRANSECT LOCATIONS WITHIN LAKE MEAD NRA

Desert tortoises were observed historically in the area of Northshore Road during inventory and research efforts, and observations were routinely submitted by park staff (Schwartz et al. 1978, LeNoue and Van Inwagen 1993). Schwartz et al. (1978) considered the desert tortoise to be widespread, but in small numbers throughout the NRA below about 4,000 feet in elevation.

Biologists surveyed the Northshore area of the NRA during the period from 1995 through 1997, and determined it to have higher densities of desert tortoise than most other areas of the NRA (Boyles 1998). Although suitable habitat occurs in areas throughout the NRA, and the southern part of the NRA contains designated critical habitat, there is no designated critical habitat in the proposed project corridor or the surrounding Overton Arm area of the NRA.

Habitat Survey Results

2003. A complete sensitive species survey was conducted along the Northshore Road corridor from July 23 to August 8, 2003. A zone of impact wildlife survey was conducted for threatened, endangered, and sensitive species for a 17.7-mile segment of Northshore Road, between mile markers 30 and 48, using protocols approved by the USFWS and Bureau of Land Management. The Echo Bay access road (5 miles), Overton Beach access road (3 miles), and Valley of Fire access road (1 mile) were also included in this survey (SNEI 2003).

The presence of desert tortoise was documented throughout this survey. Desert tortoise sign observed included adult female tortoises, burrows, scat, and two scattered and disarticulated carcasses. On July 27, 2003, a portion of one disarticulated tortoise carcass (class 5 carcass) was observed within the mouth of an active tortoise burrow, but the SNEI (2003) report did not identify the mile marker in close proximity to where this carcass was found. On August 7, 2003, one adult female desert tortoise was observed approximately 5,774 feet (1,760 meters) north of the Echo Bay launch ramp and 82 feet (25 meters) south of Echo Bay access road, along a caliche knob with several active caliche dens. A second class 5 carcass was observed west of the cattle guard located on the Echo Bay access road.

The report for this survey concluded that presence of desert tortoise activity is apparent. The plant community along this segment of Northshore Road and associated access roads was characterized as Mojave Desert creosote bush scrub community, representing the preferred habitat of desert tortoises.

2005. The area surrounding station 1+900 (a small, discontinuous portion of the overall road improvement project) was surveyed, revealing the presence of one desert tortoise burrow at UTM coordinates 688639E, 3999858N. The occupancy of this burrow could not be determined. If still active immediately prior to ground-disturbing activities, the burrow would be hand-excavated and any occupants handled according to *Guidelines for Handling Desert Tortoises* (DTC 1999).

RAZORBACK SUCKER

Razorback suckers formerly occurred throughout the Colorado River basin, from Wyoming and Colorado to Sonora and Baja California. This species is now much reduced in range and abundance. The largest extant population of razorback sucker occurs in Lake Mohave. Major known spawning areas in Lake Mohave include Cottonwood Cove, Arizona Bay, Six-Mile Cove, and Eldorado Canyon (Minckley et al. 1991). Small numbers of razorback suckers occur in Lake Mead and the Grand Canyon, although the Grand Canyon records are thought to represent transient individuals (Douglas and Marsh 1998). Adults and larvae are widely distributed in the Green River basin, especially in the upper basin from the mouth of the Duchesne River upstream to the lower 4 miles of the Yampa River. A small reproducing population exists in the lower Green River. In the upper Colorado River, most razorback suckers occur in the Grand Valley. A few have been found in the San Juan River above Lake Powell, and adults have been found in the San Juan and Colorado River arms of the lake (USFWS 1997). This species is currently considered extant in New Mexico, based on ongoing reintroduction efforts in the San Juan River basin that have resulted in documented reproduction in 1998 and 1999 (NatureServe 2004). Adults overwinter in the Echo Park area of Dinosaur National Monument (Tyus and Karp 1989). Razorback suckers were recorded in the late 1980s along the south shore of Lake Powell near the concrete boat ramp at Piute Farms Marina and near Bluff, Utah; the Lake Powell record apparently represented a spawning aggregation or staging prior to spawning elsewhere (Platania et al. 1991). Spawning has been documented in lower Yampa River near its confluence with the Green River and in the upper Green River (Tyus and Karp 1989) (NatureServe 2004).

Habitats used by razorback suckers include slow areas, backwaters, and eddies of medium to large rivers, and impoundments (three of the four remaining populations of greater than 100 individuals occur in reservoirs, NatureServe 2004). Flooded lowlands and lower portions of tributary streams presumably served as resting and feeding areas during the breeding season in the Green River basin (Tyus and Karp 1990). These fish are often associated with sand, mud, and rock substrate in areas with sparse aquatic vegetation and temperatures that are moderate to warm (Sigler and Miller 1963). They have been collected in flooded gravel pits along the Colorado River in Colorado, and juveniles were collected from irrigation canals along the lower Colorado River (Marsh and Minckley 1989). In the nonbreeding season, adults were most common in shoreline runs and along mid-channel sandbars in the main stem of the Green River, with average water depth of less than 7 feet and average velocity of less than 1.6 feet per second (Tyus and Karp 1989). Radio-tagged suckers reintroduced into the Gila River in Arizona used both sand-bottomed, flat-water, main-channel habitats and quieter pools and eddies adjacent to stronger currents (NatureServe 2004). Hatchery-reared suckers released into the San Juan River inflow of Lake Powell most often used shallowly flooded stands of salt cedar and, in some cases, cobble shorelines (Karp and Mueller 2002). Limited data indicate that young suckers tend to remain along shorelines, in embayments along sandbars, or in tributary mouths (NatureServe 2004). In Lake Mohave, individuals were associated with inshore habitats, except during the hotter months when they moved offshore, possibly to avoid warmer water temperatures (Mueller et al. 2000).

Historically, adults apparently underwent spring migrations upstream in main-stem rivers and major tributaries. Recent studies have not demonstrated directed seasonal movements.

Razorback suckers have been documented to move considerable distances (18–66 miles) to specific areas to spawn (NatureServe 2004). In Lake Mohave, individuals moved 12–18 miles between spawning areas and summer-use areas. Linear range lengths of 10 adults over 14 months were 11–45 miles, with a mean range length of 24 miles (Mueller et al. 2000). Razorback suckers typically spawn near shore in water less than 2 feet deep; known and suspected spawning sites in the Green and other upper-basin rivers are all in broad, flat-water segments (Minckley et al. 1991). In streams, they will spawn over silty sand, gravel, or rock substrate at depths of about 1–20 feet. Ripe individuals often have been taken over or near coarse sand or gravel or cobble bars, in flowing water. In reservoirs, razorback suckers spawn on gravel bars swept clean by wave action, as well as along shorelines over mixed substrates ranging from silt to cobble (USFWS 1994b). The larvae appear to remain in the substrate for a period; apparently preferring a shallow littoral zone for a few weeks after hatching, then dispersing to deeper waters (USFWS 1994b).

Razorback suckers spawn from late January to April (rarely to May or June) in the lower Colorado River basin reservoirs, including Lake Mead, when temperatures range between about 52°F –70°F (USFWS 1994b). Attainment of sexual maturity varies between genders, with males maturing sooner than females. Males at Dexter National Fish Hatchery matured as early as the second year, while females did not mature until their third year. Sexual maturity has been delayed to as much as the fifth and sixth years under other captive regimes (Minckley et al. 1991).

Factors that potentially limit the survival, successful reproduction, and recruitment of razorback suckers include

- interactions with nonnative fish
- high winter flows
- reduced high spring flows
- seasonal changes in river temperatures
- lack of inundated shorelines and bottomlands

In March 1994, the USFWS published its determination of critical habitat for the razorback sucker, Colorado squawfish, humpback chub, and bonytail chub (USFWS 1994b). Designated critical habitat units for the razorback sucker in Lake Mead NRA include the Colorado River and its 100-year floodplain as it flows through Mohave County, Arizona, and Clark County, Nevada, above Hoover Dam, including Lake Mead to the full pool elevation; and the Colorado River and its 100-year floodplain as it flows through Mohave County, Arizona, and Clark County, Nevada, from Hoover Dam to Davis Dam, including Lake Mohave to the full pool elevation.

