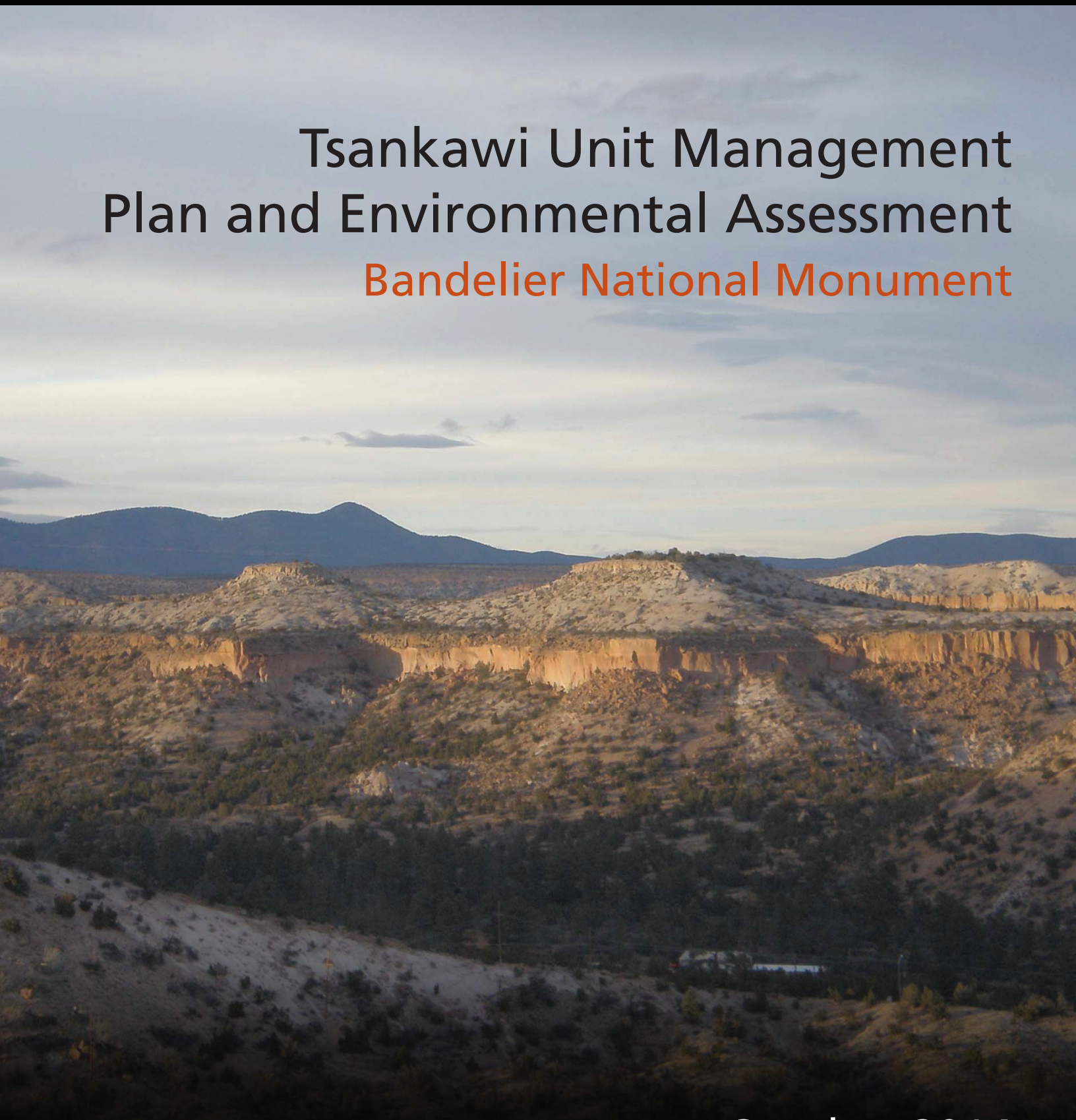
National Park Service
U.S. Department of the Interior

Tsankawi Unit Management Plan and Environmental Assessment

Bandelier National Monument



October 2014

TSANKAWI UNIT MANAGEMENT PLAN
ENVIRONMENTAL ASSESSMENT

Bandelier National Monument
New Mexico

The National Park Service is developing the Tsankawi Unit Management Plan to improve resource protection, address safety concerns, and enhance visitor opportunities. Proposed actions include changes in the trail system, interpretive program, and parking. Realignment of existing trails would help preserve and protect sensitive cultural and natural resources from visitor impacts and natural erosion processes. New trails would increase visitor safety and opportunities to experience the area's long and rich history of human occupation. New interpretive messaging would inform visitors of the significance and sensitivity of cultural and natural resources and safety issues that may be encountered while experiencing the landscape. A 150-square foot kiosk accessible for persons with limited mobility would house new interpretive messaging, safety/emergency guidance, and an upgraded fee collection station. Parking would be moved onto National Park Service lands to increase safety and enhance visitor experience.

Alternatives—which include the no-action and two action alternatives—analyzed in this environmental assessment were developed based on the results of internal and public scoping, consultation with the six affiliated pueblos, and prior planning studies. The plan would provide a framework that guides management decisions for the next 10 years. This environmental assessment was prepared in accordance with the National Environmental Policy Act of 1969 and implementing regulations, 40 *Code of Federal Regulations* (CFR) 1500–1508, and the National Park Service Director's Order 12 and Handbook, Conservation Planning, Environmental Impact Analysis, and Decision Making to provide the decision-making framework that (1) analyzes all reasonable alternatives to meet objectives of the proposal, (2) evaluates potential issues and impacts to Tsankawi's resources and values, and (3) identifies mitigation measures to lessen the degree or extent of these impacts. No major effects are anticipated as a result of the proposed actions. Comments received from the public during public scoping and other agencies largely supported actions to protect the fragile cultural and natural resources found within Tsankawi.

HOW TO COMMENT ON THIS PLAN

If you wish to comment on the plan/environmental assessment, you may post comments online at http://parkplanning.nps.gov/Tsankawi or mail or hand deliver comments to: Superintendent, Bandelier National Monument, 15 Entrance Road, Los Alamos, New Mexico 87544. This environmental assessment will be on public review for 30 days. Before including personal identifying information, you should be aware that your entire comment—including your personal identifying information—may be made publicly available at any time. Although you can ask us to withhold this information from public review, we cannot guarantee that we will be able to do so. Comments will not be accepted by fax, email, or in any other way than those specified above. Bulk comments in hard copy or electronically submitted on behalf of others will not be accepted.

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Chapter 1

Purpose of and Need for Action

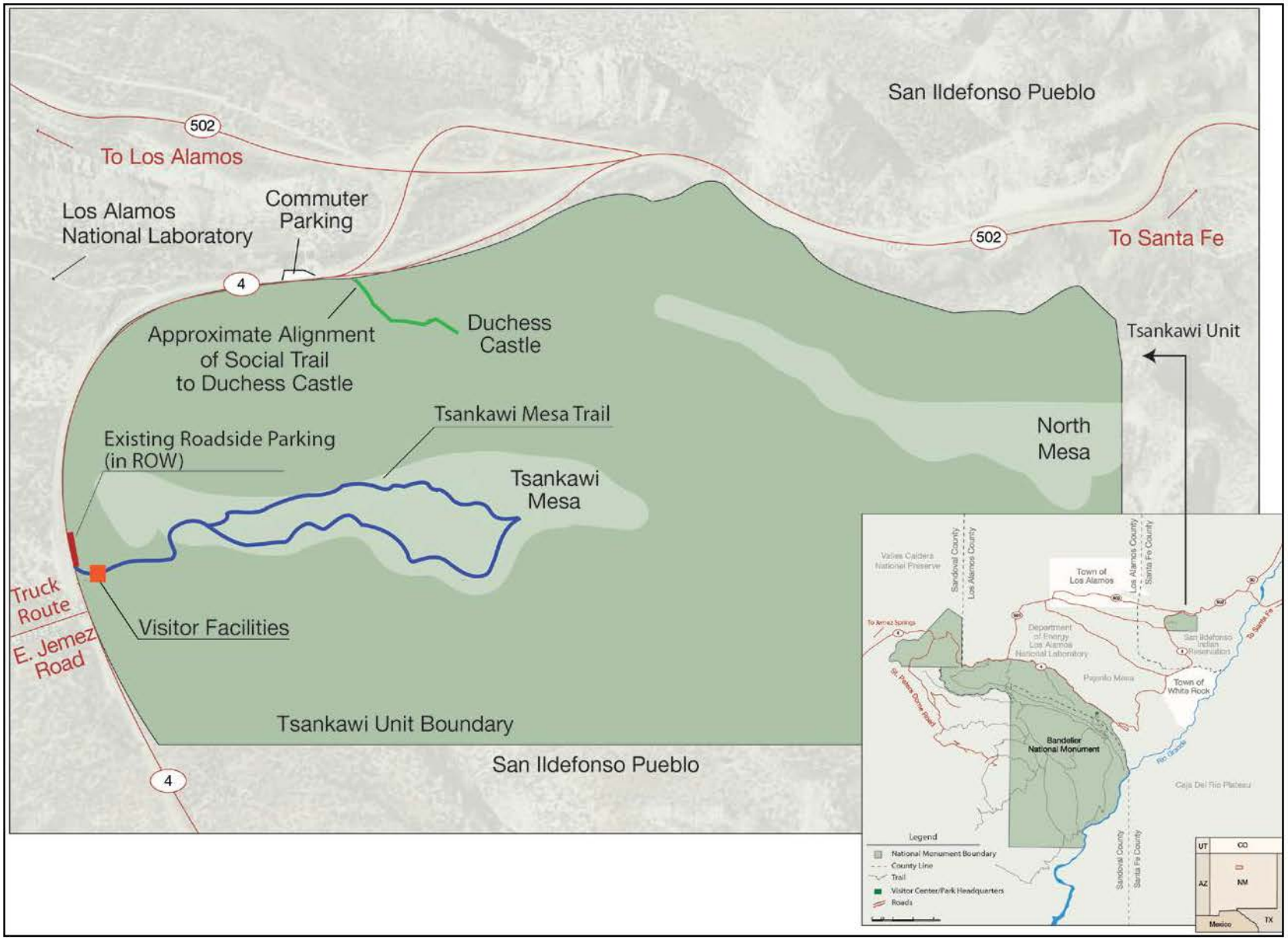
INTRODUCTION

Bandelier National Monument (hereafter referred to as "the monument") was established by presidential proclamation on February 11, 1916, to promote, preserve, and protect the significant cultural resources contained within its boundaries. The Tsankawi unit (hereafter referred to as "Tsankawi" or "the unit") is an 826-acre noncontiguous part of the monument, located approximately 12 miles from the main unit. Located in Santa Fe County, New Mexico, the main visitor arrival area for Tsankawi is located just northeast of the State Road 4 and East Jemez Road intersection (see figure 1).

The Tsankawi Unit Management Plan (hereafter referred to as "the plan") and environmental assessment examines the effects on the natural and human environment associated with proposed site improvements, including realigning existing and implementing new trails, improving site access, constructing on-site parking facilities, and implementing interpretive messaging. The plan would provide a framework that guides management decisions for resource protection, visitor use and safety, and accessibility for the next 10 years.

Three alternatives were developed through a series of internal and public meetings and continued consultation with affiliated pueblos; these alternatives are evaluated in this environmental assessment. The no-action alternative assumes that management actions would continue as under existing conditions with the exception of the reintroduction of a site steward program to provide a limited degree of oversight. The two action alternatives (alternatives 1 and 2) are similar in nature, differing in the siting of the proposed entry roadway, on-site parking facilities, kiosk, restrooms, and trailheads. As described in greater detail below, alternative 1 has been identified as the preferred alternative.

The study area considered in this environmental assessment includes all areas within Tsankawi, particularly those areas that are near proposed site improvements. This environmental assessment was prepared in accordance with the National Environmental Policy Act (NEPA) of 1969 and implementing regulations, 40 *Code of Federal Regulations* (CFR) 1500–1508, and the National Park Service's (NPS) Director's Order (DO) 12 and Handbook, *Conservation Planning, Environmental Impact Analysis, and Decision-making* (NPS 2001).



Source: NPS 2012a

FIGURE 1. TSANKAWI UNIT VICINITY MAP

PROJECT BACKGROUND

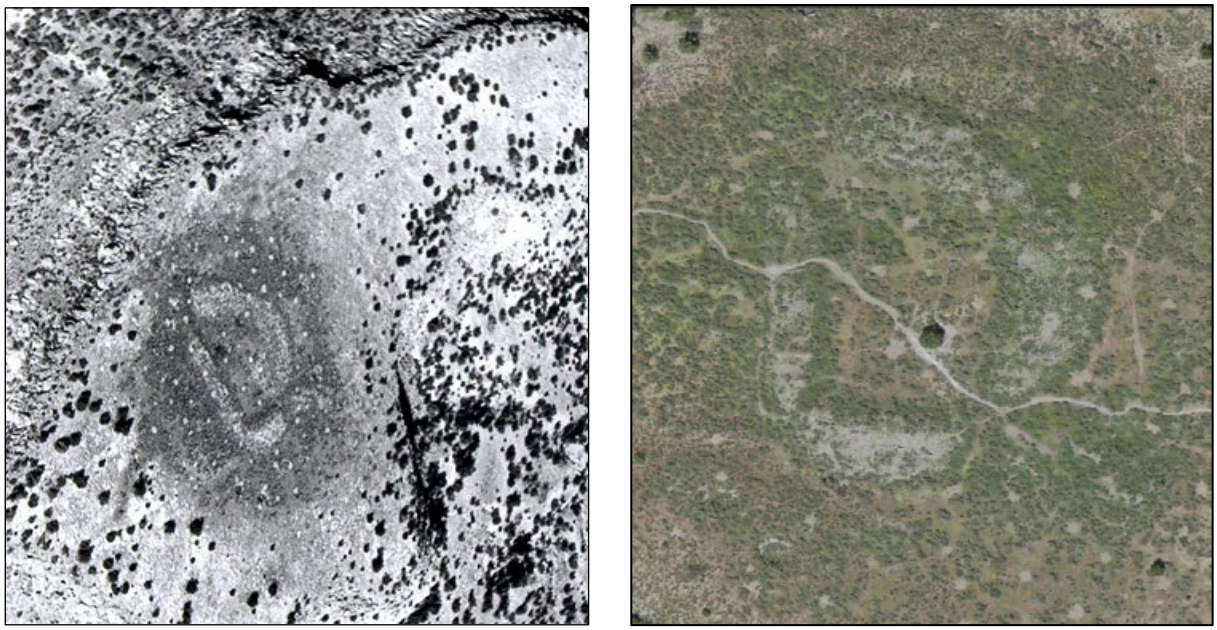
Tsankawi is home to more than 150 archeological sites dating from Ancestral Pueblo occupancy of the Pajarito Plateau (approximately 1150 to 1550). Sites include cavates, masonry pueblos, Ancestral Pueblo and Spanish contact period petroglyphs, and other significant cultural resources (see figure 2). The Spanish contact period was from approximately 1600 to 1821. These resources are showing signs of wear that reflect visitor use and natural erosion processes.

Tsankawi, the main unit of the monument, and surrounding areas have a long and rich history of human occupation. Ongoing consultation with federally recognized pueblo groups concluded there are six pueblos affiliated with the monument, including Cochiti, San Felipe, San Ildefonso, Santa Clara, Santo Domingo, and Zuni. While all of these groups hold some affiliation to the monument, the people of the nearby San Ildefonso Pueblo are the descendants of the people who inhabited the area now referred to as Tsankawi, and whose culture is represented there. The unit is of critical importance to the cultural heritage, beliefs, customs, practices, and history of the descendants. The people of San Ildefonso Pueblo maintain a continuity of use that supports cultural identity and heritage, religious and spiritual values, and traditional practices. Tsankawi forms a key component in their living cultural system; they believe the area remains alive with the spirits of their ancestors. Ongoing cultural traditions, beliefs, and values are maintained through traditional, religious, and ceremonial uses and practices within the unit. Such living traditions and values enhance and enrich the cultural heritage of all Americans.

Tsankawi was managed by the U.S. Forest Service from its inception in 1916 until 1932, when management responsibility was transferred to the National Park Service. When the National Park Service assumed management responsibility, land use practices such as grazing and firewood gathering were discontinued. However, long-term planning associated with resource protection and visitor access did not begin until recently.

The Tsankawi Mesa Trail, roadside parking area, and visitor arrival area are the only developed areas of Tsankawi. Remaining areas of the unit are open to visitation and are currently managed as a backcountry area without designated trails or interpretation. Existing interpretive information and programming—primarily located at the visitor contact station—does not support a full understanding of the history, cultural and natural resources contained within, and sensitivity of Tsankawi. Neither parking nor visitor facilities comply with the Architectural Barriers Act (ABA), which sets forth accessibility regulations for persons with limited mobility.

A cavate is shown in the figure at left. The figure at right demonstrates a cavate with stone masonry. SOURCE: NPS 2011a



Development of the Tsankawi Mesa Trail has affected the integrity of the Tsankawi Pueblo site. The image on the left is from 1929, the one on the right from 2011. SOURCE: NPS 2013a

FIGURE 2. ARCHEOLOGICAL SITES IN TSANKAWI

Currently, designated visitor access to Tsankawi is on the east side of State Road 4, just north of East Jemez Road. Figure 1 demonstrates the location of Tsankawi's existing roadside parking area in relation to the surrounding area, and figure 3 shows the roadside parking area adjacent to the highway shoulder. East Jemez Road is used as the truck route for Los Alamos National Laboratory (LANL) and also serves as a primary access point for LANL employees. As a result, the area

experiences heavy traffic volumes, particularly during the morning and evening rush hours. The roadside parking area is within the State Road 4 right-of-way on U.S. Department of Energy (DOE) lands. No signs inform visitors of the parking turnoff for Tsankawi. Heavy traffic volumes, poor visibility of oncoming traffic as a result of the roadway's slope and curvature, and the existing roadside parking configuration make access to Tsankawi challenging.

SOURCE: FHWA 2012a

FIGURE 3. EXISTING ROADSIDE PARKING AREA ALONG STATE ROAD 4

The existing visitor contact station is a simple shaded structure with adjacent restroom facilities and visitor orientation information. The visitor contact station has two picnic tables inside, and benches and a trash/recycling bin on the outside. Messaging includes a bulletin board that is updated seasonally and an interpretive panel. Also located within the visitor contact station is a fee collection station, which is not always noticed by visitors. It does not take credit cards and some visitors are unsure if their admission to the main unit is also good at Tsankawi. The Tsankawi Mesa Trail begins at the visitor contact station and brings visitors to the mesa top where they can view the exposed features of Tsankawi Pueblo and the beauty of the surrounding environment. The trail crosses the center of the pueblo affecting the resource itself, and there are few opportunities for visitors to understand the significance of the area. Trails used by Ancestral Pueblo residents are eroding and incising into the tuff geology as a result of visitation. This is also true for cavates and other sensitive resources. Impacts are exacerbated by natural erosion processes. Figure 4 shows signage along the Tsankawi Mesa Trail and incising into the tuff geology.

Source: NPS 2011a

FIGURE 4. TSANKAWI MESA TRAIL

North of Tsankawi Mesa are Duchess Castle—an early 20th century cultural site—and North Mesa, home to rock formations containing cavates, petroglyphs, and other features. These areas are undeveloped, with no designated trails or parking areas. Figure 5 shows Duchess Castle. Currently, informal parking occurs along the State Road 4 east shoulder, near the State Road 502 access ramp. When visiting these areas, visitors often use the commuter parking lot on the west side of State Road 4, making it difficult for monument staff to know when visitors are accessing this portion of Tsankawi. This presents both a visitor safety issue because the site is remote and has no designated access, and a resource protection issue because this area contains sensitive cultural resources.

PURPOSE OF AND NEED FOR ACTION

The purpose of taking action is to provide resource protection, a high quality visitor experience, and efficient unit operation. The preparation and implementation of a plan would provide a framework that guides management decisions for the next 10 years.

The need for the plan is rooted in several key elements as described above. The plan will outline the framework necessary to help achieve desired resource conditions, a diverse range of visitor opportunities and experience, and appropriate levels of interpretive messaging that will facilitate a better understanding of the sensitivity of cultural and natural resources to help ensure their protection and preservation for current and future generations.

Finally, the plan anticipates the future widening of State Road 4 to provide two travel lanes in each direction. The widening will displace the existing roadside parking area, which provides public access to Tsankawi. The New Mexico Department of Transportation considered the widening of State Road 4 in this location in the mid-1990s and is likely to evaluate its feasibility again as development of Los Alamos National Laboratory occurs.

SOURCE: NPS 2011a

FIGURE 5. DUCHESS CASTLE

OBJECTIVES

Objectives are defined as accomplishments that must be achieved for the action to be considered a success. Each alternative selected for detailed analysis in the environmental assessment must meet project objectives, and resolve the purpose of and need for action. The following objectives were developed for this project:

- Provide a framework that guides management decisions consistent with protection of resource values.
- Reduce impacts on cultural and natural resources and provide safe, accessible visitor services in response to visitor presence at Tsankawi.
- Develop and implement an adaptive management strategy that identifies a range of management options available to achieve the established desired conditions, and includes resource and visitor experience monitoring and metrics to ensure that objectives are being met. Ongoing data collection and monitoring efforts will be used to help identify the cause(s) of resource deterioration.
- Minimize impacts to ongoing ecological restoration efforts that were initiated at Tsankawi in 2007 under the monument's 2007 *Ecological Restoration Plan/Environmental Impact Statement (*see "Chapter 4: Environmental Consequences").
- Define the relationship between the natural resources present on the Pajarito Plateau and the associated history of human habitation and use. Provide improved visitor understanding, respect for, and appreciation of the unique resources of Tsankawi while honoring requests of the pueblo neighbors.

- Move facilities, such as the existing roadside parking area, onto NPS lands and improve the safety and accessibility of these facilities. It is important to provide safe access to the site. Because State Road 4 also provides access to the Los Alamos National Laboratory, activities at the Los Alamos National Laboratory, such as construction and commuter traffic, have the potential to limit safe access to Tsankawi.

Opportunities and constraints have been identified for achieving the objectives of this plan. Generally, these are associated with resource protection, visitor experience, and site access (see figure 6). These opportunities and constraints were considered in the development of project alternatives carried forward for further analysis in this environmental assessment.

PURPOSE AND SIGNIFICANCE OF THE MONUMENT

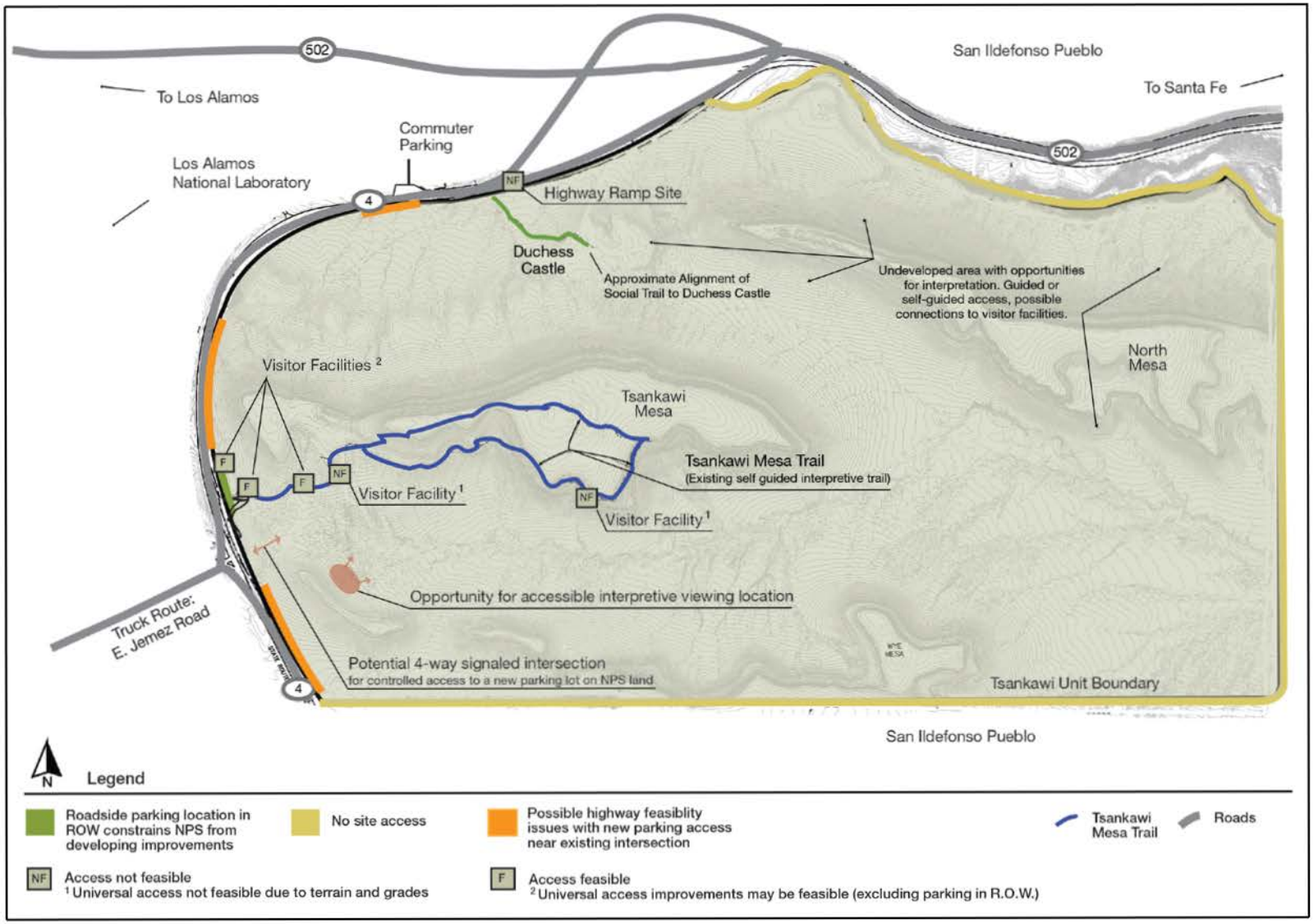
Established by Presidential Proclamation No. 1322 (39 Stat. 1764) on February 11, 1916, the monument was named after Adolph Bandelier, a leader in the study of Southwest history and ethnology. The enabling legislation identified 22,352 acres for protection. As noted earlier, the U.S. Forest Service administered these lands until 1932 when they were transferred to the National Park Service. Over the years lands were added to the monument, which now totals 33,677 acres, including Tsankawi's 826 acres.

The purpose of the monument is fourfold.

- Conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such a manner and by such means as will leave them unimpaired for the enjoyment of future generations (NPS Organic Act of 1916)
- Preserve and protect all natural and national register-eligible cultural resources and values.
- Provide educational opportunities to foster understanding and appreciation of the natural and human history of the region.
- Provide visitor opportunities for diverse groups with the protection and appreciation of monument resources.

The monument is significant for a variety of reasons as stated in the enabling legislation.

> [C]ertain prehistoric aboriginal ruins situated upon public lands…are of unusual ethnologic, scientific, and educational interest, and it appears that the public interests would be promoted by reserving these relics of a vanished people, with as much land as may be necessary for the proper protection thereof…any use of the land which interferes with its preservation or protection as a National Monument is hereby forbidden (NPS 2008).



SOURCE: DHM Design 2013

FIGURE 6. OPPORTUNITIES AND CONSTRAINTS FOR ACHIEVING OBJECTIVES AT TSANKAWI

The monument contains one of the highest densities of archeological sites from the Ancestral Pueblo period, including one of the highest concentrations of cavate structures in the world (NPS 2008).

The "prehistoric aboriginal ruins" mentioned in the enabling legislation are an integral part of the pueblo culture in New Mexico. The people of San Ildefonso Pueblo maintain their cultural traditions, beliefs, and values through continued traditional, religious, and ceremonial uses and practices at Tsankawi. By sharing in an understanding of these living traditions and values, the cultural heritage of all Americans is enhanced and enriched.

ISSUES AND IMPACT TOPICS

The Council on Environmental Quality Regulations for implementing the National Environmental Policy Act of 1969 require an "early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action" (40 CFR 1501.7). Internal and public scoping and consultation with the six affiliated pueblos was undertaken prior to the development of project alternatives to fully identify problems, opportunities, and concerns regarding current and future management levels necessary to protect cultural and natural resources while enhancing visitor experience at Tsankawi.

Consultation with affiliated pueblos focused on the protection of cultural resources and maintaining respect for the site, Tsankawi Pueblo in particular. The rerouting of Tsankawi Mesa Trail from the center of the pueblo was identified during both internal and public scoping as well as consultation with affiliated pueblos. Other primary issues that were identified during this time include opportunities for an appropriately diverse visitor experience, parking and roadway improvements, access for persons with limited mobility, enhanced interpretive messaging to inform visitors of the significance and fragility of Tsankawi, and the desire for an improved visitor contact station.

This information coupled with NPS knowledge of the site and need to address appropriate federal laws, regulations, and orders and NPS *Management Policies 2006* has resulted in the following topics being carried forward for further analysis. A more detailed discussion of public scoping and consultation with affiliated pueblos is provided in "Chapter 5: Coordination and Consultation."

"Chapter 3: Affected Environment" describes the current condition of the resources and values within Tsankawi for the resource topics described below. Potential impacts to these resource topics are discussed in "Chapter 4: Environmental Consequences."

ARCHEOLOGICAL RESOURCES

Archeological resources are spatially finite areas containing tangible remains of past activities that show use or modification by people. The Ancestral Pueblo occupation was from approximately 1150 to 1550, Spanish occupation and land use from 1600 to 1821, Mexican Period from 1821 to 1848, U.S. Territorial Period 1848 to 1912, and U.S. Statehood 1912 – present. Because of the long and rich history of human habitation of various Ancestral Pueblo peoples, there are many archeological sites that have been identified across the region.

To date, a total of 157 archeological sites have been recorded within Tsankawi's 826 acres. This includes pueblos, cavate structures, lithic scatters, bedrock grinding areas, hearth features, historic structures, storage rooms, trash scatters, rock alignments, rock art, archeological features, trails, hand-and-toeholds, animal corrals, campsites, and road segments. Although the action alternatives have been developed to avoid areas with known archeological sites, the potential does exist that unknown resources would be disturbed during construction activities. Therefore, this topic requires further analysis.

CULTURAL LANDSCAPES

Cultural landscapes are defined as reflections of human adaptation and use of natural resources, and are often expressed in the way land is organized and divided, patterns of settlement, land use, systems of circulation, and types of structures that are built. As a cultural landscape, Tsankawi tells the story of more than eight centuries of relationship between people and place. The National Park Service has determined that Tsankawi, in its entirety, is a nationally-significant cultural landscape eligible for the National Register of Historic Places (hereafter referred to as "the national register") as a historic district. Residents of the nearby San Ildefonso Pueblo maintain a continuity of use at Tsankawi for traditional, religious, and ceremonial uses and practices. Because project alternatives would occur within this cultural landscape, this topic requires further analysis.

ETHNOGRAPHIC RESOURCES

Ethnographic resources are objects and places, including sites, structures, landscapes, and natural resources, with traditional cultural meaning and value to associated peoples. Ongoing cultural traditions, beliefs, and values are maintained through traditional, religious, and ceremonial uses and practices within the unit. Consultation with affiliated pueblos has clearly revealed places of cultural significance, including within Tsankawi. The pueblos have communicated that they do not want these places revealed to the general public. Consequently, NPS staff relies on continued communication with the six affiliated pueblos about proposed actions within Tsankawi and the rest of the monument, to seek their advice and recommendations on how to minimize any impacts on the integrity of these important places. Therefore, this topic requires further analysis.

SOILS AND VEGETATION

The action alternatives would include the construction of a new entry roadway, on-site parking, and kiosk. Both alternatives also include improvements to existing or implementation of new trails and the introduction of new interpretive messaging. Within designated areas, primarily within proximity to the State Road 4 and East Jemez Road intersection and existing visitor contact station, these actions would require the disturbance of soils and, in some instances, vegetation would be removed. Because of the potential for impacts, these topics require further analysis.

WILDLIFE AND WILDLIFE HABITAT

The action alternatives would include the construction and operation of new facilities within Tsankawi. New features introduced to the site would be primarily limited to those areas near the State Road 4 and East Jemez Road intersection and existing visitor contact station. Because the disturbance of soils and vegetation has the potential to affect wildlife habitats, this topic requires further analysis.

VISITOR USE AND EXPERIENCE

The action alternatives have been developed, in part, to enhance visitor experience. Proposed modifications of existing and introduction of new trails would provide a more diverse visitor experience and also enhance opportunities for persons with limited mobility. New interpretive messaging would inform visitors of the significance of Tsankawi and how they can be stewards of the environment. Because enhancing visitor opportunities is one of the primary objects of the plan, this topic requires further analysis.

PUBLIC HEALTH AND SAFETY

The existing roadside parking area and access to Tsankawi present safety issues for visitors and NPS staff because of the curvature and slope of State Road 4 in this location, poor site lines, and lack of signage. The action alternatives would include improvements to the State Road 4 and East Jemez Road intersection, a new entry roadway, and on-site parking area. The rugged landscape within Tsankawi can make it difficult to navigate for some visitors. In addition, weather conditions can be extreme. The action alternatives would introduce new interpretive messaging that would inform visitors of potential challenges when accessing the unit. Both action alternatives would include the development of trails for persons with limited mobility and a kiosk with emergency services (i.e., first aid, water fountain, safety guidance, and emergency phone). Because the action alternatives would result in a change in public health and safety, this topic requires further analysis.

PARK OPERATIONS AND MANAGEMENT

While monument staff patrol the area and provide maintenance at Tsankawi, little visitor oversight occurs on a daily basis. The action and no-action alternatives include the reintroduction of a site steward to provide limited interpretation and visitor oversight. The action alternatives would include the introduction of a guided-only trail segment and monument staff or other NPS-trained local community volunteers and/or commercial guides to lead tours. Because a change in monument operations and management would occur, this topic requires further analysis.

