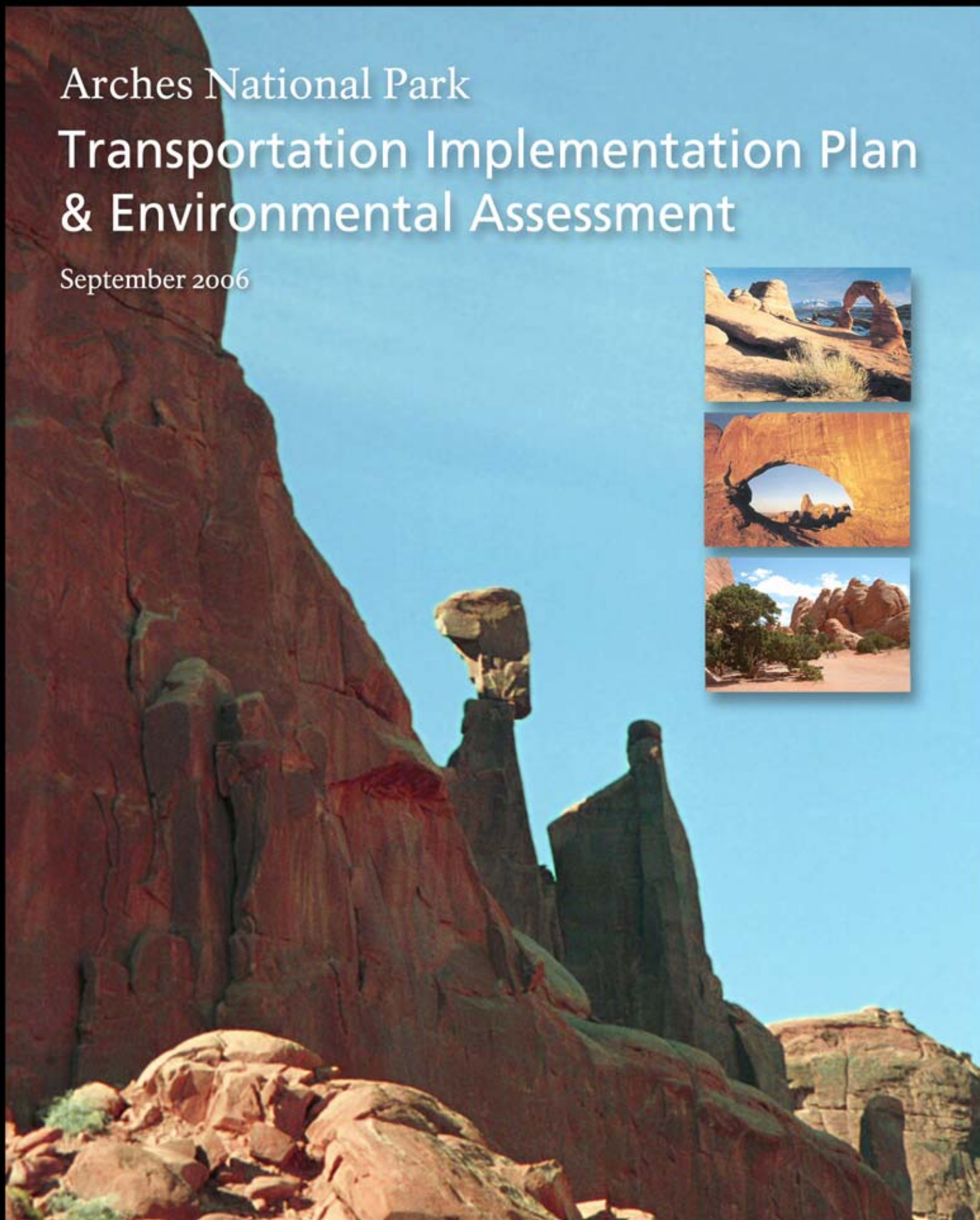




# Arches National Park Transportation Implementation Plan & Environmental Assessment

September 2006





At Arches National Park, the National Park Service (NPS) is proposing to put into action a Transportation Implementation Plan. This plan includes improvements to parking areas and roadside pull offs, traffic calming treatments, motorized interpretive tours, and intelligent transportation system applications. The NPS also will continue to pursue partnerships with local and regional interests, maintain ongoing Visitor Experience and Resource Protection (VERP) program implementation and monitoring, and employ various visitation and congestion management strategies. This action is needed to manage the quality of visitor experiences at many popular attractions in the park, which have deteriorated over time as a result of traffic congestion and crowding at parking areas, trailheads, and popular rock formations.

The Transportation Implementation Plan also includes an integrated environmental assessment prepared pursuant to the National Environmental Policy Act (NEPA). The environmental assessment examines in detail two alternatives: no action and the National Park Service preferred alternative. The preferred alternative proposes implementation of all transportation implementation plan recommendations.

The preferred alternative would have no impacts on paleontological resources, museum collections, floodplains, wetlands, prime and unique farmlands, housing, environmental justice, and geologic resources and hazards.

Short- term negligible adverse impacts could occur to the bald eagle and Southwestern willow flycatcher during construction if these species were using habitats within or adjacent to construction sites. Short- term negligible adverse impacts could also occur to four federally-endangered fish species. Short- term minor adverse impacts would occur to air quality during construction. Short- term negligible adverse impacts would also occur to water quality, wildlife and vegetation, energy and resource conservation, and noise and natural soundscapes. There would be no long- term adverse impacts to threatened

and endangered species, water quality, wildlife and vegetation, energy and resource conservation, and air quality.

Short- and long- term negligible to minor localized adverse impacts would occur to soil resources. Long- term negligible to moderate adverse impacts would occur to biological soil crusts. Short- term negligible to minor adverse impacts would occur to unknown archaeological resources if these resources are discovered during ground disturbance. Short- and long- term negligible to minor adverse impacts would occur to ethnographic resources. Short- term negligible to minor adverse impacts and long- term negligible to moderate adverse impacts would occur to visual quality. Long- term minor adverse impacts would occur to land use.

The preferred alternative would have long- term beneficial impacts on natural resources, cultural resources, transportation and traffic, and visitor use and experience, park operations, and socioeconomics. Proposed improvements at existing pull offs would protect soils and cultural resources from further disturbance and would allow previously disturbed areas to revegetate. Increased use of public motorized interpretive tours could reduce gasoline consumption, air emissions, and vehicular noise by eliminating some private vehicle trips entering the park, particularly during peak periods. The preferred alternative also would enhance traffic safety of park roads and pull offs and would reduce congestion at destination parking areas throughout the park, thereby improving the overall visitor experience. While there would be increased demands in the short term on park staffing and operational resources related to implementation of transportation improvements and monitoring of social pull offs, demands would be reduced over the long term under the preferred alternative. The proposed motorized interpretive tours under the preferred alternative would offer expanded opportunities for the general population to access and experience Arches National Park and enhance the regional economy by providing opportunities for private enterprises.





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*Note: Studies and documents referenced throughout this Transportation Implementation Plan and Environmental Assessment are listed in Chapter 7.*



### Project Context

Arches National Park is adjacent to the Colorado River, in high desert country known as the Colorado Plateau. Elevations in the park range from 4,085 to 5,653 feet above sea level. The park contains over two thousand sandstone arches in addition to a variety of unique geological resources and formations such as balanced rocks, fins, and pinnacles. In some areas, faulting has exposed millions of years of geologic history. Throughout the park, rock layers reveal millions of years of deposition, erosion, and other geologic events. Continued erosion in the park influences elemental features such as soil chemistry and water flow pathways.