Wild populations of razorback suckers continue to decline due to insufficient recruitment such that the loss of all but one of the remaining wild populations is expected within the decade. The sole exception is the Lake Mead population made up of young to middle-aged razorback suckers comprising a second post-impoundment generation (USFWS 2002). Captive-born subadults are released into portions of the species historical range, including Lake Mohave. The ongoing Lake Mohave program, sponsored by the Native Fish Work Group, provides a genetically variable source population for stocking efforts throughout the razorback sucker's range (USFWS 2002). Designated critical habitats, while neither pristine

nor unmodified, do continue to support razorback sucker populations. As with many other threatened and endangered fish species, nonnative fish may be the greatest threat to the continued survival and potential recovery of the razorback sucker (USFWS 2002).

The two known spawning areas for razorback suckers in Lake Mead are at Blackbird Point and Echo Bay. Adult razorback suckers have been documented through telemetry studies to use the spawning areas intensively during the spawning period (November to April), but may also be found in the area during the non-spawning period. During the non-spawning period, adults may also be found along the western shores of the Overton Arm and the north shore of Las Vegas Bay. While use of these areas is consistent across years, it is influenced by water levels. As the lake level has declined since 2000, use of the lower reach of Las Vegas wash and the upper end of Echo Bay has not been possible (USFWS 2002).

RELICT LEOPARD FROG

The relict leopard frog (*Rana onca*) is a medium-sized brownish gray frog in the family Ranidae. Historical records of this species exist for more than 12 sites along the Virgin and Colorado rivers in Utah, Nevada, and Arizona. Considered extinct since the 1950s, the species was rediscovered in the 1990s, during which time populations were known from only seven sites in three relatively small areas (Jaeger et al. 2001). By 2001, populations had disappeared from two of these sites, leaving only two areas inhabited by a total of five small populations of relict leopard frogs—all in the Lake Mead NRA (Bradford et al. 2004). Two of the five sites that are believed to still support this species are Rogers Spring and Blue Point Spring (Bradford et al. 2004), both of which are along the western edge of the proposed project corridor. Primary threats to the relict leopard frog include decreased water availability due to dam construction for power management, conversion of wetlands habitat to agriculture and urbanization, and habitat degradation through recreational use. The introduction of exotic predators and competitors, such as the American bullfrog (*R. catesbeiana*), various fishes, and red swamp crayfish (*Procambarus clarkii*) (Jennings 1988; Jennings and Hayes 1994), as well as habitat degradation due to feral burros, have also been implicated in the relict leopard frog's decline (Bradford et al. 2004). Finally, some of the recent population extinctions appear to have been due to modification of the frog's habitat by encroachment of native emergent vegetation; apparently in response to a lack of disturbance. Encroachment by nonnative species is thought to represent a future threat for this species (Bradford et al. 2004).

Bradford et al. (2004) conducted relict leopard frog population studies at Blue Point Spring between 1991 and 2001, and made intermittent observations at Rogers Spring during the same time period. The remainder of the discussion of the relict leopard frog and its habitat in the project area is taken from Bradford et al. (2004) unless otherwise indicated.

Blue Point Spring and Rogers Spring are located within 1.2 miles of each other at 1,607 and 1,542 feet elevation, respectively. Both springs flow in an area where gypsum-rich soil predominates. Much of the aquatic habitat at the two springs was entirely covered by dense vegetation, predominately bulrush (*Scirpus* sp.), sand spikerush (*Eleocharis montevidensis*), cattail (*Typha* sp.), yerba mansa (*Anemopsis californica*), and goldenrod (*Solidago* sp.). In the period between 1991 and 2001, when population studies were being conducted at these two

springs, continuous aquatic habitat extended downstream from Blue Point Spring for 1,821 feet below which the stream traveled underground for 1,214 feet and then remained on the surface for most of the rest of its extent. Flows terminated in a desert wash approximately 1.5 miles below the spring. At Rogers Spring, aquatic habitat extended almost continuously for approximately 2 miles to Lake Mead. Both of these springs were consistently warm (Pohlmann et al. 1998) with high discharge rates of 1,040 and 2,750 L/min, respectively (Pohlmann et al. 1998). A number of nonnative, generally small tropical fishes have been introduced at these springs (Courtenay and Deacon 1983; Bradford et al. 2004).

Numbers of relict leopard frogs observed at the Blue Point Spring study area varied from 4 to 32 individuals along the upper stream segment (0 to 1,263 feet) that was observed consistently between 1991 and 2001. Numbers of relict leopard frogs observed appeared to increase in 1996, after an embankment around a culvert approximately 394 feet downstream from the stream source eroded, potentially providing easier access to the upper section for frogs from below. Most individuals captured were adults, regardless of season. The mean distance moved by marked individuals between consecutive captures in 1995 and 1996 was approximately 59 feet. The maximum distance moved between any captures for any individual was 394 feet (Bradford et al. 2004).

Population parameters at Blue Point Spring were estimated based on 96 adult relict leopard frogs captured and marked in 1995 and 1996. The mean estimated survival rate per month averaged 0.90, which corresponds to an annual survival rate for adults of 27%. The mean estimated population size over the 13 sampling periods was 35.9 adult relict leopard frogs. At the other segments of Blue Point and Rogers springs, relict leopard frogs were observed throughout the period 1993 through 2001 (Bradford et al. 2004).

CONSERVATION MEASURES

The NPS project manager would ensure that the project is completed in accordance with the parameters established in applicable compliance documents and that conservation measures are properly implemented. The conservation measures discussed in this section are those related to minimizing impacts on desert tortoise, razorback sucker, and relict leopard frog populations. Effects to these species from the proposed action have been evaluated assuming the implementation of these conservation measures.

WATER AND AIR QUALITY

Erosion control measures would be implemented to minimize any potential for short-term impacts to water quality. Sediment traps, erosion check structures, and/or filters would be implemented as needed to prevent runoff and deposition in washes, springs, and lake waters. Fugitive dust plumes would be reduced to the extent possible using either water or a palliative to settle the dust during earth-disturbing activities. Project activities in washes within the 100-year floodplain (i.e., Las Vegas wash, Echo wash, Valley of Fire wash, and Thomas wash) would comply with all state permits for working in waterways (including washes) through use of silt fences, erosion control, and other protective measures to protect water quality. Project activities in these areas would be scheduled to occur between October and April to the greatest extent practicable, to minimize exposure to late summer thunderstorm/flood events, and further reduce the potential for work in the washes to result in increased sediment load to the lake.

Project equipment operators would follow best management practices during refueling and other activities that may have the potential to release petroleum products into the environment. Contractors would be required to keep equipment properly maintained to avoid air and water pollution.

CONTROL OF INVASIVE PLANTS

For a substantial portion of the project area, the potential for invasive plants to establish would be minimized because construction would be completed in currently disturbed (i.e., paved or packed) areas of the Northshore Road footprint. No imported topsoil (desert soil) or hay bales would be used during the projects, in an effort to avoid introduction of nonnative plant species or inappropriate genetic stock of native plant species. The contractor would be required to steam clean all equipment and submit to inspection before being allowed into Lake Mead NRA. Reclaimed areas would be monitored to ensure establishment and spread of only native species.

DESERT TORTOISE

Although the proposed project areas represent marginal habitat within the roadway footprint, the surrounding areas constitute relatively high-quality desert tortoise habitat. As such, Lake Mead NRA proposes the following measures to further minimize any potential effects to desert tortoises from the projects:

1. A desert tortoise education program would be presented to all personnel onsite during construction. This program would contain information concerning the biology and distribution of the desert tortoise, its legal status and potential occurrence near the proposed project area, the definition of "take" and associated penalties, measures designed to minimize the effects of construction activities, the means by which employees can facilitate this process, and reporting requirements to be implemented in the event that desert tortoises are encountered.

2. All areas to be disturbed would have boundaries flagged before beginning the activity and all disturbance would be confined to the flagged areas. All project personnel would be instructed that their activities must be confined to locations within flagged areas. Disturbance beyond the actual construction zone would be prohibited.

3. Before surface-disturbing activities, a qualified desert tortoise biologist would conduct a clearance survey to locate and remove tortoises using techniques providing full coverage of all areas. All desert tortoise burrows and other species' burrows that may be used by tortoises, would be examined to determine occupancy of each burrow by desert tortoises. In accordance with *Procedures for Endangered Species Act Compliance for the Mohave Desert Tortoise* (USFWS 1992), a qualified desert tortoise biologist shall possess a bachelor's degree in biology, ecology, wildlife biology, herpetology, or closely related fields. The biologist must have demonstrated prior field experience using accepted resource agency techniques to survey for desert tortoises and tortoise sign. In addition, the biologist shall have the ability to recognize and accurately record survey results.