SOCIOECONOMICS

Local and nonlocal visitors are drawn to Tsankawi and the main unit of the monument to enjoy the area's cultural and natural resources. These visitors introduce a certain amount of economic activity into the local economy in the form of overnight stays, eating in local restaurants, and buying goods from local merchants. A change in overall visitation has the potential to affect, either negatively or positively, local vendors through spending activity. Therefore, this topic requires further analysis.

CLIMATE CHANGE

Climate change refers to any substantial changes in average climatic conditions (such as mean temperature, precipitation, or wind) or variability (such as seasonality and storm frequency) lasting for an extended period (decades or longer). Recent reports by the U.S. Climate Change Science Program, National Academy of Sciences, National Climate Assessment and Development Advisory Committee, and United Nations Intergovernmental Panel on Climate Change provide clear evidence that climate change is occurring and will accelerate in the coming decades. The effects of climate change on national parks are emerging as both science and impact measurements become clearer.

Annual temperature has risen almost 1°F at the monument since 1895, and the trend is projected to continue in coming decades such that temperatures will rise an additional 2°F by 2035 and a further 2°-5° F by 2085 (Kunkel et al. 2013). Rising temperatures extend the growing season and enhance evaporation, which in turn leads to moisture stress on vegetation and the increasingly severe wildfires (Westerling et al. 2006) that the region is experiencing. Rising temperatures may also alter visitor needs and use patterns. Precisely predicting the full extent of the changes expected under an altered climate regime is difficult because much depends on future greenhouse gas emission rates. Management and planning processes should recognize, however, that future conditions are likely to shift beyond the historical range of variability and should consider the full range of projected changes (i.e., scenario planning).

The National Park Service recognizes that the major drivers of climate change are outside the agency's control but climate change impacts throughout the national park system must be addressed. The National Park Service consequently has identified climate change as one of the major threats to national park units and has developed a *Climate Change Response Strategy* (NPS 2010) that focuses on science, adaptation, mitigation, and communication. Building upon the strategy, the National Park Service's *2012-2014 Climate Change Action Plan* provides a framework for incorporating the uncertainty of climate change while moving forward with science-informed actions and engaging NPS staff, visitors, and partners in meaningful and ongoing dialogue to continue meeting stewardship responsibilities. It identifies the unique contribution the National Park Service can make at all levels of decision making to respond to climate change (NPS 2012b). A *Green Parks Plan* has been published, which calls for the National Park Service to reduce greenhouse gas emissions and to adapt facilities in anticipation of climate change (NPS 2012c). Strategies identified in these plans will help the National Park Service implement the Department of the Interior's *Secretarial Order 3289: Addressing the Impacts of Climate Change on America's Water, Land, and Other Natural and Cultural*

Resources, which requires all agencies under its auspices to consider and analyze potential climate change impacts when undertaking long-range planning (U.S. Department of the Interior 2009).

There are two different issues to consider with respect to climate change: (1) what is the contribution of a proposed project to climate change, as indicated by greenhouse gas emissions associated with the project; and (2) what are the anticipated effects of climate change on Tsankawi's resources, and specifically, the resources that would be impacted by the project?

In addressing the first issue, the limited nature of facility enhancements proposed by the action alternatives is not expected to noticeably increase greenhouse gases. Therefore, implementing any of the alternatives described in this environmental assessment would not likely have any meaningful effects on the rate and magnitude of climate change.

With regards to the second issue, climate change has the potential to adversely affect future resource conditions within Tsankawi. *Climate Change Adaptation for People and Nature: A Case Study from the U.S. Southwest* prepared by Patrick D. McCarthy of The Nature Conservancy noted that, because of the region's semi-arid climate, its ecosystems are sensitive to directional and episodic changes in temperature and precipitation. The region is undergoing three major transformations linked to climate variability and directional climate change: (1) damaging wildfires outside the historical range of variability; (2) widespread and rapid forest dieback; and (3) changes in flow regimes of rivers and streams. Rising temperatures and changing precipitation patterns are pushing ecosystems across physiological and ecological thresholds, causing widespread mortality and, in some cases, major changes in composition, structure, and function (The Nature Conservancy 2012).

If these trends continue, the effects of climate change on local ecosystems could affect understory vegetation communities and result in altered patterns of runoff and erosion. Tsankawi's pinyon-juniper ecosystem of tabular mesas and eroded valleys contains a vast array of significant cultural features, which makes the area particularly vulnerable to changes in patterns of runoff and erosion.

A series of management strategies have been developed by monument staff to proactively mitigate and adapt to the potential effects of climate change and are described in "Chapter 2: Alternatives." The potential effects of this dynamic climate on Tsankawi's resources are included in "Chapter 3: Affected Environment." However, these effects are not analyzed in "Chapter 4: Environmental Consequences" in general with respect to each alternative because these outcomes or management are not expected to differ among the alternatives.

IMPACT TOPICS DISMISSED FROM FURTHER ANALYSIS

The following impact topics were dismissed from further analysis in this environmental assessment. A brief rationale for the dismissal of each impact resource or value is provided.

INDIAN TRUST RESOURCES

Indian trust resources are land, water, minerals, timber, or other natural resources held in trust by the United States for the benefit of an Indian tribe or individual tribal member. While Tsankawi and other areas of the monument are of critical importance to the cultural heritage, beliefs, customs, practices, and history of the people of the San Ildefonso Pueblo, the land is not held in trust. Therefore, this resource topic has been dismissed from further analysis.

Other cultural resource impact topics evaluated in this environmental assessment, such as archeological resources, cultural landscapes, and ethnographic resources, discuss the historical and cultural context and ongoing relationship of San Ildefonso Pueblo and other affiliated pueblos with Tsankawi and the National Park Service.

HISTORIC STRUCTURES

Historic structures are a type of cultural resource to be considered in accordance with NPS *Management Policies 2006* (NPS 2006a) and NPS DO 28: *Cultural Resource Management* (NPS 2006b). Historic structures are also considered when analyzing the effects of an undertaking on historic properties under section 106 of the National Historic Preservation Act. Historic structures are defined by the National Park Service as "a constructed work, usually immovable by nature or design, consciously created to serve some human activity. Examples are buildings of various kinds, monuments, dams, roads, railroad tracks, canals, millraces, bridges, tunnels, locomotives, nautical vessels, stockades, forts and associated earthworks, Indian mounds, ruins, fences, and outdoor sculpture" (NPS 2006b). In the national register program “structure” is limited to functional constructions other than buildings.

Historic structures at Tsankawi consist of prehispanic and historic sites within the context of archeological sites. Their importance stems from the significant data they contain about prehispanic or historic ways of life, and for some sites, the role they play within the cultural traditions, beliefs, and practices of modern-day pueblo people. For this environmental assessment, these historic structures are analyzed as archeological resources because the nature and extent of potential impacts from the no-action and action alternatives are analyzed with regard to their archeological values and, like the other archeological resources, to their values as ethnographic and cultural landscape features. Therefore, this resource topic has been dismissed from further analysis.

MUSEUM COLLECTIONS

NPS *Management Policies 2006* (NPS 2006a), DO 28: *Cultural Resource Management*, and DO 77-2: *Floodplain Management* require protection of irreplaceable museum items, archival materials, photographs, natural and cultural specimens, artifacts, and other collections within a national park from threats by natural physical processes. The museum collection for Bandelier National Monument is located at the monument's headquarters approximately 12 miles from Tsankawi and at

the regional collection facility in Tucson, Arizona. Project alternatives would have no effect on the monument's museum collection. Therefore, this topic was dismissed from further analysis.

PALEONTOLOGY

Paleontological resources (fossils and their associated data) are a major source of evidence of past life. They are the basis for understanding the history of life on Earth and an integral part of the planet's biodiversity. There are no known paleontological resources within Tsankawi that would be affected by project alternatives. Therefore, this topic has been dismissed from further consideration.

LAND USE ADJACENT TO THE MONUMENT

The National Park Service does not maintain the land where the existing roadside parking area is located. Proposed interim improvements—which would occur within the limits of the State Road 4 right-of-way—would not change the current use of the land nor would these improvements require a transfer in land ownership. These improvements are considered as part of the cumulative impact scenario as described in "Chapter 4: Environmental Consequences." Long-term improvements to the State Road 4 and East Jemez Road intersection would also not be located on NPS land, and the overall land use function would not change. The proposed action alternatives would be limited to those areas within Tsankawi. Project alternatives would not change the function of adjacent land use. Therefore, this topic has been dismissed from further analysis.

WILDERNESS

The Wilderness Act of 1964 provides criteria for determining suitability and establishes restrictions on activities that can be undertaken in a designated area. Such criteria are applicable for roadless areas of 5,000 or more acres and every roadless island (regardless of size) within the National Wildlife Refuge and national park system (USFWS n.d.). The Bandelier Wilderness, totaling roughly 23,200 acres, was designated in 1976 (The University of Montana n.d.). This area is located within the main unit of the monument and at least 12 miles from Tsankawi. However, given the size and location of Tsankawi, it is not included in this designation and does not meet the criteria for possible inclusion in the future. Therefore, this resource impact topic was dismissed from further analysis.

PRIME AND UNIQUE FARMLANDS

The Farmland Protection Policy Act was enacted in 1981 to minimize the loss of prime and unique farmlands as a result of federal actions by converting these lands to nonagricultural uses. Prime farmland is defined as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. The land is also used as cropland, pastureland, rangeland, forest land, or other land, but cannot be used as urban built-up land or water. Unique farmland is defined as land other than prime farmland that is used for the production of specific high-value food and fiber crops. Such land has a special combination of soil quality, location, growing season, and moisture supply that is required to economically produce sustained high quality

crops when treated and managed according to acceptable farming methods (U.S. Department of Health and Human Services 2011). Lands within Tsankawi are not available for farming and do not meet these definitions. Therefore, this impact topic was dismissed from further analysis.

SPECIAL-STATUS SPECIES

The Endangered Species Act of 1973 requires federal agencies to address potential project-induced impacts on federally listed threatened, endangered species, and those species proposed for listing. NPS policy requires state-listed species and others identified as species of management concern be managed in parks in a manner similar to federally listed species. The National Park Service cooperates in the protection and enhancement of special-status species listed by states. Several federal and state listed species, including those identified as New Mexico Species of Greatest Conservation Need, occur within the monument and Santa Fe County (the county in which Tsankawi is located).

Listed species are either not likely to occur or only rarely to occasionally occur within Tsankawi. Project alternatives are not anticipated to impact these species beyond a negligible degree. As a result, only those species whose presence within Tsankawi is known are identified in the "Wildlife and Wildlife Habitat" analysis provided in this environmental assessment.

"Appendix E" identifies threatened and endangered species found within Santa Fe County and the likelihood of their occurrence within Tsankawi. The table in this appendix also describes the anticipated impact of the proposed actions for each listed species, including justification for the effect determinations which are established in section 7 of the Endangered Species Act. Because the effect would be negligible or less for listed species, this impact topic was dismissed from further analysis.

ENVIRONMENTAL JUSTICE

Executive Order (EO) 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations" requires all federal agencies to incorporate environmental justice into their missions by identifying and addressing disproportionately high or adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities. Guidelines for implementing this executive order under the National Environmental Policy Act are provided by the Council on Environmental Quality (CEQ 1997). According to the U.S. Environmental Protection Agency, environmental justice is defined as:

> The fair treatment and meaningful involvement of all people, regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic group, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies. The goal of this "fair treatment" is not to shift risks among

> populations, but to identify potentially disproportionately high and adverse effects and identify alternatives that may mitigate these impacts (U.S. Environmental Protection Agency 1998).

By definition, the people of the six affiliated pueblos are protected under this mandate. A current Memorandum of Understanding requires that NPS staff continue to consult with affiliated pueblos during any planning process that would result in a change in management policies within the monument that may affect sacred materials or places, or other ethnographic resources with which they are historically associated. All consultation efforts with affiliated pueblos related to this plan are discussed in "Chapter 5: Coordination and Consultation."

In addition to the six affiliated pueblos, there are other minority and low-income populations in the general vicinity of Tsankawi. However, environmental justice was dismissed as an impact topic for the following reasons:

- NPS staff actively solicited public participation as part of the planning process and gave equal consideration to input from all people, regardless of age, race, income status, or other socioeconomic or demographic factors.
- Impacts associated with the construction and operation of the action alternatives would not disproportionately affect any minority and/or low-income populations or communities.
- Implementation of the proposed project alternatives would not result in adverse effects specific to minority and/or low-income populations or communities.
- NPS staff does not anticipate adverse impacts on public health and safety or the human environment would fall appreciably more severely or result in disproportionately high and adverse impacts to minority and/or low-income populations or communities in the area.

SURFACE WATERS

There is one intermittent stream that runs through a portion of Tsankawi and contributes to the intermittent Sandia Canyon drainage. However, this stream is located in an area that would not be directly affected by the proposed action alternatives. Implementation of the selected alternative has the potential to generate some runoff; however, it is anticipated that this would be minimal and managed through a construction action plan that would be further refined during subsequent stages of project development. During construction activities associated with the selected alternative, best management practices would be implemented to avoid or minimize adverse impacts. This would include the use of established safety protocols, fencing (silt fences and/or weed-free straw bales) and other materials to contain runoff from entering water bodies, and inspection of erosion and sediment control measures after storm events (see "Appendix F"). Because adverse impacts to surface waters associated with construction of the selected alternative are anticipated to be negligible and would not contribute to the intermittent Sandia Canyon drainage, this topic has been dismissed from further analysis.

WETLANDS

For regulatory purposes under the Clean Water Act, the term wetland means "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and the under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas."

EO 11990, "Protection of Wetlands," requires federal agencies to avoid, where possible, adversely impacting wetlands. Furthermore, NPS *Management Policies 2006* and DO 77-1: *Wetlands Protection* requires that impacts on wetlands be considered in National Park Service undertakings. The intent of these regulations is to protect the high resource values found in wetlands by requiring that evaluation of alternatives occur and mitigation be designed prior to development in wetlands. Because there are no wetland areas within Tsankawi, the proposed action alternatives would not encroach on such resources. Therefore, this resource topic has been dismissed from further analysis.

FLOODPLAINS

EO 11988, "Floodplain Management," and NPS policy require that impacts on floodplains be considered in National Park Service undertakings. The intent of the order and guidelines is to provide for human safety and protection of floodplain functions by preventing development in 100-year floodplains. There are no floodplains located within Tsankawi; therefore, this resource topic has been dismissed from further analysis.

WILD AND SCENIC RIVERS

The Wild and Scenic Rivers Act was passed in October 1968 (Public Law 90-542, as amended 16 United States Code [USC] 1271-1287). A wild and scenic river designation is intended to preserve the character of the identified river or the section that has received such a designation. Under the act, the selected river or section must possess outstandingly remarkable scenic, geologic, fish and wildlife, recreational, or other values. If a river or section possesses any or a combination of these values, it is eligible for classification and therefore protection under the act. No designated wild and scenic rivers occur within Tsankawi; therefore, this topic has been dismissed from further analysis.

SOUNDSCAPE MANAGEMENT

NPS DO 47: *Soundscape Preservation and Noise Management* directs national parks to address excessive and inappropriate noise (NPS 2004a). Appropriate sounds are those consistent with the monument's enabling legislation. During the construction of the action alternatives, there would be short-term impacts in the vicinity of construction activities. Visitors would probably not be able to discern such sounds as they move away from areas where construction activities are taking place and continue to travel along Tsankawi Mesa Trail. A construction action plan would be developed prior to construction activities to identify measures to minimize short-term and localized noise impacts, among other measures. Such measures may include the requirement that construction occur during

low visitation periods and barriers/shields be used to help contain noise and the release of dust and dirt into the surrounding environment. No, or very little, long-term changes to the site soundscape would be anticipated as a result of the action alternatives. Therefore, this topic was dismissed from further analysis.

AIR QUALITY

Section 4.7.1 of NPS *Management Policies 2006* states that the National Park Service has a responsibility to protect air quality under the NPS Organic Act of 1916 and Clean Air Act of 1970 and its amendments (NPS 2006a). Air quality is a key resource in itself and a highly prized (and expected) element of the visitor experience. During the construction of the action alternatives, there would be short-term impacts in the vicinity of construction activities.

Such impacts would occur within a limited area, and visitors would be able to access the resources found within Tsankawi while also navigating around construction areas that would be located near the visitor arrival area. A construction action plan would be developed to identify measures to minimize short-term and localized air quality impacts. Such measures may include the requirement that construction occur during low visitation periods and barriers/shields be used that can help contain the release of dust and dirt into the surrounding environment. The introduction of vehicles on-site with the implementation of the action alternatives is not anticipated to increase hazardous air particulates. No, or very few, long-term changes to air quality would be anticipated as a result of the action alternatives. Therefore, this topic was dismissed from further analysis.

NIGHT SKY MANAGEMENT

In accordance with NPS *Management Policies 2006*, the National Park Service strives to preserve natural ambient lightscapes and protect night sky viewing, which are natural resources and values existing in the absence of human-caused light (NPS 2006a). New lighting is not proposed under the action alternatives. The area would continue to be closed to visitors at sunset. The construction and operation of the action alternatives would not interfere with natural lightscapes or detract from the appreciation of night skies of those areas near Tsankawi. Therefore, this resource topic has been dismissed from further analysis.

RELATIONSHIP TO LAWS, EXECUTIVE ORDERS, AND POLICIES

APPLICABLE FEDERAL AND STATE LAWS

National Park Service Organic Act of 1916

The National Park Service and its mandates are authorized under the Organic Act (16 USC 1, 2-4) and the General Authorities Act (16 USC 1a-8). These acts direct the agency to conserve the scenery,

natural and historic objects, and wildlife, and to provide for the enjoyment of those resources in such a manner as to leave them unimpaired for future generations.

Redwood National Park Act of 1978, as amended

Amending the Organic Act, the Redwood Act (March 27, 1978, 16 USC 1a-1) further defines that the National Park Service may not allow degradation of the values and purposes for which the various areas were established unless authorized by Congress. This act also affirms that if a conflict occurs between visitor use and protection of resources, the intent of Congress is to favor resource protection (NPS 2008).

National Historic Preservation Act of 1966, as amended

The National Historic Preservation Act (16 USC 470 et seq.), establishes as federal policy that the historical and cultural foundations of the nation's heritage be preserved. Section 106 requires that federal agencies that have direct or indirect jurisdiction over undertakings take into account the effect of those undertakings on cultural resources eligible for or included on the national register. This section also provides the Advisory Council on Historic Preservation and the state historic preservation officer an opportunity to comment on the undertaking. The 1992 amendments to the act further define the roles of Native American tribes and the affected public in the consultation process (NPS 2008).

National Environmental Policy Act of 1969, as amended

The National Environmental Policy Act was passed by Congress in 1969 to establish environmental policies, including the goal of achieving productive harmony between human and physical environments for present and future generations. It provides the tools to implement these goals by requiring every federal agency to conduct an in-depth study of potential impacts of "major federal actions having a significant effect on the environment" and alternatives to those actions. The National Environmental Policy Act of 1969 is implemented through CEQ regulations (40 CFR 1500-1508) (CEQ 1978). The National Park Service has adopted procedures to comply with NEPA and CEQ regulations. These procedures are found in DO 12: *Conservation Planning, Environmental Impact Analysis, and Decision Making* (NPS 2001), and its accompanying handbook.

National Parks Omnibus Management Act of 1998

This act outlines a strategy to improve the ability of the National Park Service to provide high-quality resource management, protection, interpretation, and research in the national park system (NPS 2008).

Archeological Resource Protection Act of 1979

The Archeological Resource Protection Act of 1979 protects archeological resources and sites on public and Indian lands, and fosters increased cooperation and exchange of information among

government authorities, the professional archeological community, and private individuals having collections of archeological resources and data that were obtained before October 31, 1979.

The act defines archeological resources as any material remains of past human life that are at least 100 years old and are of scientific interest. With penalties for violators, it requires federal permits for the excavation and removal of artifacts and materials and related data having to do with archeological survey and excavation records. It provides for the confidentiality within the federal agency of archeological site locations, information that the agency is not to share with the public. It encourages cooperation with other parties to improve and increase the protection of archeological resources. Amended in 1988, it requires the development of plans for surveying public lands and for recording and reporting incidents of suspected violations (NPS 2008).

Native American Graves Protection and Repatriation Act of 1990

This act provides for consultation and repatriation of cultural items (human remains, funerary objects, sacred objects, or objects of cultural patrimony) to culturally affiliated Indian tribes. Although the monument has completed this process for known items, this act also provides for any intentional or inadvertent discoveries of cultural items within Bandelier National Monument and calls for the monument to protect the discovery and initiate consultation with affiliated pueblos (NPS 2008).

Native American Religious Freedom Act of 1979

This act is intended to protect and preserve the freedom to believe, express, and exercise the traditional religions of American Indians and provide access to sites, use, and possession of sacred objects, as well as the freedom to worship through ceremonials and traditional rites (NPS 2008).

Architectural Barriers Act of 1968

The Architectural Barriers Act requires access to facilities designed, built, altered, or leased with federal funds. The Access Board, created under this act, develops and maintains accessibility guidelines under this law. These guidelines serve as the basis for the standards used to enforce the law. Following this act, the federal government enacted other acts to promote accessibility including the Americans with Disabilities Act of 1990 (updated in 2010), Rehabilitation Act of 1973, Uniform Federal Accessibility Standards of 1984, and Guidelines for Outdoor Developed Areas of 1999.

Endangered Species Act of 1973, as amended

The Endangered Species Act of 1973 (16 USC 1531, et seq.) requires an evaluation of the effects of proposed actions on all federally listed species, including threatened, endangered, and candidate species and those proposed for listing. The act requires NPS to promote the conservation and recovery of identified species. Any activity funded by federal monies with the potential to impact endangered biota must be consulted through the secretary of the U.S. Department of the Interior. The act requires agencies to protect designated critical habitats on which endangered and threatened

species depend. Although not required by law, it also is NPS policy to identify, preserve, and restore state and locally listed species of concern and their habitats (NPS 2008).

OTHER APPLICABLE EXECUTIVE ORDERS, REGULATIONS, AND POLICIES

Director's Order 12: Conservation Planning, Environmental Impact Analysis, and Decision Making and Handbook

DO 12 and its accompanying handbook (NPS 2001) lay the groundwork for how the National Park Service complies with the National Environmental Policy Act of 1969. DO 12 and the handbook set forth a planning process for incorporating scientific and technical information and establishing a solid administrative record for NPS projects.

Director's Order 28: Cultural Resource Management

This Director's Order directs the National Park Service to protect and manage cultural resources in its custody through effective research, planning, and stewardship in accordance with the policies and principals contained in NPS *Management Policies 2006*. DO 28 is carried out through the NPS 28: Cultural Resource Management Guideline that provides the fundamental concepts of cultural resource management for the National Park Service. While general archeological requirements are included under DO 28, DO 28A: Archeology and its reference manual provide more specific guidance on selected archeological topics. They provide the necessary information to implement those laws and policies applicable when carrying out certain activities and promote a common framework for planning, reviewing, and undertaking archeological activities and other activities that may affect archeological resources within the national park system (NPS 2004b).

Under the NPS' Archeology Program, 36 CFR 79 establishes definitions, standards, procedures, and guidelines to be followed by federal agencies to preserve collections of prehistoric and historic material remains, and associated records, recovered under the authority of the Antiquities Act (16 U.S.C. 431- 433), the Reservoir Salvage Act (16 U.S.C. 469-469c), section 110 of the National Historic Preservation Act (16 U.S.C. 470h-2), or the Archaeological Resources Protection Act (16 U.S.C. 470aa-mm) (Government Printing Office n.d.).

Director's Order 77: Natural Resource Management

DO 77 addresses natural resource protection, with specific guidance provided in Reference Manual 77: Natural Resource Management. This manual offers comprehensive guidance to NPS employees responsible for managing, conserving, and protecting the natural resources found in national park system units.

National Park Service Management Policies

NPS *Management Policies 2006* (NPS 2006a) state the "fundamental purpose" of the national park system is to conserve park resources and values and to provide for the public enjoyment of the parks resources and values so resources will be left unimpaired for future generations. Section 5.3.5 of NPS

Management Policies 2006 establishes the framework for considering cultural resources in planning efforts (NPS 2006a). Subsections include archeological resources, cultural landscapes, and ethnographic resources, all of which are applicable to this environmental assessment.

Executive Order 11593: Protection and Enhancement of the Cultural Environment

This Executive Order stipulates that the federal government provide leadership in preserving, restoring, and maintaining the historic and cultural environment of the nation. Federal agencies are required to: (1) administer the cultural properties under their control in a spirit of stewardship and trusteeship for future generations, (2) initiate measures necessary to direct their policies, plans and programs in such a way that federally owned sites, structures, and objects of historical, architectural or archeological significance are preserved, restored, and maintained for the inspiration and benefit of the people, and (3) in consultation with the Advisory Council on Historic Preservation (16 U.S.C. 470i), institute procedures to assure that federal plans and programs contribute to the preservation and enhancement of nonfederally owned sites, structures and objects of historical, architectural or archeological significance (The U.S. National Archives and Records Administration n.d.).

Executive Order 13175: Consultation and Coordination with Indian Tribal Governments

This Executive Order requires that agencies establish regular and meaningful consultation and collaboration with tribal officials in the development of federal policies that have tribal implications, to strengthen the U.S. government-to-government relationships with Indian tribes, and to reduce the imposition of unfunded mandates upon Indian tribes (CEQ 2000).

Executive Order 13186: Responsibilities to Federal Agencies to Protect Migratory Birds

Migratory birds are of great ecological and economic value to this country and to other countries. They contribute to biological diversity and bring tremendous enjoyment to millions of Americans who study, watch, feed, or hunt these birds throughout the United States and other countries. The United States has recognized the critical importance of this shared resource by ratifying international, bilateral conventions for the conservation of migratory birds. Such conventions include the Convention for the Protection of Migratory Birds with Great Britain on behalf of Canada 1916, Convention for the Protection of Migratory Birds with Game Mammals-Mexico 1936, Convention for the Protection of Birds and their Environment-Japan 1972, and Convention for the Conservation of Migratory Birds and their Environment-Union of Soviet Socialist Republics 1978. These migratory bird conventions impose substantive obligations of the United States for the conservation of migratory birds and their habitats, and through the Migratory Bird Treaty Act, the United States has implemented these migratory bird conventions with respect to the United States. This executive order directs executive departments and agencies to take certain actions to further implement the act.

Secretarial Order 3289: Addressing the Impacts of Climate Change on America's Water, Land, and Other Natural and Cultural Resources

Adopted in March 2009, this order establishes an approach for applying scientific tools to increase understanding of climate change and to coordinate an effective response to its impacts on tribes and on the land, water, ocean, fish and wildlife, and cultural heritage resources that the Department of the Interior manages. As stated in the order, the Department of the Interior is required to protect cultural and archeological resources and iconic structures that may be affected by climate change, continue to provide state-of-the art science to better understand the impacts of climate change and to develop science-based adaptive management strategies for cultural and natural resource managers, and consider and analyze potential climate change impacts when undertaking long-range planning (U.S. Department of the Interior 2009).

Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation

The standards for planning discuss identifying, evaluating, registering, and treating historic properties, while the remaining activity standards consider how each activity should be carried out. The standards outline a process that determines when an area should be examined for historic properties, whether an identified property is significant, and how a significant property should be treated. The process it outlines is flexible enough to be used at all levels while providing a common structure that promotes coordination and minimizes duplication of effort. The professional qualifications standards discuss the education and experience required to carry out various activities, and contain additional information about how to integrate various levels of planning (NPS n.d.[a]).

Secretary of the Interior's Standards for the Treatment of Historic Properties, Guidelines for the Treatment of Cultural Landscapes

This document provides guidance to cultural landscape owners, stewards and managers, landscape architects, preservation planners, architects, contractors, and project reviewers prior to and during the planning and implementation of project work. These standards can be applied to all historic resource eligible or listed on the national register including buildings sites, objects, and districts. The guidelines establish the foundation for preserving, rehabilitating, restoring, and reconstructing resources in a way that is consistent with the standards. These standards are used to ensure that projects receiving federal money or tax benefits are reviewed in a consistent fashion nationwide (NPS n.d.[b]).

RELATIONSHIP TO OTHER MONUMENT PLANNING DOCUMENTS

The current plan builds on and relates to four previous planning efforts within the monument and encompassing Tsankawi: the 1995 *Development Concept Plans for Frijoles Canyon and Tsankawi*, the 2000 *Environmental Assessment Regarding the Management of the Tsankawi Unit*, the 2005 *Bandelier National Monument Fire Management Plan/Environmental Assessment*, and the monument's 2007 *Ecological Restoration Plan/Environmental Impact Statement*.

The *Development Concept Plans for Frijoles Canyon and Tsankawi* and the *Environmental Assessment Regarding the Management of Tsankawi Unit, Bandelier National Monument* addressed the need to manage visitation to ensure protection of cultural resources while ensuring a high-quality visitor experience. The basic issues and concepts identified in those plans are carried forward in this planning process.

The *Bandelier National Monument Fire Management Plan/Environmental Assessment* and the monument's 2007 *Ecological Restoration Plan/ Environmental Impact Statement* addressed monument-wide needs for fire management and stabilization of pinyon-juniper woodlands, including a subset of management actions within Tsankawi. The monument has implemented actions identified in these plans and attained a positive understory response with associated reduction in runoff and soil erosion. Management intent is to avoid disturbing the longer term recovery process by new management actions, while controlling unplanned wildfire ignitions that could prematurely consume site vegetation and slash. The current plan avoids any actions that would inhibit progress of these two earlier planning efforts.

IMPAIRMENT

Section 1.4.5 of NPS *Management Policies 2006* states that an action constitutes an impairment when an impact "would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values" (NPS 2006a). Whether an impact satisfies this definition depends on the particular resources and values that would be affected; the severity, duration, and timing of the impact; the direct and indirect effects of the impact; and the cumulative effects of the impact in question in relation to other projects within the park and immediate vicinity. An impact on any park resource or value may constitute impairment; however, an impact would be more likely to constitute impairment to the extent it affects a resource or value whose purpose or conservation is one of the following:

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park
- key to the natural or cultural integrity of the park or to the opportunity for enjoyment of the park
- identified as a goal in the park general management plan or other relevant NPS planning documents

Impairment findings are not necessary for public health and safety, park operations and management, or socioeconomic topics because they are not generally considered park resources and values under the Organic Act of 1916. An impairment determination for the NPS preferred alternative will be submitted with the decision document at the conclusion of this planning process.

Chapter 2

Alternatives

INTRODUCTION

The Council on Environmental Quality Regulations for implementing the National Environmental Policy Act of 1969 requires federal agencies to consider a range of alternatives and fully evaluate all reasonable alternatives that address the purpose of and need for the action. Alternatives under consideration must include a "no-action" alternative in accordance with CEQ regulations (40 CFR 1502.14). Action alternatives may originate from the proponent agency, local government officials, or members of the public as expressed during the early stages of the planning process. Alternatives may also be developed in response to comments from coordinating or cooperating agencies.

Alternatives analyzed in this environmental assessment were developed based on the results of internal and public scoping, consultation with the six affiliated pueblos, and prior planning studies. A multidisciplinary understanding of the challenges that exist when identifying management actions to protect the fragile cultural and natural resources within Tsankawi while at the same time enhancing visitor experience and safety was also essential in the identification of project alternatives. This environmental assessment will evaluate potential beneficial and adverse effects associated with the no-action alternative as well as two action alternatives.

Both action alternatives meet the management objectives of the monument and achieve the overall purpose of and need for action. Because each of the identified action alternatives meets or partially meets the objectives, the alternatives are considered reasonable. Alternatives that were initially considered, but not technically or economically feasible, did not meet the purpose of and need for the project, created unnecessary or excessive adverse impacts on resources, and/or conflicted with the overall management of the monument or its resources were dismissed from further analysis. This chapter discusses in greater detail the action and no-action alternatives, the environmentally preferred and NPS preferred alternatives, and those alternatives or actions that were considered, but dismissed.

COMMON TO ALL ALTERNATIVES

Because of the sensitivity of the cultural and natural resources found within Tsankawi, some initial measures would be implemented under all alternatives, including the no-action alternative. A description of those elements common to all alternatives is provided below.

RESOURCE MONITORING PROGRAM

Tsankawi contains more than 150 archeological sites dating from the Ancestral Pueblo occupancy of the Pajarito Plateau. These sites include hand-carved trails, hand-and-toeholds, cavates, petroglyphs, pueblos, field houses, artifact scatters, rock alignments, and other archeological features. These fragile resources are changing from fair or good condition to poor condition as a result of visitor use and natural erosion processes. Some of the trails historically used by Ancestral Pueblo peoples are also being used by visitors. This has resulted in an accelerated incising of the

trail into the tuff geology. Cavates and other sensitive resources are also demonstrating notable signs of erosion (see figure 7).

Loss of features at this cavate entry includes threshold stone, infill at ventilation opening, and weakening of the lintel area. Image on the left is from 1901, the one on the right from 2012. Source: NPS 2013a

Loss of integrity to the masonry of this cavate—located at North Mesa—has occurred in the last 50 years. Image on the left is from 1960, and the one on the right from 2010. Source: NPS 2013a

FIGURE 7. CHANGE IN RESOURCES OVER TIME

Foot traffic on this Ancestral Pueblo trail has enlarged the prehispanic dimensions of the trail and trampled trail side vegetation. These changes affect local drainage patterns and have the potential to direct drainage into cavates causing additional damage. Image on the left is from 1985 (photo courtesy of Atwell), the one on the right from 2012. Source: NPS 2013a

Bright white stone surfaces seen in the 2012 photograph (right) indicate that foot traffic has worn away the weathering crust near this cavate group, exposing very soft tuff that is weathering at an accelerated rate. Darker surfaces on the earlier 1985 photograph (left, photo courtesy of Atwell) indicate intact areas of weathering crust that protect cultural features from erosion. Source: NPS 2013a

FIGURE 7. CHANGE IN RESOURCES OVER TIME

While one of the objectives of this plan is to develop a framework to guide resource management, the National Park Service has proactively initiated efforts through the Vanishing Treasures program to document baseline resource conditions, assess current conditions, and establish a resource monitoring program at Tsankawi. NPS staff are working towards determining whether visitor use, natural erosion processes, or some combination thereof are the cause(s) of deteriorating resource conditions. At select sections/areas of hand-carved trails, hand-and-

toeholds, cavates, and petroglyphs that are heavily visited as well as sites that currently are not visited, the following efforts are underway:

- Collect and review historic and recent photographs for visual comparison and locate areas of increased deterioration and/or those areas where deterioration has slowed due to no or little visitor impacts.