Arches National Park was first established as a national monument in 1929 and later became a national park in 1971. The 73,359-acre park lies entirely within Grand County, Utah, five miles northwest of the county seat, Moab – a gateway community to the park and other surrounding public lands. Arches National Park is located within the “Grand Circle,” a broad geographic region in the southwestern United States that encompasses more than sixty recreation sites in five states. The Grand Circle includes some of the Southwest’s most unique landscapes, attractions, scenic byways, and national park lands.

This transportation implementation plan and environmental assessment document focuses on transportation conditions and actions within the limits of the park, as well as access to and from the park and the park’s relationship to the gateway community of Moab. The plan also considers the implications of other tourism and recreation destinations on public lands in the region and the importance of a coordinated partnership between the National Park Service and other agencies and jurisdictions in the planning, design, and implementation of regional transportation systems and facilities.

Figure 1.1 on page 1- 3 illustrates the location of Arches National Park as part of the Grand Circle

experience. Figure 1.2 on page 1- 4 illustrates the vicinity of the park and Moab and highlights some of the park’s most popular attractions as well as other recreational sites and lands in the vicinity of the park.

### Purpose of and Need for the Plan

The National Park Service is proposing to put into action a transportation implementation plan for Arches National Park. The plan includes selected roadside pull off and parking area improvements, traffic calming measures, motorized interpretive tours, intelligent transportation system applications, and other congestion management strategies.

The purpose of the action is to ease traffic and parking congestion, protect natural and cultural resources, enhance the visitor experience, improve visitor safety and accessibility, and offer visitors an alternative to driving private vehicles through the park. Another purpose of the action is to strengthen the level of coordination and partnerships between the National Park Service and other agencies, jurisdictions, and stakeholders in the region.

The Arches National Park General Management Plan (1989) and Visitor and Resource Protection Implementation Plan (1995) were foundational plans in providing direction for the transportation implementation plan.

Objectives for developing the transportation implementation plan included the following.

- Protect the park’s natural and cultural resources from potential impacts attributable to vehicles and visitor use, including inappropriate parking along roadways and parking lot edges.
- Improve the visitor experience, including enhancement of access and travel mode choices to and within the park.



- Continue to accommodate the private automobile in the park and to enhance the experience of sightseeing and scenic driving.
- Improve traveler safety.
- Integrate park transportation plans with regional transportation planning activities.

The action is needed to address the following problems and needs.

- Parking areas at popular attractions within the park are frequently congested, causing visitors to park outside of paved areas, potentially damaging sensitive soils, vegetation, and cultural resources.
- Visitors have been parking in unpaved areas along the roadside for a variety of reasons (such as for photo stops, orientation, and scenic views), which also can cause potential damage to soils, vegetation and cultural resources.
- Parking conditions, visitor orientation, and recreation opportunities need to be improved and expanded to help better disperse visitation throughout the park.
- Visitor/traveler safety is an important ongoing need that must be addressed throughout the park, including locations along park roads and at key features where travelers tend to exceed posted speed limits and pedestrians frequently cross the road to access trails.
- There is an ongoing need to preserve and enhance the visitor experience at Arches National Park. When parking areas and trails become congested, visitor experience is diminished. An increasing number of visitors are commenting about crowding along trails and at key features and in parking areas and are raising concerns about the potential degradation of natural and cultural resources caused by this congestion.
- Currently, motorized interpretive or sight-seeing tours are not provided to the general visiting public at Arches National Park. There is a need to offer visitors an alternative to driving private vehicles through the park.

- Because the Moab, Utah region, inclusive of Arches National Park and other public lands, is one of the most popular tourism destinations in America, there is an important, ongoing need for the National Park Service, Bureau of Land Management, Utah State Parks, Grand County, City of Moab, and other agencies and stakeholders to coordinate and cooperate on planning for and addressing regional transportation issues over the near and far term.

This transportation implementation plan focuses on various strategies and improvements that could be reasonably implemented within approximately the next six years or less to address these needs.

The environmental assessment integrated with this transportation implementation plan was prepared pursuant to the National Environmental Policy Act (NEPA) of 1969 and regulations of the council on Environmental Quality (40 CFR 1508.9), the National Park Service's Director's Order (DO)- 12 (*Conservation Planning, Environmental Impact Analysis, and Decision-making*), and the National Historic Preservation Act of 1966 (as amended).

Additional environmental analysis and NEPA compliance may be needed to support specific implementation of motorized interpretive tours since the physical aspects outside the park related to this action have only been generally defined in the plan.

## Purpose and Significance of the Park

The Arches National Park Visitor Experience and Resource Protection (VERP) Implementation Plan, published in 1995, describes the purpose and significance of the park based on the park's enabling legislation, legislative history, NPS policies, park plans, public input, and the knowledge and insights of NPS staff. According to the VERP Implementation Plan, the purposes of Arches National Park are to:

- protect extraordinary examples of eroded sandstone formations and the setting in which they occur;