4. All burrows found within areas proposed for disturbance, whether occupied or vacant, would be excavated by a qualified biologist and collapsed or blocked to prevent desert tortoise re-entry. All burrows would be excavated with hand tools to allow removal of desert tortoises or desert tortoise eggs. All desert tortoise handling and excavations, including nests, would be conducted by a qualified desert tortoise biologist in accordance with USFWS-approved protocol (Desert Tortoise Council (DTC) Guidelines for Handling Desert Tortoises During Construction Projects 1994, revised 1999).

5. All located desert tortoises and desert tortoise eggs would be relocated offsite 300 to 1,000 feet into adjacent undisturbed habitat. Tortoises found aboveground would be placed under a bush in the shade. A tortoise located in a burrow would be placed inside an artificially constructed burrow of the same size and orientation as the one from which it was removed, using the protocol for burrow construction in section B.5.f. of the revised DTC guidelines (1999).

6. The onsite biologist would record each observed or handled desert tortoise. Information would include the following: Location, date and time of observation, whether tortoise was handled, general health and whether it voided its bladder, location tortoise was moved from and location moved to, and unique physical characteristics of each tortoise. Reports documenting effectiveness and compliance with the tortoise protection measures would be prepared every 6 months during the proposed construction.

7. Project activities that may endanger a tortoise would cease if a tortoise is found on a project site. Project activities would resume after the biologist removes the tortoise from danger or after the tortoise has moved to a safe area.

8. During the tortoise active season (March 1 through October 31), all trenches and other excavations with side slopes steeper than a 1-foot rise to 3-foot length would be immediately backfilled prior to being left unattended, or: (1) fenced with tortoise-proof fencing, (2) covered with tortoise-proof fencing, (3) covered with plywood or a similarly impassable material, or (4) constructed with escape ramps at each end of the trench and every 1,000 feet in between (at a minimum). All coverings and fences would have zero ground clearance. If alternative (4) is selected, the trench or other excavation would be inspected periodically and following periods of substantial rainfall to ensure structural integrity and that escape ramps are functional. An open trench or other excavation would be inspected for entrapped animals immediately prior to backfilling. If at any time a tortoise is discovered within a trench, all activity associated with that trench would cease until a qualified biologist has removed the tortoise in accordance with USFWS-approved guidelines (DTC 1999).

9. Trash and food items would be disposed properly in predator-proof containers with resealing lids. Trash containers would be emptied daily and waste would be removed from the project area and disposed in an approved off-recreation area landfill. Trash removal would reduce the attractiveness of the area to opportunistic predators such as desert kit fox, coyotes, and common ravens. Construction waste would be removed from the site daily and disposed properly.

10. Prior to surface disturbance activities within desert tortoise habitat, the National Park Service or the project proponent would pay a remuneration fee per acre of proposed disturbance into the Desert Tortoise Public Lands Conservation Fund Number 730-9999-2315 (section 7 account). This fund is administered by Clark County, and used for securing and enhancing desert tortoise habitat and desert tortoise research.

RAZORBACK SUCKER

Although the known spawning habitats are either across the channel or upstream from proposed project areas such that any increased sediment reaching the water as a result of this project would be extremely unlikely to impact these razorback suckers. Lake Mead NRA proposes the following conservation measures for razorback suckers:

1. A razorback sucker spawning area educational program would be presented to all personnel present during construction. This program would contain information pertaining to the biology and distribution of the razorback sucker, its legal status and occurrence in the lake waters near the project areas, the definition of "take" and associated penalties, measures designed to minimize the effects of construction activities, the means by which individuals can facilitate this process, and reporting requirements and corrective actions to be implemented in the unlikely event that breaches to these conservation measures should be observed.

2. All construction personnel would be advised not to feed fish and to dispose of all refuse properly. Trash and food items would be disposed properly in predator-proof containers with resealing lids. Trash containers would be emptied daily and waste would be removed from the project area and disposed in an approved off-NRA landfill. These measures would be implemented to avoid attracting nonnative fish that interact negatively with razorback suckers.

3. Best management practices to protect water quality from sedimentation would be implemented as conservation measures for the razorback sucker. Erosion control measures would be implemented to minimize any potential for short-term impacts to water quality. Sediment traps, erosion check structures, and/or filters would be implemented as needed to prevent runoff and deposition in washes, springs, and lake waters. Fugitive dust plumes would be reduced to the extent possible using either water or a palliative to settle the dust during earth-disturbing activities.

4. Project equipment operators would follow best management practices during refueling and other activities that may have the potential to release petroleum products into the environment. Contractors would be required to properly maintain equipment to avoid contamination of razorback sucker habitat.

RELICT LEOPARD FROG

Conservation measures described above for protecting water and air quality, and for preventing establishment of nonnative plant species, are applicable to protection of the relict leopard frog's habitat at Rogers Spring and Blue Point Spring.

EFFECTS OF THE ACTION

This section provides an analysis of the effects to desert tortoise, razorback sucker, and relict leopard frog populations as a result of the proposed action. The impacts to these three species were evaluated for adverse or beneficial effects, short- and long-term effects, direct and indirect effects, impact intensity, context, and cumulative effects. The proposed construction would occur in two phases, each of which would take 2 years, for a total project duration of approximately 4 years. The frequency of disturbances due to such extensive road rehabilitation is estimated to be approximately once every 50 years; the period between events may increase as better materials and techniques are developed and implemented.

DESERT TORTOISE

The proposed action would result in disturbance of a *total* of approximately 19 previously undisturbed acres of upland habitat. Desert tortoise density varies throughout the park, ranging from zero to as high as 100 individuals per square mile (Boyles 1998). Surveys of the Northshore area of Lake Mead NRA during the period from 1995 through 1997 indicated it to have higher densities of the desert tortoise than most other areas of Lake Mead NRA (Boyles 1998). The proposed project corridor is not within or adjacent to the boundaries of a designated critical habitat for the desert tortoise.

Construction projects in high-density desert tortoise habitat do have the potential to directly impact individual desert tortoises. Desert tortoises could be crushed or entombed in their burrows by earth-moving equipment. Project vehicles and equipment could move into areas outside the project areas, destroying habitat or killing or injuring desert tortoises. The potential for such incidents to occur would be minimized through implementation of the conservation measures described above. Project areas would be clearly flagged and activity beyond flagged boundaries prohibited. Clearance surveys and monitoring for desert tortoises would be conducted according to USFWS and DTC guidelines. All project personnel would be educated about the biology, legal status, and conservation measures for desert tortoises. Project activities and schedules would be designed in consideration of active periods for desert tortoises and minimizing impacts to desert wash habitats.

Potential indirect effects could include impacts to food resources through introduction of nonnative/invasive plant species and continued use of the roads. Activities of the proposed action are not anticipated to measurably impact food resources for desert tortoises due to their proximity to the already existing road. Monitoring and controlling any attempted establishment by undesirable plant species, as described under “Conservation Measures” would further reduce the potential for any impact to desert tortoise food resources. The proposed activities are not anticipated to increase visitor numbers above those currently experienced.

The potential for direct and indirect, short-term and long-term, adverse impacts to desert tortoises and their habitat would be reduced to the extent practicable by implementation of the conservation measures previously described. No beneficial effects of the proposed action have been identified for this species. Continued use of the roads would represent an indirect,

long-term, adverse impact on the desert tortoise population of the area. Because the rehabilitated road would bring all of Northshore Road up to a uniform design speed of 50 miles per hour, the proposed action is anticipated to result in a slight, but probably not measurable, increase of these impacts above those currently experienced.

Critical Habitat

No designated critical habitat for the desert tortoise would be impacted by the proposed action.

RAZORBACK SUCKER

Neither past road construction activities nor current levels of existing road use at Lake Mead NRA have been documented to affect razorback sucker populations. Recent, intensive monitoring of the spawning areas used by this species indicates that razorback sucker use has remained consistent over several years. Spawning, during which these areas receive the highest concentration of use by individual razorback suckers, is during the decreased visitor-use periods; reducing the overall impact of human disturbance during this critical period. During the non-spawning period, razorback suckers in Lake Mead are more dispersed along the western shorelines away from the marinas (USFWS 2002).

The proposed action is not anticipated to result in increased or otherwise changed recreational and commercial use of the marina areas. The proposed action would have minimal potential to increase sediment reaching the lake waters. Diligent use of appropriate erosion barriers and controls, along with measures to minimize suspension of dust during construction activities and appropriate timing of activities in desert washes, would ameliorate this potential. As such, the potential for short-term, or long-term, adverse impacts due to increased levels of sediment reaching the lake waters, is minimal.