- Identify study sites and measure changes in the depth and width of features, presence/absence of weathering crusts, localized runoff patterns, and presence/absence of vegetation. All locations are referenced so future measurements can be collected to determine the rate of decay, as appropriate.

- Conduct condition assessments at select cavates to determine changed conditions since the 2008-2010 documentation of identified high priority cavates, including: the presence of graffiti, changes in the entryway (moved stones or materials), and floor conditions (including loss of materials and cavate floors covered with protective fabric and fill).

- Compare and summarize photo-documentation, field measurements, field observations, and condition assessments to identify the cause(s) of deteriorating resource conditions and establish the future frequency for monitoring conditions.

- Establish an ongoing monitoring program for cavates, petroglyphs, ancestral trails, and hand-and-toeholds. This could also include establishing a New Mexico SiteWatch Program at Tsankawi. This program trains citizen volunteers to assist land-management agencies and their preservation partners in the protection of the state's cultural resources. This network of trained volunteers monitors prehispanic and historic resources such as pueblos, field houses, artifact scatters, rock alignments, and other archeological features for signs of wear, vandalism, and looting.

It should be noted that this effort is likely to be challenging, take multiple years, with the pace of progress dependent on continued levels of Vanishing Treasures program funding. Potential management strategies to protect resources are outlined under the action alternatives considered in this plan.

SITE STEWARD AREA

Given budget constraints, monument staff does not anticipate staff would be stationed at Tsankawi in the short term. An alternative staffing option is to have a volunteer site steward(s) residing in the unit near the main trailhead and visitor contact station. Previously, there had been a site steward and this program would be reintroduced to Tsankawi under all alternatives. Site steward arrangements would be made through the monument’s housing office, similar to the way reservations are made for campground hosts.

CLIMATE CHANGE

Climate change is a far-reaching and long-term issue. Although some climate change effects are already evident or considered likely, many potential impacts are unknown. As global and regional climates continue to change, a management approach that assesses vulnerabilities, enhances the protection and resiliency of climate-sensitive resources, and guides climate change-driven alterations in ecosystems is becoming increasingly important. For this reason, monument staff are developing a series of management strategies to proactively identify and manage the potential effects of climate change, consistent with the NPS *Climate Change Response Strategy*.

Adaptation

- Engage in the NPS Climate Change Response initiative, using scientific data and planning tools specific to the Jemez Mountains and potentially develop a climate change vulnerability assessment encompassing Tsankawi and the main unit of the monument. Use the results of the vulnerability assessment in a scenario planning exercise that considers the full spectrum of potential climate futures and identifies appropriate management approaches in response to both uncertainty and lack of control over future climate.
- Identify key cultural and natural resources and processes that are at risk from climate change. Establish baseline conditions for these resources, identify their metrics, and monitor for change (as part of the resource monitoring program). Utilize tools such as climate change scenario planning to test ongoing management strategies and consider additional approaches that may be relevant for future climatic conditions. Implement adaptive management (under the action alternatives) as a means to determine the success of these strategies.
- Maintain and restore key ecosystem features and processes, document and protect cultural resources. Ecological restoration efforts that were undertaken in Tsankawi from 2008 to 2010 are an example of this strategy (see "Chapter 4: Environmental Consequences").
- Use best management practices to reduce human-caused stresses (e.g., monument infrastructure and visitor related disturbances) that hinder the ability of fragile cultural resources and species to withstand climatic events.
- Enhance partnerships with local resource management entities to maintain regional habitat connectivity and refugia that allow species dependent on park resources to better adapt to changing conditions.

Mitigation

- Reduce or mitigate greenhouse gas emissions associated with monument operations through use of alternative transportation and renewable energy.

Communication

- Interpret the potential adverse effects of climate change on cultural resources to educate visitors and inform management.

NO-ACTION ALTERNATIVE

The no-action alternative is defined as the continuation of current policies and management actions regarding site access, visitor use, safety, and interpretive features at Tsankawi. Trails would continue to traverse Tsankawi Pueblo and lead visitors through the highly erodible cavate village (see figure 8). Access to Duchess Castle and North Mesa would continue to be self-guided.

The roadside parking area would continue to be located on lands that fall under the auspices of the Department of Energy and site access would remain a safety concern. Interpretive features would not be enhanced and staffing levels would not be increased, although the site steward program would be reintroduced. The visitor contact station would remain in its current location without improvements, the fee collection station would continue to be difficult to locate, and there would be minimal access for persons with limited mobility. The abovementioned resource monitoring program would be implemented.

ACTION ALTERNATIVES

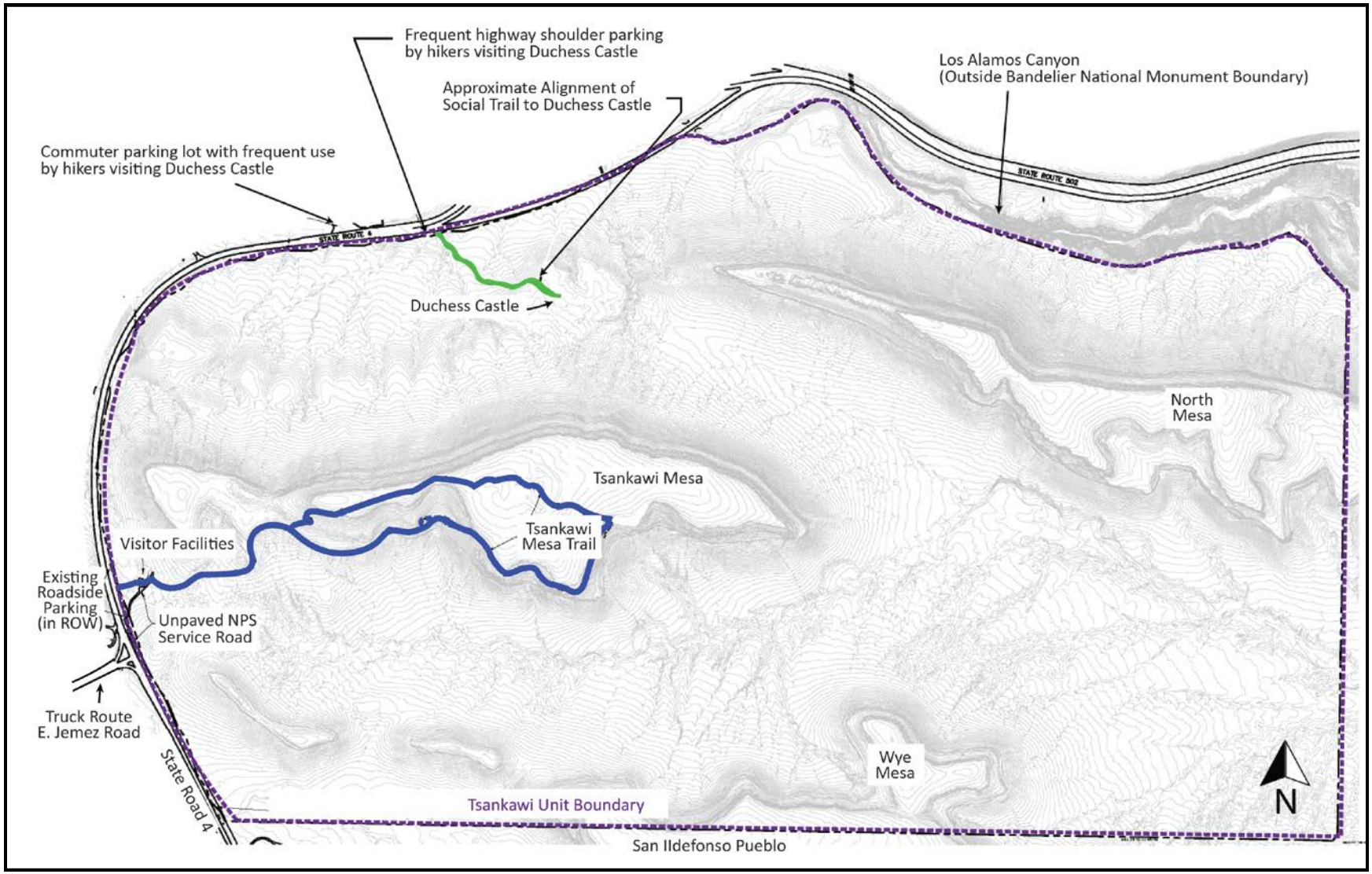
Two action alternatives have been identified and there are numerous project elements common to both. The primary difference between the two action alternatives is the siting of the proposed on-site parking area, entry roadway, trailheads, kiosk, and restrooms. Other than the trailhead locations, enhancements to existing trails and development of new trails would be the same under the action alternatives. Those project elements common to both action alternatives are described below under "Actions Common to All Action Alternatives." The differences between the two action alternatives are identified under "Discussion of Action Alternatives."

These alternatives were identified for further analysis because they best meet the purpose of and need for action. The action alternatives are designed to improve site access, infrastructure, and visitor experience while protecting the fragile cultural and natural resources present in the area. It should be noted that the implementation of either action alternative is subject to available funds and staffing given current fiscal constraints and potential sequestration scenarios.

ACTIONS COMMON TO ALL ACTION ALTERNATIVES

Adaptive Management

Adaptive management—evaluating the need to change management direction in response to changing conditions—is important for resource management and visitor experience. It is based on the assumption that current scientific knowledge is limited and that a level of uncertainty exists. In

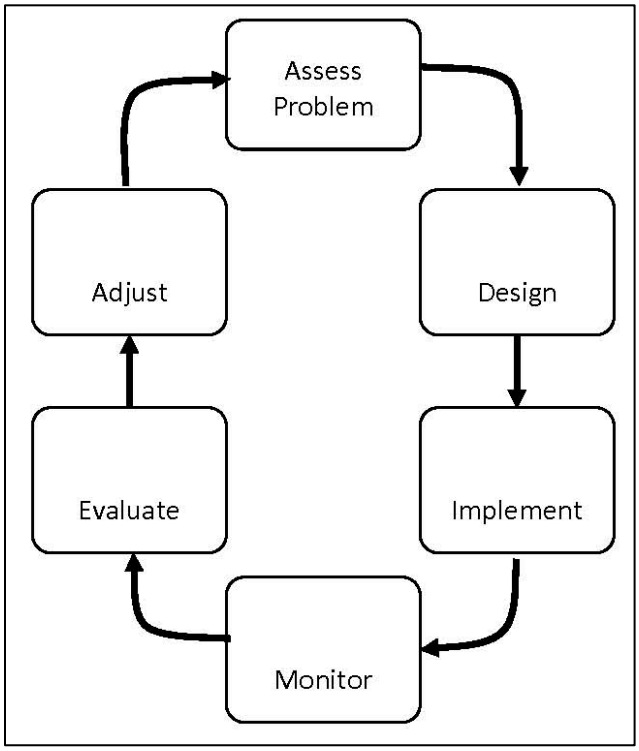


SOURCE: DHM Design 2013

FIGURE 8. NO-ACTION ALTERNATIVE

2007, the Department of the Interior released its Adaptive Management Technical Guide, defining the term and providing a clear process for incorporating adaptive management processes into natural resource management (Williams et al. 2007). In 2008, the Department of the Interior codified the definition stating that adaptive management is "a system of management practices based on clearly identified outcomes and monitoring to determine whether management actions are meeting desired outcomes; and, if not, facilitating management changes that will best ensure that outcomes are met or re-evaluated" (43 CFR 46.30). The Department of the Interior instructs its agencies to use adaptive management in their planning processes (43 CFR 46.145).

Adaptive management is an iterative process where a problem is assessed, potential management actions are designed and implemented, those actions and resource responses are monitored over time, continuous data is evaluated, and actions are adjusted, as necessary, to better achieve desired management outcomes. A summary of a typical approach to adaptive management is presented in figure 9.



SOURCE: Williams et al. 2007

FIGURE 9. GENERAL ADAPTIVE MANAGEMENT PROCESS DEVELOPMENT

The action alternatives would move beyond monitoring resource conditions as outlined under the no-action alternative and use a number of strategies to improve the condition of sites and resources. Given the sensitivity of cultural and natural resources present within Tsankawi, the uncertainty of the future effects of climate change, and the effectiveness of different strategies, a tiered adaptive management strategy would be implemented for resource and visitor use management and would be complemented with a flexible, scenario planning-based climate adaptation approach.

Under the action alternatives, monument staff would manage towards maintaining sites in a good condition according to NPS standards. Impacts directly associated with visitor use should not be a significant contributor of changing overall site condition to a lesser condition (i.e., good to fair, fair to poor). For sites in less than good condition as a consequence of visitor impacts, management actions should seek to return the resource to good condition over time and through appropriate conservation actions. Archeological sites where deterioration or damage effects more than 25% of the feature or that exhibit imminent failure of a structural feature should be returned to sound condition requiring only routine or preventive cyclic stabilization. Ongoing monitoring at select locations would help determine the success of initial strategies or if it is appropriate to introduce additional measures to achieve desired conditions.

Table 1 provides an overview of the locations, monitoring activities, desired outcomes/conditions, indicators, metrics, and range of incremental management strategies for protecting archeological resources, segregating weathering /climate change effects from the effects of visitation, and enhancing visitor enjoyment. The sections that follow identify how specific elements of the action alternatives would influence the adaptive management strategy.

Site Access and Intersection Improvements

Under the action alternatives, vehicular access to Tsankawi would be relocated from the existing roadside parking area along State Road 4. The tee intersection of State Road 4 and East Jemez Road would be modified to become a four-way intersection allowing for site access via a signalized intersection. Figure 10 shows the existing tee intersection at the State Road 4 and East Jemez Road intersection. Federal Highway Administration (FHWA) staff identified a series of improvements that would facilitate this conversion and allow for streamlined access to the proposed on-site parking areas and visitor services (see figure 11).

Intersection improvements in this area would facilitate controlled left-hand turning movements in and out of Tsankawi with a designated lane and eliminate the use of the existing roadside parking area which requires left-hand turns in an area with poor site lines of oncoming traffic because of the slope and curvature of the road. A designated right-turn lane would also be introduced. Cameras at the intersection would help determine the duration of the traffic signal, which would help maintain or improve traffic volumes at the intersection while also facilitating safe entry to Tsankawi. New lane configurations and pavement marking would help ensure safe, easy access to the unit. Other improvements to support the success of this action would include the installation of new signal poles and supporting features, utility relocation, and embankment work, among others.

The funding of such improvements is outside the scope of this project and does not fall under the jurisdiction of the National Park Service because it does not own the roadway. However, the action alternatives would be most successful should this action be implemented prior or simultaneous to the implementation of the selected alternative. Identified improvements would result in safety benefits for all users, including visitors and staff accessing Tsankawi, people accessing the Los Alamos National Laboratory, and other motorists using the roadway. NPS staff would work with appropriate partners to secure funding for these improvements. Furthermore, there may be an

TABLE 1. ADAPTIVE MANAGEMENT STRATEGY FOR THE ACTION ALTERNATIVES

Location/Focus	Monitoring Activity	Desired Outcomes/ Conditions	Indicators	Metrics	Potential Management Strategies
Archeological Resources					
Guided-only segment of Tsankawi Mesa Trail	After conducting a guided tour, the first 100-feet of trail segment would be raked. The trail segment would be periodically checked for footprints to verify any unauthorized access.	Unauthorized visitor access along the guided-only trail segment is diminished.	Footprints on the trail absent a guided tour.	35% of status checks identify footprints on the trail absent a guided tour.	Ensure that all guides have current training and provide additional training, as needed. Revise and amplify site interpretive messaging, especially resource protection messaging in combination with reinforcing signs and barriers. Amplify outreach and messaging to local communities of monument visitors regarding the resource protection plan and intent of changes to site access. Establish law enforcement protocols, increase on-site law enforcement patrols, and/or introduce regulatory messaging.
Cavates along guided-only segment of Tsankawi Mesa Trail	After conducting a guided tour, cavate floors would be swept clean. A representative sampling of significant and highly sensitive cavates would be monitored for footprints to detect any unauthorized access.	Unauthorized visitor presence within cavates is diminished to negligible.	Footprints within cavates.	20% of status checks identify footprints within cavates.	
Ancestral hand-and-toeholds	The retention or loss of surface material would be documented. The extent of loss would be documented. The monitoring interval is likely to be quarterly or annually.	Material is stable or rate of loss is negligible. Biofilms (weathering crusts) reestablish on the feature surfaces, providing additional weathering resistance over a period of five years.	Average depth and width of ancestral hand-and-toeholds; surface area of abraded, unweathered exposed tuff.	Surface areas exhibit additional abrasion, visible impact damage is identified enlarging the average depth of hand or toeholds by 3mm or more, and/or over a period of five years, features do not exhibit reestablishment of biofilms.	

TABLE 1. ADAPTIVE MANAGEMENT STRATEGY FOR THE ACTION ALTERNATIVES

Location/Focus	Monitoring Activity	Desired Outcomes/ Conditions	Indicators	Metrics	Potential Management Strategies
Ancestral hand-carved trails	Current conditions of ancestral hand-carved trails would be documented and then monitored for any trail loss or collapse.	Current condition of ancestral hand-carved trail system is maintained, accepting the effects of natural weathering. Over a period of five years, unused trail segments exhibit reestablishment of biofilms (weathering crust.)	Average depth and width of Ancestral hand-carved trails; surface area of abraded, unweathered exposed tuff.	For hand-carved trails not subject to foot traffic, visible impact damage is identified, surface areas exhibit additional abrasion, and/or average depth and/or width is enlarged 5mm or more.	Establish seasonal standing tour times, and consider/evaluate limits on group size. Establish a reservation system; limit overall tours of Tsankawi using monitoring to establish the level below which impacts are unacceptable.
Segregate Weathering / Climate Change Effects From Effects of Visitation					
Geohazards	Comparable locations in areas subject to concentrated visitation and areas that receive negligible visitation would be selected for monitoring. Baseline conditions for vegetation, erosion, water intrusion in cavates and/or other variables to segregate weathering effects from visitation effects would be established. Baseline conditions for vegetation, erosion, water intrusion in cavates	Environmental conditions to allow for safe use by staff and visitors.	Rock falls.	More than one rock fall occurrence in areas subject to visitation.	Additional minor trail revisions may be necessary to ensure visitor safety that may result from accelerated erosion and rock fall.
Standing Masonry		Potential trampling of cultural and natural resources by visitors is monitored and curtailed for areas of the site open to general visitation.	Collapse of standing masonry.	More than one occurrence of collapse of standing masonry in combination with evidence of human visitation.	Conservation efforts would be reprioritized based on information from monitoring efforts to identify and address the critical resources at risk. Localized limits in access to unstable or rapidly deteriorating cultural features would be implemented. For
Water Intrusion at Cavates		Water is directed to drainage routes that avoid cavate openings.	Frequency and depth of water intrusion in cavates.	More than one cavate exhibiting water intrusion in combination with evidence of human visitation.	

TABLE 1. ADAPTIVE MANAGEMENT STRATEGY FOR THE ACTION ALTERNATIVES

Location/Focus	Monitoring Activity	Desired Outcomes/ Conditions	Indicators	Metrics	Potential Management Strategies
	and/or other variables to segregate weathering effects from visitation effects would be established. Monitoring that allows NPS staff to segregate visitor impacts from weathering impacts would be implemented. This would allow for continued unsupervised visitor access to areas and features not being damaged by visitation.				example, a specific cavate may be closed to staff and public visitation.
Trailside Vegetation, Social Trailing and Visitor Behavior	Photo-documentation points along the mesatop would be established to document baseline conditions along established trail segments. Vegetation condition alongside trails would be monitored for indications of trampling and off-trail movement. The pace of monitoring is yet to be determined but could potentially occur on a weekly basis during active season. Monument staff would	Vegetation exhibits comparable density and vigor to areas away from trails. Visitors generally stay on the trail with few exceptions. No new social trails appear and restored social trails remain reclaimed. Visitor behavior reflects respect for cultural	Vegetation density and vigor. Visitor behavior indicates messaging on appropriate behavior at the site is successful.	Loss of 25% or more of vegetation along trail corridors (alongside trails, within 10-feet of the trail edge). One or more new social trails appear. One or more reclaimed social trails show signs of use, including footprints, trampled vegetation or removal of slash. Observations of visitors	Social trails would be reclaimed using available on-site organic material. Interpretive and resource protection messaging would be revised/amplified. Resource protection messaging would be circulated within local community. More defined trail edges, such as slash treatment near trails, intentional plantings, and railings or post-and-cable fencing, would be introduced.

TABLE 1. ADAPTIVE MANAGEMENT STRATEGY FOR THE ACTION ALTERNATIVES

Location/Focus	Monitoring Activity	Desired Outcomes/ Conditions	Indicators	Metrics	Potential Management Strategies
	observe and/or participate in group tours and independent visits.	resources of the site.		reflect that more than 25% are off-trail.	The need for connector loop trail would be evaluated based on the extent of social trailing or unsafe climbing on talus slopes. On-site staff or volunteer site steward presence would be increased, and additional training for guides would be provided.
Visitor Experience					
Levels of Visitation	Mechanical/electronic trail monitors combined with fee collection data to track visitation (numbers) on a daily or weekly basis would be used. During peak season, the number of NPS visitor contacts on trails, number of NPS programs and visitor attendance would be recorded.	Visitation data is complete and collection method is reliable. NPS management understands visitation trends at the unit.	Visitation quantity.	Recorded number of visits does not fit within a range of 75% to 125% of historic average annual visits established by records for 2000-2012.	Visitation data collection methods would be analyzed, revised, and improved.

TABLE 1. ADAPTIVE MANAGEMENT STRATEGY FOR THE ACTION ALTERNATIVES

Location/Focus	Monitoring Activity	Desired Outcomes/ Conditions	Indicators	Metrics	Potential Management Strategies
Visitor Enjoyment	The monument's visitor survey card program would have a subcomponent specific to Tsankawi, and a similar survey effort would be undertaken.	Visitors indicate satisfaction with their experience and indicate an understanding of site history.	Visitor Feedback NPS staff observations of encounter rates, visitor congregation areas, and anthropogenic noise.	Tsankawi visitor satisfaction with facilities and visitor services falls below 85%. More than 10 written visitor comments during a single year indicate a need for improvement of facilities and visitor services. NPS staff observes and records concentrated encounter rates, visitor congregation, and/or anthropogenic noise.	NPS management discussion would focus on means to increase visitor understanding and appreciation of Tsankawi. An approved visitor survey would be undertaken to collect data from visitors on their experience at Tsankawi. Ensure that all guides have current training and provide additional training, as needed.

SOURCE: NPS 2013a

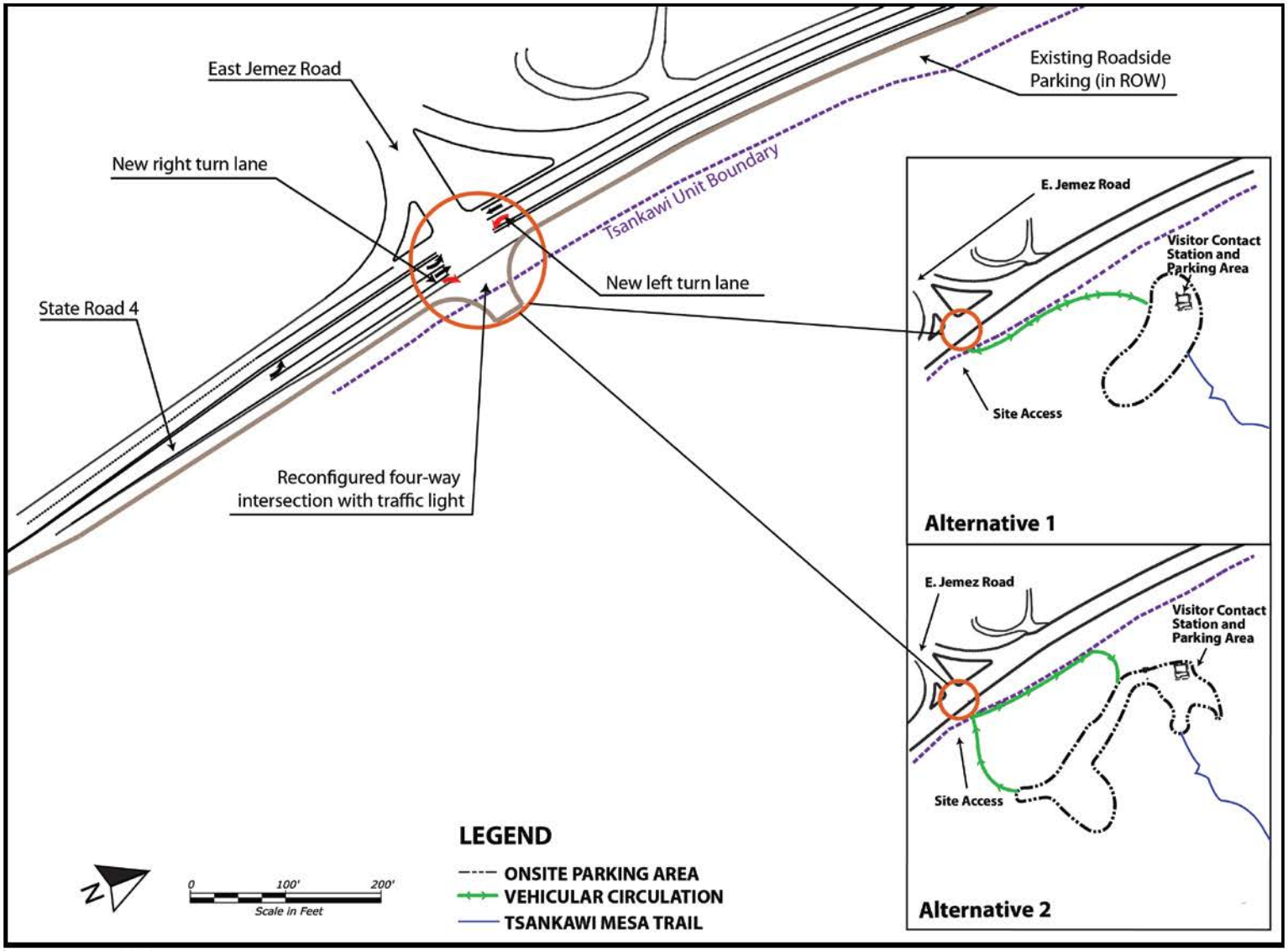
FIGURE 10. EXISTING STATE ROAD 4 AND EAST JEMEZ ROAD TEE INTERSECTION

opportunity for the construction of the proposed entry roadway and on-site parking area to occur at the same time as intersection improvements, which would likely reduce overall costs and the duration of anticipated disruption during construction activities.

The initial part of the entry roadway entering Tsankawi would be paved. At this time, it has not yet been determined if the roadway, once on NPS land, and/or on-site parking area would be paved or gravel. However, this environmental assessment assumes that the entry roadway and on-site parking area in their entirety would be paved to evaluate the highest level of development in the area. An automated gate would be installed along the entry roadway closer to the four-way intersection to indicate times when Tsankawi is closed to visitors.

The fence and "No Trespassing" sign in the vicinity of Duchess Castle would be removed. Signage would inform visitors of the designated entry location and brush and boulders would be dragged across the trail to indicate route closure.

NPS staff would work with the state and county to determine if relocating the commuter parking lot, across the street from where people currently access Duchess Castle, would be feasible. Relocation of the commuter lot would help resolve the issue of visitors accessing Tsankawi from locations other than the designated entrance as well as safety concerns associated with people crossing State Road 4.



SOURCE: FHWA 2012a

FIGURE 11. SITE ACCESS AND INTERSECTION IMPROVEMENTS UNDER THE ACTION ALTERNATIVES

Under both action alternatives, the proposed site access improvements would facilitate options for transit service to the site by providing a bus/car drop-off lane near the proposed kiosk. The proposed on-site parking area layouts vary by alternative and are discussed in alternatives 1 and 2.

Site Steward. Similar to the no-action alternative, the site steward program would be reintroduced under the action alternatives. However, under the action alternatives, the site steward area would be relocated to provide for privacy and improved to include a small shaded platform, possibly an RV cover and concrete pad to park on, phone/internet hook-ups, and water/electricity/sewer hook-ups.

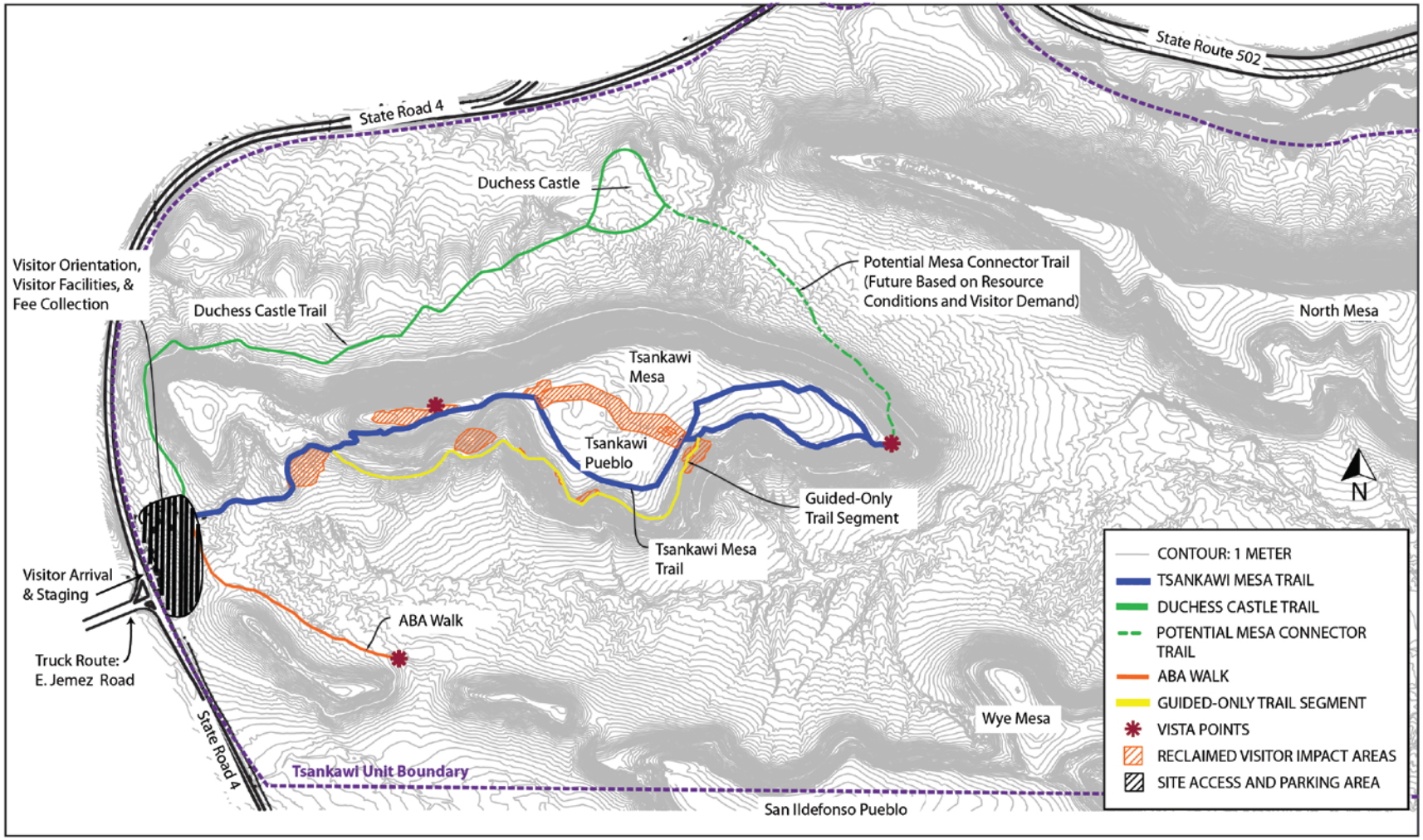
Phased Trail Improvements

Under the action alternatives, proposed trail improvements would occur in three phases, as described below. New interpretive messaging and materials would be introduced at strategically located points around Tsankawi to maximize resource protection and enhance visitor experience. Figure 12 gives an overview of proposed trail configurations that would be implemented under the action alternatives. The discussion of the difference between the trails, which is generally limited to the trailhead locations, is presented under each respective alternative.

Phase 1: Reroute Tsankawi Mesa Trail around Tsankawi Pueblo. The purpose of rerouting the Tsankawi Mesa Trail is to protect sacred ground and pueblo features. The first part of the trail would follow a similar alignment to that under existing conditions. Closer to the mesa top, the trail would be routed away from and south of the center of Tsankawi Pueblo. The current trail through the center of Tsankawi Pueblo would be reclaimed and restored to natural conditions.

At this location, there is no elevation issue, e.g., the pueblo masonry features are in view of the proposed reroute alignment for its entire length. A kiva is partially in view at the southernmost portion of the reroute. The reroute is in an area of less-concentrated artifact scatter than the current route through the pueblo plaza.

Reinforcing the resource protection message would require skillful design of the rerouted trail segment. Absent a design that reinforces the message, visitors are likely to wander across the landscape through the site, potentially trampling vegetation and impacting resource integrity. The new route would have a width adequate to accommodate multiple visitors, and would include one larger area where groups could gather for interpretation of the site. An interpretive display would be incorporated into this larger area. Route design would consider a range of configurations: design may begin with understated trail definition such as defining the trail width, edging including low post-and-cable fencing, and site respect messaging. However, should visitors consistently continue to go off-trail, resulting in damage to the site, design features such as a more defined barrier system and improved messaging may be considered. To the extent feasible, new site features would use natural materials or those that are nonreflective and colored to fit unobtrusively into the setting.