Figure 1.1 – Regional Map

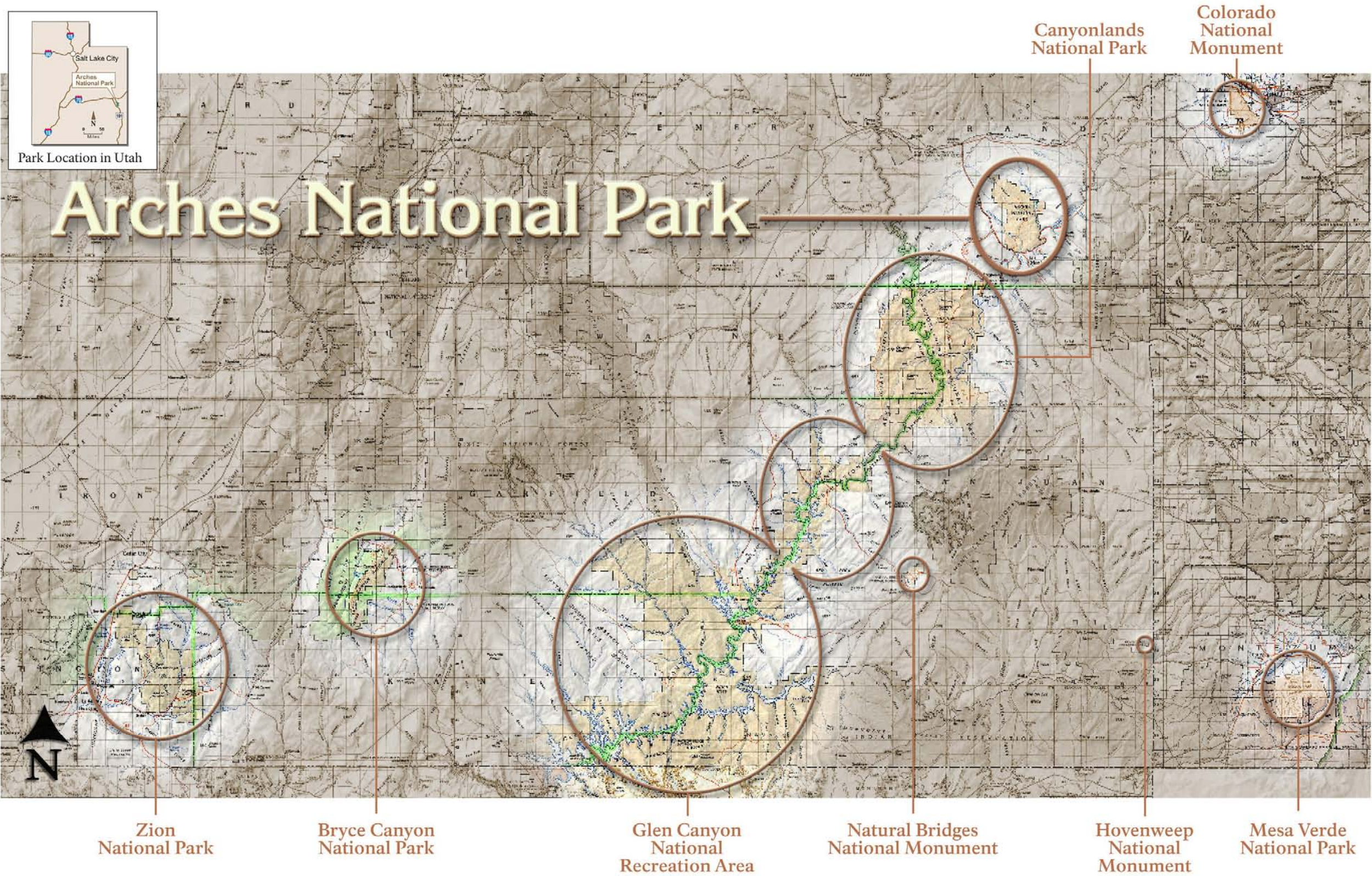
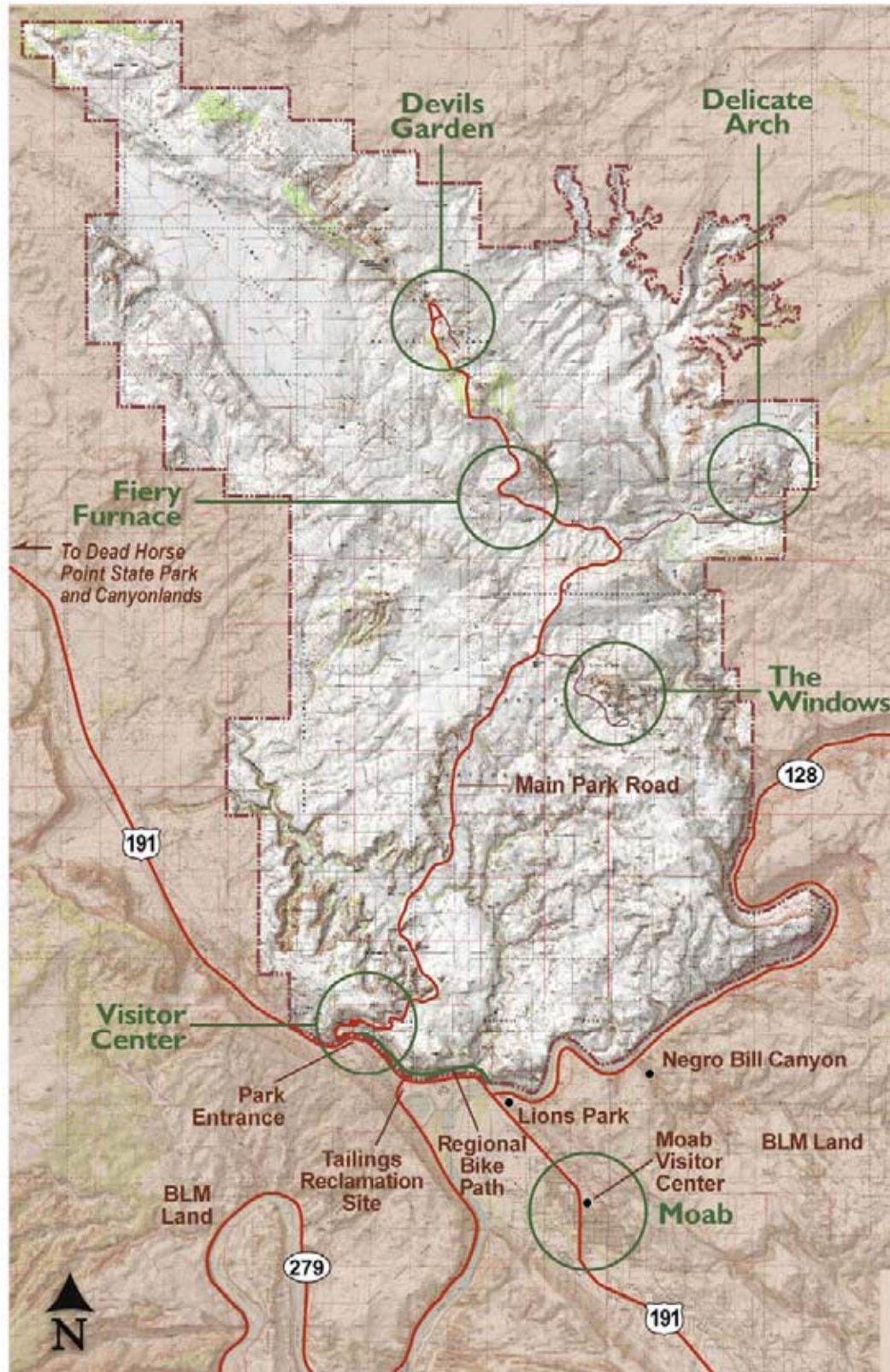




Figure 1.2 – Park Map



- protect other features of geological, historical, prehistorical, and scientific interest, and
- provide opportunities for visitor appreciation and education that leave park resources unimpaired.

Several factors contribute to the significance of Arches National Park. The park contains the largest concentration of natural arches in the country and one of the largest concentrations in the world. Its extraordinary geological features are easily accessible, many by vehicle or short walking distances from trailhead parking areas.

Arches National Park has striking foreground and background views created by contrasting colors, landforms, and textures. The juxtaposition of shale, gypsum, and sandstone substrates within this protected area provides unusual research opportunities. The park preserves a portion of the Colorado Plateau ecosystems, which have unusual nutrient and energy cycles, offering unique opportunities for studying protected ecosystems and environmental changes over long periods.

Arches National Park also contains cultural resources that are listed on or eligible for the National Register of Historic Places, and the park contains part of the most concentrated dinosaur megatrack site in the world.

The park is part of a complex of surrounding parks and public lands offering millions of acres of access and a wide range of recreation opportunities and experiences to regional, national, and international visitors.

In accordance with the overall mission of the National Park Service, the Arches National Park General Management Plan (GMP), published in 1989, states that *“protection and preservation of the natural environment to ensure ecosystem integrity while providing for visitor enjoyment will be the principal consideration.”*

## Previous Planning Efforts

Following is a chronological summary of planning efforts relevant to transportation issues at Arches National Park. These documents were referenced

as background information for development of the transportation implementation plan.

## Early Transportation Planning (1970s)

Transportation planning involving Arches National Park dates back at least as far as the early 1970s. In 1973, a regional transportation study analyzed existing transportation conditions and proposed actions to strengthen interconnectivity and intraconnectivity between Arches, Canyonlands, and Capitol Reef national parks. Proposals resulting from the study ranged from plans for expansion of regional roadway systems to development of a three- park regional transportation system involving air and bus transit coordination. Specific to Arches National Park, the study noted:

*“Arches, by virtue of its physiographic characteristics – its broad, open areas with concentrated segments of erosional forms – lends itself well to the existing automobile- oriented experience. The movement of visitors between points of interest in Arches is provided by a paved entrance road that extends nearly 18 miles into the park, and a series of connecting roads and trails. In order to cope with future increases in visitation, a system of mini transit vehicles similar to that proposed for Canyonlands will be implemented when park management deems it necessary.”*

## Arches National Park General Management Plan (1989)

The Arches National Park GMP established an overall direction for management and use of the park. The GMP proposed improvement and expansion of some visitor and administrative facilities at the park to:

- 1 Remove people and property from the 500- year floodplain,
- 2 Correct traffic hazards along the main park road,
- 3 Provide adequate visitor orientation and information,
- 4 Meet the existing demand for parking at most overlooks and trailheads,



- 5 Confine the impacts of vehicle and foot traffic,
- 6 Make the Delicate Arch viewpoint accessible to all visitors, and
- 7 Rectify miscellaneous visitor use, resource management, and operational problems.