Critical Habitat

Designated critical habitat for the razorback sucker occurs in both Lake Mead and Lake Mohave and includes the 100-year floodplain of the Colorado River. Four of the desert washes in which construction activities would occur are mapped within the 100-year floodplain (FEMA 2005). Razorback suckers cannot occupy these washes at any time other than a 100-year flood event, which is unlikely during the proposed project, given past modifications to the hydrology of the Colorado River system. However, disturbances in these washes have an increased potential to result in more sediments actually reaching the lake waters. Therefore, project activities in these washes would be scheduled between October and April to avoid late summer thunderstorm/flood events and minimize the potential for work in the washes to result in increased sediment load to the lake. Conservation measures to preserve air and water quality, as described under “Conservation Measures” would further reduce the potential for any increased sedimentation due to the project. Finally, project-related activities in these washes are designed to maintain their natural condition and function. Therefore, the resulting

potential for adverse impacts to critical habitat for the razorback sucker is considered negligible.

RELICT LEOPARD FROG

The current status of relict leopard frogs in the Rogers Spring and Blue Point Spring areas is unknown. Best available data for these populations are based on work completed in 2001 (Bradford et al. 2004). At that time, the estimated total number of adult relict leopard frogs in the Overton Arm of Lake Mead NRA was approximately 330 adults; a likely overestimate skewed by the relatively high concentration of adult relict leopard frogs in the Blue Point Spring area (Bradford et al. 2004). Recent extinctions of other small populations of relict leopard frogs indicate that periodic disturbance of the habitat to prevent encroachment by emergent vegetation into the open-water habitats is needed. Adequate water quality (although specific requirements/limits are currently unknown) and an absence of predatory species (e.g., American bullfrog, predatory game fishes) are also prerequisites for continued existence of the few remaining small, isolated populations of this species. Although not tested to date, the genetic diversity of these small populations is likely severely diminished. This, combined with low numbers and high geographic isolation, suggests that the survivability of this species is questionable.

The potential for direct and indirect, short-term and long-term, adverse impacts to this species would be minimized to the extent practicable through the conservation measures described above for protection of air and water quality, and prevention of invasive species establishment. Given the paucity of information on the specific habitat requirements for this species, the potential still exists that the proposed action would have some direct or indirect adverse impacts on the species. Beneficial impacts are anticipated from redesign of the parking lots associated with the two springs to further direct surface drainage and associated potential contaminants away from the area of relict leopard frog habitat.

Critical Habitat

No critical habitat for the relict leopard frog has been designated.

TABLE 1. ACTIVITY TABLE DEPICTING THE SUMMARY OF POTENTIAL EFFECTS

Activity	Description	Short-Term Impacts	Long-Term Impacts
Overton Beach / Northshore Road Intersection	▪ Shift Northshore Road alignment to west ▪ Extend turning lanes ▪ Add turning lane ▪ Extend Overton Beach Road to meet new alignment	Short-term adverse impacts possible to desert tortoise and relict leopard frog due to movement of machinery; to desert tortoise due to loss of habitat (~5 acre).	Long-term impact to desert tortoise due to permanent loss of habitat (~5 acres). Long-term impact to desert tortoise and relict leopard frog due to continued road use.
Overton Beach Spur Road	▪ Widen entire 2.9 miles from 20 feet to 30 feet	Short-term adverse impacts to desert tortoise and relict leopard frog due to movement of machinery; to desert tortoise due to loss of ~3 acres of habitat.	Long-term impact to desert tortoise due to permanent loss of habitat (~3 acres) and to relict leopard frog and desert tortoise due to continued road use.
Curve Realignment between Stations 67+300 and 69+400	▪ Straighten three sections	Short-term adverse impacts to desert tortoise and relict leopard frog due to movement of machinery. Short-term adverse impacts to desert tortoise through loss of habitat (~2 acres).	Long-term adverse impacts to desert tortoise and relict leopard frog due to continued use of road. Abandoned portions of road would be reclaimed, but ~2 acres would be permanently impacted.
Valley of Fire Bridge	▪ Construct parallel bridge to replace current culvert system	Short-term adverse impacts to desert tortoise and relict leopard frog due to movement of machinery along road.	Long-term adverse impacts to desert tortoise and relict leopard frog due to continued use of road.
Blue Point Spring and Rogers Spring Improvements	▪ Redesign existing parking lots to protect relict leopard frog habitat ▪ Resurface parking lots	Potential short-term adverse impacts to desert tortoise and relict leopard frog due to use of heavy equipment.	Long-term impact to desert tortoise and relict leopard frog due to continued road use. Beneficial impacts to relict leopard frogs may result from improved runoff design.
Echo Bay / Northshore Road Intersection	▪ Extend turn lanes ▪ Add turn lane	Potential short-term impacts due to use of heavy equipment and loss of ~1 acre of habitat.	Long-term impact to desert tortoise due to permanent loss of habitat (~1 acre); and to desert tortoise and relict leopard frog due to continued road use.
Echo Bay Road	▪ Widen 4.7-mile segment to 30 feet ▪ Install curb and gutter for erosion control ▪ Install two paved turnouts	Potential short-term impacts to desert tortoise due to use of heavy equipment and loss of ~5 acres of habitat.	Long-term impact to desert tortoise due to permanent loss of habitat (~5 acres); and to desert tortoise and relict leopard frog due to continued road use.

TABLE 1. ACTIVITY TABLE DEPICTING THE SUMMARY OF POTENTIAL EFFECTS

Activity	Description	Short-Term Impacts	Long-Term Impacts
Echo Wash Bridge	▪ Construct parallel bridge	Potential short-term impacts to desert tortoise due to use of heavy equipment and loss of ~0.5 acres of habitat.	Long-term impact to desert tortoise due to permanent loss of habitat (~0.5 acres); and to desert tortoise and relict leopard frog due to continued road use.
Las Vegas Wash (Stations 1+ 750 to 2+ 050)	▪ Realign curves	Potential short-term impacts to desert tortoise due to use of heavy equipment and loss of ~1 acre of habitat.	Long-term impact to desert tortoise due to loss of ~ 1 acre of habitat and to desert tortoise and relict leopard frog due to continued road use.
Northshore Road (19 miles)	▪ Widen 19-mile segment of road from the current 22- to 24-foot width to a standard 32-foot width	Potential short-term impacts to desert tortoise due to use of heavy equipment and loss of ~17 acre of habitat.	Long-term impact to desert tortoise due to loss of ~17 acres of habitat and to desert tortoise and relict leopard frog due to continued road use.
Northshore Road Drainage	▪ Replace 20 culverts ▪ Clean and repair remaining culverts	Potential short-term impacts to desert tortoise and relict leopard frog due to use of heavy equipment.	Long-term adverse impacts to desert tortoise and relict leopard frog due to continued use of road.
Turnouts	▪ Lengthen and widen 10 existing turnouts ▪ Add one turnout	Potential short-term impacts to desert tortoise and relict leopard frog due to use of heavy equipment; and to desert tortoise due to loss of ~1 acre of habitat.	Long-term adverse impacts to desert tortoise and relict leopard frog due to continued use of road; and to desert tortoise due to loss of ~1 acre of habitat.

INTERDEPENDENT AND INTERRELATED EFFECTS

Interdependent effects are those due to actions that have no independent utility apart from the proposed action. In this case, the work associated with rehabilitation and improvement of the Overton Beach and Echo Bay spur roads and marina areas would all be interdependent as it is not anticipated that these roads and areas would be used for any other purpose than fulfilling the mission of the recreation area. As such, the potential impacts of the work in these areas, as described in the previous sections for each species and summarized in table 2, would constitute the interdependent effects. This does not apply to the main stem of Northshore Road, which is used as a travel corridor through the park for purposes other than recreation in the park.

This work is interrelated to the Lake Mead NRA Lake Management Plan (2002) in that the road system is an essential component of the infrastructure needed to support fulfillment of the NRA's mission and purpose. Failure to bring the project portion of Northshore Road up to the condition and design speeds of the road south of the project area could result in an increased likelihood of vehicle accidents, and inhibition of the NRA's ability to fulfill its mission and purpose as stated in the 2002 Lake Management Plan. Reduction or cessation of NPS influence over the NRA could have drastic consequences for the biota and other natural resources existing therein.