SOURCE: DHM Design 2013

FIGURE 12. PROPOSED TRAIL CONFIGURATIONS UNDER THE ACTION ALTERNATIVES

Phase 1: Tsankawi Mesa Trail Extension to Easternmost Point of Tsankawi Mesa. A new trail segment would be introduced bringing visitors to a vista point overlooking the immediate area (San Ildefonso Pueblo, the Rio Grande/White Rock Canyon) and a distant view of the Sangre de Cristo Mountains. The new trail segment would form a loop at the end of Tsankawi Mesa, allowing visitors to use an existing social trail to lead them to spectacular views and isolation from State Road 4.

This trail extension would provide an opportunity to interpret cavate villages visible at portions of Tsankawi Mesa, including the guided-only trail segment (currently the return segment), North Mesa, and elsewhere. Traveling along the existing mesa top route, the reroute around the pueblo, and the extension to the east end of the mesa, visitors would encounter an array of archeological site features. These include lengths of the Ancestral Pueblo trail system, petroglyphs, hand-and-toeholds, grinding stones, and views of cavate villages and agricultural fields, among other features.

For this and all mesa top trail segments, new small scale landscape features would be introduced to define the edges of trails and reinforce the site messaging. To the extent feasible, new site features would use natural materials or those materials that are nonreflective and colored to fit harmoniously into the landscape.

Phase 1: Guided-only Trail Segment. The existing trail segment that forms the return segment of Tsankawi Mesa Trail would be converted to a guided-only trail segment. The fragility of archeological sites along this trail segment have been demonstrated by the loss of protective weathering crust on tuff surfaces, loss of protective vegetation cover, and direct loss of features due to impacts from unsupervised visitors. The goal of guided visitation would be to inform and reinforce appropriately sensitive visitor behavior while allowing continued access to the site. The frequency and intensity of visitation would be reduced, but visitors with a specific interest in this particular area would be able to access the resource. For additional information on staffing and tour frequency, see the "Staffing and Personal Services" section below.

Localized, small scale landscape structures would be needed at both ends of the guided-only trail segment to ensure that unsupervised visitation does not occur. The existing ladder 3 would be removed for safety and to better manage access to the cavate village. To the extent feasible, new site features would use natural materials or those that are nonreflective and colored to fit unobtrusively into the setting.

Phase 2: Trail for Persons with Limited Mobility. A new trail would be constructed on level terrain to a vista point that encompasses views of cavate villages at Tsankawi Mesa and a vista east/south of the surrounding landscape. The trail would be ABA-compliant and serve visitors with limited mobility as well as those who are reluctant to use ladders, can only spend a limited amount of time at Tsankawi, or are only equipped to traverse well-developed trails (e.g., families with baby strollers). The proposed trail is likely to be quite popular and has the potential to alleviate some visitor use impacts on the Tsankawi Mesa Trail.

The starting point of this trail is different under each of the action alternatives and is discussed in greater detail in each respective section below. However, under both action alternatives, this would be a Type D trail that is level with a hardened surface. Type D trails generally include sidewalks,

boardwalks, and gravel trails that interconnect developed areas, or serve as short scenic walks, and interpretive trails (NPS 1983). Site furnishings such as a binocular stand would allow for viewing of archeological and landscape features in greater detail.

Phase 2: Duchess Castle Trail. A new trail would be constructed on level terrain, leading from the site of the existing visitor contact station and main trailhead. The trail would create a small loop near Duchess Castle, and visitors would return to the trailhead and on-site parking area on the same trail.

The trail would provide safe access to Duchess Castle and allow for interpretation of cultural resources and historic land use types not present elsewhere in Tsankawi. It would be a Type C trail, except for limited locations where gradient exceeds 5%. Type C trails are marked but are generally unimproved except for clearing and some work on dangerous areas (see "Appendix D").

Phase 2: Reclaim Current Duchess Castle Social Trail. The existing social trail from State Road 4 to Duchess Castle would be reclaimed. Signs at the site boundary would advise visitors to use the designated entry. The monument's superintendent's compendium (a document that lists special designations, closures, public use limits, and other restrictions) would implement a small closure, and brush and boulders would be dragged across the trail to indicate as such.

Phase 3: Future Potential Connector Route from Tsankawi Mesa to Duchess Castle. Monument staff would continue to monitor resources to determine if the implementation of the connector route is feasible based on the change in impacts on resources. If determined feasible from a resource protection perspective, Office of Management and Budget approved visitor surveys would be used to gather information about visitor satisfaction with the revised trail system and to assess demand for a connector route. This route would exit Tsankawi Mesa to the canyon bottom below and travel north and west to meet the Duchess Castle Trail.

A loop would provide a varied visitor experience that would be easier to manage operationally. Under this type of configuration, every visitor on a trail could be contacted by a single ranger following the looped sequence. The implementation of this trail would be dependent on whether resource conditions are met and visitor demand exists. This action would be part of the monument's adaptive management strategy.

Interpretive Program

Under the action alternatives, monument staff would implement a new interpretive messaging program at Tsankawi. This program would be designed to inform visitors of the sensitivity and historical context of the area through the use of new interpretive media and visitor contact opportunities. Opportunities would be provided for visitors to interact with NPS staff, site stewards, or other NPS-trained local community volunteers and/or commercial guides providing interpretation at Tsankawi and along the guided-only trail segment.

Interpretive features would include understated site signage, furnishings, pamphlets, brochures, digital displays, and electronic downloads for handheld devices. NPS staff may elect to implement formalized design guidelines for Tsankawi. Recently prepared NPS guidance such as DO 52B:

Graphic Design Standards and DO 52C: *Park Signs* may prove to be useful reference tools should this effort be undertaken.

All interpretive materials would be designed to foster a sense of place and value of the landscape, so that visitors approach Tsankawi with a sense of care and understanding of the fragility of the site and of the role their personal responsibility plays in protecting the site and every feature contained therein. Materials would indicate that the landscape was sacred to the Ancestral Pueblo people who occupied the area, is considered sacred to their living descendants, and is a living landscape where the memory of a vibrant community still survives.

Visitor education regarding the sacredness of the site to San Ildefonso Pueblo would begin at the site arrival area. Messaging would reinforce the human values of Tsankawi. Rather than emphasizing conformance to "Stay on Trail," messaging would emphasize the need to "Respect this Sacred Site." More signs stating "Trail Closed" may be necessary to encourage people not to access closed trails.

Messaging at the arrival area would be larger and more complex and likely include a cast metal scale model or planimetric view of Tsankawi Pueblo, allowing visitors to visualize the pueblo from another perspective. Electronic media could include an explanation of the visitor effects on Tsankawi over the last 100 years, adverse effects of climate change on cultural resources, and challenges to site management.

Messaging along the trail would be smaller in scale and reinforce concepts established at the arrival area. Signs, trail markers, trail edges, and similar features would be constructed with native materials, to the greatest extent possible, to fit harmoniously into the landscape.

The National Park Service would implement a tiered management approach to identify the right amount of interpretive features necessary to protect sensitive resources found at Tsankawi. This would be incorporated as part of the adaptive management strategy. The tiered approach would be, in part, based on findings from Office of Management and Budget approved visitor surveys that measure visitor understanding of the significance of the site and new management policies. Interpretive features would be increased until monument staff is satisfied that they are reasonably effective in conveying the importance and meaning of the site to visitors.

While the implementation of new interpretive features is highly desired and essential to the mission of the National Park Service to protect and preserve sensitive resources, such actions are also dependent on funding availability. The design and siting of desired materials may be labor intensive and require assistance from contractors or agency specialists beyond current monument staff.

Local users often act as stewards of the landscape, and their understanding of proposed/implemented changes can help ensure the success of the selected alternative. Monument staff would design a system to relay messages to the local community identifying management changes.

Kiosk Accessible for Persons with Limited Mobility

Both action alternatives would include the introduction of an approximately 150-square foot kiosk designed to address some of the deficiencies of the existing visitor contact station. Geographic

constraints at Tsankawi make alterations for persons with limited mobility to the existing nonconforming visitor contact station less feasible than the introduction of this small structure.

The kiosk would be sited at a different location under each of the action alternatives (see the discussion on the individual action alternatives for additional information). It would serve as an ABA-accessible open air shade shelter and include, but not be limited to: a fee collection station; safety and interpretive guidance; a drinking fountain; data link for digital downloads; first aid; and an emergency phone. It would serve as a collection point for tours.

Fee Collection Program

Under the action alternatives, the fee collection station would be upgraded to allow use of credit cards, moved to the proposed kiosk or other visible location, and provide instructions for payment. A relocated, upgraded fee collection station would improve visitor compliance and reduce visitor frustration about cash issues at Tsankawi. An upgraded fee collection station would assist in obtaining visitor counts both in terms of daily visitation as well as hourly and seasonal distribution of people accessing the unit. Periodic review of visitor numbers would allow NPS staff to determine if adjustments are necessary to protect resources and ensure a high quality visitor experience.

Staffing and Personal Services

Under the action alternatives, the guided-only trail segment would be led by NPS staff or other NPS-trained local community volunteers and/or commercial guides, potentially including representatives from San Ildefonso Pueblo. The number of staff needed has yet to be determined. This would largely depend on the number of guided trips and people permitted per trip per day. The potential to build partnerships for interpretation and site supervision would be pursued by monument staff, particularly given reduced spending budgets. Visitor numbers and compliance as well as funding availability may determine if fulltime NPS staff presence would be introduced at Tsankawi.

Once the selected alternative is implemented, monument staff would continue to monitor resources and associated visitor impacts and compliance to determine if a permanent staff presence would be appropriate.

ALTERNATIVE 1: TWO-DIRECTIONAL ENTRY ROADWAY (PREFERRED ALTERNATIVE)

Under this alternative, the existing visitor contact station would remain and the proposed on-site parking area would be located adjacent to these facilities. Additional facilities would be introduced either during the implementation phase or on an as-needed basis. Figure 13 demonstrates the general layout of the on-site parking area, siting of the ABA-accessible kiosk, and access points of trails.

The actual footprint of the on-site parking area would be significantly smaller than presented in the figure. The exact location of the on-site parking area has yet to be defined (this would take place as part of a separate analysis as funding becomes available for design and construction); therefore, this analysis uses a larger area to ensure all potential impacts on resource areas are evaluated in this

environmental assessment. The footprint is designed to be sensitive to the presence of archeological resources and to avoid potential archeological impacts. Findings would facilitate future decisions regarding the footprint of the on-site parking area and mitigation measures, as appropriate.

Parking

The new on-site parking area would be located adjacent to the existing visitor contact station. Visitors and staff would access the on-site parking area via the new four-way intersection at State Road 4 and East Jemez Road and travel down the entry roadway running parallel to State Road 4 until reaching the on-site parking area.

The entry roadway would be a two-directional roadway. Approximately 29,400 square feet would be necessary to support the on-site parking area and entry roadway. The on-site parking area would be curvilinear to blend with the topography and designed to accommodate a transit/car drop-off area, 20 car parking stalls (including two ABA van stalls), and two oversized vehicle stalls for buses or RVs.

This on-site parking area location would allow for the trail leading from the existing roadside parking area to the visitor contact station to be removed and reclaimed. Tsankawi Mesa Trail and the proposed ABA Walk and Duchess Castle Trail would be accessible from the new on-site parking area. The existing service road would be removed and reclaimed.

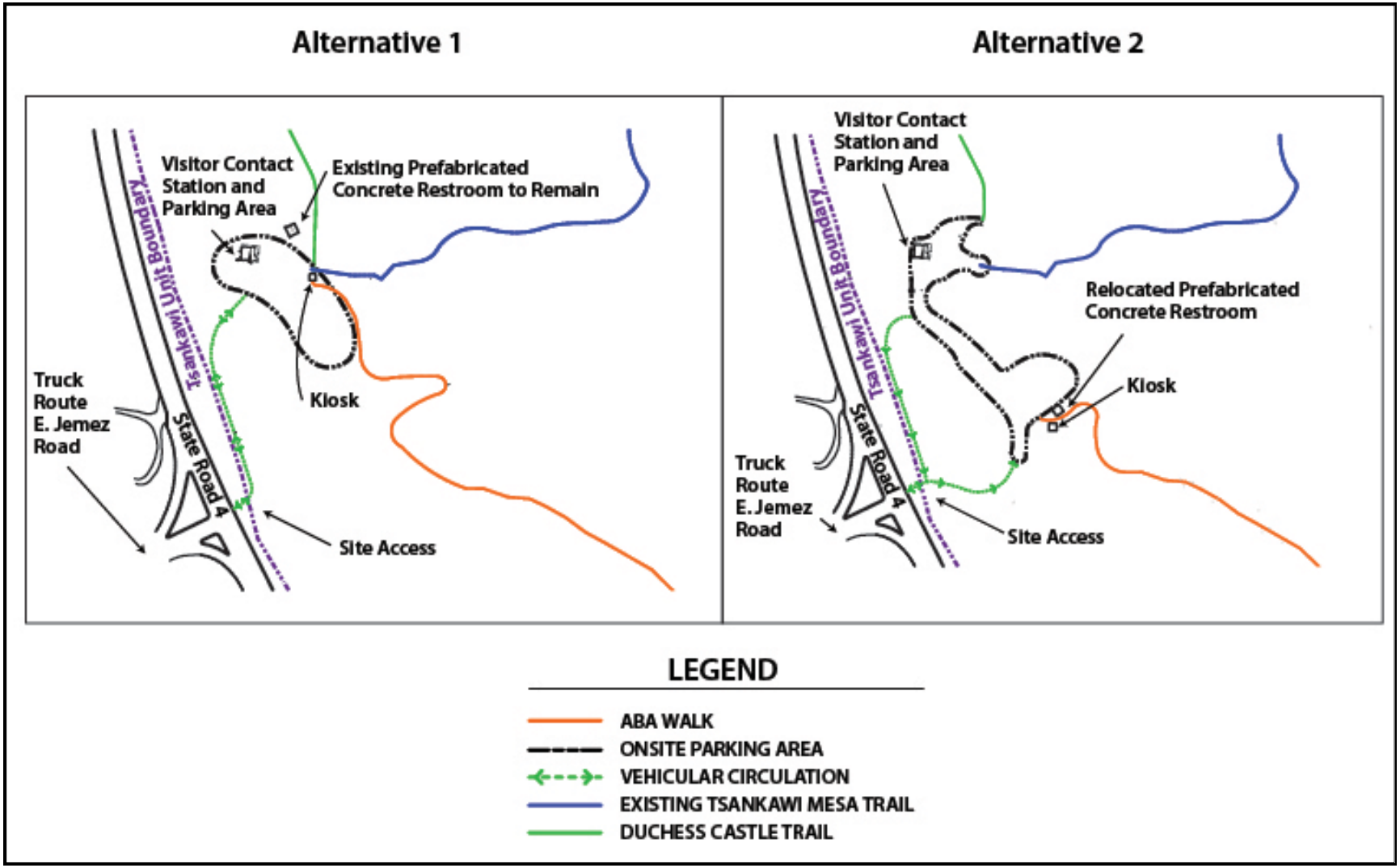
Facilities

Under this alternative, the existing visitor contact station and restroom facilities would remain as under existing conditions. Should there be sufficient demand, a new restroom facility would be installed in the future.

The proposed 150-square foot kiosk would be located adjacent to the existing visitor contact station, restrooms, and trailhead allowing visitors to find all services in one general location. The kiosk would also be ABA-compliant and located next to the proposed ABA Walk trailhead. Because of its location adjacent to the existing trailhead, visitors would easily see the ABA-accessible kiosk regardless of the implementation of new on-site parking. As a result, it may be feasible to implement the kiosk sooner than it would be if alternative 2 is chosen.

Trails

Under alternative 1, the three proposed trails would converge at one general location, the site of the existing visitor contact station and main trailhead. The ABA Walk would be approximately 1,779 linear feet with a gradient accommodating all persons regardless of mobility limitations. The trail would end at a location set back from State Road 4 and offer views of cavate villages at Tsankawi Mesa and a vista east/south of the surrounding landscape. The Duchess Castle Trail would be approximately 5,524 linear feet.



SOURCE: DHM Design 2013

FIGURE 13. PROPOSED PARKING LOT AND VISITOR FACILITIES CONFIGURATIONS UNDER THE ACTION ALTERNATIVES

ALTERNATIVE 2: LOOPED ENTRY ROADWAY

Under this alternative, vehicles would enter NPS lands from the same location as alternative 1. The site entrance would be a two-way circulation pattern, changing to a one-way circulation loop not long after entering the site. The new on-site parking area would be located closer to the site access point (the four-way intersection at State Road 4 and East Jemez Road) and facilities would either be relocated or newly introduced at Tsankawi. Figure 13 shows the general layout of the on-site parking area, siting of the proposed kiosk, access points of the various trails, and relocated restrooms.

Similar to alternative 1, the actual footprint of the proposed on-site parking area would be smaller than presented in figure 13. The footprint of the on-site parking area is designed to be sensitive to the presence of archeological resources and to avoid potential archeological impacts. The exact location of the on-site parking area has yet to be defined (this would take place as part of a separate analysis as funding becomes available for design and construction); this analysis uses a larger area to ensure that all potential impacts on other resource areas are evaluated in this environmental assessment. Findings would facilitate decisions regarding the footprint of the on-site parking area and mitigation measures, as appropriate.

Parking

Similar to alternative 1, the on-site parking area would be designed to accommodate a transit/car drop-off area, 20 car parking stalls (including two ABA van stalls), and two oversized vehicle stalls for buses or RVs.

The on-site parking area would be elongated with a pod for parking on either end. It would be set back further from State Road 4 than under alternative 1. The exit road out of the site would be located closer to the existing visitor contact station and would run east of and parallel to State Road 4 before leaving NPS lands at the four-way intersection. Approximately 42,792 square feet would be necessary to support the on-site parking area and entry roadway.

The trail leading from the existing roadside parking area to the visitor contact station and the existing service road would also be removed and reclaimed.

Facilities

Under this alternative, the existing visitor contact station would remain at its current location. Restroom facilities would be relocated adjacent to the proposed kiosk and ABA Walk trailhead. Should there be sufficient demand, a new restroom facility would be installed in the future.

Under this alternative, because the ABA-accessible kiosk would be located in the on-site parking area adjacent to the new ABA Walk, these actions could occur simultaneously. As a result both would occur during a later phase of project implementation because of funding constraints.

Trails

Under alternative 2, the ABA Walk trailhead would be located next to the ABA-accessible kiosk and relocated restrooms, in the new on-site parking area closer to the new four-way intersection. Because it would be located further southeast, the ABA Walk would be approximately 600 feet shorter than under alternative 1. It would terminate at the same location offering views of cavate villages at Tsankawi Mesa and a vista east/south of the surrounding landscape.

The start of the Duchess Castle Trail would be located just north, but within proximity to the existing visitor contact station and main trailhead. Under alternative 2, this trail would be approximately 5,387 linear feet. Once the new on-site parking area is implemented, the trail from the existing roadside parking area to the trailhead would be removed and reclaimed.

COST ESTIMATE FOR IMPLEMENTING THE ALTERNATIVES

Cost estimates of the various project elements were prepared to help identify the preferred alternative. Estimates are based on costs associated with life, health, and safety measures; implementation of accessibility features; and resource protection. A summary of estimated costs is presented in fiscal year 2013 dollars and shown in table 2.

There are no capital investment costs associated with the no-action alternative. Staffing costs would continue to require approximately 2.7 full-time staff equivalents with an annual operating cost of approximately $134,800 (see "Chapter 3: Affected Environment"). Under the action alternatives, full-time staff equivalents would increase to 3.0 from 2.7 under the no-action alternative. It is anticipated this increase would be associated with monument staffing efforts from personnel associated with interpretation, maintenance, and the tribal liaison. As a result, annual operating costs under the action alternatives would increase approximately $15,200.

Capital investment costs associated with alternative 1 would be slightly less than costs for alternative 2. The overall cost to implement alternative 1 would be approximately $1,368,000. The majority of costs would be less than or equal to costs identified under alternative 2, with the exception of the ABA Walk because of its increased length. Costs to implement the Duchess Castle Trail are slightly higher (approximately $2,000) because of the proposed location of the trailhead.

Estimated implementation costs associated with alternative 2 are $1,681,000. The increase in cost is primarily associated with the amount of surface required to support the proposed entry roadway and relocation of the existing prefabricated restrooms to a site adjacent to the proposed ABA Walk trailhead.

The action alternatives have been designed to reduce deferred maintenance costs by the removal and reclamation of the service road, connector trail from the existing parking area to the visitor contact station, and the portion of the Tsankawi Mesa Trail that currently traverses Tsankawi Pueblo.

Funding for implementation of the preferred alternative is anticipated to come from a variety of sources and would occur over a period of time. Many components are eligible for funding under a

number of federal programs that entail an annual competitive process. Others could be supported by revenue collected through park entrance fees. The National Park Service would pursue funding of the new entry road and parking area through the Federal Lands Transportation Program. Accessibility enhancements would be requested through the Flex Park Base Program and Recreation Fee Program. Resource protection elements, such as enhanced interpretive messaging, trail work, and site restoration, could be supported through park entrance fees or competed through the Recreation Fee Program. The park may also choose to reallocate base funding as appropriate to fund small-scale enhancements. Partnerships, youth groups, and volunteer opportunities would also be pursued to help leverage the financial and labor resources needed to implement the plan.

TABLE 2. ESTIMATED IMPLEMENTATION COST OF THE ALTERNATIVES

	No-Action	Alternative 1: Preferred Alternative	Alternative 2
Annual Operating Costs	**$134,800**	**$150,000***	**$150,000***
Total Full-Time Staff Equivalent	**2.7**	**3.0***	**3.0***
Capital Investments	**$0**	**$1,368,000**	**$1,681,000**
Life, Health, and Safety			
Provide entry roadway and on-site parking	N/A	$703,000	$1,046,000
Accessibility			
Provide accessible walk and kiosk	N/A	$138,000	$102,000
Resource Protection			
Enhance interpretive messaging	N/A	$88,000	$88,000
Realign Tsankawi Mesa trail	N/A	$101,000	$109,000
Provide backcountry trails	N/A	$90,000	$88,000
Restore impacted areas	N/A	$213,000	$213,000
Enhance site steward RV area	N/A	$35,000	$35,000

SOURCE: Kirk Associates 2012, NPS 2014a

Note: *Redirected staffing efforts: interpretation, maintenance, and the tribal liaison.

**Costs are presented in fiscal year 2013 dollars. Construction contracting mark-ups are not associated with those project elements that can be accomplished by NPS trail crews, youth groups, or volunteers. This includes all work listed under Resource Protection.

MITIGATION MEASURES

To minimize or avoid potential impacts of the action alternatives, particularly during construction activities, monument staff identified a series of mitigation measures. Construction activities would follow all identified protocols with respect to archeological, ethnographic, biological, and physical

resources; contamination and erosion prevention and control; and human safety (both worker and visitor).

Design activities would be undertaken during a subsequent stage of the planning process. Mitigation measures identified to date stipulate that all new structures and site furnishings be designed to fit harmoniously into the surrounding landscape. This includes material, color, and reflectivity. Similar measures were identified for material and stone used along trails. A full list of identified measures is presented in "Appendix F."

ALTERNATIVES OR ACTIONS CONSIDERED BUT DISMISSED FROM FURTHER EVALUATION

Several alternatives or actions suggested by monument staff, other agencies, or the public, were considered but not carried forward for further evaluation because they were not technically or economically feasible, did not meet the purpose of and need for the project, created unnecessary or excessive adverse impacts on resources, and/or conflicted with the overall management of the monument or its resources. Consistent with section 1502.14 of CEQ regulations for implementing the National Environmental Policy Act of 1969, this section identifies those alternatives or actions and the reasons they were dismissed from further analysis.

CLOSING AREAS TO VISITATION

NPS staff indicated that they would prefer not to close any area of the unit to visitation because it would take away from the self-guided aspect enjoyed by visitors. Should future conditions indicate a need to close areas for resource protection, the monument's superintendent's compendium would be modified to indicate the extent of the closure.

RANGE OF DEVELOPMENT INTENSITY AS PART OF ALTERNATIVES

The action alternatives were designed to find an appropriate balance between resource protection and visitor experience at Tsankawi. A range of development intensities would not be appropriate for the landscape and sensitive resources present in the unit. For example, 157 archeological sites spread across 120 acres of Tsankawi have been inventoried. Tsankawi also has 472 acres where an ecological restoration treatment has been implemented and that are in the process of long term recovery. Approximately 72% of the 826-acre Tsankawi unit consists of these valuable cultural and natural resources, and additional site area consists of steep, scenic terrain. Low and high intensity alternatives would not meet the purpose of and need for action as they would not be able to avoid impacts on cultural and natural resources that this planning process seeks to protect.

ALTERATIONS TO THE EXISTING VISITOR CONTACT STATION

Improvements to the existing visitor contact station to support access for persons with limited mobility would require ground-disturbing activities. The introduction of features to address site deficiencies at the existing visitor contact station would increase noise and limit visitor use when construction activities are ongoing. Under the action alternatives, the introduction of the proposed 150-square foot kiosk within proximity to the on-site parking area and ABA Walk trailhead would likely provide an opportunity to minimize ground disturbance in this area. The introduction of the proposed kiosk would allow for continued access to the existing visitor contact station as a resting place for visitors when construction activities associated with the proposed kiosk are ongoing.

NPS staff considered the feasibility of making structural alterations to the existing visitor contact station to address site deficiencies. Identified deficiencies include lack of accessibility by persons with limited mobility, safety and interpretive guidance, an automated fee collection station, drinking fountain, and emergency phone. The function design of the existing visitor contact station would make alterations to this structure more challenging and likely more costly than the introduction of a small, ABA-accessible structure to accommodate new interpretive and safety guidance. Therefore, alterations to the existing visitor contact station was dismissed from further consideration.

UNIVERSAL ACCESSIBILITY AND ABA WALK IN PHASE I TRAIL IMPROVEMENTS

The geography of Tsankawi does not support universal accessibility. The action alternatives would introduce ABA opportunities to the site that are not currently available. The implementation of ABA-accessible features is required under federal law. The action alternatives were designed to meet the needs of cultural and natural resources identified as most critical. While some funding would be required, the implementation of phase I would be significantly less costly than phase II. Without first having paved surfaces to access the ABA Walk, few persons with limited mobility would be able to access the trailhead. The needs of cultural and natural resources and fiscal constraints require that the proposed on-site parking area be implemented during a later implementation phase. Therefore, the implementation of the ABA Walk in phase I was dismissed from further consideration.

CANYON BOTTOM AND NORTH MESA TRAILS

A trail along the canyon bottom, north of Tsankawi Mesa, has been considered. A formalized trail to North Mesa would result in trail construction, operation, and maintenance costs as well as resource impacts. It would require additional staffing to provide interpretive services and monitor visitor activity. This area is not sought out by visitors and, therefore, was dismissed from further consideration.

1995 DEVELOPMENT CONCEPT PLAN PARKING PROPOSAL AND OVERLOOK PLATFORM

The 1995 Development Concept Plan identified parking improvements, including the construction of a new full movement tee intersection approximately 500 to 600 feet south of the existing State Road 4 and East Jemez Road intersection. This intersection—which has since been widened and signalized—has current vehicular volumes that exceed 9,000 vehicles per day.

With the current configuration of the State Road 4 and East Jemez Road intersection, improvements identified in 1995 are no longer viable for the following reasons:

- The proposed intersection is too close to the signalized intersection and would result in a reduction to the level of service of both roadways.
- The layout does not allow for oversize vehicles and circulation in and out of the on-site parking area would be difficult for people to maneuver.
- High traffic volumes on State Road 4 would create a significant safety issue for vehicles turning out of the proposed (unsignalized) intersection.
- Sight distance is relatively limited in both directions due to the steep vertical grades (FHWA 2012b).

The length of new trail required by relocating access south of the existing intersection would create unnecessary environmental impacts and would not be a good financial investment. An overlook platform was proposed as part of this plan. The New Mexico Office of Historic Preservation and representatives of San Ildefonso Pueblo strongly opposed adding this feature to the setting, finding it incompatible with the cultural and natural setting due to its scale, materials, and placement. An overlook platform on the mesa top would be a substantial change to the natural landscape character on Tsankawi Mesa due to its visibility and visual prominence. For these reasons, these actions were dismissed from further consideration.

ALLOWING ACCESS BY PERMIT ONLY

NPS staff considered options to allow access to the proposed guided-only trail segment by permit only. NPS staff determined that this approach would not be feasible because the resources in this area are highly charismatic and in the absence of a site steward, compliance with the “Stay on Trail” message would be minimal. Staff considered this approach to be inadequate in providing appropriate resource protection and visitor experience at Tsankawi, which would not meet the purpose of and need for the project.

ON-SITE PARKING LOT RUNNING PARALLEL TO STATE ROAD 4

An on-site parking area located on NPS lands running parallel to State Road 4, adjacent to its existing location, was proposed as a means to minimize ground disturbance. This action was not carried

forward for further analysis because the configuration would not provide adequate width to support parking and vehicular movements and connections to trailheads and interpretive services.

LIMIT BUS SIZE AND/OR NUMBER OF VISITORS AT TSANKAWI

NPS staff would prefer not to limit the number of people who visit Tsankawi at a given time. While measures are necessary to protect fragile resources from visitor impacts, current observation of the existing roadside parking area and Tsankawi overall reveals that such limitations are not necessary at this time. Implementation of an automated fee collection station—which would indicate the day and time of visitation—and demand for guided-only tours would help NPS staff better understand visitation patterns. This coupled with the continued monitoring of resources and an adaptive management strategy to interpretive messaging would help determine if limiting the size of buses and/or visitors on-site at any given time is necessary. Therefore, this action has been dismissed from further consideration.

NPS SHUTTLE IN LIEU OF ON-SITE PARKING

During internal meetings, the potential of only allowing NPS shuttles (and not private vehicles) to access Tsankawi under the action alternatives was discussed. While this option would minimize adverse effects in the vicinity of the proposed on-site parking area, it would change the visitor experience by not permitting people to drive to the unit. Additionally, daily visitation to Tsankawi, particularly during the off season, would not likely make this option financially feasible. As a result, this alternative element was dismissed from further consideration.

ENVIRONMENTALLY PREFERABLE ALTERNATIVE

The National Park Service is required to identify the environmentally preferable alternative in its NEPA documents for public review and comment. The National Park Service, in accordance with the Department of the Interior's NEPA Regulations (43 CFR Part 46) and CEQ's Forty Questions, defines the environmentally preferable alternative (or alternatives) as the alternative that best promotes the national environmental policy expressed in the National Environmental Policy Act of 1969 (Section 101(b)) (516 DM 4.10). CEQ's Forty Questions (Q6a) further clarifies the identification of the environmentally preferable alternative as "the alternative that causes the least damage to the biological and physical environment; it also means the alternative which best protects, preserves, and enhances historic, cultural, and natural resources."

The rerouting of Tsankawi Mesa Trail under the action alternatives would help protect, preserve, and enhance historic, cultural, and natural resources in a way that would not be feasible under the no-action alternative. The implementation of the action alternatives would, however, include a certain amount of ground disturbance not required under the no-action alternative. In the vicinity of the proposed on-site parking areas and visitor facilities, previous archeological surveying has concluded that minimal adverse effects would result. There would be slightly more ground disturbance under alternative 2 because of the relocation of the restrooms and area required to

support the entry roadway. Careful consideration during the siting of the Duchess Castle Trail would ensure that sensitive resources are avoided.

While there would be less ground disturbance under the no-action alternative, there would also be fewer opportunities to help protect the fragile cultural and natural resources found within Tsankawi. A resource monitoring program would be implemented under all alternatives, but the adaptive management strategy would only be implemented under the action alternatives.

Because it offers the greatest potential to protect; preserve; and enhance historic, cultural, and natural resources and because it would require less ground disturbance and could be implemented with more flexibility than alternative 2, alternative 1 has been identified as the environmentally preferred alternative.

NATIONAL PARK SERVICE PREFERRED ALTERNATIVE

A multidisciplinary team of subject-matter experts from the monument evaluated the alternatives based on each alternative's ability to meet project objectives and by its potential impacts on the environment (see "Chapter 4: Environmental Consequences"). An initial screening of the alternatives, including the no-action alternative, was accomplished by a team of subject-matter experts through the Choosing by Advantages/Value Analysis process held at the monument in November 2012. This process considered the advantages of each of the proposed alternatives and its ability to achieve project objectives (see "Chapter 1: Purpose of and Need for Action").

Alternative 1 was identified as the NPS preferred alternative because it best meets the objectives of the plan. Both action alternatives would achieve the purpose of and need for action through the rerouting of Tsankawi Mesa Trail, implementation of the ABA Walk, Duchess Castle, and guided-only trail segments; improved site access and introduction of on-site parking; and implementation of an adaptive management strategy and interpretive messaging to help protect resources and enhance visitor experience. However, the siting of the proposed ABA-accessible kiosk near the existing trailhead under alternative 1 would allow for funding to be independent of on-site parking funding, which was a distinct advantage over alternative 2. Alternative 1 would also require slightly less ground disturbance because the existing restrooms would not be relocated and the overall square footage necessary to support the entry roadway would be smaller. Implementation costs would be less than under alternative 2.

Under the no-action alternative, visitation impacts would likely continue similar to existing conditions. Monument staff and San Ildefonso Pueblo have expressed the desire to have Tsankawi Mesa Trail rerouted around the pueblo. Under the no-action alternative, this would not occur, and visitation impacts coupled with natural erosion processes would continue to deteriorate the landscape. No new trails would be introduced at Tsankawi, and no new interpretive features would be introduced to allow visitors to better understand the area's overall significance and how their presence affects the landscape. Because no improvements would be made, site access and parking conditions would continue to present safety concerns.

As mentioned in "Chapter 1: Purpose of and Need for Action," all action alternatives carried forward for further analysis must meet all project objectives to a large degree. The action alternatives must also address the stated purpose of taking action and resolve the need for action; therefore, the alternatives were individually assessed for their ability to meet the objectives of this environmental assessment.