Some of the specific topics addressed by the GMP include analysis of visitor capacity, interpretive signing, accessibility for all park visitors, visitor center development, flooding hazards, treatment and storage of artifacts, and issues related to adjacent lands. Many of the recommendations of the GMP have been implemented, including expansion and improvement of the Visitor Center, Devils Garden, Balanced Rock, Wolfe Ranch, and the Delicate Arch Viewpoint parking lots. Other recommendations have not yet been implemented, such as the expansion of the Sand Dune Arch parking lot.

The GMP included an environmental assessment (EA) of the plan's recommendations. Three alternatives were reviewed in the GMP/EA: the preferred alternative, a no-action alternative, and a minimum requirement alternative (only improvements needed for life safety and resource protection). The preferred alternative development plan included flood mitigation, improvements to existing and development of new visitor facilities and services (interpretation, trails, and trailheads), and improvements to existing roads.

The preferred alternative was favored during the public comment period. The EA determined that the preferred alternative would not have an appreciable effect on the human environment or impacts on public safety, threatened species, or other unique characteristics in the park. The results of the analysis determined that an environmental impact statement would not be required for the alternatives in the GMP.

The 1989 GMP provided a limited assessment of transportation conditions and needs at Arches National Park, primarily focused on defining parking lot capacities and improving operations of park roads and trails. The GMP highlighted the urgent need for managing increasing visitor and vehicle traffic and congestion in the park. It called

for the development of a visitor impact management program to address impacts on natural and cultural resources and visitor experience. The GMP stated: *"To gather the necessary data for decisions on capacity, a visitor impact management (VIM) program will be implemented."* Without making specific decisions on carrying capacity or alternative transportation systems, the GMP anticipated that the visitor impact management program would make recommendations for changes in the way park visitors and their vehicles are managed.

The GMP identified "Options Considered but Rejected," one of which was to "Implement a Public Transportation System." Implementation of a public transportation system was studied as a possible alternative to expanding parking at interpretive viewpoints. The study concluded that public transportation would be quite costly and might not be economically feasible for Arches National Park.

## Visitor Experience and Resource Protection Program and Implementation Plan (1990s)

For much of the 1990s the National Park Service (NPS) was involved in a planning process designed to address the agency's requirement to include visitor carrying capacity considerations in all general management plans. The NPS developed the Visitor Experience and Resource Protection (VERP) program to address carrying capacity and help parks make sound decisions about visitor use.

The VERP program interprets carrying capacity as a prescription of desired ecological and social conditions rather than a prescription of numbers of people. VERP provides support for informed, defensible decisions about visitor use and provides a framework for cost-effectively coordinating planning, research, monitoring, and management actions.

Arches National Park was selected in 1992 as the first park to test the VERP process. The park then developed and published a VERP Implementation Plan in 1995. Development of the VERP plan for





Arches tiered from the 1989 GMP and Environmental Assessment, which identified an urgent need for a visitor impact management program at the park.

The Arches National Park VERP Implementation Plan includes four primary elements:

- management zoning scheme
- indicators and standards for each zone
- management actions to address visitor use, and infrastructure in each zone
- monitoring program.

The park is divided into nine management zones. Each zone contains indicators and standards for monitoring desired visitor experience and resource conditions. Specific methodologies were developed for monitoring since monitoring is a key element of the VERP program. Ongoing collection of up-to-date data on resource conditions and visitors ensures the ability of park staff to determine if discrepancies occur between desired and existing conditions.

In addition to developing the VERP Implementation Plan, park staff began the process of installing improvements at key feature parking areas to help reduce roadside parking in undesignated areas and to maintain acceptable resource and crowding conditions at these locations consistent with the standards in the VERP plan. Elements such as striping, signs, curbing, fencing, and boulders were placed in key feature and trailhead parking areas to physically manage parking and roadside pull off activities in these areas.

A review of the monitoring results between 1998 and 2003 for three key features that are a focus of this transportation implementation plan (the Windows, Delicate Arch, and Devils Garden) indicates the following:

- In 1998, conditions at all three areas were within the VERP standards. In 1999, Delicate Arch conditions failed to meet the standards.
- In 2000 and 2001, conditions at Delicate Arch and Windows failed to meet the standards.

- In 2002 and 2003, conditions at Delicate Arch and Devils Garden failed to meet standards.

Funding for ongoing VERP monitoring at Arches National Park is not guaranteed. However, VERP monitoring is an extremely important tool for management of visitor experience and resource protection. Ongoing VERP monitoring would help park staff to determine where and when various strategies for reducing congestion in the park would be implemented.

## Alternative Transportation Needs Study (1999)

Section 3039 of the Transportation Equity Act for the 21st Century (TEA-21) required the Secretary of Transportation, in coordination with the Secretary of the Interior, to: *“undertake a comprehensive study of alternative transportation needs in national parks and related federal lands.”* The results of the Federal Lands Alternative Transportation Systems (ATS) study identified major transportation needs at sites managed by the National Park Service (NPS), the Bureau of Land Management (BLM), and the U.S. Fish and Wildlife Service (USFWS).

During the summer of 1999, Arches National Park participated in the study, administered by the Federal Transit Administration in cooperation with the Federal Highway Administration. A contractor team visited the park and Moab, gathered information on park infrastructure, planning documents and community resources, and met with park staff and community leaders to discuss the potential for an Alternative Transportation System (ATS) concept. The ATS concept included consideration of potential shuttle bus services to and from and within the park. Community representatives were supportive of the ATS concept and expressed interest in working with the National Park Service on future planning and implementation activities. The 3039 Alternative Transportation Needs Study determined that the park was a strong candidate for the introduction of an ATS.



## Arches National Park Road Pullout Analysis Report (2001) and Updated Social Pull Off Study (2004)

For many years, visitors have been parking their vehicles on roadside shoulders throughout the park, which causes potential damage to the road edge, sensitive soils, vegetation, and cultural resources. This “social” pull off activity has become a widespread problem throughout the park. In locations where the shoulders have not been paved or delineated to support vehicles pulling off the road, informal pull offs are being created that are often wider and longer than needed, and damage to soils and vegetation occurs regularly. In addition to the effects on natural resources, the locations of many of the social pull offs compromise traffic safety and visitor experience.

As part of VERP- related project funding provided by the Natural Resource Preservation Program (NRPP), a detailed assessment of the informal road shoulder parking or social pull off conditions was conducted. The resulting study, published in March 2001, involved a survey of roadside conditions and identified and classified 177 informal pull off locations. Some locations were recommended for formalizing (improving for permanent use). Others were recommended for removal (closure and treatment to discourage continued social pull off activities).

An updated analysis of existing formal and social roadside pull off areas was completed November 2- 5, 2004 at Arches National Park by park staff and transportation planning consultants. The number of pull off locations had grown from the 177 originally analyzed in the 2001 study to over 200 in the park, and park management staff felt it was time to move forward with closing and treating pull off locations to help deter more from being created. The team assessed all the pull off recommendations in the 2001 study, as well as additional pull offs created since that time and more current considerations and recommendations offered by Arches National Park staff.