CUMULATIVE EFFECTS

This section considers cumulative effects as defined by both the National Environmental Policy Act and the Endangered Species Act. Past, present, and reasonably foreseeable future activities, whether privately-funded or funded by some level of government (i.e., local, state, federal), and which have the potential to impact desert tortoises, razorback suckers, relict leopard frogs, or their habitat in the vicinity of the proposed project (i.e., in the Overton Arm reach of Lake Mead NRA). In addition, past, present, and future projects in or near the park are considered for their cumulative effect on desert tortoises or their habitat on a regional basis.

ACTIVITIES IN THE OVERTON ARM AREA

Past activities in the western portion of the Overton Arm area of Lake Mead NRA include those associated with road rehabilitation and improvement (to Callville Bay and Northshore roads) to the south of the proposed project, and installation of entrance stations. Future activities that have the potential to impact the addressed species in the Overton Arm area of Lake Mead NRA include those associated with replacement of water distribution and sewage collection systems at Overton Beach and Echo Bay marinas as part of a NRA-wide renovation. Recreational use of the various habitats within the Overton Arm area, as well as use of Northshore Road by through traffic, present past, present, and future cumulative impacts to all three species. The proposed action would make minor to moderate contributions to potential impacts on the desert tortoise and the relict leopard frog resulting from these cumulative actions; and only negligible to minor contributions to impacts on the razorback sucker.

PROJECTS IN OR NEAR THE PARK, BUT DISTANT FROM PROJECT AREA

Past Actions

The following past actions could contribute to cumulative effects on a regional basis:

- Expansion of Las Vegas populations (humans and their commensals) and concomitant increases in consumption of natural resources and environmental impacts.
- Replacement of the wastewater collection and treatment system with a new system that uses septic tanks, a recirculating sand filter, and subsurface disposal at Willow Beach.

Current and Future Actions

Current and projected future actions that could contribute to cumulative effects on a regional basis include:

- Parkwide renovation of water distribution and sewage collections systems.

- Movement and modification of marina facilities to accommodate reduced lake levels.
- Expansion of the Las Vegas populations (humans and their commensals) and concomitant increases in consumption of natural resources and environmental impacts.

The contribution of the proposed action to impacts resulting from these cumulative actions is anticipated to be negligible to minor.

DETERMINATION OF EFFECT

The proposed action would generate new disturbance of approximately 19 acres along the entire segment of the main and secondary roads. This disturbance would include all widening that results in exceeding the previous road footprint, all realignments and road extensions to meet those realignments at intersections, new bridge construction, and turnout enhancements.

DESERT TORTOISE

The proposed action would occur in an area of Lake Mead NRA that reportedly contains a relatively high density of desert tortoises (Boyles 1998, Boyles 2002). Impacts to individuals and habitat in the project area would be minimized through proposed mitigation measures; however, there is still the potential for some adverse impact, at the individual or habitat level, to occur. Therefore, the determination of effect on the desert tortoise for implementation of the proposed action is "*may affect, likely to adversely affect.*"

RAZORBACK SUCKER

The activities of the proposed action would largely occur far from the lake shoreline. Activities in close proximity to the lake (i.e., at Overton Beach and Echo Bay marinas) would occur in developed areas, minimizing the potential for impact to lake waters. Project activities in washes within the 100-year floodplain (i.e., Las Vegas wash, Echo wash, Valley of Fire wash, and Thomas wash) would be scheduled to occur between October and April, to the greatest extent practicable, to avoid late summer thunderstorm/flood events, and minimize the potential for work in the washes to result in increased sediment load to the lake. Conservation measures to protect air and water quality would further reduce the potential for impacts on razorback suckers or their designated critical habitat. Therefore, the determination of effect on the razorback sucker and its designated critical habitat for implementation of the proposed action is "*may affect, not likely to adversely affect.*"

RELICT LEOPARD FROG

The proposed project would occur in close proximity to one of only two areas within Lake Mead NRA that are believed to support populations of relict leopard frogs. Impacts to mesic and open-water habitats required by this species would be minimized by implementation of conservation measures designed to protect air and water quality, and to prevent the establishment of nonnative plant species. However, given the apparently tenuous status of these populations and the current lack of specific knowledge of their habitat requirements and life history, the potential still exists for project-related activities to have detrimental effects on relict leopard frogs. Therefore, the determination of effect on the relict leopard frog for implementation of the proposed action is "*may affect, likely to adversely affect.*"

TABLE 2. SUMMARY OF DETERMINATIONS OF EFFECT

Species	Determination of Effect on Species	Determination of Effect on Critical Habitat
Desert Tortoise	*May affect, likely to adversely affect*	No effect; none present
Razorback Sucker	*May affect, not likely to adversely affect*	*May affect, not likely to adversely affect*
Relict Leopard Frog	*May affect, likely to adversely affect*	No effect; none designated

SUMMARY AND CONCLUSION

The proposed action is needed to enhance and maintain visitor safety and to protect natural resources. However, the proposed project would occur in a portion of Lake Mead NRA that is perceived to support a relatively high density of desert tortoises; and it would occur in close proximity to two of only five remaining sites thought to support populations of relict leopard frogs. The biology of both of these species, as described above, is such that adverse impacts to their populations and habitats are likely.

The majority of the activities associated with the proposed action would occur far from the lake. A number of these activities, such as replacing an inadequate culvert array with a bridge in Valley of Fire wash, and cleaning, repair, and replacement of culverts, are designed to reduce the potential for catastrophic failures during storm events resulting in potential impacts to lake waters. Although the potential does exist for these activities to contribute to runoff into the lake, conservation measures to protect air and water quality, and timing of activities in desert washes within the 100-year floodplain, reduce this risk to a negligible level. No adverse impacts to the razorback sucker or its critical habitat in Lake Mead NRA are anticipated as a result of the proposed action.

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As the nation's principal conservation agency, the Department of the Interior has the responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historic places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. Administration.

APPENDIX C

CONSULTATION AND COORDINATION LETTERS

United States Department of the Interior

NATIONAL PARK SERVICE

LAKE MEAD NATIONAL RECREATION AREA
601 NEVADA HIGHWAY
BOULDER CITY, NEVADA 89005

IN REPLY REFER TO:
H4217 (LAME-RM)

April 16, 2003

Mr. Ron James
State Historic Preservation Office
100 Stewart Street
Capitol Complex
Carson City, Nevada 89701

Dear Mr. James:

Lake Mead National Recreation Area (Lake Mead NRA) proposes to rehabilitate approximately 16 miles of Northshore Road, north of Echo Wash to the park boundary; the Overton Beach Access Road (approximately 3 miles in length); the Echo Bay Access Road (approximately 5 miles in length); and approximately one mile of the Valley of Fire Road from Northshore Road to the park boundary. This would be phase three in the rehabilitation of the Northshore within the park.

The work would consist of widening the road from the existing 22-feet to a 26 to 28-foot wide road with 1 to 2-foot wide paved shoulders. The proposed project would improve the poor condition of the pavement, and widen currently inadequate width lanes for the large vehicles and trailers using these roads. There would be some minor road alignment adjustments at the junction of the Northshore Road and the Overton Beach Road to improve sight distances at a dangerous intersection. Curve widening may be considered to improve safety in high accident zones and existing paved pullouts may be abandoned and/or relocated to safer locations as needed.

This project has the potential to affect resources that are listed on or are eligible for listing on the National Register of Historic Places. This letter serves as notification that we have begun the Section 106, National Historic Preservation Act (NHPA) process and look forward to receiving any comments you may have regarding the process or the project itself.

This project has the potential to affect site 26CK5431, Route No. 1-Overton-Lake Mead. In 1997, Lake Mead NRA, the Nevada State Historic Preservation Office, and the Advisory Council on Historic Preservation detailing how the site should be documented signed a Memorandum of Agreement (MOA). Lake Mead NRA is preparing a scope of work to document the site based on the stipulations in the MOA. A copy of the MOA is enclosed.

If you have any questions or comments, please contact Park Archeologist Steve Daron at (702) 293-8019.