Table 3 provides a brief summary of the elements associated with each action alternative and the no-action alternative and how they differ between and among each other. Table 4 summarizes the ability of project alternatives to meet project objectives. "Chapter 4: Environmental Consequences" provides a detailed discussion of potential impacts associated with the action and no-action alternatives. Table 5 includes a summary of potential impacts on resource topics that were carried forward for further evaluation in this environmental assessment.

TABLE 3. SUMMARY OF ELEMENTS ASSOCIATED WITH PROJECT ALTERNATIVES

	No-Action Alternative	Alternative 1: Two-Directional Entry Roadway (Preferred Alternative)	Alternative 2: Looped Entry Roadway
Resource Management	A resource monitoring program would be implemented to document baseline resource conditions and assess current conditions at select areas within Tsankawi.	In addition to the resource monitoring program, adaptive management strategies would be applied, as needed, to ensure resource protection and visitor understanding. An adaptive management strategy that includes measures, indicators, metrics, and potential management strategies to achieve desired conditions would be further refined under this alternative.	Same as alternative 1.
Site Access	Site access would not change.	NPS would develop vehicular access into Tsankawi at the existing tee intersection between State Road 4 and East Jemez Road, which would be modified into a four-way intersection with a dedicated left-turn lane (westbound) and a dedicated right-turn lane (eastbound). The entry roadway to the on-site parking area would run parallel to State Road 4 and then northeast towards the visitor contact station. It would be a two-directional roadway.	Same as alternative 1 except the entry roadway into the on-site parking area would be one way from the reconfigured intersection. The one-way exit from the on-site parking area would be located closer to the existing visitor contact station and roughly follow the same alignment as the entry roadway under alternative 1.
Parking	The existing roadside parking area would remain.	Long-term parking improvements would be implemented as funding becomes available. - The existing roadside parking area would be removed and relocated onto NPS lands near the visitor contact station and main trailhead. - Planned parking capacity of on-site parking would be approximately 20 car spaces plus two shuttle/RV spaces. Two spaces would be ABA-compliant and another would support government vehicles.	Same as alternative 1 except the on-site parking area would be located across from reconfigured four-way intersection.
Facilities	Existing facilities would remain in place.	The site steward area would be relocated and improved to include a small shaded platform, possibly an RV cover and concrete pad to park on, phone/internet hook-ups, and	Same as alternative 1, except the kiosk would be located closer to the reconfigured four-way intersection,

TABLE 3. SUMMARY OF ELEMENTS ASSOCIATED WITH PROJECT ALTERNATIVES

	No-Action Alternative	Alternative 1: Two-Directional Entry Roadway (Preferred Alternative)	Alternative 2: Looped Entry Roadway
		water/electricity/sewer hook-ups. The visitor contact station and restroom facilities would be retained. Facility use would be monitored to determine if another restroom would be necessary on-site. A 150-square foot kiosk adjacent to the main trailhead and visitor contact station would be constructed to provide interpretive messaging services, and include a fee collection machine (automated), safety/interpretive guidance, a drinking fountain, a data link for electronic downloads for handheld devices, first aid, and an emergency phone. It would provide shade, serve as a collection point for tours, and be ABA compliant.	within proximity to proposed ABA Walk trailhead but away from the main and Duchess Castle trailheads. Restrooms would be relocated to an area within proximity to the proposed kiosk and ABA Walk trailhead.
Trails	No changes to existing trails would occur.	The trail that runs through Tsankawi Pueblo would be closed and reclaimed. A new trail segment would form a loop at the end of Tsankawi Mesa that follows existing social trails. The existing trail segment that forms the return segment of existing Tsankawi Mesa Trail would be converted to a guided-only trail segment. The social trail to Duchess Castle from State Road 4 would be reclaimed. A new trail would be constructed on level terrain leading from the on-site parking area. The trail would loop around Duchess Castle and bring visitors back to the on-site parking area along the same trail. Resource conditions and visitor demand would help determine if there is an opportunity to extend the trail from Duchess Castle to the eastern edge of the unguided trail. An ABA Walk for those with limited mobility and families with small children who may not be able to visit other parts of Tsankawi would be implemented. The trail would start near the kiosk, visitor contact station, and main trailhead.	Same as alternative 1, except the ABA Walk trailhead would be located closer to the reconfigured four-way intersection, kiosk, and relocated restrooms. The Duchess Castle Trail would begin at a location just north of the main trailhead.

TABLE 3. SUMMARY OF ELEMENTS ASSOCIATED WITH PROJECT ALTERNATIVES

	No-Action Alternative	Alternative 1: Two-Directional Entry Roadway (Preferred Alternative)	Alternative 2: Looped Entry Roadway
Interpretive Program	No new interpretive messaging or materials would be introduced. A site steward would provide some historical, cultural, and natural context for visitors. However, site stewards would not be able or expected to speak with all visitors.	New interpretive messaging and materials would educate visitors about the sensitivity of Tsankawi and encourage them to be stewards of its protection and preservation. Signage at the arrival area would be larger and more complex; messaging along the trail would reinforce concepts established through panels at the arrival area and electronic media. The reroute of Tsankawi Mesa Trail would have a width adequate to accommodate multiple visitors, and would include one larger area where groups could gather for interpretation of Tsankawi. NPS staff, local community volunteers, commercial guides, and/or the site steward would provide additional interpretation.	Same as alternative 1.
Fee Program	The fee collection station would remain unchanged and in its current location.	The fee collection station would be upgraded to allow for credit card transactions. The station would be relocated to the proposed kiosk or close to the main trailhead.	Same as alternative 1, except the fee collection station would be located within the proposed kiosk near the reconfigured four-way intersection close to the proposed ABA Walk trailhead.
Staffing and Personal Services	With the exception of the reintroduced site steward program, no other changes in staffing or personal services would occur.	To support the introduction of the guided-only trail segment, NPS staff, local community volunteers, and/or commercial guides, potentially including representatives from San Ildefonso Pueblo, would lead tours. The number of tours requiring guides would be determined closer to the implementation of the guided-only trail segment. The site steward area would be relocated and improved to allow for a permanent presence on-site.	Same as alternative 1.

TABLE 3. SUMMARY OF ELEMENTS ASSOCIATED WITH PROJECT ALTERNATIVES

	No-Action Alternative	Alternative 1: Two-Directional Entry Roadway (Preferred Alternative)	Alternative 2: Looped Entry Roadway
		Increases in staffing activities would be programmed for maintenance, interpretation, and tribal liaison.	

TABLE 4. HOW THE ALTERNATIVES MEET PROJECT OBJECTIVES

Objective	No-Action Alternative	Alternative 1: Two-Directional Entry Roadway (Preferred Alternative)	Alternative 2: Looped Entry Roadway
Provide a framework that guides management decisions consistent with the protection of resource values.	Minimally meets this objective with the implementation of the resource monitoring program. Maintaining trails and interpretive messaging as under existing conditions would not help achieve this objective.	Fully meets the objective with the implementation of a resource monitoring program, adaptive management strategy, reroute of the Tsankawi Mesa Trail, and interpretive messaging.	Same as alternative 1.
Reduce impacts on cultural and natural resources and provide safe, accessible visitor services in response to visitor presence at Tsankawi.	Minimally meets this objective with the implementation of the resource monitoring program and reintroduction of the site steward. Visitor facilities and interpretation would remain as under existing conditions. This would not meet this objective.	Fully meets the objective with the implementation of a resource monitoring program, adaptive management strategy, interpretive messaging, reconfigured intersection and on-site parking, kiosk with safety/emergency services, and trail modification and enhancement.	Mostly meets this objective. The various project elements would achieve objectives in the same fashion as under alternative 1 with the exception of the proposed kiosk. The siting of the kiosk—which would provide new interpretive messaging designed to encourage visitors to be stewards of the landscape and safety/emergency services—away from the main and

TABLE 4. HOW THE ALTERNATIVES MEET PROJECT OBJECTIVES

Objective	No-Action Alternative	Alternative 1: Two-Directional Entry Roadway (Preferred Alternative)	Alternative 2: Looped Entry Roadway
			Duchess Castle trailheads may result in fewer visitors receiving this important messages.
Develop and implement an adaptive management strategy that identifies a range of management options available to achieve the established desired conditions, and includes resource and visitor experience monitoring and metrics to ensure that objectives are being met. The adaptive management strategy would include ongoing data collection efforts to help identify the cause(s) of resource deterioration.	Does not meet this objective because no adaptive management strategy would be implemented. The resource monitoring program would be implemented; however, additional measures necessary to protect resources and enhance visitor experience would not be introduced.	Fully meets this objective with the implementation of the resource monitoring program and adaptive management strategy to achieve the highest levels of resource protection while enhancing visitor experience.	Same as alternative 1.
Support long-term ecosystem restoration that would continue for decades.	Minimally meets this objective with the implementation of the resource monitoring program. The continued use of heavily impacted trails would not support this objective. Ecological restoration efforts independent of this plan would continue (see "Chapter 4: Environmental Consequences").	Fully meets this objective with the use of appropriate materials to clearly identify trails to encourage people to stay in designated areas and indicate trail reclamation/closure. These measures coupled with an adaptive management strategy would help meet this objective. Ecological restoration efforts independent of this plan would continue (see "Chapter 4: Environmental Consequences").	Same as alternative 1.

TABLE 4. HOW THE ALTERNATIVES MEET PROJECT OBJECTIVES

Objective	No-Action Alternative	Alternative 1: Two-Directional Entry Roadway (Preferred Alternative)	Alternative 2: Looped Entry Roadway
Define the relationship between the natural resources present on the Pajarito Plateau and the associated history of human habitation and use. Provide improved visitor understanding, respect for, and appreciation of the unique resources of Tsankawi while honoring requests of the pueblo neighbors.	Minimally meets this objective with the reintroduction of a site steward. The continuation of interpretive programming or materials as under existing conditions would not help achieve this objective.	Fully meets this objective with the implementation of new interpretive messaging and an adaptive management strategy to determine the appropriate level of interpretive programming and materials to ensure that visitors understand the historical and current significance of Tsankawi as well as impacts on unit resources. NPS staff, local community volunteers, commercial guides, and/or a site steward(s) would help reinforce this message.	Mostly meets this objective. The various project elements would achieve objectives in the same fashion as under alternative 1 with the exception of the proposed kiosk. The siting of the kiosk—which would provide new interpretive messaging designed to encourage visitors to be stewards of the landscape—away from the main and Duchess Castle trailheads may result in fewer visitors receiving this important messages.
Move facilities, such as the existing roadside parking area, onto NPS lands and improve the safety and accessibility of these facilities.	The no-action alternative would not meet this objective because parking would remain as under existing conditions.	Fully meets this objective by relocating parking on NPS lands via the reconfigured State Road 4 and East Jemez Road intersection.	Same as alternative 1.

TABLE 5. IMPACTS OF PROJECT ALTERNATIVES

Resource Impact Topic	No-Action Alternative	Alternative 1: Two-Directional Entry Roadway (Preferred Alternative)	Alternative 2: Looped Entry Roadway
Archeological Resources	Permanent moderate adverse impact Rationale: Continuation of inadvertent and intentional visitor use related impacts on these resources.	Long-term moderate beneficial impact Rationale: Changes in the trail system, new interpretive messaging, reintroduction of a site steward(s) and introduction of NPS staff, local community volunteers, and/or commercial guides, and implementation of an adaptive management strategy would reduce adverse visitor use related impacts on archeological resources.	Same as alternative 1.
Cultural Landscapes	Long-term to permanent moderate adverse impact Rational: Continuation of inadvertent and intentional visitor use related impacts on these resources.	Long-term moderate beneficial impact Rationale: Changes in the trail system, new interpretive messaging, reintroduction of a site steward(s) and introduction of NPS staff, local community volunteers, and/or commercial guides, and implementation of an adaptive management strategy would reduce adverse visitor use related impacts on the cultural landscape.	Same as alternative 1.
Ethnographic Resources	Long-term to permanent moderate adverse impact Rationale: Continuation of inadvertent and intentional visitor use related impacts on these resources.	Long-term minor to moderate beneficial impact Rationale: Changes in the trail system, new interpretive messaging, reintroduction of a site steward(s) and introduction of NPS staff, local community volunteers, and/or commercial guides, and implementation of an adaptive management strategy would reduce adverse visitor use related impacts on ethnographic resources.	Same as alternative 1.

TABLE 5. IMPACTS OF PROJECT ALTERNATIVES

Resource Impact Topic	No-Action Alternative	Alternative 1: Two-Directional Entry Roadway (Preferred Alternative)	Alternative 2: Looped Entry Roadway
Soils	Long-term localized moderate adverse impact Rationale: Continued disturbance from visitor use in sensitive areas, including the portion of Tsankawi Mesa Trail that traverses the pueblo and along social trails.	Long-term moderate beneficial impact Rationale: Removal and reclamation of the portion of the Tsankawi Mesa Trail that currently crosses the pueblo and social trails. Reduce erosion and compaction and support the grounds ability to support native vegetation.	Same as alternative 1, except a larger land area would be necessary to support the proposed entry roadway. However, overall impacts are anticipated to be similar to those under alternative 1.
Vegetation	Long-term localized minor to moderate adverse impact Rationale: Direct vegetation loss from trampling and indirectly from soil erosion. The continued use of the Tsankawi Mesa Trail and social trails would result in loss of vegetation in localized areas.	Long-term minor to moderate beneficial impact Rationale: Removal and reclamation of the portion of the Tsankawi Mesa Trail that currently crosses the pueblo and social trails. Reduce erosion and compaction and support the grounds ability to support native vegetation. New interpretive messaging would reinforce the message of the sensitive and living landscape.	Same as alternative 1, except a larger land area would be necessary to support the proposed entry roadway. However, overall impacts are anticipated to be similar to those under alternative 1.
Wildlife and Wildlife Habitat	Long-term negligible to minor adverse impact Rationale: Damage to native vegetation (i.e., suitable habitat) and habitat avoidance from continuation of existing management actions.	Long-term negligible to minor beneficial impact Rationale: Improvements to interpretive messaging, as well as increased presence of NPS staff, local community volunteers, and/or commercial guides would facilitate a greater understanding of wildlife and wildlife habitat.	Same as alternative 1.
Visitor Use and Experience	Long-term minor to moderate adverse impact Rationale: Continuation of existing management policies regarding site access, visitor use, and interpretive messaging limits visitor opportunities and understanding of Tsankawi.	Long-term moderate beneficial impact Rationale: Range of opportunities for visitors with varying mobility and new interpretive messaging to provide historical and cultural context.	Same as alternative 1.

TABLE 5. IMPACTS OF PROJECT ALTERNATIVES

Resource Impact Topic	No-Action Alternative	Alternative 1: Two-Directional Entry Roadway (Preferred Alternative)	Alternative 2: Looped Entry Roadway
Public Health and Safety	Long-term minor adverse impact Rationale: Visitors would continue to use the existing roadside parking area and cross State Road 4 to access Duchess Castle. Messaging does not inform visitors of conditions within Tsankawi and there is no safety/emergency guidance.	Long-term moderate beneficial impact Rationale: New interpretive messaging, first aid, water fountain, emergency phone, ABA Walk, Duchess Castle Trail, reconfiguration of the State Road 4 and East Jemez Road intersection, and relocation of the roadside parking area onto NPS lands would improve public health and safety.	Same as alternative 1, except the location of the kiosk away from the main trailhead and Duchess Castle Trail may result in some visitors not being informed of potential public health and safety risks or mechanisms in place in the event of an emergency.
Park Operations and Management	Negligible impact Rationale: No changes to park operations or management would occur.	Long-term negligible to minor adverse impact Rationale: Implementation of the guided-only trail segment may increase staffing costs.	Same as alternative 1.
Socioeconomics	Long-term negligible beneficial or adverse impact Rationale: Because Tsankawi represents such a small share of overall monument visitation, any change in visitation to Tsankawi, increase or decrease, is not anticipated to affect local or regional markets beyond a negligible degree.	Long-term negligible beneficial impact Rationale: Enhanced visitor opportunities have the potential to increase visitation to Tsankawi. An increase in nonlocal visitor spending would benefit local markets.	Same as alternative 1.

Chapter 3

Affected Environment

CULTURAL RESOURCES

Cultural resources are manifestations of culture relating to human activities, society, and cultural institutions that hold communities together and link them to their surroundings. They include past and present expressions of human culture and history in the physical environment that are considered important to a culture or community. Cultural resources can also include aspects of the natural and physical environment, such as natural features of the land or biota, which play a role in traditional culture and practices.

Cultural resources evaluated in this environmental assessment include archeological resources, cultural landscapes, and ethnographic resources. Archeological resources are spatially finite areas containing tangible remains of past activities that show use or modification by people. They are important because of the information they can provide regarding prehispanic and historic ways of life and can also have significance to people as a tangible link to the events and people of the past. Cultural landscapes are reflections of human adaptation and use of natural resources, and are 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. Ethnographic resources are defined as objects and places, including sites, structures, landscapes, and natural resources, with traditional cultural meaning and value to associated peoples. These resources often have traditional, legendary, religious, subsistence, or other significance in the cultural system of the group traditionally associated with it.

EVALUATION OF RESOURCE SIGNIFICANCE

NPS staff conducted inventories of Tsankawi to identify cultural resources (see detailed discussion below) and evaluated the cultural resources within Tsankawi to determine their eligibility for listing on the national register as historic properties. According to 36 CFR 60.4, a cultural resource is considered significant when the resource meets at least one of four significance criteria:

- association with events that have made a significant contribution to the broad patterns of our history
- association with the lives of persons significant in our past
- embodiment of the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction
- have yielded, or may be likely to yield, information important in prehistory or history

The property must also possess integrity, or the ability to convey its significance. The national register recognizes seven aspects or qualities that, in varying combinations, define integrity. These include: location, design, setting, materials, workmanship, feeling, and association. In the case of

properties that possess traditional cultural significance, it is also important to consider the integrity of relationship and condition, in addition to the previous seven aspects of integrity.

HISTORIC CONTEXT

A significant share of archeological resources identified within Tsankawi are related to the use of the area by the Ancestral Pueblo people from approximately 1150 to 1550, although there are a few sites from earlier and later time periods. The pueblo people constructed masonry dwellings and carved rooms in cliff faces. Subsistence was based on farming and supplemented by hunting and gathering of wild food sources. They also built small structures near their agricultural fields that were occupied seasonally. People crossed the landscape to visit other communities, farm, hunt, and gather materials, using trails etched into the bedrock. All of these activities resulted in material remains that are today classified as archeological sites (NPS 2000).

Beginning in the mid-1500s, populations began to migrate from the region to form or join the pueblos located close to the Rio Grande. After 1550, pueblo populations continued limited use of the area for hunting, gathering wild resources, and traditional or religious purposes. Land use of the Pajarito Plateau by pueblo and Hispanic people into the 1880s included sheep and cattle grazing, hunting, timber and fuel-wood cutting, some agriculture, mining, and collection of nuts, berries, and grass. Activities conducted during this period also resulted in archeological sites that are found today in the monument (NPS 2000).

At the turn of the 20th century, efforts to set aside the area now known as Tsankawi were initiated. When the monument was created in 1916, it included three separate areas—the Bandelier Main Tract; the Otowi Tract; and the Tsankawi Tract, the latter measuring approximately 160 acres. In 1917, Madame von Blumenthal received permission to build a summer home within Tsankawi, and the chosen site was atop and adjacent to a 50-room pueblo along the northern boundary. The house, now referred to as Duchess Castle, was also used as a school for pueblo potters to stimulate a resurgence of pueblo ceramic production and design. In 1929, the house and school were abandoned, and the structures disintegrated to ruins over the ensuing years.

When the administration of the monument was transferred to the National Park Service in 1932, the Otowi and Tsankawi Tracts were combined into the larger Otowi unit, which also included additional acreage transferred from the Santa Fe National Forest. During World War II, the U.S. Army Corps of Engineers conducted construction projects within the Otowi unit in support of Los Alamos Scientific Laboratories (later renamed to Los Alamos National Laboratory). This included road improvements (currently State Road 502), power line right-of-way clearance, and installation of buildings. Post-war and into the 1960s, LANL employees conducted activities and development within the unit, including road improvements, establishment of technical areas, and drilling of monitoring wells. These impacts, along with extensive recreational use of the northwest portion of the unit, looting of cultural sites, and insufficient NPS resources for proper protection of the resources, led to the 1963 transfer of all Otowi unit lands north and west of State Road 4 to the Atomic Energy Commission. The Otowi unit was reduced by 82%, and the remaining acres once again became known as Tsankawi. Use of the unit through 2013 has since been limited to visitation

by tourists and traditional cultural uses by pueblo people. However, there is some evidence of illicit activities such as looting of cultural sites and vandalism (NPS 2000).

ARCHEOLOGICAL RESOURCES

Archeological Investigations

Archeological investigation of the resources located within Tsankawi began at the end of the 19th century with well-known explorer/scholar Adolph Bandelier (for whom the monument is named), and continued into the 20th century with Edgar Hewett and H.P. Mera. These researchers focused their efforts on the mesa-top pueblo and cavates located along the southern escarpment. Under the auspices of the National Park Service, excavation and stabilization work was conducted at the pueblo and cavates in the 1930s and 1940s. In the mid-1980s, the National Park Service undertook a surface survey that included approximately 73% of Tsankawi. An additional survey was conducted in the late 1990s that completed the coverage, and relocated and reassessed all previously recorded sites. In 1998, 140 cavates located in four groups within Tsankawi were inventoried, assessed for condition, and evaluated for potential management treatments (NPS 2000).

Resources in the Area of Potential Effect

A total of 157 archeological sites have been recorded in the 826 acres that comprise Tsankawi. This includes pueblos, cavate structures, lithic scatters, bedrock grinding areas, hearth features, historic structures, storage rooms, trash scatters, rock alignments, rock art, archeological features, trails, animal corrals, campsites, and road segments. Natural impacts on these resources include weathering, moisture damage, soil erosion, invasive flora, hazard fuel accumulation, and faunal activity. Changes to and reduction in vegetation from the effects of climate change is anticipated to impact archeological resources by increasing sheet wash and erosion. Portions of sites could be washed away, and buried resources could be exposed. An increase in the intensity and frequency of severe storms would exacerbate these impacts.

Human-induced impacts include historic period use, historic livestock grazing (1870s to 1932), removal of building stone for use elsewhere, illegal artifact collection, pot-hunting activities (circa 1900 to 1980), early small-scale archeological excavations (1900, 1905, and 1939), early restoration efforts by NPS staff (1939 and 1940), historic and modern graffiti, mechanical abrasion, social trails, littering, and general visitor use. Trails used by Ancestral Pueblo residents are eroding and incising into the tuff geology as a result of visitor use. This may be further exacerbated by climate change. Other sensitive resources, such as cavates, are also being impacted by natural erosion processes and visitor use. At Tsankawi Pueblo, social trails currently cross the pueblo site, directly impacting the resource and causing increased erosion. Exposure of buried archeological resources due to visitor use and climate change could result in an increased risk for vandalism.

NPS staff consulted with the New Mexico state historic preservation office on determinations of national register-eligibility for each of the archeological sites located within Tsankawi. All 157 archeological sites within Tsankawi are eligible for listing on the national register. The following provides an overview of the types of archeological sites located within Tsankawi.

Tsankawi Pueblo. Surrounding a central plaza, the collapsed masonry walls of Sækewi' onwikeji or Tsankawi Pueblo are located on top of Tsankawi Mesa. The pueblo was built and occupied between 1300 and 1550 by ancestral Pueblo Tewa Indians, the greater number of whom eventually relocated between 1550 and 1600 to the Rio Grande Valley, to what is now known as San Ildefonso Pueblo (NPS 2005a). The people of San Ildefonso Pueblo are descendants of the people from Tsankawi Pueblo; however, other pueblos are also reported to have connections to Tsankawi Pueblo. Roughly rectangular in shape, Tsankawi Pueblo contains four large room blocks with more than 200 ground floor rooms up to seven rooms deep. An additional 50 upper story rooms were likely present. Rooms were arranged eight rooms deep and two, in some instances three, stories high. These room blocks currently appear as rectangular piles of rock rubble. While Tsankawi Pueblo was subjected to several limited and small-scale excavations, for the most part, it generally remains unexcavated (NPS 2005a). Two other pueblos are also present within the unit; a small village of approximately 20 rooms and a larger village containing an estimated 50 rooms located at the site of Duchess Castle.

Duchess Castle. Duchess Castle was built atop and adjacent to a 50-room pueblo. The main building and several outbuildings were constructed in part using shaped masonry blocks scavenged from the prehispanic pueblo. Currently, the partial walls and foundation of the house, several outbuildings, kilns, and a single cistern remain (NPS 2005a).

Cavates. Taken together, cavate structures are the most common archeological feature within Tsankawi. Cavates consist of an excavated cave in the cliff face, with the entrance often closed with rock masonry. They were used during Ancestral Pueblo occupation, and later by shepherds who modified portions of the sites for use as corrals to contain sheep. Cavates in Tsankawi range from single room structures to villages containing more than 100 rooms. They are generally oriented to the south, southeast, or southwest. Four major cavate clusters have been identified within Tsankawi: West Tsankawi Mesa Group, Tsankawi Mesa South Rincon Group, Tsankawi Mesa Southeast Rincon Group, and North Mesa Group. Together, there are approximately 250 to 300 cavate rooms.

Rock Art. Rock art sites in Tsankawi, including petroglyphs (chipped or scratched into the rock surface) and pictographs (painted onto the rock surface), are usually found on south-facing cliff faces and often times are associated with cavate structures. A variety of motifs are present including animal figures, human or katsina masks, and geometric patterns, with one example believed to represent a conquistador on horseback.

Lithic Scatters. Lithic scatters are represented by a scatter of stone tool-making debris that may indicate use as a campsite or perhaps a limited activity area, possibly for butchering an animal or harvesting wild or cultivated plants. Lithic scatters typically do not contain diagnostic artifacts, making temporal placement difficult. In nearby areas, many of these site types are found to date to the Archaic period, 4000 Before the Common Era to 500. The most common types of stone indicate use of nearby sources such as Pedernal Chert, Jemez Obsidian, and Bandelier Dacite.

Agricultural Sites. Small structures or field houses are believed to represent structures used as shelter and storage for people maintaining agricultural fields. Typically they are simple one or two room structures that were seasonally occupied. Artifacts are not common at these sites. A number of sites associated with farming areas have been classified as water control features, or rock alignments

and features such as terraces and bordered gardens that served to reduce soil erosion and to conserve soil moisture. Most of these agricultural features are found on north-facing slopes, typically in areas where soils contain more moisture.

Trails. One of the more interesting site types found within Tsankawi is trails that have been carved into the bedrock. These trails represent the remains of a transportation system that connected villages to resource areas and to each other. Within Tsankawi, trails, stairs, and hand-and-toeholds are carved or worn into the soft tuff substrate.

CULTURAL LANDSCAPES

The National Park Service defines cultural landscapes as a geographic area, including both cultural and natural resources therein, associated with a historic event, activity or person, or that exhibits other cultural or aesthetic values (NPS 1998). As a cultural landscape, Tsankawi tells the story of more than eight centuries of relationship between people and place. Tsankawi, in its entirety, is a nationally significant cultural landscape that has been determined by the National Park Service as eligible for the national register as a historic district, a determination that has been concurred by the New Mexico State Historic Preservation Office (SHPO). Integrated cultural and natural resource systems make up the landscape, with evidence of human use throughout.

NPS staff completed a Cultural Landscape Inventory for Tsankawi in 1998 and conducted an update in 2005 to document and evaluate the unit as a cultural landscape resource (NPS 2005a). The Cultural Landscape Inventory stresses that Tsankawi is part of a larger regional cultural landscape, with Tsankawi Pueblo as one of four major pueblos, located in this section of the Pajarito Plateau. The landscape's historic period of significance extends from 1200 to 1925, encompassing Ancestral Pueblo, Spanish, and Euro-American settlement and use. The landscape continues to hold significance for traditionally associated pueblos, primarily San Ildefonso Pueblo.

Through the process of analyzing the landscape's constituent systems and features (defined by the National Park Service as landscape characteristics: archeological resources, buildings and structures, circulation patterns, cluster arrangement, constructed water features, cultural traditions, land use, natural systems, small scale features, spatial organization, topography, vegetation, and views and vistas) (NPS 2005a), the Cultural Landscape Inventory identifies several key contributing landscape elements that need to be preserved in order to retain historic integrity, including:

- dramatic dissected topography of canyons and mesas
- inspiring 360 degree views of the Pajarito Plateau, Jemez Mountains, and the Rio Grande Valley from the mesa tops
- native vegetation communities, and indicator vegetation species associated with the time and consequences of occupation and use
- masonry pueblos, cavates, and incised trails clustered on mesa tops and south slopes
- areas interpreted as historic sheep-herding camps and pens

- Duchess Castle and the underlying "Little Tsankawi" pueblo
- petroglyphs, rock features such as grid gardens and erosion-control devices, pottery shards and lithics, and other cultural features and artifacts found throughout the unit
- the relative solitude and quiet of the area, and the sense of distance and timelessness (NPS 2005a)

These contributing elements combine to make up Tsankawi's overall historic landscape character—the quality of the past in the present, and the combination of the parts that still exist from the period of significance. The intentional siting and layout of Tsankawi Pueblo and Duchess Castle; the trails, petroglyphs, and other features that developed over time; and on-going meanings, values, and associations contribute to overall historic landscape character. While changes have occurred within the landscape over the years (e.g., setting, vegetation patterns, and erosion of trails and cavates), the overall historic integrity has been retained.

The 2005 Cultural Landscape Inventory overall condition rating was poor, based on vegetation and trail condition. Between fall 2007 and spring 2010, ecological restoration treatments were implemented to restore the vegetation communities, including cutting live juniper and dead pinyon less than six to eight inches diameter, and lopping and scattering the cut trees onto bare soil spaces between the former canopy mounds. These actions were expected to mitigate accelerated run-off and soil erosion, restore understory vegetation, and return a more natural fire cycle to woodland areas. In 2010, with positive results from the ecological restoration treatment, the condition rating was upgraded to fair. Preservation projects designed to improve trail and cavate condition have had mixed results. The Tsankawi cultural landscape is fragile and worn. The long-term goal for the landscape is good condition, which can be achieved by actions including stabilizing the condition of prehispanic trails and continuing vegetation recovery within the ecological restoration treatment project area.

Climate change is anticipated to affect resources within Tsankawi, including changes in habitat, reduction in vegetation, and impacts to archeological resources from erosion, visitor use, and vandalism. These resources are contributing elements to the historic landscape's character. Vegetation changes to the areas surrounding the unit would subsequently change the character of the viewshed from Tsankawi. These cultural and natural resources and the viewshed contribute to the significance of this historic landscape, thus changes to them would impact the historic landscape.

The Cultural Landscape Inventory does not include treatment recommendations. A cultural landscape report, which is the NPS-approved document for development of preservation goals and landscape treatments, has not yet been completed for Tsankawi. The overall goal of treatment would be to maintain and/or enhance historic landscape character and historic integrity.

ETHNOGRAPHIC RESOURCES

As described above, an ethnographic resource is a place that has traditional cultural significance for the cultural group or groups associated with it. Three ethnographic resources-related studies have been undertaken by NPS staff for the monument. The *Bandelier Ethnographic Literature Search and*

Consultation, conducted in 1997, reviewed the ethnographic literature and previous consultations with pueblo communities potentially affiliated with the monument to document traditional uses of cultural and natural resources within the monument (Levine and Merlan 1997). The second study, *Study of Traditionally Associated Native American Communities*, was completed in 2000 (Merlan and Levine 2000). The objectives of this study were to research the ethnographic literature and consult with pueblos potentially affiliated with the monument to document traditional uses. Consultation was initiated with the 19 federally recognized Pueblo Indian groups in New Mexico, but the scope was adjusted during the study to focus on the six pueblos that were identified as affiliated with the monument through a literature review and consultation. Affiliated pueblos include Cochiti, San Felipe, San Ildefonso, Santa Clara, Santo Domingo, and Zuni. The last report, *A Study of Natural Resource Use among Culturally Affiliated Pueblo Communities* was completed in 2007 by the University of Arizona (Stoffle et al. 2007). The purpose of this report was to identify plant, animal, and mineral use of the monument by affiliated pueblos.

Consultation conducted with the six affiliated pueblos for this environmental assessment is described in "Chapter 5: Coordination and Consultation." The resources within Tsankawi are of critical importance to the cultural heritage, beliefs, customs, practices, and history of living communities of pueblo people. These resources include both archeological and natural resources. Descendants of the original inhabitants of Tsankawi Pueblo continue to live in nearby communities.

The traditional associations of San Ildefonso Pueblo with Tsankawi are historic, geographic, contemporary, and religious in nature. The people of San Ildefonso Pueblo maintain a continuity of use of Tsankawi that supports cultural identity and heritage, religious and spiritual values, and traditional practices. Tsankawi forms a key component in their living cultural system; they believe that the area remains alive with the spirits of their ancestors, and they continue to revere it as the home of their ancestors. As a result, they do not consider these sites abandoned, but rather alive with the spirits of their ancestors. Ongoing cultural traditions, beliefs, and values are maintained through traditional, religious, and ceremonial uses and practices within Tsankawi. A continuation of use serves to bestow respect on these places by caring for them, and the associated values are protected and enhanced through the preservation of these ancestral sites. There is also a specific historic association between Santa Clara Pueblo and Tsankawi Pueblo. The abovementioned studies as well as past and continuing consultations reaffirm these associations between Tsankawi and affiliated pueblos.

Climate change is anticipated to affect resources within Tsankawi, including changes in habitat, reduction in vegetation, changes in number and species of wildlife, and impacts to archeological resources. Some of these resources are also ethnographic resources, and impacts to them would also affect traditional practices.

There are currently no places within the monument listed on the national register as traditional cultural properties (NPS 2007a). Traditional cultural properties are places that qualify for listing on the national register due to their association with cultural practices or beliefs of a living community that (1) are rooted in that community's history, and (2) are important in maintaining the continuing cultural identity of the community (Parker and King 1998). However, this does not mean there are no places within Tsankawi or other places within the monument that meet these criteria.