Of the all the social pull off locations in the park, the 2004 study determined that twenty- one should be formally improved to include paving, fencing, advanced signing, and treatment of disturbed adjacent landscape pending the outcome of detailed environmental analysis. The study also determined that five locations should receive minor improvements, remaining in their current condition and open to use, but not paved or formalized. The study determined that other remaining pull off locations throughout the park could be treated over time to deter usage. Treatment could include raking out tire treads and depressions caused by social pull off activity, restoration with native vegetation, and edging areas with large boulders, and may also include soil restoration, fencing, and other treatments where needed.

## Intelligent Transportation Systems Study, Arches National Park (2004)

Intelligent Transportation Systems (ITS) include the application of computers, communications, and sensor technology to multi- modal transportation systems and facilities. When integrated into the transportation system infrastructure, and in vehicles themselves, these technologies help monitor and manage traffic flow, reduce congestion, provide alternate routes to travelers, enhance productivity, and save lives, time, and money.

A study of potential ITS applications suitable for Arches National Park was completed in 2004. The study proposed short- term and long- term ITS improvements for the park. The short- term proposals of the ITS study are part of the collective actions proposed in the transportation implementation plan. Potential long- term options require further study prior to implementation. Additional study and analysis of these elements likely would be included as part of a future update to the park’s GMP, and as such, the long- term options are not analyzed here.



## Issues and Impact Topics

### Issues

Issues describe problems or concerns associated with current impacts from environmental conditions or current operations, as well as problems that may arise from the implementation of any of the alternatives. Potential issues related to the transportation implementation plan were identified and discussed during agency and public scoping meetings, other public meetings, and National Park Service working group meetings. The primary concern of the park is to protect and minimize disturbance to natural and cultural resources, enhance the visitor experience, and improve visitor safety and accessibility. Other issues and concerns identified include:

- **Natural Resources.** Continued social pull off and parking activity and visitor congestion and proposed pull off and parking area improvements likely will affect natural resources such as biological soil crusts. Impromptu parking along park roads and social trails created in the vicinity of these areas has and will continue to affect soils and vegetation.
- **Cultural Resources.** Continued social pull off and parking activity and visitor congestion and proposed pull off and parking area improvements could affect a variety of cultural resources at the park, including plants collected for ethnobotanical purposes.
- **Visitor Use and Experience.** Continued congestion and overcrowding at key park features could affect visitor experience and proposed actions of the transportation implementation plan also could affect visitor experience. General motorized interpretive tours have not yet been provided at the park.
- **Visual and Scenic Quality.** Continued social pull off use and creation of social trails in the vicinity of these areas, as well as proposed parking and pull off improvements, have the potential to affect the visual and scenic quality and views of the resources for which the park was established.

- **Health and Safety.** Visitors frequently speed on the main park road and pedestrians cross the main road at several locations to access trailheads. The park must ensure visitor safety and traffic safety within the park.
- **Traffic and Transportation.** Ongoing traffic and parking area congestion could continue, and existing transportation facilities (roads and parking areas) may not adequately support future visitor needs. There is currently a lack of opportunity for visitors to experience the park other than by private vehicle.
- **Park Operations.** Considerable levels of park staffing and resources are currently devoted to traffic, parking, and social pull off management. There may be an opportunity to reduce the demand for staffing and resources for these purposes, and then to redirect staffing and resources to important needs such as visitor interpretation and education and resource protection.
- **Socioeconomics, Regional Partnerships and the Gateway Community.** The City of Moab serves as the gateway community to the park. Opportunities for the park to collaborate with the City of Moab, Grand County, and other regional interests (such as the Bureau of Land Management and Utah State Parks) are ongoing. Motorized interpretive tours, if implemented, would originate in Moab, which could have positive affects on the local economy and strengthen the town's function as a gateway to the park. Development and construction of facilities to support tour operations could temporarily affect the town in both positive and negative ways.

### Derivation of Impact Topics

Impact topics were identified in order to focus the analysis of impacts on resources and the potential consequences of the proposed actions of the transportation implementation plan in relation to the no action alternative. Impact topics were based on legislative requirements; topics specified in the *Reference Manual to Director's Order 12* (USDI National Park Service 2001a); environmental statutes, regulations, executive



orders and *NPS Management Policies* (USDI National Park Service 2001b); park-specific resource information; and concerns raised during project scoping.

As the transportation implementation plan was further developed and refined, the National Park Service determined that some of the issues did not need to be carried forward as impact topics for detailed analysis because the impacts anticipated under any of the alternatives would not exceed negligible or minor adverse levels. However, some impact topics (transportation and traffic, visitor use and experience, park operations, and socioeconomics) were carried forward due to the potential for positive effects and/or their specific relationship to the transportation implementation plan. Issues identified as impact topics to be carried forward in the environmental impact analysis are presented below under “Impact Topics Selected for Detailed Analysis.”

## Impact Topics Selected for Detailed Analysis

Topics carried forward as impact topics in this transportation implementation plan and environmental assessment are presented below. Brief explanations of the reasons for selection of the specific impact topics are provided.

### Soils and Biological Soil Crusts

The *NPS Management Policies* (USDI National Park Service 2001b) Section 4.8.2.4 relating to Natural Resource Management Guidelines for soil resources management states that the National Park Service will actively seek to understand and preserve the soil resources of parks and to prevent, to the extent possible, the unnatural erosion, physical removal, or contamination of the soil, or its contamination of other resources.

Continued use of social pull offs under Alternative A and planned construction activities under Alternative B could result in potential loss of sensitive biological soil crusts. The natural recovery of soil crusts can take many years. Therefore, soils and biological soil crusts are analyzed in detail in this document.

## Visual Resources

In accordance with the *NPS Management Policies* (2001), the NPS strives to integrate facilities into the park landscape and environs with sustainable designs and systems to minimize environmental impact (sec. 9.1.2.1). When large parking areas are planned, *NPS Management Policies* (sec. 9.2.5) state that appropriate plantings and other design elements will be used to reduce negative visual and environmental impacts. In addition, in accordance with *NPS Management Policies* (2001), the NPS strives to preserve natural ambient landscapes, which are natural resources and values that exist in the absence of human caused light.

Both alternatives could have impacts on visual resources. Therefore, potential impacts on visual quality and night skies are analyzed in detail in this document.

## Visitor Use, Visitor Experience, and Recreation Resources

The *NPS Management Policies* (2001) state that the NPS has the responsibility to promote and regulate appropriate use of the parks and provide services necessary to meet the basic needs of park visitors and achieve each park’s goals. The park’s Visitor Experience and Resource Protection Plan and General Management Plan also contain guiding principles related to the need to provide for enjoyment of the park balanced with resource preservation and management goals.

Both alternatives could affect visitor use, visitor experience and recreation resources of the park, and therefore are analyzed in detail in this document.

## Traffic and Transportation

In accordance with the *NPS Management Policies* (2001), the NPS strives to protect human life and provide a safe and healthful environment for visitors and employees. The policies state that management decisions regarding transportation facilities require consideration of alternatives and understanding of their consequences. The policies



also address NPS responsibilities to provide accessibility for persons with disabilities

Both alternatives could have potential effects on traffic and transportation conditions within and immediately surrounding the park and as such, traffic and transportation are analyzed in detail in this document.

### Park Operations

The *NPS Management Policies* (2001) recognize that there is a maintenance responsibility and cost for every asset administered by the NPS. The policies state that the NPS will provide a safe, sanitary, environmentally protective and aesthetically pleasing environment for park visitors and employees; protect the physical integrity of facilities; and preserve or maintain facilities in their optimum sustainable condition to the greatest extent possible.

Because both alternatives could affect park operations, the topic is analyzed in detail in this document.

### Socioeconomics

NEPA provisions require environmental analysis to consider potential impacts of socioeconomic conditions related to employment, occupation, income, housing, and tax base.