Sincerely,

James D. Vanderford

William K. Dickinson
Superintendent

Enclosure

cc:
Ms. Jane Crisler
Advisory Council on Historic Preservation
12136 West Bayaud Avenue
Suite 330
Lakewood, Colorado 80226

Ms. Jane Sikoryak
Denver Service Center
Planning and Site Design
P.O. Box 25287
Denver, Colorado 80225-0287

NPS-DSC-TIC-Project Information Files

APPENDIX D

MEMORANDUM OF AGREEMENT

MEMORANDUM OF AGREEMENT

WHEREAS, Lake Mead National Recreation Area (NRA) has determined repair and/or maintenance actions along historic Route No.1-Overton-Lake Mead Road (Northshore Road/Overton Beach Access Roads/SR 167,169) may have an adverse effect on historic drainage features determined eligible for the National Register, and has consulted with the Nevada State Historic Preservation Officer (NSHPO) and the Advisory Council on Historic Preservation (Council) pursuant to 36 CFR 800 regulations implementing Section 106 of the National Historic Preservation Act (16 U.S.C. 470f); and

WHEREAS, Lake Mead NRA is in the process of completing baseline historic documentation on Route No.1 (26CK5431), which will be included as part of the project's Section 106 documentation submitted to the NSHPO and Council; and

WHEREAS, a mitigation plan has been prepared by Lake Mead NRA to further document the road and associated drainage features according to Historic American Engineering Survey (HAER) standards;

NOW, THEREFORE, Lake Mead NRA, NSHPO, and the Council agree that the undertaking shall be implemented in accordance with the following stipulations in order to take into account the effect of the undertaking on the historic property.

Stipulations

Lake Mead NRA shall ensure that the following measures are carried out:

1. HAER documentation, as stipulated by the Pacific Great Basin System Support Office of the National Park Service (NPS), will be collected for a single headwall/culvert requiring immediate repair. This information will be incorporated into a larger HAER report documenting Route No.1 (26CK5431) road features located in Lake Mead NRA. Repair of the culvert will occur prior to the completion of the final HAER report.

2. The roadsides of Route No. 1 have been previously surveyed for archeological resources (Brooks and Sedgwick 1971, Dodge 1975).. Should any previously documented resources be encountered during the recording of headwalls, Their condition will be evaluated. New or revised IMACS forms will be prepared for these sites and submitted to the SHPO. Should any previously unrecorded resources be encountered, the sites will be recorded and new IMACS forms will be prepared. The survey forms will be accompanied by requests for concurrence on the National Register eligibility or non-eligibility of these resources.

3. HAER documentation will be completed for a representative sample of the drainage features located on Route No.1 (26CK5431) and approved by the NPS prior to any future repair/maintenance actions taken on historic drainage features.

4. A copy of the HAER documentation will be sent to the Nevada State Historic Preservation Office in Carson City and the Nevada State Museum and Historic Society in Las Vegas.

Execution of this Memorandum of Agreement and implementation of its terms evidence that Lake Mead NRA has afforded the Council an opportunity to comment on proposed repair/maintenance plans for Route No.1 (26CK5431) and the potential effects on a historic property, and that Lake Mead NRA has taken into account the effect of the undertaking on this historic property.

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LAKE MEAD NATIONAL RECREATION AREA, NATIONAL PARK SERVICE

By: _____ Date: 6/10/97
for Superintendent, Lake Mead National Recreation Area

NEVADA STATE HISTORIC PRESERVATION OFFICE

By: Alice M Baldrica Date: 6/13/97
Deputy SHPO

CONCUR:

ADVISORY COUNCIL ON HISTORIC PRESERVATION

By: John M. Fowler Date: 7/10/97

APPENDIX E

STATEMENT OF FLOODPLAIN FINDINGS

STATEMENT OF FINDINGS FOR EXECUTIVE ORDER 11988,
"FLOODPLAIN MANAGEMENT"

Environmental Assessment for the Rehabilitation of Northshore Road and Echo Bay and Overton Beach Spur Roads

RECOMMENDED:

Superintendent, Lake Mead National Recreation Area Date

CONCURRED:

Chief, Water Resources Division Date

CONCURRED:

Chief, Pacific West Safety Officer Date

APPROVED:

Pacific West Regional Director Date

FLOODPLAINS, STATEMENT OF FINDINGS

REHABILITATION OF NORTHSHORE ROAD TO RECREATION AREA BOUNDARY, REHABILITATE ECHO BAY AND OVERTON BEACH SPUR ROADS

Lake Mead National Recreation Area
Clark County, Nevada
U.S. Department of the Interior
National Park Service

INTRODUCTION

Executive Order 11988 (*Floodplain Management*) requires the National Park Service (NPS) and other agencies to evaluate the likely impacts of actions in floodplains. National Park Service Director's Order 77-2: *Floodplain Management* establishes NPS procedures for implementing floodplain protection and management actions in units of the national park system as required by Executive Order 11988 (*Floodplain Management*). This statement of findings has been prepared to comply with Executive Order 11988.

Description of the Proposed Action:

The National Park Service is proposing to rehabilitate and reconstruct portions of Northshore Road (milepost 27.5 to 48.0) and rehabilitate Echo Bay and Overton Beach access roads at Lake Mead National Recreation Area (NRA), Clark County, Nevada. The proposed project would begin at approximately milepost 27.5 and proceed to the recreation area boundary (milepost 48.0); and would include 2.9 miles of Echo Bay spur road, and 4.7 miles of Overton Beach spur road, and a section of Northshore Road north of Las Vegas Wash. This segment of Northshore Road crosses predominantly small desert washes, but four of the larger washes are mapped within the 100-year floodplain according to the Federal Emergency Management Agency (FEMA 2005): Thomas Wash, Valley of Fire Wash, Echo Wash, and Las Vegas Wash. The purpose of the action is to correct deficiencies in existing road design and conditions including pavement deterioration; roadway alignments; road, shoulder, and bridge widths; and drainage facilities. The purpose of this action is also to upgrade this road segment for consistency (design speed and sight distance) with the other roads and road segments within Lake Mead NRA.

Specific concerns include:

- Segments of the roads do not meet NPS *Park Road Standards* (1984) for width, sight distance, and stopping distances, including a curve along Las Vegas Wash and the section of road that crosses Thomas Wash.

- The proposed road rehabilitation and widening would result in the existing Echo Wash Bridge lanes being narrower than the road and inconsistent with NPS *Park Road Standards* (1984).

- The six large culverts currently in place at the road crossing for Valley of Fire Wash are inadequate for a 50-year flood event.

The preferred alternative would widen the road along Thomas and Las Vegas washes, which would include pulverizing, recycling, and paving the road to a 32-foot width (two 12-foot travel lanes and adjacent 4-foot-wide paved shoulders), with spot reconstruction of subgrade and shoulders, as required. The culverts for Thomas Wash would be repaired or replaced, as necessary. The culverts crossing Valley

of Fire Wash would be replaced with a new bridge, which would be installed parallel to the current culvert system, so the existing roadway would be used during construction, eliminating the need to construct a detour route. The existing Echo Wash Bridge lanes would be too narrow under current NPS regulations to accommodate the proposed widening of Northshore Road, and further analysis determined that the existing bridge could not be widened due to its design. Therefore, a new bridge would be constructed parallel to the current bridge, and Northshore Road would be diverted to connect to the new bridge. The current bridge and road alignment would be used during construction of the new bridge, eliminating the need to construct a temporary detour. The box culverts and road embankment that currently exist within Echo Wash, will be removed.

Site Description:

The proposed rehabilitation of Northshore Road encompasses 19 miles and extends to the northern recreation area boundary. The stretch of road crosses several small desert washes by way of culverts. According to the Federal Emergency Management Agency, Northshore Road crosses four major desert washes that are located in the 100-year floodplain: Valley of Fire Wash, Thomas Wash, Las Vegas Wash, and Echo Wash. The appropriate FEMA floodplain maps are attached as figures 1, 2, 3, and 4 of the statement of findings. Valley of Fire Wash, Thomas Wash, and Echo Wash are almost always dry, except during and after large rainstorms that usually occur in the summer months. Las Vegas Wash has perennial flow because it receives treated wastewater and urban runoff from the entire Las Vegas valley.

General Characterization of the Nature of Flooding in the Area: Hydrologic Risk

The washes are located in broad alluvial fans that drain into Lake Mead through the Boulder and Virgin river basins. Flooding of these desert washes is triggered by heavy rain events that quickly fill the usually dry wash bottoms. The flash floods are sudden, violent, and short-lived. The Western Regional Climate Center has recorded 2 to 3 inches of precipitation during intense rainstorms during the months of July and August for Valley of Fire State Park, and numerous rainfalls of 1 to 2 inches almost anytime in the year. The short but intense flash floods carry large amounts of sediment that scour the wash bottoms and wash out sections of Northshore Road.