Consultation with the six affiliated pueblos has clearly revealed places of cultural significance, including within Tsankawi. The pueblos have communicated that they do not want these places revealed to the general public. Consequently, NPS staff relies on continued communication with the six affiliated pueblos about proposed actions within Tsankawi and the rest of the monument for advice and recommendations on how to minimize any impacts on the integrity of these important places. The National Park Service is committed to working with pueblo communities regarding the protection of these places to help preserve a traditional way of life.

NATURAL RESOURCES

SOILS

The geology underlying the monument is composed of volcanic deposits underlain by the Puye Formation, a large Pliocene alluvial fan complex derived from the erosion of the Tshicoma highlands in the geologic past. Sedimentary rocks are exposed in the lower elevations of White Rock Canyon and in the canyon floors in the western part of the monument, and include sandstones and siltstones of the Miocene Santa Fe Group. Sedimentary rocks are found on the east edge of the San Miguel Mountains and in the bottom of Capulin Canyon. Quaternary gravels (alluvium) occur in lower reaches of the canyons and along the Rio Grande. East of the Rio Grande are a group of cinder cone vents forming the Cerros del Rio. These cones erupted three million years ago filling ancient valleys with basalt (NPS 2013c).

The dramatic mesas of Tsankawi were created from the ash of massive volcanic eruptions. After the volcano emptied its magma chamber, it collapsed into itself, leaving a caldera. The monument is located on the outer slope of this caldera, known today as the Valles Caldera. The Sierra de los Valles Mountains encircle the caldera's rim. During the eruptions that formed the Valles Caldera, ash flows up to 1,000 feet thick covered the landscape from the caldera rim to the Rio Grande. As the hot ash cooled, it welded into a rock called tuff. The monument is located on this broad, sloping layer of tuff called the Pajarito Plateau (NPS 2013d).

Tsankawi—located on the outer edge of the Valles Caldera—is well known for its characteristic terrain and prehispanic pattern of human settlement. Undulating mountainous topography ranges from about 6,300 feet to nearly 6,700 feet in elevation at the top of Tsankawi Mesa and is pocketed by manmade features (cavates) carved into the soft tuff material by the Ancestral Pueblo people.

Several distinct soils have developed as a result of interactions between bedrock, topography, and localized climatic conditions. Soil orders found at the monument include Entisols, Inceptisols, Alfisols, Mollisols, and Aridisols (Allen 1989). Soils generally vary by elevation and terrain. The two most prominent soil types within Tsankawi are Piojillo and Navajita soils, which together comprise more than half of the land area of the unit. Piojillo soils are very deep somewhat excessively drained soils that formed in slope alluvium derived from pumice and volcanic ash. These soils are found on south-facing footslopes and toeslopes of valley sides. Navajita soils are very deep well-drained soils that formed from slope alluvium derived from rhyolitic tuff. These soils are on north-facing footslopes and toeslopes of valley sides (USDA 2013a).

Soils types found within Tsankawi reflect varying degrees of vulnerability to disturbances. Table 6 provides soil associations and their respective erodibility factor (known as their K factor). K factor measures susceptibility of soil to erosion. Soils high in clay have low K values, about 0.05 to 0.15, because they are resistant to detachment. Coarse textured soils, such as sandy soils, have low K values, about 0.05 to 0.2, because of low runoff even though these soils are easily detached. Medium textured soils, such as silt loam soils, have moderate K values, about 0.25 to 0.4, because they are moderately susceptible to detachment and produce moderate runoff. Soils with high silt content are the most erodible. They are easily detached, tend to crust, and produce high rates of runoff. Values of K for these soils tend to be greater than 0.4 (IWR 2013). Figure 14 shows soil types present within Tsankawi in relation to existing unit features.

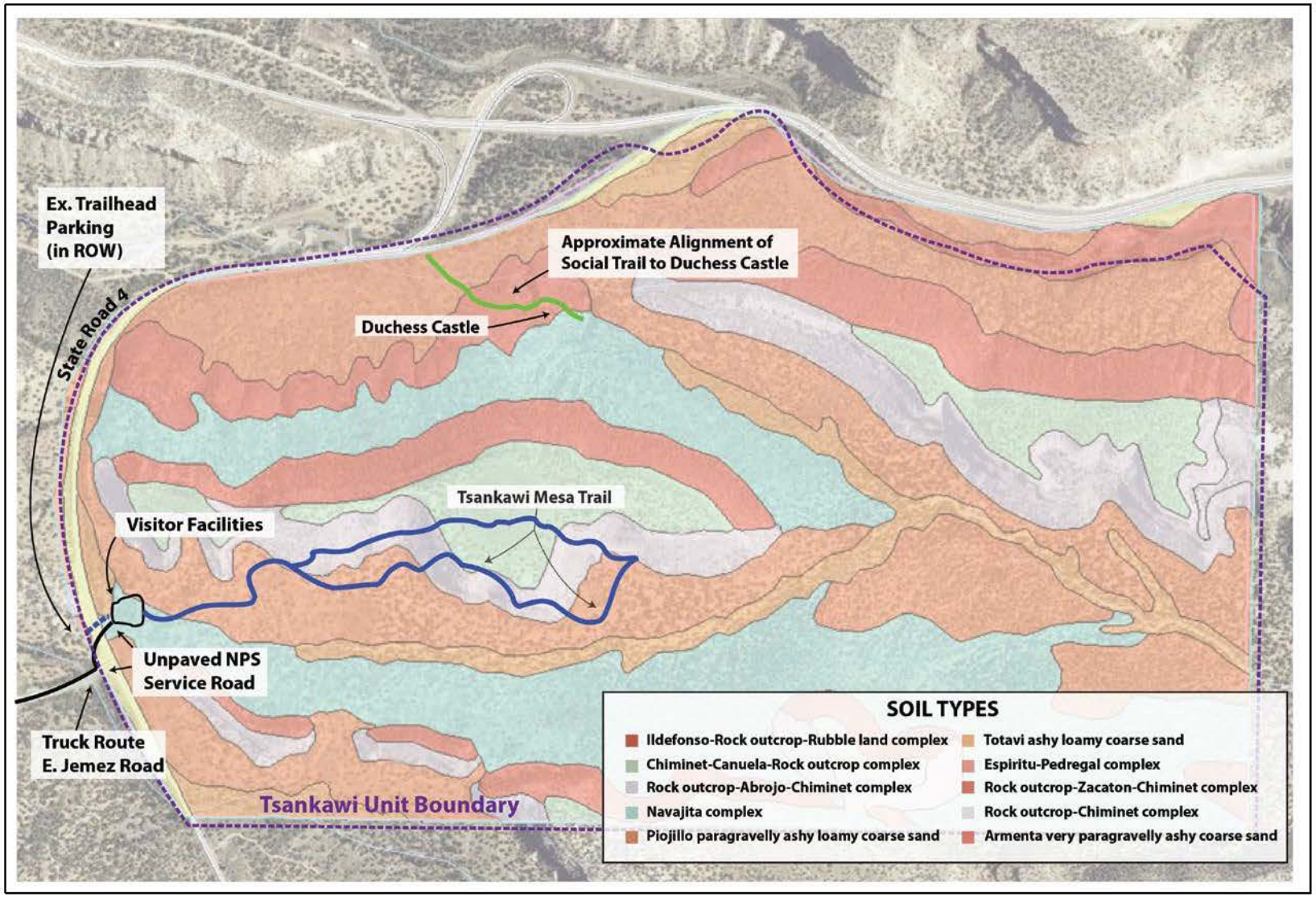
TABLE 6. SOIL ASSOCIATIONS AND ERODIBILITY FACTOR OF SOIL TYPES WITHIN TSANKAWI

Soil Type	K Factor rating	% of Total Tsankawi Acreage
Ildefonso-Rock outcrop-Rubble land complex	0.02	2.0
Chiminet-Canuela-Rock outcrop complex	0.28	8.4
Rock outcrop-Abrojo-Chiminet complex	NA	11.8
Navajita complex	0.32	24.4
Piojillo paragravelly ashy loamy coarse sand	0.05	31.3
Totavi ashy loamy coarse sand	0.1	6.0
Espiritu-Pedregal complex	0.02	4.4
Rock outcrop-Zacaton-Chiminet complex	0.02	11.1
Rock outcrop-Chiminet complex	NA	0.5
Armenta very paragravelly ashy coarse sand	0.02	0.1
TOTAL		**819**[1]

SOURCE: USDA 2013b

1. The National Resources Conservation Service, a division of the USDA, states that the scale at which data was collected for this analysis was too small to provide for a high level of accuracy in specific location of soil types and boundaries. As a result, small areas of contrasting soils at a more detailed scale are not represented. The difference in the reported acreage and exact acreage of Tsankawi is for areas along the unit's boundary. It is expected that the remaining seven acres are classified as Arents-Urban land-Orthents complex, a soil type that is generally present along roadway corridors or where fill has been applied to the landscape. Acreages are approximate.

As table 6 demonstrates, the Navajita complex has the highest K factor of all soil types within Tsankawi. At 0.32, the K factor for these soils reveals a moderate potential for erosion. Soils of the Chiminet-Canuela-Rock outcrop complex also reflect a moderate potential for erosion (K factor of .28). These K factors represent soils in their natural condition but do not indicate how past management or misuse of a soil increases a soil's erodibility. In areas where the subsoil is exposed, organic matter has been depleted, and/or the soil's structure destroyed or soil compaction has reduced permeability; the K factor would be increased regardless of soil type (IWR 2013). Soils with higher K factors (such as Navajita, Chiminet and Canuela) are found on the Tsankawi Mesa and in undeveloped backcountry areas at toeslopes and valley side elevations north and south of the mesa.



SOURCE: USDA 2013b

FIGURE 14. SOIL TYPES PRESENT WITHIN TSANKAWI

The loss of vegetation due to warmer and drier conditions as a result of climate change would likely accelerate soil erosion. Natural geologic processes, such as wind erosion and fire events, also have the potential to be further exacerbated by climate change and would result in increased soil loss and decreased ability to support native vegetation.

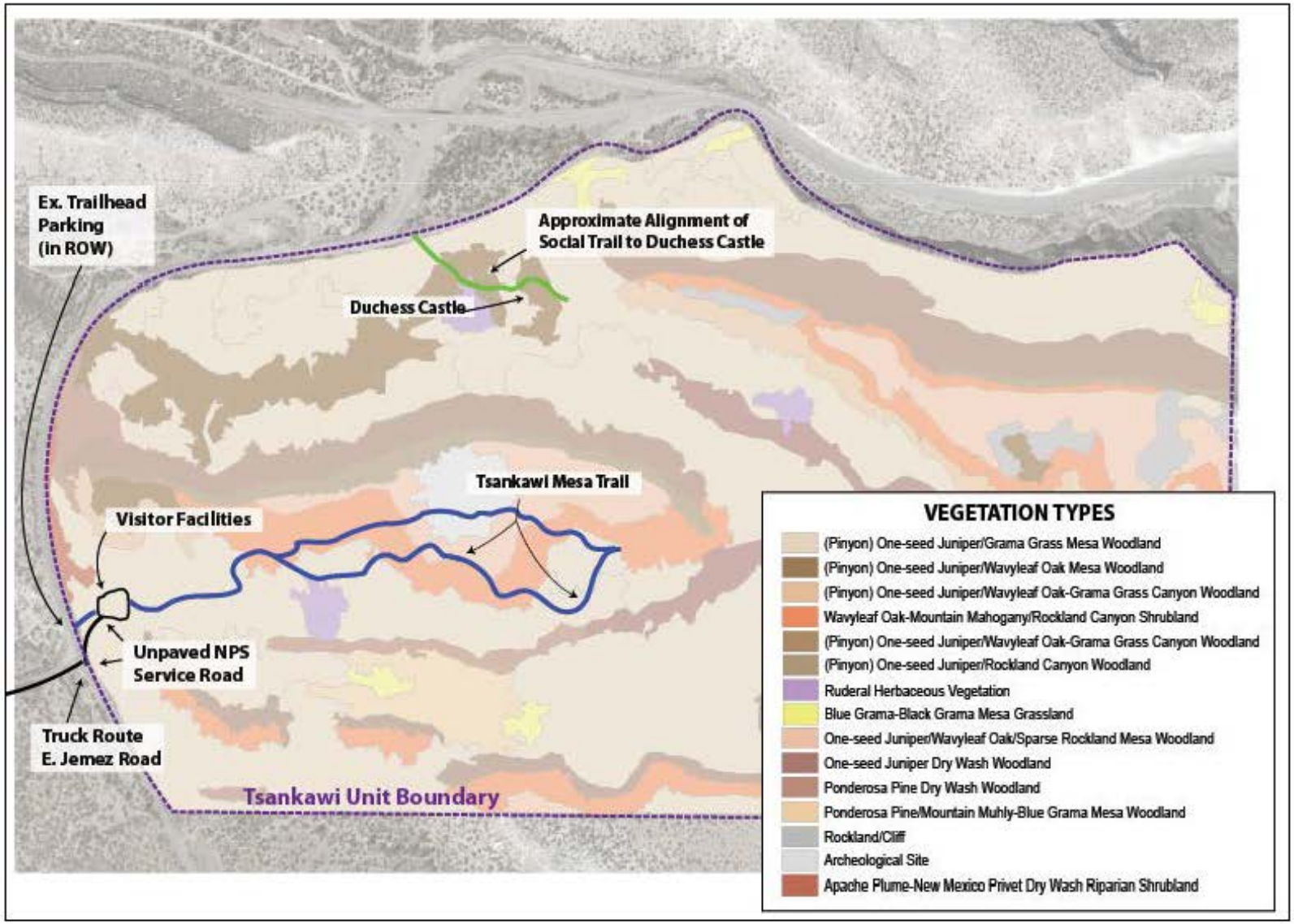
VEGETATION

Tsankawi is located within a pinyon-juniper woodland landscape characterized by various vegetation communities. Table 7 and figure 15 demonstrate the extent to which each of these communities is present within Tsankawi. Vegetation at Tsankawi is undergoing a long-term transition in the face of heating and drying trends—one that would likely continue as the effects of climate change become more widely recognized. This transition is exemplified by loss of ponderosa pine stringers in drainages, loss of pinyon pine throughout the landscape, and potential loss of juniper trees as climate trends continue.

TABLE 7. VEGETATION COMMUNITIES WITHIN TSANKAWI

Vegetation Community	% of Tsankawi
(Pinyon) One-Seed Juniper / Grama Grass Mesa Woodland	49.8
(Pinyon) One-Seed Juniper / Wavyleaf Oak Mesa Woodland	10.8
(Pinyon) One-Seed Juniper / Wavyleaf Oak-Grama Grass Canyon Woodland	9.3
Wavyleaf Oak-Mountain Mahogany / Rockland Canyon Shrubland	8.5
One-Seed Juniper / Wavyleaf Oak / Sparse Rockland Mesa Woodland	5.9
One-Seed Juniper Dry Wash Woodland	2.6
Ponderosa Pine Dry Wash Woodland	2.5
Ponderosa Pine / Mountain Muhly-Blue Grama Mesa Woodland	2.4
One-Seed Juniper / Wavyleaf Oak-Grama Grass Canyon Woodland	2.2
(Pinyon) One-Seed Juniper / Rockland Canyon Woodland	1.7
Rockland / Cliff	1.2
Archeological Site	1.1
Ruderal Herbaceous Vegetation	0.8
Blue Grama-Black Grama Mesa Grassland	0.8
Apache Plume-New Mexico Privet Dry Wash Riparian Shrubland	0.3
TOTAL	**100**

SOURCE: USGS 2013



SOURCE: USGS 2013

FIGURE 15. VEGETATION COMMUNITIES WITHIN TSANKAWI

Climate change would likely affect vegetation processes within Tsankawi. Extreme weather events, which could shift or disrupt ecological processes, have the potential to result in considerable changes to the landscape because of the vulnerability of the dry, arid environment in the region. The effects of climate change on vegetation could be recognized in a number of ways including longer and more intense fire seasons, drought, increase in insect and/or disease epidemics, and nonnative invasive species. A change in vegetation communities within Tsankawi would lead to increased soil erosion and compaction and decreases in the soils ability to support native vegetation.

The two most notable communities—which together comprise more than 60% of vegetation community types in Tsankawi—are the one-seed juniper / grama grass mesa woodland and the one-seed juniper / wavyleaf oak woodland (described in additional detail below). Areas near the existing Tsankawi Mesa Trail include vegetation community types such as one-seed juniper / rockland canyon woodland, wavyleaf oak-mountain mahogany / rockland canyon shrubland, and one-seed juniper dry wash woodland. The vegetation community type on Tsankawi Mesa is the one-seed juniper / wavyleaf oak / sparse rockland mesa woodland.

One-Seed Juniper / Grama Grass Mesa Woodland

This Southern Rocky Mountains woodland occurs on foothills in south central Colorado, northern New Mexico, and southward into south central New Mexico, where it is present on desert mountains and mesas at elevations between 4,500 and 7,500 feet. The ground surface is characterized by scattered grass patches and litter amid an equal amount of exposed soil and gravel. Vegetation is characterized by a 10 to 40% open tree canopy of mature *Juniperus monosperma* forming a generally open woodland or savanna with the grassy inter tree spaces dominated by *Bouteloua gracilis*. Occasionally mature individuals, seedlings or saplings of *Pinus edulis* can be present. The dwarf shrub, *Gutierrezia sarothrae*, is usually present and scattered throughout sites. Other shrubs are poorly represented or absent. At the monument, this lower-elevation woodland ranges from around 6,000 to 7,000 feet and occurs on the summits and shoulders of undulating plateaus with gentle to moderate slopes. Solar exposure is generally northerly at lower elevation and southerly on higher sites (NPS 2011b).

One-Seed Juniper / Wavyleaf Oak Mesa Woodland

This woodland occurs in the Rocky Mountains in central and northern New Mexico, on gentle to steep rocky slopes, and less commonly on flat mesa tops and valley bottoms. It occurs at elevations from 6,000 to 6,600 feet, and the ground surface is characterized by exposed soil and gravel with widely scattered grass patches and litter. Characteristic canopy consists of mature *Juniperus monosperma* trees with scattered saplings or seedlings. In the shrub layer, *Quercus X pauciloba* is well-represented in the intercanopy spaces. Additional shrub species may be present, including *Atriplex canescens*, *Cercocarpus montanus* var. *paucidentatus*, *Dalea formosa*, *Ephedra viridis*, *Fallugia paradoxa*, *Lycium pallidum*, *Nolina microcarpa*, *Opuntia* spp., *Quercus turbinella*, and *Yucca* spp. At the monument, this lower-elevation woodland lies between 6,150 and 6,900 feet in areas with moderate to high solar exposure. It is generally found on moderately steep to steep (10 to 65%) rocky escarpment sideslopes and shoulders of plateaus, but occasionally extending onto valley floors. It can also be seen on rocky exposures of the undulating plateau tops (NPS 2011b).

WILDLIFE AND WILDLIFE HABITAT

Many of the species reported below are found within the larger monument and may not be specific to Tsankawi. Its location 12 miles from the main unit of the monument and dry landscape with little to no surface water sources makes Tsankawi a challenging environment for many wildlife species to frequent or become established.

Wildlife and wildlife habitat is reported for the entire monument and not Tsankawi specifically. Knowledge of the landscape and conversations with monument staff have helped prepare an analysis that is more specific to Tsankawi than the monument as a whole.

Climate change would likely result in changes in vegetation communities and habitat. Such changes have the potential to result in loss of habitat, an increase in invasive species, affect species composition and distribution, and induce insect and/or disease epidemics.

Mammals

There are more than 55 species of mammals found within the monument, including carnivores, ungulates, small mammals, and bats (NPS 2013e). Many of these species are present in the main unit of the monument closer to water sources, such as the Rio Grande, and in locations where food sources are more plentiful. There are few mammals observed within Tsankawi with any real regularity, and they often pass through because the environment does not make it ideal for becoming established.

Mule deer (*Odocoileus hemionis*) and Abert's squirrels (*Sciurus aberti*) are among the most encountered mammals in the monument (NPS 2013f). Mule deer are one of the more commonly seen mammals within Tsankawi; although, their presence is not regular and is generally limited to areas closer to the unit's eastern boundary, away from areas frequented by visitors (Fettig, pers. comm. 2013d). Abert's squirrels remain active year-round and can be found anywhere in the monument where there are enough ponderosa pine trees (NPS 2013g).

In addition to mule deer, coyotes (*Canis latrans*) are one of the more common mammal species present in Tsankawi, although they are also not observed frequently (Fettig, pers. comm. 2013d). Black bears (*Ursus americanus*), mountain lions (*Puma concolo*r), and bobcats (*Lynx rufus*) are present in the main unit of the monument (NPS 2013h; 2013i); however, they are rarely observed within Tsankawi. These species are generally seen every few years; more often people see tracks not the animal itself. If one of these animals is observed, it is often not an adult but a younger animal exploring the area (Fettig, pers. comm. 2013d). These species have large ranges but prefer habitats with more water and food sources.

Elk (*Cervus canadensis*) are observed in the main unit of the monument year-round and tend to migrate through the monument with the seasons, moving from the higher cooler elevations in the summer to the lower less snowy elevations in the winter (NPS 2013j). They prefer environments closer to water sources but are seen intermittently in Tsankawi (Fettig, pers. comm. 2013d).

Thirteen species of bats live within the monument. However, the majority of bat species do not occur within Tsankawi because existing vegetation and lack of surface water sources are not ideal habitats. Many species also prefer caves for roosting, which are not present within Tsankawi. The most commonly seen species in the monument overall is the Mexican free-tailed bat (*Tadarida brasiliensis*) (NPS 2013k). However, Tsankawi does not have suitable habitat for cave roosting species and, therefore, the Mexican free-tailed bat is not present. Occasionally they may fly over and feed in the area, but they are unlikely to roost within Tsankawi (Fettig, pers. comm. 2013d).

Birds

More than 150 bird species, including shorebirds, waterfowl, raptors (birds of prey), and migrants, have been documented in the monument with varying abundance (Fettig 1997; NPS 2007b). Common year-round birds likely to inhabit the mesas and pinyon-juniper woodlands include western bluebird (*Sialia mexicana*), western scrub-jay (*Aphelocoma californica*), hairy woodpecker (*Picoides villosus*), house finch (*Carpodacus mexicanus*), northern flicker (*Colaptes auratus*), juniper titmouse (*Baeolophus ridgwayi*), and bushtit (*Psaltriparus minimus*) (NPS 2013k).

Western meadowlark and dark-eyed junco are known to breed in the monument and nest on or near the ground. Western meadowlark may be seen within Tsankawi but there is no identified breeding habitat within the unit. This species prefers grassland and does not like to breed near trees (Fettig, pers. comm. 2013d).

Raptors known to occur in the monument depend on other birds and mammals for food, and include red-tailed hawk (*Buteo jamaicensis*), turkey vulture (*Cathartes aura*), golden eagle (*Aquila chrysaetos*), American kestrel (*Falco sparverius*), sharp-shinned hawk (*Accipiter striatus*), and great horned owl (*Bubo virginianus*). The common nighthawk (*Chordeiles minor*), a nightjar, is also present within the monument (NPS 2007b). Because food sources are limited, these species are not regularly observed within Tsankawi.

Reptiles and Amphibians

Reptiles found within Tsankawi include lizards, snakes, and skinks, with the three most common being eastern fence lizards (*Sceloporus undulates*), short-horned lizards (*Phrynosoma douglassi*), and western diamondback rattlesnake (*Crotalus atrox*) (Fettig, pers. comm. 2013d). Populations of wild horned lizards are declining due to destruction of habitat, reduction of prey (pesticide use to kill ants), and collection as pets (NPS n.d.[c]).

Snakes that may occasionally be observed within Tsankawi include the bullsnake (*Pituophis melanoleucus*), mountain patch-nosed snake (*Salvadora grahamiae*), and western terrestrial garter snake (*Thamnophis elegans*) (NPS 2005b). The bullsnake is most common in lower elevation areas of the monument, while the garter snake is particularly common along waterways (NPS 2013l). The mountain patch-nosed snake is the most rarely observed species (Fettig, pers. comm. 2013d).

The relatively dry environment in the area limits the number of amphibian species occurring in the monument to seven: two species of salamanders, two species of toad, and three species of frogs.

Most of these, including the canyon treefrog (*Hyla arenicolor*) and bullfrog (*Rana catesbeiana*), are found in riparian zones or near high country ponds (NPS 2013n), and therefore, are unlikely to occur within Tsankawi. If these species are present within Tsankawi, it would be during really wet periods for a very short period of time because the landscape does not hold pockets of water for extended periods of time (Fettig, pers. comm. 2013d). Other species such as the Jemez Mountain salamander (*Plethodon neomexicanus*) (further discussed in "Appendix E") are only present in areas with elevations of more than 7,000 feet in mixed conifer habitat with an abundance of rotted logs, surface rocks, and moist soils. As a result, this species would not occur within Tsankawi.

Migratory Birds

Migratory birds are protected under the Migratory Bird Treaty Act (1918), as well as EO 13186, "Responsibilities of Federal Agencies to Protect Migratory Birds", which directs federal agencies to (among other things) "support the conservation intent of the migratory bird conventions by integrating bird conservation principles, measures, and practices into agency activities and by avoiding or minimizing, to the extent practicable, adverse impacts on migratory bird resources when conducting agency actions" (Government Printing Office 2001).

Migratory bird species found within Tsankawi and listed as New Mexico Species of Greatest Conservation Need include northern harrier (*Circus cyaneus*), pinyon jay (*Gymnorhinus cyanocephalus*), osprey (*Pandion haliaetus*), loggerhead shrike (*Lanius ludovicianus*), Williamson's sapsucker (*Sphyrapicus thyroideus*), sage thrasher (*Oreoscoptes montanus*), black-throated gray warbler (*Dendroica nigrescens*), sandhill crane (*Grus canadensis*), and juniper titmouse (Fettig, pers. comm. 2013a). Sandhill cranes rarely land in the monument but make their presence known each fall and spring as they migrate overhead (NPS 2013m). No documented breeding habitat exists within Tsankawi for the northern harrier, pinyon jay, loggerhead shrike, Williamson's sapsucker, and sage thrasher, and these species are all considered rare to occasional visitors within Tsankawi. Osprey is a migratory bird associated with the Rio Grande; therefore, it is unlikely this species occurs within Tsankawi (Fettig, pers. comm. 2013a).

The most numerous migratory birds known to occur within Tsankawi include gray flycatcher *(Empidonax wrightii),* Virginia's warbler (*Vermivora virginiae*), Bewick's wren (*Thryomanes bewickii*), spotted towhee (*Pipilo maculatus*), chipping sparrow (*Spizella passerina*), ash-throated flycatcher (*Myiarchus cinerascens*), blue-gray gnatcatcher (*Polioptila caerulea*), mourning dove *(Zenaida macroura)*, hairy woodpecker *(Picoides villosus),* bushtit, and juniper titmouse (Fettig, pers. comm. 2013a).

The chipping sparrow nests in shrubs or saplings from a few centimeters to a few meters above the ground. Breeding birds likely to occur within Tsankawi that nest in the upper parts of the understory or canopy of woodlands include the mourning dove, bushtit, and blue-gray gnatcatcher. The juniper titmouse and black-throated gray warbler are considered uncommon breeding species within Tsankawi (Fettig, pers. comm. 2013a). The juniper titmouse typically occurs in juniper woodlands and is a cavity-nester, building nests in the hole of a tree. The black-throated gray warbler is a common species of pine-oak and pinyon-juniper forests. It is a tree-nester, but much of its breeding biology is unknown (New Mexico Department of Game and Fish 2011).

VISITOR USE AND EXPERIENCE

Tsankawi offers visitors a unique opportunity to experience the region's rich history of human habitation in a natural environment. Visitors can independently explore the area and enjoy the feeling of wilderness that this experience provides. However, site deficiencies present safety issues and do not provide visitors with the understanding necessary to support a high quality visitor experience that also serves as a means to preserve and protect sensitive cultural and natural resources.

The road configuration and existing roadside parking area can make access to Tsankawi challenging for visitors and staff, particularly those who have not been to the area; no signs exist that inform visitors of the turn off into the roadside parking area; it can be difficult to see oncoming traffic on State Road 4 because of the grade and curvature of the road. The roadside parking area and trail leading to the visitor contact station and main trailhead is unpaved making it inaccessible for persons with limited mobility.

Currently, interpretive programming at Tsankawi is limited. Over the past several years, programming consisted mainly of informal interpretive roves, several hours per month, usually on weekends during peak visitation season as staffing allows. Formal interpretive hikes are not regularly scheduled, although they are conducted sporadically. In 2013, there are plans for an experimental project coordinated with Northern New Mexico College to train pueblo students in interpreting Tsankawi within an ethnobiological and cultural history context that considers site sensitivity and resource impacts. Several weekly roves and at least one weekly formal ranger-led hike would take place. A seasonal staff person would be hired to lead this project, which is funded for 2013 only.

Messaging consists of one bulletin board that is updated seasonally, one interpretive panel, and two routed wood signs, all of which need to be replaced. The main interpretive tool is a trail guide in booklet form that may be purchased for a minimal charge at an "Iron Ranger" brochure dispenser at the unit entrance. Numbered posts along the trail correspond to sections of text in the trail guide (Torrez pers. comm. 2013).

Much of the interpretive messaging is located next to the existing visitor contact station. Located just before the start of the main trailhead, the visitor contact station is a simple open air shaded structure with picnic tables. It does not comply with ABA regulations and is not accessible by persons with limited mobility. The fee collection station is located in the visitor contact station and not noticed by all people. It does not take credit cards and some visitors are confused about payment and whether their admission to the main unit of the monument is also good at Tsankawi.

The Tsankawi Mesa Trail is currently the only designated trail within Tsankawi. The 1.5-mile-long trail brings visitors up to the mesa top and provides opportunities for viewing cavates, petroglyphs, Tsankawi Pueblo, and the surrounding environment. Because the trail crosses the center of the pueblo and there is little interpretive messaging in the area, it is difficult for visitors to fully understand the significance of the resource. There are three ladders at various locations along the

trail. Narrow portions of the trail and rugged natural landscape provide a feeling of wilderness and ancestral past that some visitors are seeking; however, for others the area is difficult to navigate.

Further north on State Road 4, visitors often use the commuter parking lot to access backcountry areas such as Duchess Castle. There are safety issues associated with people crossing this high volume corridor to access NPS land (see "Public Health and Safety" later in this chapter). There is currently a "No Trespassing" sign where visitors enter the area. Because it is social trail and not a designated trail, vegetation has not been cleared to provide a clearly identified route for visitors.

VISITATION NUMBERS

Visitation to Tsankawi has fluctuated considerably over the past 12 years with a reported low of 6,250 visitors in 2008 and high of 12,297 visitors in 2011 (see table 8). While visitation varies annually, there have also been changes in data collection methods that may be partially attributable to this variation. Visitation was highest in the earlier part of the reported time series and also in 2011 after the Las Conchas Fire when visitation to the main unit of the monument was limited. However, numbers for 2012 demonstrate a relative decline in visitation that more closely resembles pre-2011 figures. Visitors to Tsankawi include local and nonlocal users, including school programs and small tour groups. Rising temperatures and an increase in the number of extreme weather events as a result of climate change have the potential to affect visitation patterns.

TABLE 8. VISITATION STATISTICS, 2000 TO 2012

Year	Tsankawi Unit	Bandelier National Monument
2000	9,606	248,276
2001	10,836	313,850
2002	12,023	291,436
2003	9,175	287,096
2004	8,743	263,285
2005	7,668	250,161
2006	9,169	243,765
2007	8,163	224,134
2008	6,250	207,656
2009	6,760	212,544
2010	7,528	234,896
2011	12,297	193,914
2012	7,887	150,289

SOURCE: NPS 2013o, NPS n.d.[d]

PUBLIC HEALTH AND SAFETY

The National Park Service is committed to providing high quality opportunities for visitors and employees to enjoy monuments and other protected resources in a safe and healthy environment. The National Park Service strives to protect human life and provide for injury-free visits. Safety applies to monument visitors as well as staff. A visitor incident is defined as an unintentional event or mishap affecting any person, other than an NPS employee, resulting in serious injury or illness requiring medical treatment.

As mentioned above, there are numerous safety concerns associated with visitation to Tsankawi. This includes access to the existing roadside parking area, difficultly navigating the site for persons with limited mobility, the crossing of State Road 4 to access backcountry areas such as Duchess Castle, severe weather conditions/events, and a generally rugged natural landscape.

Rising temperatures and an increase in the number of extreme weather events as a result of climate change would likely affect public health and safety. Increased soil erosion as a result of climate change could make portions of Tsankawi more difficult to safely navigate.

Interpretive messaging currently does not inform visitors of extreme weather conditions that can occur across the region or other safety issues. Weather conditions can change rather rapidly so it is important for visitors to be aware of their surroundings. During the summer months, the dry, arid landscape in and around Tsankawi can result in high temperatures. Visitors should wear sunscreen and bring water. Afternoon thunderstorms are not uncommon and visitors should be prepared to respond to changing conditions. Temperatures in the late afternoon can drop considerably. Frost and snow generally occur from October through May. Sneakers or hiking boots are recommended. Incidents can occur if people are not properly prepared for a visit in this environment.

At this time, there have been few reported incidents with regard to public health and safety within Tsankawi. However, because of the lack of regular NPS staff on-site, there may be unknown or unreported incidents. See “Park Operations and Management” for a discussion of incidents related to law enforcement.

PARK OPERATIONS AND MANAGEMENT

Tsankawi, as well as other parts of the monument, is open from dawn until dusk. As a result, operating hours can vary by season. There are currently 40 permanent full time, 10 term, and 20 seasonal employees at the monument. At present, there is no dedicated full-time staff stationed at Tsankawi. However, staff periodically visits the area to provide a variety of services.

Estimated staffing levels presented in this environmental assessment come from conversations with various divisions at the monument who conduct activities within Tsankawi. According to staff, approximately 4,641 staff hours are spent at Tsankawi annually (see table 9). This represents approximately 2.7 full-time staff equivalents and approximately 4.5% of annual operational costs. These numbers can fluctuate, and are largely dependent on fiscal constraints.