The local economy of the Grand County area may be affected by both alternatives, and as such the topic of socioeconomics is analyzed in detail in this document.

### Land Use Planning

In accordance with the *NPS Management Policies* (2001), park planning helps define which types of resource conditions, visitor experiences, and management actions will best achieve the mandate to preserve resources unimpaired for the enjoyment of future generations. The policies also acknowledge the responsibility of the NPS to cooperatively plan with gateway communities and surrounding jurisdictions. The park's GMP also includes provisions related to planning and management of park resources and cooperation with regional and community interests.

Because the alternatives have the potential to affect planning and management decisions within the park and at the local level, potential impacts related to land use plans and policies are analyzed in detail in this document.

### Impact Topics Dismissed from Detailed Analysis

According to the CEQ "Regulations for Implementing the National Environmental Policy Act" (40 CFR Part 1500-1508) and NPS Policy (*Director's Order 12*), certain topics may be eliminated from detailed analysis if the expected adverse impacts would be negligible to minor with implementation of required mitigation. The following topics were eliminated from further analysis in this document for the reasons stated under each below.

#### Geologic Resources and Hazards

*NPS Management Policies* (2001) (USDI National Park Service 2001b) Section 4.8.1 requires NPS to allow natural geologic processes to proceed unimpeded. NPS can intervene in these processes only when required by Congress to save human lives, or there is no other feasible way to protect other natural resources, park facilities, or historic properties. Section 4.8.2 requires the NPS to protect geologic features from adverse effects of human activity.

The alternatives evaluated in this document would not result in impacts to geologic resources or hazards. Although ground-disturbing activities are anticipated under Alternative B, they would occur within and adjacent to previously disturbed areas such as roadways and designated visitor facilities and parking lots, which are not known to contain unique geologic features. Construction activities would only affect previously disturbed geologic features or geologic hazards. No problems with landslides, rockfall, or other geologic hazards have been experienced to date at existing and proposed improvement sites such as parking lot and pull off locations. Also, the Moab Fault has not been active in historic times and poses little risk to the project components associated with the transportation implementation plan. For these reasons, the topic



related to geologic resources and geologic hazards has been dismissed as an impact topic in this document.

### 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. *The NPS 2001 Management Policies* provide direction for the preservation, use and quality of water in national park units.

Although the potential for sedimentation exists with both alternatives, sediment controls would be implemented consistent with National Park Service design standards. There is the potential for some limited sedimentation during construction of improvements associated with Alternative B. However, use of construction best management practices to control erosion would ensure that any effects on surface waters would be short- term and negligible. The improvements and activities proposed under the alternatives would not be located near or impact navigable streams or fisheries.

Alternative B proposes long- term reclamation of approximately 150 existing social pull offs in the park, whereby 4.4 acres of currently impacted area would be returned to a more natural condition. Proposed physical modifications and treatments designed to keep visitors on trails, reduce the number and size of social pull offs, and to prevent overflow parking would improve water quality in localized areas by reducing soil disturbance, loss of vegetation, and the volume and intensity of surface runoff. These actions would have a long-term beneficial impact on water quality. For these reasons, water quality has been dismissed as an impact topic in this document.

### Floodplains

Executive Order 11988, Floodplain Management (Federal Register 1977a), and NPS *Director's Order 77- 2, Floodplain Management* (USDI National Park Service 2003) requires an

examination of impacts on floodplains and the potential risk involved in placing facilities within floodplains. Certain construction within a 100- year floodplain requires preparation of a Statement of Findings. After review of the alternatives, it was determined that proposed actions would not be affected by flooding and that project implementation would not impact the 100- year or 500- year (regulatory) floodplains. Therefore, floodplains were dismissed as an issue topic in this document.

### Wetlands

Executive Order 11990, Protection of Wetlands (Federal Register 1977b) requires an examination of impacts on wetlands and protection of wetlands. The *NPS Management Policies 2001* (USDI National Park Service 2001b) and the *Reference Manual to Director's Order 12* (USDI National Park Service 2001a) require federal agencies to avoid, where possible, adversely impacting wetlands. Wetlands are areas that are inundated or saturated by surface or groundwater often enough and long enough to support a prevalence of vegetation typically adopted for life in saturated soil conditions. According to the park's GMP, wetlands are limited to areas adjacent to seeps and springs and along streams. None of the areas proposed for physical disturbance are located near these resources. In addition, based on an aerial photo review of all proposed construction sites, no wetlands were identified. Therefore, these resources would not be affected by the alternatives and Wetlands was dismissed as an impact topic.

### Wildlife and Vegetation

The NPS Organic Act directs parks to conserve wildlife unimpaired for future generations and is interpreted by the agency to mean that native animal life should be protected and perpetuated as part of the park's natural ecosystem. Natural processes are relied on to control populations of native species to the greatest extent possible; otherwise they are protected from harvest, harassment, or harm by human activities.

According to NPS *Management Policies 2001*, the restoration of native species is a high priority (sec.



4.1). Management goals for wildlife include maintaining components and processes of naturally evolving park ecosystems, including natural abundance, diversity, and the ecological integrity of plants and animals.

Under Alternative A, the No Action alternative, disturbance to existing wildlife populations and habitats in the park at social pull offs and at other major visitor destinations from human activity would continue. These ongoing activities however, in combination with measures to mitigate wildlife impacts contained in the park's GMP (USDI National Park Service 1989), would continue to result in minor impacts on these resources.

Construction activities proposed under Alternative B that would occur outside of existing roadways, parking lots, and other previously disturbed areas would result in some displacement of wildlife and vegetation communities. Vegetation currently found in areas proposed for roadside pull off and parking lot improvements, including native grasses and shrubs, would be removed wherever soil is disturbed. Although impacts on wildlife and vegetation would be detectable due to displacement and habitat removal, they would be localized (concentrated in areas of proposed construction). Effects on individuals of a given species would not have an adverse impact on overall park-wide populations. Furthermore, alternate habitat for these species is available throughout the park. Removal of vegetation would not adversely affect the viability or relative abundance of any vegetation species. Therefore, short-term, adverse impacts would be negligible.

Construction and rehabilitation activities also would be expected to cause short-term negligible adverse impacts on aquatic habitat. During construction, there would be some limited potential for soil erosion and sedimentation to occur that could indirectly affect aquatic habitat in the park's perennial streams. Use of construction best management practices to control erosion would ensure that any effects on surface waters and their associated aquatic habitat would be negligible. Nearly all construction activities would occur in areas that have already been heavily

disturbed. In addition, Alternative B would include efforts to restore approximately 191,664 square feet (4.4 acres) of previously disturbed habitat in areas currently used for social pull offs, and approximately 18,095 square feet of existing paved parking areas at The Windows, Sand Dune Arch Trailhead, and Devils Garden parking areas would be removed and the landscape would be rehabilitated to enable a return to its natural condition. These habitat rehabilitation efforts would have a beneficial impact resulting from a long-term net increase in habitat area. For these reasons wildlife and vegetation have been dismissed as impact topics in this document.

### Threatened and Endangered Species

The 1973 Endangered Species Act, as amended, requires an examination of impacts on all federally listed threatened or endangered species. NPS policy requires examination of the impacts on state listed threatened or endangered species and federal candidate species.

For purposes of Section 7 Consultation with the U.S. Fish and Wildlife Service (USFWS), the impact assessments presented below for federally listed species also include a concluding statement as to whether the alternative would have "no effect," "may affect but is not likely to adversely affect," or "may affect and is likely to adversely affect" any federally listed species. Review of this impact analysis and the Biological Assessment (submitted under separate cover to the USFWS) is intended to serve in support of the Section 7 consultation process.