JUSTIFICATION FOR USE OF THE FLOODPLAIN

Why the Proposed Action Must be Located in the Floodplain

Northshore Road is a primary entry point into the recreation area. There is an obvious need to rehabilitate the Northshore Road including the four desert washes located in floodplains. The rehabilitation of Northshore Road cannot be accomplished via alignments that would avoid the washes. This is due to the fact that Northshore Road intersects these washes at approximate right angles, rendering parallel or other tangential alignments outside of the washes infeasible. It is necessary for the road to be rehabilitated to meet safety standards, and the Valley of Fire Wash crossing needs to be improved to prevent catastrophic culvert failure. The Echo Wash Bridge needs to be replaced, at least in part, to protect against the continuing high degree of scour around foundations.

Investigation of Alternative Sites

The relocation of Northshore Road is impractical. Furthermore, the possibility of crossing these four desert washes at sites outside of the floodplains does not exist, and therefore, no other alternative sites were considered.

DESCRIPTION OF SITE-SPECIFIC FLOOD RISK

Recurrence Interval of Flooding the Washes

Flooding of the washes relies entirely on the amount of rainfall the area receives. Any large rainstorm can trigger flash floods in the washes. According to the Western Regional Climate Center database, the project area has recorded the wettest months of the year, on average, as February (1.31 inches), January (1.00 inch), and March (0.84 inches). July is the wettest spring/summer month (0.35 inches). These averages are derived from data collected at the Echo Bay climate station on Lake Mead from August 1, 1989 to December 31, 2005.

Hydraulics of Flooding at the Washes

The amount of water contained in the flash floods depends on the amount of precipitation that the area receives and the intensity of the rainstorm. Las Vegas Wash has suffered multiple flash floods in recent years, including 1984, 1998, and 1999. The 1999 flash flood event resulted in an estimated peak discharge rate of approximately 17,000 cubic feet per second. A comparison of 1989 and 1999 reports and maps for Las Vegas Wash at the Northshore Road Bridge reveal that the channel bottom had been lowered 4.9 to 5.9 feet over the 10-year period (Ayres Associates 2001).

Time Required for Flooding to Occur

Flash floods occur within a few minutes or hours of excessive rainfall (NOAA/NWS 1992).

Opportunity for Evacuation in the Event of Flooding

The opportunity to evacuate any of the four desert washes is good because each wash is relatively open and Northshore Road is an available paved route for escape from the area.

Geomorphic Considerations

Flash flooding washes sediment down these intermittent drainages typically resulting in channel aggradation upstream of roadway culverts where the flow velocity decreases and sediment deposits and channel incision or down-cutting below the culverts where flow velocity increases. Formation of plunge-pools downstream of the culverts can cause eddying that erodes the roadway fill at its toeslope. Sediments are delivered to the washes due to erosion of soils and gravel from uplands and sloughing of drainage banks. A combination of sediment and debris (annual vegetation such as Russian thistle, shrubs, cobble, etc.) can obstruct culverts and further restrict or even block flows. When flows are sufficiently restricted at culvert openings, the water overtops the roadway and erodes the downstream fill-slope.

MITIGATION (DESCRIPTION OF HOW THE ACTION WILL BE DESIGNED OR MODIFIED TO MINIMIZE HARM TO FLOODPLAIN VALUES OR RISK TO LIFE OR PROPERTY)

Best management practices (BMPs) are effective, feasible (including technological, economic, and institutional considerations) practices and management measures that avoid or minimize adverse impacts to a given natural or cultural resource or operation. BMPs may include schedules for activities, prohibitions, maintenance guidelines, and other management practices.

BMPs would be used to prevent or reduce nonpoint source pollution in the affected watersheds and to minimize soil loss and sedimentation. BMPs would minimize impacts to the washes and would include some or all of the following features, depending on site-specific requirements:

- Locating waste and excess excavation outside the floodplain to avoid sedimentation.

- Prior to construction, installing silt fences, straw bale barriers, temporary earthen berms, temporary water bars, sediment traps, stone check dams, brush barriers, or other equivalent measures, including installing erosion-control measures around the perimeter of stockpiled fill material.

- Restricting the work in and around the washes to October through June to avoid the sudden flash floods spawned by summer thunderstorms, thereby reducing the risk to human life during construction, and reducing the risk of mass movement of disturbed sediment during construction.

- Conducting regular site inspections throughout the construction period to ensure that erosion-control measures were properly installed and functioning effectively.

- Refueling construction equipment in upland areas only, to prevent fuel spillage near water resources.

The new bridge across Valley of Fire Wash has been designed to accommodate a 100-year flood, whereas the current culvert system could only accommodate a 50-year flood event. This would help to reduce erosion associated with culverts, including the aggradation of materials upstream and channel incision downstream of the culverts. Eliminating the potential for catastrophic culvert failure would reduce the risk to life, property, and natural resources (e.g., soil and riparian vegetation) associated with flooding in this section of Valley of Fire Wash. The new bridge across Echo Wash would accommodate the wider Northshore Road and ensure that the highway adheres to NPS safety standards. The Echo Wash Bridge would also be designed to accommodate a minimum 50-year flood, thereby enhancing public safety and protecting property. The culverts for Thomas Wash would be repaired or replaced, helping to maintain erosion control and prevent channel incision downstream of the culverts. No direct construction work in Las Vegas Wash would be necessary, and therefore, no changes to floodplain conditions are anticipated there.

COMPLIANCE

Bridges and culverts for the Northshore Road rehabilitation project would be constructed in the 100-year floodplains of four separate washes in the project area, including: Thomas Wash, Valley of Fire Wash, Echo Wash, and Las Vegas Wash. The floodplains for all of these washes, and the stream in Las Vegas Wash, would be impacted through fill operations associated with grading and drainage work required for bridge and culvert construction. There would be some localized measurable changes in the ability of the floodplains to convey and store floodwaters, but construction would not contribute to flooding.

Section 401 of the Clean Water Act requires a permit for any activity that may result in any discharge into navigable waters of the United States. Section 404 of the Clean Water Act requires a permit for any activity that may result in the discharge of dredged or fill material into navigable waters of the United States. Therefore, section 401 and section 404 permits would both be required for this project.

Section 401 and section 404 permits, the environmental assessment, this statement of findings for Executive Order 11988, and the finding of no significant impact, when signed, would complete the requirements for the National Environmental Policy Act for this project.

SUMMARY

Lake Mead NRA proposes to rehabilitate Northshore Road and Echo Bay and Overton Beach spur roads. The rehabilitation includes a 19-mile stretch of Northshore Road and a section of road along Las Vegas Wash that do not currently meet NPS *Park Road Standards* (1984) for width, sight distance, and stopping distance. Within this span of highway, Northshore Road crosses four desert washes that are in the 100-year floodplain, including: Thomas Wash, Las Vegas Wash, Echo Wash, and Valley of Fire Wash. The rehabilitation of Northshore Road includes widening the road adjacent to Las Vegas Wash and the point where Northshore Road crosses Thomas Wash. The culverts for Valley of Fire Wash cannot accommodate a 50-year flood and would be replaced with a newly constructed bridge that would accommodate a 100-year flood. The current Echo Wash Bridge is not wide enough under NPS standards to accommodate the proposed widening of Northshore Road, so a new bridge would be constructed. The current bridge can be used during construction for Valley of Fire Wash and Echo Wash to eliminate the need to create temporary detours that would further impact the floodplains. There is a need to rehabilitate Northshore Road, including the four desert washes that cross 100-year floodplains. The possibility of crossing these four desert washes at sites outside of the floodplains does not exist, and therefore, no other alternative sites were considered.

The washes are located in broad alluvial fans that drain into Lake Mead through the Boulder and Virgin river basins. Flooding of these desert washes is triggered by heavy rain events that quickly fill the usually dry wash bottoms. The flash floods are sudden, violent, and short-lived. The short but intense flash floods carry large amounts of sediment that scour the wash bottoms.

BMPs would be utilized to prevent or reduce nonpoint source pollution in the affected watersheds and to minimize soil loss and sedimentation including erosion-control measures, restricting construction within the floodplains to the winter months, and locating waste and excess excavation materials outside of riparian areas. The new bridge over Valley of Fire Wash would reduce erosion associated with culverts and eliminate the potential for catastrophic culvert failure and the subsequent risks to health, safety, and natural resources. The construction of the Echo Wash Bridge would ensure that Northshore Road adheres to NP*S Park Road Standards* (1984).