TABLE 9. ESTIMATED ANNUAL STAFFING AT TSANKAWI

Staff	Frequency	Total Annual Hours
Law Enforcement (patrols)	2 hours, one time daily	730
Fee Collection	1.5 hours, one time monthly	18
Interpretation (roving & programs)	8 hours, one time biweekly	208
Maintenance (custodial)	6 hours, three times weekly	936
Vanishing Treasures Program	Staffing hours averaged over last 4 years 2009-2012	2,309
Tribal Liaison		24
Wildlife Biologist		24
Archeologist		208
Botanist		80
Chief of Resource Management		104
TOTAL		**4,641**

SOURCE: Judy pers. comm. 2013, NPS 2014b

Law enforcement patrols Tsankawi once a day for about two hours. Interpretive staff roves for approximately eight hours every other week. Formal interpretive hikes are not regularly scheduled, although they are conducted sporadically. Maintenance staff visits Tsankawi three times a week for approximately six hours a visit.

Staff from the Vanishing Treasures program often visits Tsankawi to monitor cultural resources. Over the past few years, such activity has averaged 2,309 hours annually (Judy, pers. comm. 2013). People from various volunteer groups are also periodically on-site.

The effects of climate change on cultural and natural resources would continue to be monitored by NPS staff and may be adjusted in the future to ensure that appropriate monitoring levels are in place. An increase in fire frequency may require additional staff during such events as well as after when ecological treatments are put in place.

The National Park Service maintains records regarding violations of agency policy. The following violations have recently been reported within Tsankawi:

- A possible explosive device washed down from a firearms training area. It was determined to be an expended CS grenade.
- Two accounts of vandalism. One included damage to Duchess Castle and the other included damage to the trail where rock had been purposefully broken off the edges of the historic track.

- One report of an entry alarm response. This turned out to be a false alarm that was likely triggered by a change in the natural environment or a rodent.
- One closure violation where a visitor travelled off the trail during a period of restriction to remain on the trail.
- Two shard theft investigations have been undertaken and five shard theft citations have been written.
- Two reports of damage to ladders (Betts pers. comm. 2013).

SOCIOECONOMICS

Tsankawi, as well as the main unit of the monument, reside within and are influenced by the regional economies of northwestern New Mexico. Los Alamos, home to Los Alamos National Laboratory, is the largest local economy while nearby Santa Fe is a larger regional economic center and also the state capital. Smaller municipalities in the area include White Rock, El Rancho, and Pojoaque, all of which are located within 10 miles of Tsankawi. The White Rock Visitor Center is located approximately three miles north of Tsankawi on State Road 4. San Ildefonso Pueblo, the home of descendants of the Ancestral Pueblo people who resided in Tsankawi, is adjacent to Tsankawi.

LOCAL AREA ECONOMIES

San Ildefonso Pueblo

At the time of the 2010 decennial census, the population of San Ildefonso Pueblo was 524 people. The median household income is lower than the national average and the unemployment rate is higher. More than 50% of workers commute less than 25 minutes to their place of employment. The following employment sectors represent approximately 75% of total San Ildefonso Pueblo employment: sales and office occupations; management, business, and financial occupations; education, legal, community service, arts, and media occupations; and service occupations (USA City Facts 2013). Artisans make and sell traditional crafts from their homes.

Towns of Los Alamos and White Rock and Los Alamos National Laboratory

As of 2011, the town of Los Alamos had an estimated population of less than 13,000 people. Per capita income was $49,689 and the unemployment rate was 5%. About 54% of all employment occurs in the professional, scientific, and management and administrative and waste management services sectors (U.S. Census Bureau 2011). A large share of this employment is attributable to Los Alamos National Laboratory, the largest employer in northern New Mexico. There are more than 10,000 LANL employees, including contracted personnel, researchers, and security staff. About 35% of employees live in Los Alamos, with the remainder commuting from Santa Fe, Española, Taos, and Albuquerque (LANL 2012). Due to its proximity to Los Alamos National Laboratory, the town of White Rock serves as a bedroom community for many LANL employees and their families.

Santa Fe and Los Alamos Counties, New Mexico

Table 10 shows a comparison of Santa Fe and Los Alamos counties to the state of New Mexico and the nation in terms of population and per capita income over the past two decades. Since 1990, population in Santa Fe County and the state of New Mexico has increased at a higher rate than that of the nation, while the Los Alamos County population has experienced relatively flat growth.

TABLE 10. POPULATION AND INCOME IN STUDY AREA GEOGRAPHIES, 1990-2010

Geography and Indicator	Year			% Change	
	1990	2000	2010	1990-2000	2000-2010
Santa Fe County					
Population	99,587	129,713	144,497	23.2	10.2
Per Capita Income	$19,159	$30,930	$41,916	38.1	26.2
Los Alamos County					
Population	18,144	18,263	18,031	0.7	-1.3
Per Capita Income	$28,572	$42,777	$59,237	33.2	27.8
New Mexico					
Population	1,521,574	1,821,204	2,065,913	16.5	11.9
Per Capita Income	$14,823	$22,746	$32,940	34.8	31.0
United States					
Population	249,622,814	282,162,411	309,330,219	11.5	8.8
Per Capita Income	$19,354	$30,319	$39,791	36.2	23.8

SOURCE: BEA 2012a

Per capita income in Los Alamos County is higher than that of Santa Fe County, New Mexico, or the nation overall, although it grew at a slower pace than other areas between 1990 and 2000. In 2010, the per capita income in Los Alamos County was $59,237, compared to $41,916 for neighboring Santa Fe County. Between 2000 and 2010, per capita income in Los Alamos County increased by approximately 27.8% while the state of New Mexico experienced an increase of 31.0%.

Table 11 presents the largest employment sectors in each of the geographic areas of comparison between 1990 and 2010. During this time period, employment in Los Alamos County remained dominated by jobs in the services industry. Although reporting prior to 2001 does not distinguish between subsectors in this industry, the professional, scientific, and technical services subsector contributed greatly to jobs in the services sector in Los Alamos in 2010.

TABLE 11. EMPLOYMENT BY PERCENT IN STUDY AREA GEOGRAPHIES, 1990-2010

Geography	Top Three Employment Sectors	Year[1] 1990	2000	2010
Santa Fe County	Government and government enterprises	22.3	21.9	28.6
	Retail trade	19.5	19.1	15.1
	Services[2]	33.6	35.2	15.1
Los Alamos County	Services[2]	28.7	33.5	65.7
	Government and government enterprises	56.4	51.4	11.2
	Retail trade	7.7	6.7	3.2
New Mexico	Government and government enterprises	24.2	27.3	26.6
	Health care and social assistance	7.7	12.0	14.6
	Retail trade	12.1	15.3	13.6
United States	Services[2]	28.2	32.2	13.1
	Government and government enterprises	15.7	14.1	16.9
	Retail trade	16.7	16.6	12.1

SOURCE: BEA 2012b

1. Percentages are for total non-farm employment.

2. Individual services sectors (North American Industry Classification System [NAICS] classifications) are not reported at the county level for years 1990 and 2000. Subsequent to 2001, industry data (employing NAICS classifications) reveals high concentrations of employment in specific service sectors such as professional, scientific, and technical services (Los Alamos County) and healthcare and social assistance (Santa Fe County, New Mexico, and United States).

VISITOR SPENDING

Visitation to the monument and associated spending contribute to the local and regional economies. The following section presents information specific to the monument and estimates visitor spending attributable to annual visitation numbers at Tsankawi.

The 2010 *Economic Benefits to Local Communities from National Park Visitation and Payroll* (Stynes 2010) provides estimates of NPS visitor spending for 2010 to estimate economic impacts associated with visitor and NPS employee spending on local economies. This information is prepared using the Money Generation Model from the Department of Parks, Recreation, and Tourism Resources at

Michigan State University, which estimates visitor spending by visitor type (i.e., local day trips, nonlocal trips, overnight stays, and camping). Visitor spending is presented for local and nonlocal visitors. Nonlocal visitors are those travelling 60 miles or more to enjoy the resource. The 60-mile

radius is a general average representing the primary impact region around most parks. The radius is closer to 30 miles in urban environments and can be as large as 100 miles for some western parks. Economic impacts are only estimated for nonlocal visitor spending.

For neighboring Santa Fe County, the three sectors representing the greatest share of total employment included government and government enterprises (28.3%); retail trade (15.0%); and services dominated by the healthcare and social assistance (15.0%). These three sectors also represented the greatest share of total employment in the state of New Mexico overall.

The report estimates that the 234,896 visitors to the monument generated approximately $10,507,000 in total visitor spending in 2010. The report attributes 96.6% of this spending ($10,152,000) with nonlocal visitors. Approximately 3% or 7,263 visitors had an overnight stay in the area. The majority of such spending can be associated with the accommodation, retail trade, and services sectors. Overnight stays are generally thought to be in camping facilities and in nearby communities.

Stynes estimates that 121 jobs in the areas surrounding the monument are directly attributable to nonlocal visitor spending and an additional 85 jobs are sustained by spending from the 84 NPS staff on the payroll in 2010. One job is supported for every $83,900 in nonlocal visitor spending.

Visitation to Tsankawi represents a relatively small share of total monument visitation. Holding the same ratios presented above constant, visitor spending attributable to visitation at Tsankawi was approximately $336,731 in 2010, $550,050 in 2011, and $352,789 in 2012. However, actual spending in the area as a result of visitation to Tsankawi may be lower because of higher local visitation and fewer nonlocal visitors.

Chapter 4

Environmental Consequences

GENERAL ANALYSIS METHOD

Impact analyses and conclusions included in the environmental review are based on data and other pertinent information found in existing literature, information and insight provided by NPS subject-matter experts and other agencies, and professional judgment.

For each impact topic, a discussion of potential beneficial and adverse effects of each of the three alternatives is presented. This information is then used to determine how each of the action alternatives would affect resource conditions when compared to the no-action alternative and each other. A summary of potential project-induced impacts by resource topic and alternative is presented in table 5.

For each resource topic, impact analyses involve the following steps:

- Define issues of concern based on findings from internal and external (or public) scoping.
- Identify the geographic area that could be affected.
- Define the resources within that area that could be affected.
- Impose the alternative on the resources within the geographic area of potential effect.
- Identify the effects caused by the alternative, in comparison to the no-action alternative to determine the relative change in resource conditions. The effects of each are characterized based on the following factors:
    - Whether the effect would be beneficial or adverse.
    - The intensity of the effect, which is defined as negligible, minor, moderate, or major. Intensity definitions for such effects are provided in the methodology section for each impact topic. Intensity definitions were developed based on federal and state regulations and standards, NPS policies, consultation with regulators from applicable agencies, and discussions with subject-matter experts.
    - The duration of the effect as either short or long term. The duration of short-term effects and at which point long-term effects begin to differ by resource topic and therefore are defined under each respective discussion.
    - The geographic extent of effects, which may vary by resource topic and/or alternative.
    - Whether the effect would be a direct result of the action or would occur indirectly because of a change to another resource or impact topic.
- Determine cumulative effects by evaluating the effect in conjunction with past, present, or reasonably foreseeable future actions within Tsankawi, the main unit of the monument, and adjacent areas.

CUMULATIVE EFFECTS ANALYSIS METHOD

Sections 1508.7 and 1508.25 (a)(2) of CEQ regulations (1978) for implementing the National Environmental Policy Act of 1969 require an assessment of cumulative effects in the decision-making process for federal actions. Cumulative effects 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).

NPS guidance on environmental impact analysis (NPS DO 12) is designed to evaluate cumulative effects in a way that helps to determine the additive impact of the alternative on each resource of concern. The guidance states "it is irrelevant who takes these actions (i.e., they are not confined to NPS or even federal activities), or whether they took place in the past, are taking place in the present, or will take place in the reasonably foreseeable future."

Cumulative effects were evaluated by combining the effects of each alternative with other past, present, and reasonably foreseeable future actions in Tsankawi, the main unit of the monument, and/or in the surrounding area. Because Tsankawi is located approximately 12 miles from the main unit of the monument, many of the plans and actions that are either in place or proposed for the main unit are not necessarily applicable for inclusion in the cumulative impact analysis for Tsankawi. The following section identifies those plans and actions that will be evaluated as part of the cumulative impact analysis for this plan/environmental assessment.

IDENTIFIED CUMULATIVE ACTIONS

Resource Actions

Resource protection measures at Tsankawi, the main unit of the monument, and adjacent areas have the potential to contribute to cumulative impacts at Tsankawi. The following actions have been identified for consideration in this environmental assessment.

Bandelier National Monument Fire Management Plan/Environmental Assessment. Completed in 2005, this plan serves as a detailed program of action, providing specific guidance and procedures for achieving fire management objectives at the monument, including Tsankawi. It defines the levels of protection necessary to ensure the safety and protection of resources and facilities and to restore and perpetuate natural processes given the current understanding of the complex relationships in natural ecosystems. Such measures are also designed to minimize undesirable environmental impacts of fire management. The plan considers advances in fire science knowledge, new technologies and fire-fighting techniques, long-term solutions to new and current resource challenges, the most up-to-date science-based research and monitoring, and new information about sensitive, threatened, or endangered species. Changes in monument resources, such as landscape-wide tree mortality due to drought conditions and beetle infestations—that have occurred since the previous fire management plan in 1997—are identified and further evaluated in this plan (NPS 2005c).

The monument is currently in the process of preparing a new fire management plan to comply with interagency fire policy direction—the *2009 Guidance for Implementation of Federal Wildland Fire Management Policy*—which requires strategic and terminology updates in all new fire management plans. In addition, the Las Conchas Fire in 2011 resulted in direct and indirect changes in the monument's environment. Such changes included but were not limited to: flooding/debris flows, surface water quality and quantity, landscape level changes to the vegetation, wildlife habitat and insect populations, soils, adverse effects to cultural resources, and visitor use and experience. The fire management plan/environmental assessment is expected to be complete in December 2013 (Robertson 2013). The current fire management plan as well as the update currently underway would also serve as a means to protect public health and safety.

Monument Response to the Las Conchas Fire. The Las Conchas Fire—which started just west of the main unit of the monument in late June 2011—burned more than 156,000 acres and became the largest wildfire in New Mexico's history (it was later surpassed by the Whitewater-Baldy Fire in 2012 as the largest fire in New Mexico history). The fire was able to grow quickly due to extreme drought, high temperatures, low relative humidity, and strong winds. Approximately 70% of Frijoles Canyon—the area where the visitor center and most visited archeological sites in the monument are located—was burned. Overall, approximately 40% of Frijoles Canyon burned with high severity.

Flash flooding became a major concern after the fire was contained as a result of removed vegetation and hydrophobic soils. In late August 2011, heavy rains caused flooding and subsequent damage to trails across Frijoles Canyon. Once immediate safety issues were addressed, the monument was reopened; however, many locations have remained at risk of flash floods.

The fire resulted in a change in the way in which visitors can access the main unit of the monument. The removal of bridges in Frijoles Canyon as a result of the fire and related flash flooding decreased the number of parking spaces available for visitors. Atomic City Transit, the local transit provider in Los Alamos County, now provides required shuttle service to the main visitor center during the peak season (June through October). During the closure of the Frijoles Canyon developed area, some visitors seeking to experience the monument's cultural and natural resources elected to visit Tsankawi, and as a result visitation increased in 2011 (NPS 2013p). Visitation statistics for 2012 indicate that visitation at Tsankawi has returned to volumes that more closely reflect pre-2011 numbers (NPS2013o).

Ecological Restoration Efforts. Prior to its designation as a national monument, historic land uses within the Otowi-Tsankawi unit of the monument, including fuelwooding (wood grown or used for fuel) and sheep grazing, caused changes in ecosystem processes that continue to adversely affect cultural and natural resources. One of the most substantial effects includes the accelerated rate of soil erosion and associated loss of archeological resources ongoing within the pinyon-juniper woodland. More recently, vegetation at Tsankawi is in the process of type conversion in the face of climate change. This transition is exemplified by loss of ponderosa pine stringers in drainages, wholesale die-off of pinyon pine throughout the landscape, and even reduction of the remaining juniper overstory as warming-drying trends continue.

Measures identified in the *2007 Ecological Restoration Plan/Environmental Impact Statement*—while not specific to Tsankawi—were applied as a means to help restore natural ecosystem functions within the unit. Quantitative monitoring of the treatments implemented at Tsankawi is a component of the monument-wide ecological restoration monitoring and management plan developed as a supplement to the *2007 Ecological Restoration Plan/Environmental Impact Statement*. Although no instrumented monitoring sites are located within Tsankawi, comparable areas within the main unit of the monument provide information sufficient to inform management action relative to established metrics. In addition to quantitative monitoring efforts, informal walking inspections of representative treatment areas within Tsankawi are conducted annually by the monument resource staff.

The monument has responded to these effects by implementing an ecological restoration treatment, which was analyzed in the 2000 *Environmental Assessment Regarding the Management of the Tsankawi Unit* and *2007 Ecological Restoration Plan/Environmental Impact Statement*. The *2007 Ecological Restoration Plan/Environmental Impact Statement* establishes goals, objectives, and specific implementation actions needed to restore approximately 5,000 acres of degraded pinyon-juniper woodland to a more naturally functioning state over the next 15 to 20 years. Within Tsankawi, all of the woodland area suitable for restoration was treated between fall 2007 and spring 2010, a total of 472 acres, excluding only mesa tops and adjacent steep rocky slopes. Treatment involved cutting live juniper and dead pinyon less than six to eight inches diameter, and lopping and scattering the cut trees onto bare soil spaces between the former canopy mounds. Restoration actions are expected to mitigate accelerated soil erosion within the monument, which would also help restore understory vegetation and return a more natural fire cycle to woodland areas. Observations at five years post-treatment suggest the response to restoration at Tsankawi is generally robust and comparable to other restoration locations with monitoring data. Data from those other locations have documented several-fold increases in understory cover and one-two fold reductions in runoff and sediment loss (Jacobs 2013).

Transportation Actions

There are numerous transportation-related actions in and around the monument that have the potential to contribute to cumulative impacts at Tsankawi. These projects are described in further detail below.

Bandelier National Monument Transportation Plan/Environmental Assessment. This study currently underway would evaluate actions for improving transportation management in the monument. Previous studies have identified transportation and congestion management issues at the monument, primarily related to access to Frijoles Canyon and adequate parking. Recent fire and flood events have exacerbated ongoing challenges. The monument is currently partnering with Los Alamos County and Atomic City Transit to provide temporary and seasonal shuttle service from the White Rock Visitor Center to Frijoles Canyon; however, long-term strategies to address the monument's transportation issues have not yet been developed and implemented.

The current study would analyze the environmental effects of a range of alternatives (including both transit and nontransit options) designed to address the existing transportation challenges at the

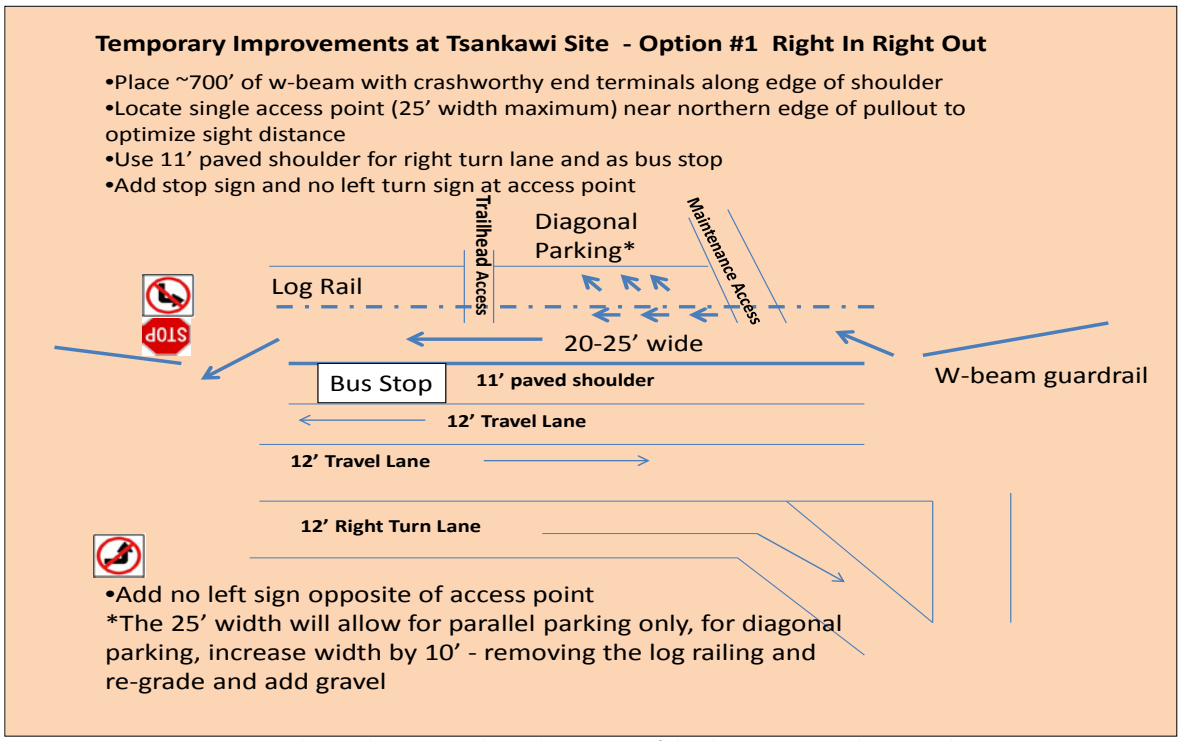
monument. Potential measures include encouraging visitation during off-peak hours; intelligent transportation systems; employee carpools/vanpools to reduce parking demand; parking lot, road, and trail infrastructure improvements to improve efficiency and/or promote visitor use in less congested areas of the monument while relieving congestion in Frijoles Canyon; a reservation system; and/or limits on visitor use to address parking and traffic congestion (NPS n.d.[e]). Because of its location away from the main unit of the monument and relatively low daily visitation numbers, it is anticipated that the potential measures identified to address existing transportation issues would be primarily but not exclusively limited to the main unit of the monument.

Interim Improvements. There are a number of safety concerns associated with the existing roadside parking area used by visitors and staff at Tsankawi. The Federal Highway Administration considers safety enhancements to this area to be of critical importance and has identified interim improvements that would be implemented under the no-action alternative and also under the action alternatives until funding can be secured to relocate the existing roadside parking area onto NPS lands. Proposed on-site parking configurations and associated improvements identified as part of the action alternatives are described in "Chapter 2: Alternatives."

FHWA staff has identified three concepts for roadside and parking improvements that could be implemented to help improve access and safety in the short term. These concepts—which have a number of common elements—largely differ in the ability to make left-hand turns into the roadside parking area when traveling south on State Road 4, siting of the bus stop, parking angles, and circulation patterns once in the parking area. Each concept is designed, in part, to exclude informal use of the existing roadside parking area by tracker-trailer rigs (as currently happens) and force drivers to turn into the existing roadside parking area where sight lines of oncoming traffic are best.

The following concept has been identified as the preferred option because it would enhance safety to the same extent as the other options but at significantly less cost. The preferred interim improvements would eliminate left turn movements into and out of the parking area and create a single entry and single exit point (see figure 16). Open access would be limited and a crashworthy barrier system would be installed adjacent to the existing paved shoulder to protect the parking area. Adequate space between the log railing and new barrier would allow for parallel parking and the one-way traffic lane (approximately 25 feet). The log railing could be reset and parking area expanded slightly to accommodate diagonal parking should demand exist and monument staff determine that resource management measures have been effective to help reduce visitation impacts. Appropriate signs would also be installed.

Such improvements are estimated to cost between $30,000 and $50,000. Coordination among the National Park Service, Department of Energy, and Federal Highway Administration is ongoing. The Department of Energy—the agency with jurisdiction over the State Road 4 right-of-way where the existing roadside parking area is located—would join the National Park Service in approving a final set of interim measures to enhance traffic safety at the site (FHWA 2012a). NPS staff would continue to coordinate with partnering agencies to secure necessary funding.



Note: Interim improvements as shown above are in the earliest stages of development. Consultation with appropriate agencies to refine improvement elements is ongoing. SOURCE: FHWA 2012c

FIGURE 16. PROPOSED INTERIM IMPROVEMENTS

Widening of State Road 4. The land currently used as roadside parking for Tsankawi is on DOE lands and subject to a transportation easement held by the New Mexico Department of Transportation (NMDOT). This segment of State Road 4 may be impacted by developments at Los Alamos National Laboratory, potentially including the Chemistry and Metallurgy Research Replacement-Nuclear Facility or other projects proposed in recent years. Because delivery traffic is routed through the State Road 4 and East Jemez Road intersection for security screening, and because Los Alamos National Laboratory development opportunities are concentrated on the Pajarito Road corridor accessed through this intersection, construction and development activities at Los Alamos National Laboratory have the potential to create additional traffic near the site access point for Tsankawi. Continued heavy traffic conditions may generate the need to widen State Road 4 on lands currently used for Tsankawi roadside parking. The NMDOT transportation easement permits widening of State Road 4. Should this widening occur, it would displace the existing roadside parking area for Tsankawi.

IMPACTS ON CULTURAL RESOURCES

The national register is a listing of cultural resources, specifically prehispanic and historic buildings, structures, sites, districts, and objects that are considered significant at a national, state, or local level. Listed resources can have significance in the areas of history, archeology, architecture, engineering, or culture. Cultural resources that are listed or eligible for listing on the national register have been

documented and evaluated according to uniform standards, and have been found to meet criteria of significance and integrity. Anyone can submit a nomination form for a property; NPS staff reviews the nomination and makes the decision as to which properties are listed. Cultural resources that are eligible (i.e., meet the criteria) for listing or are listed on the national register are called historic properties. Resources that have undetermined eligibility are treated as historic properties until a determination otherwise is made.

A number of federal laws address cultural resources and agency responsibility for complying with the mandates they set forth. The long history of legal jurisdiction over cultural resources, dating back to the 1906 passage of the Antiquities Act, demonstrates a continuing national concern to preserve and protect such resources. Foremost among these statutory provisions is section 106 of the National Historic Preservation Act, which requires federal agencies to take into account the effect of their undertakings on historic properties. The regulations that implement section 106 (36 CFR Part 800) describe the process for identifying and evaluating resources; assessing effects of federal undertakings (actions) on historic properties; and consulting to avoid, minimize, or mitigate adverse effects. The National Historic Preservation Act does not require preservation of historic properties, but it does ensure that federal agency decisions concerning the treatment of these resources result from meaningful consideration of cultural and historic values and identification of available measures to protect resources. The following sections evaluate potential impacts to archeological, cultural, and ethnographic resources that may result under the proposed project alternatives.

ARCHEOLOGICAL RESOURCES

Methods and Assumptions

The following analysis discusses the anticipated direct, indirect, and cumulative impacts of project alternatives on archeological resources. Potential impacts are assessed with regard to the level of anticipated disturbance or change to archeological resources that may result from construction activities and/or visitor use associated with the action alternatives. The analysis is based on information about resources and previous disturbances provided by monument staff and the professional judgment of subject-matter experts.

As described in "Chapter 3, Affected Environment," all 157 archeological resources identified within Tsankawi have been determined eligible for listing on the national register and, therefore, have been classified as historic properties. Adverse effects were identified through application of the section 106 Criteria of Adverse Effects. Under section 106, the types of possible adverse effects include:

- physical destruction of or damage to all or part of a property
- physical alteration of a property
- removal of a property from its historic location
- change in the character of a property's use or of physical features within a property's setting that contribute to its historic significance

- introduction of visual, atmospheric, or auditory elements that diminish the integrity of a property's significant historic features
- neglect of a property that causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance
- transfer, lease, or sale of property out of federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of a property's historic significance (36 CFR 800.5(a)(2))

NPS staff would consult with New Mexico SHPO staff on the potential effect of the selected alternative on historic properties, prior to initiating the activities associated with that alternative. If adverse effects to historic properties are anticipated, NPS staff would work with New Mexico SHPO staff and the six affiliated pueblos to develop measures to avoid, minimize, or mitigate those effects. These measures would be described in an agreement document, such as a memorandum of agreement or programmatic agreement. The agreement would be signed by the National Park Service, New Mexico State Historic Preservation Office, and, if necessary, Advisory Council on Historic Preservation. The six affiliated pueblos would be consulted on the development of the agreement and invited to sign as concurring parties.

Study Area

Under the implementing regulations of section 106, analysis of effects to historic properties is conducted within the area of potential effects. An area of potential effects is defined as:

> . . . the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking (36 CFR 800.16[d]).

To analyze the potential for these effects, the area of potential effects includes all areas within Tsankawi.

Impact Definitions

The following definitions are used to assess the intensity of beneficial and adverse impacts on archeological resources that may result from project alternatives and the duration at which point impacts would be either short or long term.

Negligible. The impact, either adverse or beneficial, on archeological resources is the lowest level of detection, barely perceptible and not measurable. The section 106 determination would be no adverse effect.

Minor Adverse Impact. The impact on archeological resources is measureable or perceptible, but it is slight and localized within a relatively small area of a site or group of sites. The impact does not affect the character-defining features of national register-listed or eligible archeological resources

and would not have an effect on the integrity of any archeological resources. The section 106 determination would be no adverse effect.

Minor Beneficial Impact. A resource would be preserved in its natural state. The section 106 determination would be no adverse effect.

Moderate Adverse Impact. The impact is measurable and perceptible. The impact is readily apparent and/or changes one or more character-defining features of an archeological resource to the extent that its national register eligibility is jeopardized. The section 106 determination would be adverse effect. Measures would be implemented to either minimize or mitigate the effect.

Moderate Beneficial Impact. A resource would be stabilized. The section 106 determination would be no adverse effect.

Major Adverse Impact. The impact on archeological resources is substantial, noticeable, and permanent. The impact changes one or more character-defining features of an archeological resource, diminishing the integrity of the resource to the extent that it is no longer eligible for listing on the national register. The section 106 determination would be adverse effect. Measures would be implemented to either minimize or mitigate the effect.

Major Beneficial Impact. Active intervention would be undertaken to preserve the resource. The section 106 determination would be no adverse effect.

Duration. Due to the nonrenewable nature of all archeological resources, all adverse impacts to archeological resources are permanent. Beneficial impacts may be short-term in duration if the effects are only sustained for up to 10 years. Long-term beneficial impacts are those sustained for greater than 10 years.

Impacts of the No-Action Alternative

Analysis. Under the no-action alternative, visitor facilities and interpretive messaging would remain as under existing conditions. Trails, and subsequently visitors, would continue to traverse and cause damage to Tsankawi Pueblo and other resources. Visitor use would continue to erode and damage cavates, prehispanic trails, hand-and-toeholds, and rock art. Natural erosion of these resources, which may be further influenced by climate change, would be exacerbated by visitor-induced impacts. Compaction of soils from visitor foot traffic on social trails would potentially result in an associated increase in runoff and erosion. The rate of erosion would increase appreciably and spread over a relatively wide area over time, causing damage to archeological resources.

Interpretive messaging would not be improved to inform visitors of the fragile nature of archeological resources, need for resource protection, or sensitivity and significance of Tsankawi to present-day pueblo communities. Visitor decisions on how to visit Tsankawi and interact with resources would not be influenced by an ethic of preservation, and would result in continued use of social trails. The current pattern of degradation of archeological resources within Tsankawi would

continue, resulting in a permanent moderate adverse impact on archeological resources, and an adverse effect on historic properties.

Under the no-action alternative, a site steward would be located within Tsankawi to provide a limited degree of oversight and historical context to visitors. The presence of someone at the unit would help reinforce the message of a sensitive and living landscape, ensuring that visitors stay on designated paths and do not harm resources, either inadvertently or intentionally. The site steward would monitor the condition of archeological resources and report to monument staff when impacts are observed. Although the site steward(s) would not be expected to constantly be on trails, speak with all visitors, or monitor all archeological resources, the presence of a site steward(s) at the unit would have a long-term minor beneficial impact because it would help reduce visitor-induced impacts on archeological resources through visitor education and increased awareness of the sensitivity and significance of the resources. This would reduce some of the adverse impacts noted above. However, resources would continue to deteriorate from visitor-induced impacts and the adverse effect on historic properties would remain.

Monument staff is in the process of implementing a resource monitoring program to document and determine the level of erosion and wear occurring to fragile archeological resources within Tsankawi from visitor use and natural erosion processes. At select areas of Tsankawi, baseline resource conditions would be documented and condition assessments conducted. Monitoring activities would help identify areas where deterioration has increased and/or those areas where deterioration has slowed due to no or little visitor impacts. While monitoring efforts would help identify the extent to which resources are being affected by visitor use and natural erosion processes, no measures or treatments would be implemented to help reduce impacts. A more comprehensive understanding as to how resources are being affected would result in a long-term negligible to minor beneficial impact on archeological resources because monument staff would better understand the cause of resource deterioration, which could benefit future planning efforts. The adverse effect from the no-action alternative on these historic properties would remain.

Cumulative Impacts. The current fire management plan as well as the 2013 update underway detail strategies and actions to be implemented to attain fire management objectives at the monument. The actions conducted in accordance with the fire management plans are and would continue to be designed and implemented to minimize undesirable impacts of fire, such as loss of vegetation and soil erosion, while attaining the objectives of improved ecosystem management. Actions identified to help protect natural resources from fires would also benefit archeological resources, primarily through the mitigation of accelerated soil erosion, which has the potential to disturb archeological resources. Fire prevention or the ability to limit the extent to which resources are affected by fire would also minimize potential adverse impacts to archeological resources. Additionally, it is anticipated that fire management actions, both in the existing and updated plan, would be designed to avoid known archeological resources. The actions associated with the fire management plans would result in a long-term minor beneficial impact to archeological resources by mitigating accelerated soil erosion in sensitive areas.