A review of literature, park records, and other available resources (USDI National Park Service 2004a, Utah Division of Wildlife Resources [UDWR] 2005a, b, Utah Native Plant Society 2004) current as of October 8, 2005 indicates that the park supports one federal threatened bird species, the bald eagle (*Haliaeetus leucocephalus*), and the following five federal endangered species:

- Southwestern willow flycatcher (*Empidonax traillii extimus*)
- bonytail chub (*Gila elegans*)
- Colorado pikeminnow (*Ptychocheilus lucius*)



- humpback chub (*Gila cypha*)
- razorback sucker (*Xyrauchen texanus*)

The USFWS has designated the floodplain and the Colorado River segment adjacent to Arches National Park as critical habitat for Colorado pikeminnow and razorback sucker (U.S. Fish and Wildlife Service 2005a). This includes the Colorado River and the confluences of Courthouse Wash and Salt Wash where the spring floods of the Colorado back up into those tributaries. The boundaries of these critical habitats, however, are outside of the area (several miles) that could be affected by the transportation implementation plan (USFWS, Valdez, pers. comm. 2005b).

According to the USFWS Biologist Larry England, there are no listed plants of concern with regard to the transportation implementation plan. One listed plant species, *Cycladenia jonesii*, has been found in riparian areas around the Colorado River outside the park, but has not been found within the park (NPS, Schelz, pers. comm. to Wood, 2006). In any case, Colorado River riparian areas are away from the road system and would not be affected by actions in this plan.

Under Alternative A, the No Action alternative, currently planned improvements and operation and maintenance activities in the park would continue as authorized under the existing GMP. Disturbance levels to threatened and endangered species would not be expected to change substantially from existing conditions. Continuation of current activities under this alternative, in combination with measures to mitigate threatened and endangered species impacts contained in the park's GMP would result in minor long- term impacts on threatened and endangered species. Therefore, the NPS has determined that Alternative A would have "no effect" on threatened and endangered species.

Under Alternative B, noise and other activities undertaken during construction and rehabilitation of existing and new parking areas may have a short- term adverse impact on ground- dwelling wildlife by causing animals to avoid project areas. This impact would be minor

for bald eagles and willow flycatchers, however, because these species likely avoid these sites already disturbed by park visitors that use these areas. Long- term effects would result from the net loss of a small amount of potential habitat (6,300- 9,300 square feet) that may displace burrowing and ground- nesting species. For bald eagle foraging, the affected area is insignificant compared to the remainder of alternate habitat available throughout the park. Therefore, effects to bald eagles would be negligible. The areas of disturbance are not near potential willow flycatcher habitat (riparian vegetation). Use of construction best management practices to control erosion would ensure that any effects on surface waters and their associated fish habitat would be negligible.

Noise and other activities undertaken during construction and rehabilitation of proposed roadside pull offs in the park may have a short- term adverse impact on ground- dwelling wildlife by causing animals to avoid these areas. This impact would be minor, however, because it would not have a principal effect at the population level on wildlife resources and habitat. Bald eagles would not be appreciably affected during construction because of the dispersed distribution of construction sites throughout the park, the fact that the majority of these sites are already disturbed and subject to human activity, and represent an insignificant fraction of the total foraging habitat. None of the roadside pull off sites is close to potential willow flycatcher habitat.

Long- term adverse impacts at pull off areas would result from loss of a small amount of habitat (1,875 square feet) for burrowing and ground- nesting species that potentially could be used as forage for bald eagles. However displaced habitat is already heavily disturbed. Although impacts on wildlife would be detectable due to displacement and habitat removal they would be localized (concentrated in areas of proposed construction). Effects on individuals of a given species would not have an adverse impact on overall park- wide populations. Furthermore alternate habitat for these species is available throughout the park. Therefore impacts would be minor.





Construction and rehabilitation of roadside pull offs would have negligible effects on listed fish. No fill material would be placed in or removed from any surface waters and no in- water activities would be required for construction in the pull off areas. During construction, there would be some limited potential for soil erosion and sedimentation to occur that could indirectly affect fish habitat in the park's perennial streams. Areas of improvement that are located in the vicinity of the park's two perennial streams include pull offs 4 and 21 (near Courthouse Wash), proposed to be formalized for permanent use. However, use of construction best management practices to control erosion would ensure that any effects on surface waters and their associated listed fish habitat would be negligible. Furthermore, there are no surface waters such as streams or channels in the construction limits of pull off areas. There would be a decrease in total impervious surface area with full project implementation (up to 4.4 acres of restoration). Thus, short- term impacts on fish species would be negligible.

A centralized operation and maintenance facility to support motorized interpretive tours is proposed for development in Moab. Although the type and magnitude of impacts to fish, wildlife, and habitat would depend on the specific site location, impacts are expected to be short- term and range from negligible to minor if construction complies with City of Moab policies and regulations governing the protection of wildlife habitat. Consultation with USFWS pursuant to Section 7 of the ESA would be prepared by the National Park Service for the identified facility site in Moab if this plan component is determined to be a federal undertaking.

Other proposed transportation implementation plan activities such as traffic calming measures, ITS, partnerships with regional interests, and visitation and congestion management would result in negligible impacts on fish, wildlife, or habitat.

The NPS has determined that Alternative B “may affect, but would not likely adversely affect” the bald eagle, southwestern willow flycatcher, bonytail chub, Colorado pikeminnow, humpback chub, or razorback sucker. The NPS has further

determined that Alternative B “may affect, but would not likely adversely” modify the designated critical habitats of the Colorado pikeminnow and razorback sucker. Therefore, impacts on special status species are not further analyzed in this document.

### Cultural Resources and Section 106 of the National Historic Preservation Act

This environmental assessment describes potential impacts to cultural resources consistent with the regulations of the Council on Environmental Quality (CEQ) that implement NEPA. These impact analyses are intended, however, to comply with the requirements of both NEPA and Section 106 of the National Historic Preservation Act (NHPA).

In accordance with regulations of the Advisory Council on Historic Preservations that implement Section 106 of the NHPA (36 CFR part 800), impacts to archaeological resources, historic structures, cultural landscape, and ethnographic resources were identified and evaluated by 1) determining the area of potential effects (APE); 2) identifying cultural resources present in the area of potential effects that were either listed in or eligible to be listed in the National Register of Historic Places; 3) applying the criteria of adverse effect to affected cultural resources either listed in or eligible to be listed in the National Register, and 4) considering ways to avoid, minimize or mitigate adverse effects.

Under the Advisory Council's regulations, a determination of either adverse effect or no adverse effect must be made for affected National Register- eligible cultural resources. An adverse effect occurs whenever an impact alters any characteristic of a cultural resource that qualifies it for inclusion in the National Register. Adverse effects also include reasonably foreseeable effects caused by the preferred alternative that would occur later in time, be farther removed in distance, or be cumulative (36 CFR Part 800.5). A determination of no adverse effect means there is an effect, but the effect would not diminish in any way the characteristics of the cultural resource that qualify it for inclusion in the National Register.



CEQ regulations and the National Park Service's Director's Order 12 also call for a discussion of the appropriateness of mitigation, as well as an analysis of how effective the mitigation would be in reducing the intensity of a potential impact (e.g., from moderate to minor or negligible, etc.). However, any reduction in intensity of impact due to mitigation is an estimate of the effectiveness of mitigation under NEPA only. It does not suggest that the level of effect as defined by Section 106 is similarly reduced. Although adverse effects under Section 106 may be mitigated, the effect remains adverse.