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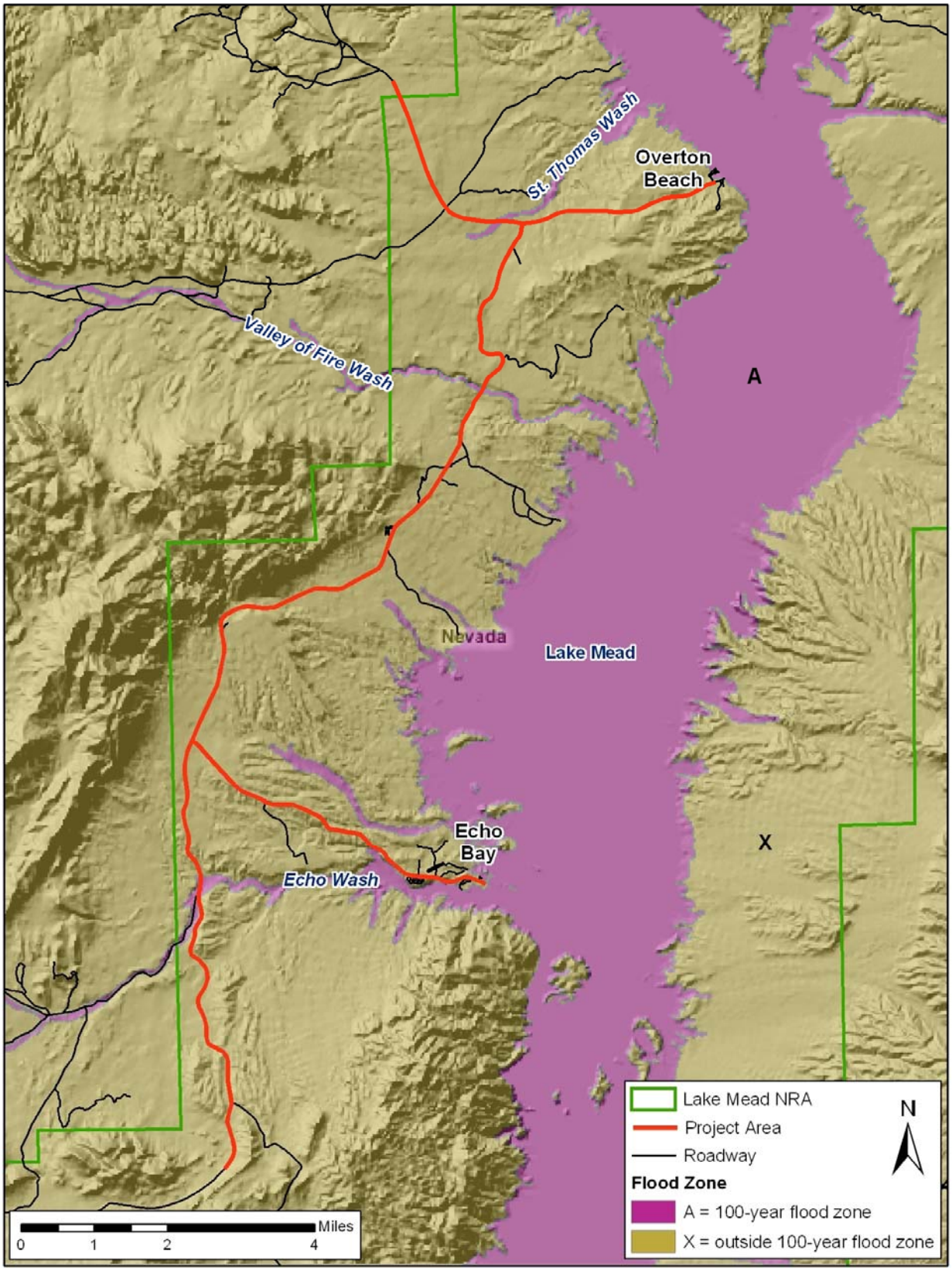
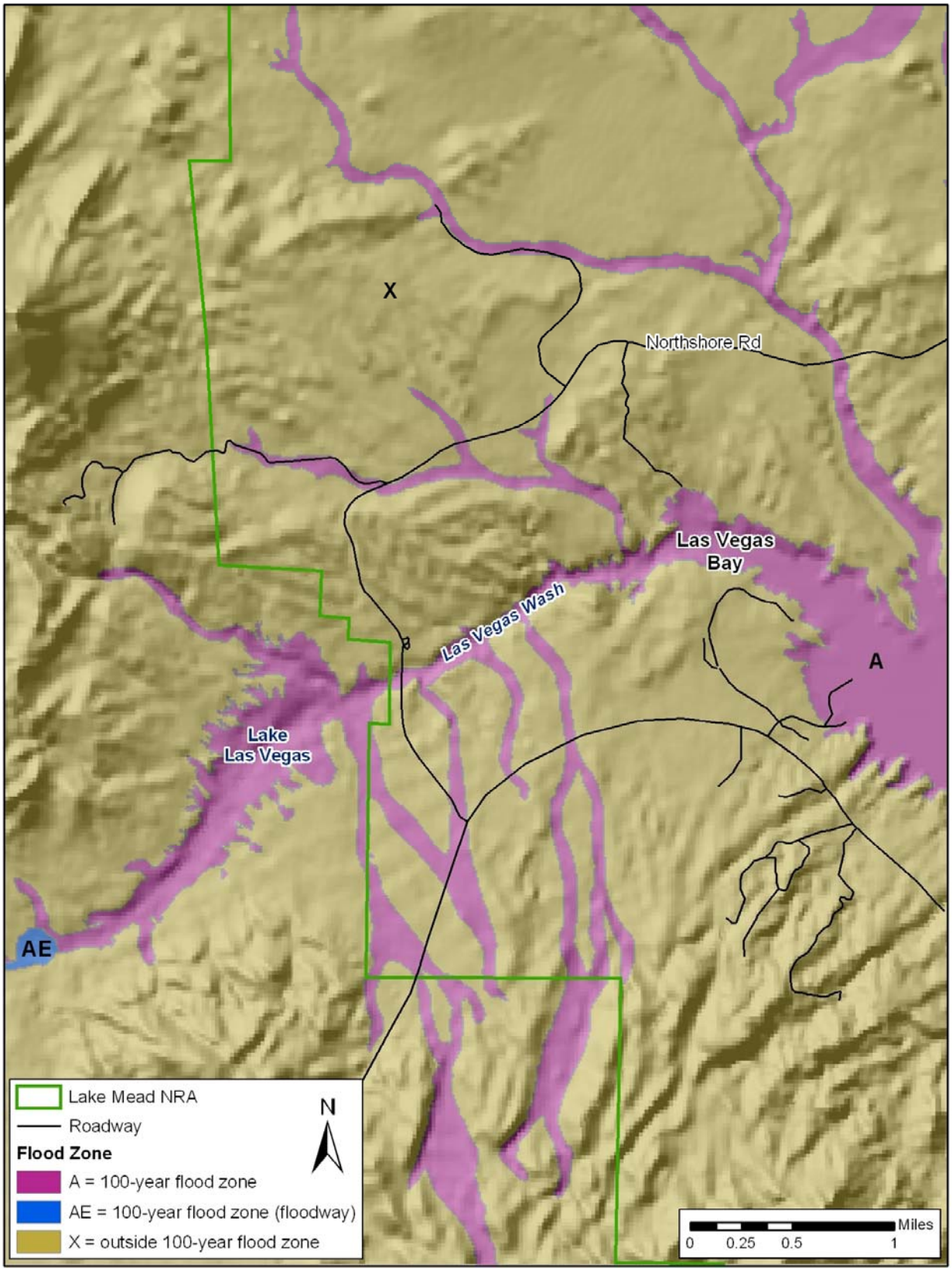

St. Thomas Wash
Overton Beach
Valley of Fire Wash
A
Nevada
Lake Mead
Echo Bay
Echo Wash
X
Lake Mead NRA
Project Area
Roadway
Flood Zone
A = 100-year flood zone
X = outside 100-year flood zone
N
Miles
0
1
2
4


X
Northshore Rd
Las Vegas
Bay
Las Vegas Wash
A
Lake
Las Vegas
AE
Lake Mead NRA
Roadway
Flood Zone
A = 100-year flood zone
AE = 100-year flood zone (floodway)
X = outside 100-year flood zone
N
Miles
0
0.25
0.5
1

As the nation's principal conservation agency, the Department of the Interior has the responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historic places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. Administration.

Lake Mead National Recreation Area
Nevada