Cultural resources include archaeological resources, ethnographic resources, historic structures, museum collections, and cultural landscapes. Numerous legislative acts, regulations, and National Park Service policies provide direction for the protection, preservation, and management of cultural resources on public lands. Applicable laws and regulations include the National Park Service 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 Archaeological Resources Protection Act of 1979, the Native American Graves Protection and Repatriation Act of 1990, and the Curation of Federally Owned and Administered Archaeological Collections (1991). Applicable agency policies relevant to cultural resources include Chapter 5 of *NPS 2001 Management Policies*, and Director's Order — 28: *Cultural Resource Management*, as well as other related policy directives such as the National Park Service *Museum Handbook*, *National Park Service Manual for Museums*, and *Interpretation and Visitor Services Guidelines* (NPS- 26).

The Arches National Park archaeologist completed a Section 106 assessment for the proposed Transportation Implementation Plan on March 15, 2005. The field survey of each of the proposed pull off locations and parking areas did not identify any cultural resources within the project APE (NPS, Chris Goetze, Archaeologist, Arches National Park, telephone conversation with Lara Rooke, Cultural Resource Specialist, AMEC/Shapiro and Associates, March 30, 2005).

The 1995 Programmatic Agreement among the National Park Service, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers states that "repaving of existing roads or existing parking areas within previously disturbed areas may be reviewed internally by the National Park Service for Section 106 purposes, without further review by the Advisory Council or the State Historic Preservation Offices." Arches National Park has determined that based upon the results of their field survey there would be no effect to cultural resources under the alternatives for activities undertaken within the park. Therefore, cultural resources have been dismissed as an impact topic in this environmental assessment.

Construction of a centralized operation and maintenance facility in Moab to support motorized interpretive tours could result in impacts on cultural resources. The intensity of effect from this facility would depend on the nature and integrity of the affected resource. Proposed mitigation includes a survey of the site prior to construction, consideration of alternative sites and/or designs to avoid or minimize impacts to resources, if present, and compliance with state and local historic preservation laws and regulations. Implementation of these measures would ensure that short- term adverse impacts on cultural resources, including archaeological resources, ethnographic resources, and historic structures and cultural landscapes, would be negligible to minor. A Section 106 assessment would be prepared by the National Park Service for the identified facility site in Moab if this plan component is determined to be a federal undertaking.

Should previously 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 Collections

*NPS Management Policies* (USDI National Park Service 2001b) and *NPS Director's Order 28, Cultural Resource Management Guideline* (UDSI



National Park Service 1998) require the consideration of impacts on museum collections (archaeology, ethnology, history, biology, paleontology, geology and archives) as a subtopic of Cultural Resources. The Arches National Park museum collection would not be affected by the proposed alternatives, another reason Cultural Resources were dismissed as an impact topic.

### Indian Trust Resources

Secretarial Order 3175 requires that any anticipated impacts to Indian trust resources from a proposed project or action by Department of 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 States to protect tribal lands, assets, resources, and treaty rights, and it represents a duty to carry out the mandates of federal law with respect to American Indian and Alaska Native tribes. The lands comprising the park are not held in trust by the Secretary of the Interior for the benefit of Indians due to their status as Indians. Therefore, Indian trust resources have been dismissed as an impact topic in this environmental assessment.

### Paleontological Resources

There would be no measurable impact to or loss of fossils at Arches National Park under either of the alternatives because activities would occur in geologic layers not known to contain extensive fossils, and the volume of bedrock disturbance would be negligible. Therefore, paleontological resources were dismissed as an impact topic.

### Energy and Resource Conservation

Energy would be directly expended during construction activities necessary under either alternative. However, this expenditure of energy would be short- term, negligible, and adverse. Short- term energy expenditures would be offset by long- term energy savings associated with the proposed actions of the transportation implementation plan. Proposed motorized tours could reduce the number and types of private vehicles entering the park, thereby reducing overall levels of fuel consumption. The type of

vehicle chosen for tours in Arches National Park could include a range of alternative fuel options to reduce use of petroleum fuels such as vehicles with engines modified to burn compressed propane, dual natural gas/gasoline, or biodiesel. Also, ITS components would help to monitor and manage traffic flow, and reduce congestion at the park's major visitor destinations. Roadside pull off, parking area, and traffic calming improvements would further contribute to overall energy savings and improved vehicle fuel efficiency to the extent they reduce vehicle queuing and unnecessary engine idling. This reduction in fuel consumption would be considered a long- term beneficial impact.

For these reasons energy and resource conservation has been dismissed as an impact topic in this document.

### Prime and Unique Farmlands

The Farmland Protection Policy Act (7 USC 4201 et seq.) and the U.S. Department of the Interior (Environmental Statement Memorandum No. ESM94- 7) require an evaluation of impacts on prime or unique agricultural lands. Prime or unique farmland is defined as soil that particularly produces general crops such as common fruits, vegetables, and nuts. According to NRCS, none of the soils in the park are classified as prime or unique farmlands. Therefore, the topic of prime and unique farmlands is dismissed as an impact topic in this document.

### Environmental Justice

Executive Order 12898, General Actions to Address Environmental Justice in Minority Populations and Low- Income Populations (Federal Register 1994), requires all federal 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 and communities. The alternatives would not have disproportionately high and adverse effects on minorities or low- income populations or communities as defined in the U.S. Environmental Protection Agency (EPA)



Environmental Justice Guidance (EPA 1998). Therefore, environmental justice is dismissed as an impact topic in this document.

### 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 pollution standards. *NPS 2001 Management Policies* address the need to analyze potential impacts to air quality during park planning. Under the Clean Air Act, Arches National Park is designated as a Class I area. Class I areas are afforded the greatest degree of air quality protection.

Construction activities necessary under either alternative would have short- term minor adverse impacts on air quality due to releases of pollutants from internal combustion engines and fugitive emissions. Sources would include continued emissions from visitor vehicles in the park, construction vehicle emissions, and construction-related impacts from the disturbance of soils. Dust abatement efforts would be implemented to control fugitive dust emissions during construction and impacts would be localized. In the long- term, project actions associated with the transportation implementation plan such as motorized interpretive tours, ITS, and pull off and parking facility improvements would reduce vehicle emissions to the extent that they reduce the number of private vehicles entering the park or that they reduce vehicle queuing and unnecessary engine idling. This would be considered a long- term, beneficial impact to air quality. Therefore, air quality was dismissed as an impact topic in this document.

### Noise and Natural Soundscapes

In accordance with NPS 2001 Management Policies and Director's Order 47: Sound Preservation and Noise Management, an important part of the National Park Service mission is preservation of natural soundscapes associated with national park units. The natural soundscape is the aggregate of all the natural sounds that occur in the park (absent human-

caused sound), 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. It includes all of the sounds of nature including such "non-quiet" sounds as birds calling and thunder. Some natural sounds are also part of the biological or other physical resource components of parks (e.g., animal communication and sounds produced by physical processes such as wind in trees or running water).

Construction activities necessary under either alternative would cause impacts to the natural soundscape. However, these impacts would be limited in scope, short- term, and negligible. In the long- term, noise from motor vehicles and visitors using the park would continue. However, the resulting adverse impacts would be minor.

Improvements proposed under Alternative B, the transportation implementation plan would be placed in or adjacent to areas that are already developed, where minor or short- term additions to background noise levels are not as noticeable. The proposal of recessed pavement markers (rumble strips) within the paved roadway as a traffic calming component would create additional noise in the park, but related noise would be localized and negligible and not generally discernable to visitors at nearby scenic overlooks. The proposed operation and maintenance facility in Moab to support motorized tours could have long- term beneficial impacts to noise levels and the natural soundscape inside the park by reducing the number and types of private vehicles entering the park. For these reasons, noise and natural soundscapes has been dismissed as an impact topic in this document.