Ecological restoration treatments—which were analyzed in the 2000 *Environmental Assessment Regarding the Management of the Tsankawi Unit* and *2007 Ecological Restoration Plan/Environmental*

Impact Statement—were applied to all of the woodland area in Tsankawi suitable for restoration. Between fall 2007 and spring 2010, a total of 472 acres, excluding only mesa tops and adjacent steep rocky slopes, were treated. This included cutting live juniper and dead pinyon less than six to eight inches in diameter, and lopping and scattering the cut trees onto bare soil spaces between the former canopy mounds. Restoration actions are expected to mitigate accelerated soil erosion and the ground's ability to support native vegetation, all of which would limit ground disturbance and protect archeological resources. Observations at five years post-treatment suggest the response to restoration at Tsankawi is generally robust and comparable to other restoration locations with monitoring data. Data from those other locations have documented several-fold increases in understory cover and one-two fold reductions in runoff and sediment loss. Efforts undertaken as part of the restoration treatment are anticipated to continue to provide long-term minor to moderate beneficial impact to archeological resources because they assist in preserving the resources in their existing state.

The transportation plan/environmental assessment currently being prepared will evaluate a number of actions and may ultimately include improvements to parking, road, and trail infrastructure. It is anticipated that the majority of activities recommended as part of this plan would be located in the main unit of the monument and would not affect archeological resources within Tsankawi. Potential actions at Tsankawi may include a bus route and shuttle stop.

Construction activities associated with identified improvements could impact archeological resources through ground disturbance. However, existing access to Tsankawi via the roadside parking area would require that the shuttle stop be located within the NMDOT transportation easement area which is previously disturbed and outside of Tsankawi. Depending on the type of shuttle stop, little to no ground-disturbing activities would be required. As a result, it is not anticipated that known archeological resources would be impacted. If a resource would be impacted, the appropriate federal agency would consult with New Mexico SHPO staff and the six affiliated pueblos regarding the appropriate treatment of the resource. Because of the location of known archeological resources and anticipated siting of actions at Tsankawi identified in the transportation plan/environmental assessment, implementation of these actions would likely have a negligible to minor permanent adverse impact on individual archeological resources—should they exist in the construction area—due to the avoidance or minimization of ground-disturbing activities. Because the existing roadside parking area is located on DOE lands, implementation of a bus route and shuttle stop would need to be coordinated among appropriate parties.

The proposed interim improvements would be limited to the existing roadside parking area and are not anticipated to include ground-disturbing activities. As a result, it is not anticipated that adverse impacts to archeological resources would result. Widening of State Road 4 would have the potential to impact archeological resources if the project extends beyond previously disturbed areas. Although much of the construction would likely occur within previously disturbed areas, the potential for impacts to archeological resources would increase as more undisturbed area is included in project design. Resource surveys would be conducted prior to construction, and the footprint of the widening would be designed to avoid known archeological resources, if possible. If a resource would be impacted, the appropriate federal agency would consult with New Mexico SHPO staff and the six affiliated pueblos regarding the appropriate treatment of the resource. Disturbance of archeological

resources from ground-disturbing activities associated with the widening of State Road 4 would likely have a permanent moderate adverse impact on individual archeological resources should they exist in the construction area due to the removal of the resource from its historic location.

As described above, the implementation of the no-action alternative would result in permanent moderate adverse impacts to archeological resources. The fire management plan would have long-term widespread minor beneficial impacts; ecological restoration efforts would have long-term widespread minor to moderate beneficial impacts; and the various transportation-related activities could have permanent localized negligible to moderate adverse impacts, although unlikely. Adverse impacts associated with the no-action alternative, in combination with the long-term and widespread minor to moderate beneficial impacts and permanent yet localized negligible to moderate adverse impacts of other past, present, and reasonably foreseeable future actions, would result in both long-term minor beneficial and adverse impacts on archeological resources.

Conclusion. Under the no-action alternative, maintaining existing visitor facilities and interpretive messaging as under existing conditions would result in a permanent moderate adverse impact on archeological resources. Reintroduction of a site steward(s) to provide historical context and a limited degree of oversight would result in a minimal reduction in this impact. Overall, the no-action alternative would result in an adverse effect on historic properties. Adverse impacts associated with the no-action alternative, in combination with the long-term and widespread minor to moderate beneficial and permanent yet localized negligible to moderate adverse impacts of other past, present, and reasonably foreseeable future actions, would result in both long-term minor benefit and adverse impacts on archeological resources.

Impacts of Alternative 1: Two-Directional Entry Roadway (Preferred Alternative)

Analysis. Under alternative 1, modification of existing and implementation of new trails would occur. New interpretive messaging would also be introduced to the unit. Trail modifications would include the closure of social trails, reroute of the existing Tsankawi Mesa Trail south of Tsankawi Pueblo, conversion of the current return section of the Tsankawi Mesa Trail to a guided-only trail segment, construction of the ABA Walk with the trailhead being located near existing and proposed visitor facilities, addition of a new trail to Duchess Castle, and a possible future connector route from the new Duchess Castle Trail to Tsankawi Mesa Trail if resource conditions are being met and there is sufficient visitor demand.

Abandoned trails would be obscured and rehabilitated to a natural state. New trails would be designed to avoid disturbance to archeological resources. Trail alignments included in this plan are general and would be further refined prior to implementation. Final trail alignments would avoid direct impacts on archeological resources. Specifically, preference would be given to siting alignments on native rock rather than soils that may contain cultural deposits. Additionally, trails would be designed to be offset from cavates, masonry pueblo walls, kivas, and petroglyphs to ensure that visitation on trails would not indirectly create conditions of deterioration.

The proposed kiosk and interpretive messaging would inform visitors of the sensitivity and significance of Tsankawi. A “Stay on Trails” message would be conveyed through signs at various

locations along the trails. New interpretive messaging would be constructed of natural materials or materials that fit unobtrusively into the setting. These changes would reduce visitor-induced impacts on sensitive archeological resources and minimize the effects of visitor use on natural erosion processes. These protective actions would result in a long-term moderate beneficial impact on archeological resources. Therefore, no adverse effect to historic properties would result.

Under alternative 1, interpretive messaging introduced at Tsankawi would stress the sensitivity of resources, need for protection, and historical context and traditional importance of the resources to present-day pueblo communities, particularly San Ildefonso Pueblo. Signage, furnishings, pamphlets, brochures, digital displays, and electronic downloads for handheld devices would be designed to promote a new message to "Respect this Sacred Site," with the intention of making all visitors stewards of the landscape. The proposed kiosk—which would include much of this information—would be located next to the existing visitor contact station and within proximity to the existing trailhead. Adjacent to the proposed kiosk, a cast metal scale model or planimetric view of the pueblo would be sited, which may help reinforce the Tsankawi message. As a result, visitor decisions on how to visit Tsankawi and treat the resources would be influenced by an ethic of preservation, thereby reducing the visitor-induced impacts, either inadvertent or intentional. Because new interpretive messaging would be designed to educate visitors and reinforce the message of a sensitive and living landscape, introduction of these features would result in a long-term moderate beneficial impact on archeological resources. Implementation of interpretive messaging—the amount of which would depend on the extent to which NPS goals of resource protection are being achieved—would reduce adverse impacts on historic properties. Therefore, no adverse effect to historic properties would result.

A new entry roadway from the State Road 4 and East Jemez Road intersection and on-site parking area would be implemented under this alternative. While the exact location of these features is not known at this time, the general configuration has been designed to avoid known archeological resources, and further surveys would be conducted in advance of construction to ensure that significant archeological resources are avoided. In the unlikely event that previously unknown archeological resources (e.g., subsurface artifacts or features) are encountered during construction activities, monument staff would stop work in the area of the discovery and consult with New Mexico SHPO staff and the six affiliated pueblos regarding the appropriate treatment of identified resources. Limited improvements would also be made to accommodate the reintroduction of a site steward at Tsankawi. Construction activities can occasionally result in changes to natural erosion patterns, which can impact archeological resources. This would be addressed through implementing best management practices during construction to control erosion (see "Appendix F"). Monitoring would identify any erosion problems to be addressed. Ground-disturbing activities associated with the construction of new facilities would result in permanent minor adverse impacts to archeological resources, if found, and no adverse effect on historic properties because the character-defining features of the national register-eligible resource would not be affected.

The long-term minor beneficial impact on archeological resources that would result from the presence of the site steward under the no-action alternative would also be true under alternative 1. Implementation of a guided-only trail segment under alternative 1 would introduce NPS-trained local community volunteers and/or commercial guides to Tsankawi at designated times. The

presence of monument staff or other NPS-trained local community volunteers and/or commercial guides would provide more opportunities to inform and reinforce appropriately sensitive visitor behavior and a limited degree of oversight. Trail guides would be able to monitor the condition of archeological resources and report to monument staff when impacts are observed. It is anticipated that the small increase in monument staff or other NPS-trained local community volunteers and/or commercial guides at Tsankawi would result in a long-term minor beneficial impact on archeological resources. No adverse effect on historic properties would result.

Adaptive Management Strategy. Under alternative 1, the integration of an adaptive management strategy into the resource monitoring program would allow monument staff to implement and/or adjust management strategies to better achieve desired resource conditions, as necessary, in order to help meet goals of resource and visitor use management.

Monitoring of archeological resources would occur along the guided-only trail segment and at cavates along the guided-only trail segment, ancestral hand-and-toeholds, and ancestral hand caved trails. Monitoring activities—which are slightly different at each of the abovementioned locations—included in the adaptive management strategy have identified indicators and metrics associated with each to determine if resource protection measures are being met.

Potential management strategies that may be implemented at one or more of the abovementioned locations to help preserve and protect sensitive archeological resources if it is determined that desired outcomes are not being met include:

- ensuring that all guides have current training and additional training is provided, as necessary
- revising and amplifying interpretive messaging, especially resource protection messaging in combination with reinforcing signs and barriers
- amplifying outreach and messaging to local communities of monument visitors regarding the resource protection plan and intent of changes to site access
- establishing law enforcement protocols, increasing on-site law enforcement protocols, and/or introducing regulatory messaging
- establishing seasonal standing tour times, and consider/evaluate limits on group size
- establishing a reservation system; limit overall tours of Tsankawi using monitoring to establish the level below which impacts are unacceptable (see table 1)

Desired conditions for archeological resources would demonstrate that unauthorized visitor access along the guided-only trail segment is diminished; unauthorized visitor presence within cavates is diminished to negligible; material is stable or rate of loss is negligible and biofilms have reestablished on feature surfaces of ancestral hand-and-toeholds; the current condition of the ancestral hand-carved trail system is maintained, accepting the effects of natural weathering; and unused trail segments demonstrate reestablished biofilms.

The implementation of any one or combination of the abovementioned management strategies to help preserve and protect archeological resources would raise the long-term beneficial impact on archeological resources, and would result in no adverse effect on historic properties.

Cumulative Impacts. Past, present, and reasonably foreseeable future actions in the monument and areas adjacent to Tsankawi under alternative 1 would be the same as those described for the no-action alternative. However, the proposed on-site parking area would be designed to allow for a shuttle drop-off lane near the proposed kiosk should a bus route and shuttle stop be implemented as part of the transportation plan/environmental assessment. As a result, no additional ground disturbance would be required.

Alternative 1 has been designed to reduce impacts to cultural and natural resources while enhancing visitor experience. Realignment of existing and implementation of new trails would help ensure that visitors stay on designated trails which would help preserve and protect sensitive archeological resources. Interpretive messaging would reinforce the message of a sensitive and living landscape that requires visitors to be stewards of the environment. Implementation of alternative 1 would result in long-term moderate beneficial impacts to archeological resources through the realignment of trails in sensitive areas, introduction of interpretive messaging to convey the message of a sensitive and living landscape, and implementation of an adaptive management strategy to help achieve desired conditions to protect and preserve sensitive archeological resources. Beneficial impacts associated with alternative 1, in combination with the long-term and widespread minor to moderate beneficial and permanent yet localized negligible to moderate adverse impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term moderate beneficial impact on archeological resources through increased resource protection. Beneficial impacts of alternative 1 would represent a notable share of the beneficial cumulative impact.

Conclusion. Under alternative 1, realignment of the Tsankawi Mesa Trail to a location just south of the pueblo would result in long-term moderate beneficial impacts on archeological resources because it would reduce visitor-induced impacts in this highly sensitive area. New interpretive messaging would promote an ethic of preservation. The addition of a site steward and monument staff or other NPS-trained local community volunteers and/or commercial guides leading tours along the guided-only trail segment would result in a long-term minor beneficial impact. Potential management strategies that may be implemented as part of the adaptive management strategy would be designed to help preserve and protect archeological resources and are anticipated to result in a long-term beneficial impact on archeological resources should any one or combination of thereof be implemented. Construction of new visitor and site steward facilities would result in no adverse impact. Beneficial impacts associated with alternative 1, in combination with the long-term and widespread minor to moderate beneficial impacts and permanent yet localized negligible to moderate adverse impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term moderate beneficial impact on archeological resources. Beneficial impacts of alternative 1 would represent a notable share of the beneficial cumulative impact.

Impacts of Alternative 2: Looped Entry Roadway

Analysis. The proposed trails and visitor services would be the same as under alternative 1. The difference between the two action alternatives includes the siting of the proposed trailheads, kiosk, relocated restrooms, on-site parking area, and entry roadway—all of which have been designed to avoid known archeological resources. The siting of the proposed kiosk may result in fewer visitors receiving the important message about the fragility of Tsankawi and need to be stewards of the landscape. Additional interpretive messaging may be necessary to help reinforce this message, the extent of which would be assessed as part of the resource monitoring program and adaptive management strategy.

Best management practices would be implemented during construction to control erosion, and monitoring would identify any erosional problems to be addressed (see "Appendix F"). A site steward, tours on the guided-only trail segment, and adaptive management strategy would also be implemented under this alternative. Even with the siting of the proposed kiosk located further from the main trailhead, actions implemented under alternative 2 would result in long-term moderate beneficial impacts on archeological resources because they are designed for increased resource protection and preservation and no adverse effect on historic properties.

Adaptive Management Strategy. The integration of an adaptive management strategy into the resource monitoring program would be the same as under alternative 1. This would allow monument staff to implement and/or adjust management strategies to better achieve desired resource conditions, as necessary, in order to help meet goals of resource and visitor use management.

Monitoring of archeological resources would occur along the guided-only trail segment and at cavates along the guided-only trail segment, ancestral hand-and-toeholds, and ancestral hand caved trails. Monitoring activities and potential management strategies may be implemented, as necessary, to help achieve desired conditions. Desired conditions for archeological resources would demonstrate that unauthorized visitor access along the guided-only trail segment is diminished; unauthorized visitor presence within cavates is diminished to negligible; material is stable or rate of loss is negligible and biofilms have reestablished on feature surfaces of ancestral hand-and-toeholds; the current condition of the ancestral hand-carved trail system is maintained, accepting the effects of natural weathering; and unused trail segments demonstrate reestablished biofilms.

The implementation of any one or combination of potential management strategies to help preserve and protect archeological resources would raise the long-term beneficial impact on archeological resources, and would result in no adverse effect on historic properties.

Cumulative Impacts. Past, present, and reasonably foreseeable future actions in the monument and areas adjacent to Tsankawi under alternative 2 would be the same as for the no-action alternative. However, the proposed on-site parking area would be designed to allow for a shuttle drop-off lane near the proposed kiosk should a bus route and shuttle stop be implemented as part of the transportation plan/environmental assessment. As a result, no additional ground disturbance would be required.

Alternative 2 has been designed to reduce impacts to cultural and natural resources while enhancing visitor experience. Realignment of existing and implementation of new trails would help ensure that visitors stay on designated trails, which would help preserve and protect sensitive archeological resources. Interpretive messaging would reinforce the message of a sensitive and living landscape that requires visitors to be stewards of the environment. Implementation of alternative 2 would result in long-term moderate beneficial impacts to archeological resources through the realignment of trails in sensitive areas, introduction of interpretive messaging to convey the message of a sensitive and living landscape, and implementation of an adaptive management strategy to help achieve desired conditions to protect and preserve sensitive archeological resources. Beneficial impacts associated with alternative 2, in combination with the long-term and widespread minor to moderate beneficial and permanent yet localized negligible to moderate adverse impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term moderate beneficial impact on archeological resources. Beneficial impacts of alternative 2 would represent a notable share of the beneficial cumulative impact.

Conclusion. Similar to alternative 1, realignment of the Tsankawi Mesa Trail to a location just south of the pueblo would result in a long-term moderate beneficial impact on archeological resources. Addition of a site steward and monument staff or other NPS-trained local community volunteers and/or commercial guides leading tours along the guided-only trail segment would result in a long-term minor beneficial impact. Potential management strategies that may be implemented as part of the adaptive management strategy would be designed to help preserve and protect archeological resources and are anticipated to result in a long-term beneficial impact on archeological resources should any one or combination of thereof be implemented. Construction of new visitor and site steward facilities would result in no adverse impact. Beneficial impacts associated with alternative 2, in combination with the long-term and widespread minor to moderate beneficial impacts and permanent yet localized negligible to moderate adverse impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term moderate beneficial impact on archeological resources. Beneficial impacts of alternative 2 would represent a notable share of the beneficial cumulative impact.

CULTURAL LANDSCAPES

Methods and Assumptions

The following analysis discusses the anticipated direct, indirect, and cumulative impacts of project alternatives on the cultural landscape. Potential impacts were assessed with regard to the level of anticipated disturbance or change to the significant cultural and natural features of the landscape that may result from construction activities and/or visitor use associated with the action alternatives. The analysis was based on information regarding the cultural landscape and previous disturbance provided by monument staff, and the professional judgment of subject-matter experts.

Section 106 requires federal agencies to take into account the effects of their actions on any historic property. As described in “Chapter 3: Affected Environment,” the National Park Service determined that the cultural landscape that includes all 826 acres of Tsankawi is eligible for listing on the national

register as a district, and therefore it is classified as a historic property. Adverse effects were identified through application of the section 106 Criteria of Adverse Effects. Under section 106, the types of possible adverse effects include:

- physical destruction of or damage to all or part of a property
- physical alteration of a property
- removal of a property from its historic location
- change in the character of a property's use or of physical features within a property's setting that contribute to its historic significance
- introduction of visual, atmospheric, or auditory elements that diminish the integrity of a property's significant historic features
- neglect of a property that causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance
- transfer, lease, or sale of property out of federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of a property's historic significance (36 CFR 800.5(a)(2))

NPS staff would consult with New Mexico SHPO staff on potential effects of the selected alternative on the cultural landscape, prior to initiating activities associated with that alternative. If adverse effects are anticipated, NPS staff would work with New Mexico SHPO staff and the six affiliated pueblos to develop measures to avoid, minimize, or mitigate those effects. Measures would be described in an agreement document, such as a memorandum of agreement or programmatic agreement. The agreement would be signed by the National Park Service, New Mexico State Historic Preservation Office, and, if necessary, Advisory Council on Historic Preservation. The six affiliated pueblos would be consulted on agreement development and invited to sign as concurring parties.

Study Area

The study area for the cultural landscape analysis includes all areas within Tsankawi. This study area is the same geographic area that comprises the APE for compliance with section 106. This study area also constitutes the area considered for cumulative impact analysis.

Impact Definitions

The following definitions are used to assess the intensity of beneficial and adverse impacts on the cultural landscape that may result from project alternatives and the duration at which point impacts would be either short or long term.

Negligible. The impact, either adverse or beneficial, on the cultural landscape is the lowest level of detection, barely perceptible and not measurable. The section 106 determination would be no adverse effect.

Minor Adverse Impact. Impacts to one or more character-defining (national register-contributing) landscape feature or pattern would not diminish the integrity (location, design, setting, materials, workmanship, feeling, or association) of the landscape feature or pattern. For purposes of section 106, the determination of effect would be no adverse effect.

Minor Beneficial Impact. Preservation of landscape patterns and features would be in accordance with the Secretary of the Interior's *Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes*. The section 106 determination would be no adverse effect.

Moderate Adverse Impact. Impacts would alter one or more character-defining (national register-contributing) landscape feature or pattern, diminishing the integrity (location, design, setting, materials, workmanship, feeling, or association) of the landscape feature or pattern to the extent that it would have fewer aspects of integrity. For purposes of section 106, the determination of effect would be adverse effect.

Moderate Beneficial Impact. Rehabilitation or restoration of a landscape or its patterns or features would occur in accordance with the Secretary of the Interior's *Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes*. The section 106 determination would be no adverse effect.

Major Adverse Impact. Impacts would alter one or more character-defining (national register-contributing) landscape feature or pattern, diminishing the integrity (location, design, setting, materials, workmanship, feeling, or association) of the landscape feature or pattern to the extent that it would no longer be eligible to be listed on the national register. For purposes of section 106, the determination of effect would be adverse effect.

Major Beneficial Impact. Rehabilitation or restoration of a landscape or its patterns and features would occur in accordance with the Secretary of the Interior's *Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes*. The section 106 determination would be no adverse effect.

Duration. Duration of impacts depends on the type of landscape patterns or features being impacted. Due to the nonrenewable nature of prehispanic and historic archeological resources, all adverse impacts on archeological resources are permanent. Adverse impacts on natural features of the landscape can be short term (up to 10 years) or long term (lasting beyond 10 years). Beneficial impacts on either archeological or natural resources may be short term in duration, if the effects are only sustained for up to 10 years, or long term for effects sustained for longer than 10 years.

Impacts of the No-Action Alternative

Analysis. Under the no-action alternative, visitor facilities and interpretive messaging would remain as under existing conditions. Trails and subsequently visitors would continue to traverse and cause damage to Tsankawi Pueblo and other resources. Visitor use would continue to erode and damage cavates, prehispanic trails, hand-and-toeholds, and rock art. Natural erosion of these cultural landscape features, which may be further influenced by climate change, would be exacerbated by

visitor-induced impacts. Compaction of soils from visitor foot traffic on social trails would potentially result in an associated increase in runoff and erosion. Increased soil erosion and foot traffic by visitors would result in direct vegetation losses and a decrease in the ability of soils to support native vegetation.

Interpretive messaging would remain as under existing conditions. This messaging does not inform visitors of the fragile nature of cultural and natural resources, need for resource protection, or sensitivity and significance of Tsankawi to present-day pueblo communities. Visitor decisions on how to visit Tsankawi and interact with resources would not be influenced by an ethic of preservation, and would result in continued use of social trails. The current pattern of degradation of the integrated cultural and natural resource systems in the cultural landscape would continue. These cultural and natural resources are contributing elements to the historic integrity of the national register-eligible cultural landscape. Impacts associated with visitation, erosion, and soil loss as experienced under existing conditions would continue under the no-action alternative. As a result, the no-action alternative would result in a permanent (to archeological resources) and long-term (to soils and vegetation) moderate adverse impact on the cultural landscape because important character-defining landscape features would be altered. Therefore, this would result in an adverse effect to this historic property.

Under the no-action alternative, a site steward would be located within Tsankawi to provide historical context to visitors and a limited degree of oversight. The presence of someone at the unit would help reinforce the message of a sensitive and living landscape, ensure that visitors stay on designated paths and do not harm cultural and natural resources, either inadvertently or intentionally. The site steward would also monitor the condition of the landscape, report to monument staff when impacts are observed, and help ensure that visitors do not impact the character-defining (national register-contributing) landscape features or patterns and diminish the integrity of the resource. Although the site steward(s) would not be expected to constantly be on trails, speak with all visitors, or monitor the condition of the entire landscape, the presence of a site steward(s) at Tsankawi would have a long-term minor beneficial impact on the cultural landscape because it would help reduce visitor-induced impacts on the cultural landscape through visitor education and increased awareness of the sensitivity and significance of cultural and natural resources. This would reduce some of the adverse impacts noted above. However, the cultural landscape would continue to deteriorate from visitor-induced impacts and the adverse effect on this historic property would remain.

Monument staff is in the process of implementing a resource monitoring program to document and determine the level of erosion and wear occurring to fragile archeological resources within Tsankawi from visitor use and natural erosion processes. At select areas of Tsankawi, baseline resource conditions would be documented and condition assessments conducted. Monitoring activities would help identify areas where deterioration has increased and/or those areas where deterioration has slowed due to no or little visitor impacts. While monitoring efforts would help identify the extent to which resources are being affected by visitor use and natural erosion processes, no measures or treatments would be implemented to help reduce impacts. A more comprehensive understanding as to how the character-defining (national register-contributing) landscape features or patterns are being affected would result in a long-term negligible to minor beneficial impact on the cultural

landscape because monument staff would better understand the cause of resource deterioration, which could benefit future planning efforts. The adverse effect from the no-action alternative on this historic property would remain because no measures or treatments would be implemented to protect the integrity of the cultural landscape.

Cumulative Impacts. The current fire management plan and 2013 update currently underway detail strategies and actions to be implemented to attain fire management objectives at the monument. The actions conducted in accordance with the fire management plans are and would continue to be designed and implemented to minimize undesirable impacts of fire, such as loss of vegetation and soil erosion, while attaining the objectives of improved ecosystem management. Actions identified to help ensure the safety and protection of resources and to restore and perpetuate natural processes would also benefit features of the cultural landscape. Fire prevention or the ability to limit the extent to which resources are impacted by fire would also minimize adverse impacts to the cultural landscape. Additionally, it is anticipated that avoidance of archeological and ethnographic resources is and would be conducted during implementation of these activities. Because actions associated with the fire management plans would be designed to avoid or minimize the physical destruction of or damage to all or part of the cultural landscape from fire events, these actions would result in a long-term minor beneficial impact to the cultural landscape.

Ecological restoration treatments—which were analyzed in the 2000 *Environmental Assessment Regarding the Management of the Tsankawi Unit* and *2007 Ecological Restoration Plan/Environmental Impact Statement*—were applied to all of the woodland area in Tsankawi suitable for restoration. Between fall 2007 and spring 2010, a total of 472 acres, excluding only mesa tops and adjacent steep rocky slopes, were treated. This included cutting live juniper and dead pinyon less than six to eight inches in diameter, and lopping and scattering the cut trees onto bare soil spaces between the former canopy mounds. Restoration actions are expected to mitigate accelerated soil erosion and the grounds ability to support native vegetation. The cultural landscape would benefit through restoration of native vegetation and preservation of cultural resources. Observations at five years post-treatment suggest the response to restoration at Tsankawi is generally robust and comparable to other restoration locations with monitoring data. Data from those other locations have documented several-fold increases in understory cover and one-two fold reductions in runoff and sediment loss. Efforts undertaken as part of the restoration treatment are anticipated to continue to provide long-term minor to moderate beneficial impact to the cultural landscape.

The transportation plan/environmental assessment currently being prepared will evaluate a number of actions and may ultimately include improvements to parking, road, and trail infrastructure. It is anticipated that the majority of activities recommended as part of this plan would be located in the main unit of the monument and would not affect the cultural landscape within Tsankawi. Potential actions at Tsankawi may include a bus route and shuttle stop. Existing access to Tsankawi via the roadside parking area would require that the shuttle stop be located outside of the cultural landscape. While visible from limited areas within Tsankawi, the introduction of a shuttle stop would not diminish the overall integrity of the cultural landscape. Additionally, any furnishings introduced to the area to support a shuttle stop would be designed to fit harmoniously and unobtrusively into the surrounding environment. Because no character-defining features would be affected, impacts

would be long-term but localized negligible and adverse. No adverse impact to the historic property would result.

Proposed interim improvements to the existing roadside parking area would be limited to previously disturbed areas. Identified improvements would include the siting of a crashworthy barrier system adjacent to the existing paved shoulder. New material introduced to the area to support these improvements—which would be located on DOE lands—would be limited and no ground-disturbing activities would occur. The widening of State Road 4 would have the potential to adversely impact the cultural landscape if the project extends into Tsankawi. However, it is anticipated that the widening would be limited to lands currently under the auspices of the Department of Energy and would not intrude into the setting of and therefore not diminish the overall integrity of the cultural landscape. Both the proposed interim improvements and potential widening of State Road 4 would be located on lands outside the Tsankawi cultural landscape and would only be visible from limited locations from within Tsankawi. These actions would not change the character or introduce new visual elements that would diminish the integrity of the Tsankawi cultural landscape. As a result, these actions would not diminish the overall integrity of the landscape; impacts would be long-term localized and negligible to minor. No adverse impact to the historic property would result.

As described above, implementation of the no-action alternative would result in long-term to permanent moderate adverse impacts because visitor facilities and interpretive messaging would remain as under existing conditions and the current pattern of degradation of the integrated cultural and natural resource systems in the cultural landscape would continue. The fire management plan would have long-term widespread minor beneficial impacts, ecological restoration efforts would have long-term widespread minor to moderate beneficial impacts, and the various transportation-related activities could have long-term localized negligible to minor adverse impacts. Adverse impacts associated with the no-action alternative, in combination with the long-term and widespread minor to moderate beneficial impacts and long-term yet localized negligible to minor adverse impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term minor beneficial impact on the cultural landscape. Adverse impacts of the no-action alternative would reduce the overall benefit of the cumulative impact.

Conclusion. Under the no-action alternative, visitor facilities and interpretive messaging would remain as under existing conditions and the current pattern of degradation of the integrated cultural and natural resource systems in the cultural landscape would continue. As a result, the no-action alternative would result in a long-term to permanent moderate adverse impact. The reintroduction of a site steward(s) to provide historic context and a limited degree of oversight would result in a minimal reduction in this impact. Adverse impacts associated with the no-action alternative, in combination with the long-term and widespread minor to moderate beneficial impacts and long-term yet localized negligible to minor adverse impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term minor beneficial impact on the cultural landscape. Adverse impacts of the no-action alternative would reduce the overall benefit of the cumulative impact.

Impacts of Alternative 1: Two-Directional Entry Roadway (Preferred Alternative)

Analysis. Under alternative 1, modification of existing and implementation of new trails would occur. New interpretive messaging would also be introduced to the unit. Trail modifications would include the closure of social trails, reroute of the existing Tsankawi Mesa Trail south of Tsankawi Pueblo, conversion of the current return section of the Tsankawi Mesa Trail to a guided-only trail segment, construction of the ABA Walk with the trailhead being located near existing and proposed visitor facilities, addition of a new trail to Duchess Castle, and a possible future connector route from the new Duchess Castle Trail to Tsankawi Mesa if resource conditions are being met and there is sufficient visitor demand. New trails would be designed to avoid disturbance to archeological resources. Visitor impacts from damage, wear, and trampling to archeological resources, soils, and vegetation would be greatly reduced. Because the realignment of existing and introduction of new trails would help minimize the physical destruction of or damage to the cultural landscape and preserve the features that contribute to the historic integrity of the national register-eligible cultural landscape, a long-term moderate beneficial impact would result. No adverse effect would occur.

New trails, defining features to control visitor movement, and interpretive messaging would be designed to be compatible with the Tsankawi setting, using natural materials that fit unobtrusively into the existing landscape. Interpretive messaging—which would be small in size but large enough to convey the Tsankawi message and designed to fit harmoniously into the landscape to the greatest extent feasible—would blend with the scale, color, texture, nonreflectivity, and natural materials established by native vegetation and geology that are character-defining features of the cultural landscape. Local stone and uncoated natural wood would be used to the extent feasible. By integrating new trails, features, and messaging into the landscape in such a way as to minimize their intrusion into the setting, the overall integrity of the landscape would not be diminished. Therefore, these actions would result in a long-term minor adverse impact and no adverse effect to this historic property.

Abandoned trails would be obscured and rehabilitated to a natural state. Locally collected natural materials would be used to obscure the visual intrusion of social trails and trampling of off-trail areas. These changes would reduce visitor-induced impacts on cultural and natural resources through wear and damage, minimize the contribution of visitation to natural erosion processes and impacts to native vegetation, and preserve these important elements of the cultural landscape. These protective actions would result in a long-term moderate beneficial impact to the national register-eligible cultural landscape. Therefore, no adverse effect to this historic property would result.

Under alternative 1, interpretive messaging introduced to the site would stress the sensitivity of resources, need for protection, and historical context and traditional importance of the resources to present-day pueblo communities, particularly San Ildefonso Pueblo. Signage, furnishings, pamphlets, brochures, digital displays, and electronic downloads for handheld devices would be designed to promote a new message to "Respect this Sacred Site," with the intention of making all visitors stewards of the landscape. The proposed kiosk—which would include much of this information—would be sited adjacent to the existing visitor contact station and within proximity to the existing trailhead. Adjacent to the proposed kiosk, a cast metal scale model or planimetric view of the pueblo would be sited, which may help reinforce the Tsankawi message. As a result, visitor decisions on how

to visit Tsankawi and treat the resources would be influenced by an ethic of preservation, thereby reducing visitor-induced impacts, either inadvertent or intentional. New interpretive messaging informing visitors of the sensitivity and significance of Tsankawi and appropriately sensitive visitor behavior to help preserve and protect resources would result in a long-term minor beneficial impact on character-defining features that contribute to the cultural landscape. Therefore, no adverse effect on this historic property would result.

A new entry roadway from the State Road 4 and East Jemez Road intersection and on-site parking area would be implemented under this alternative. Improvements would also be made for housing of a site steward at Tsankawi. The construction and operation of these manmade features could have an impact on the archeological and natural settings of the cultural landscape, which are considered to be contributing elements necessary to retain the historic integrity of the landscape. To address this potential impact, new surfaces would be selected to blend into the landscape to the greatest extent feasible, with colors chosen to avoid contrast with adjacent soils and vegetation. Sufficient existing vegetation, such as trees, would be maintained to shield the view of new features and structures from trails and other locations within Tsankawi. The proposed 150 square foot kiosk would be located next to the existing visitor contact station and designed to be lower than the 15 foot height of surrounding junipers. Naturally occurring colors and nonreflective materials would be used in its construction.

New facilities would be sited and construction staging areas would be located to avoid known archeological resources, and further surveys would be conducted in advance of construction to ensure that significant archeological resources are avoided. In the unlikely event that previously unknown archeological resources (e.g., subsurface artifacts or features) are encountered during construction activities, monument staff would stop work in the area of the discovery and consult with New Mexico SHPO staff and the six affiliated pueblos regarding appropriate treatment of identified resources. A small vegetated area would be replaced with an impermeable surface; however, those areas only used for construction staging would be reseeded with native species once construction activities are complete. During construction activities, best management practices would be implemented to control erosion, and monitoring would identify any erosional problems to be addressed (see "Appendix F"). With these parameters in place, the construction and presence of the new site features would not diminish the overall integrity of this historic property, thereby resulting in no more than a permanent minor adverse impact to the cultural landscape and no adverse effect on this historic property.

Under alternative 1, a site steward would be reintroduced within Tsankawi. The long-term minor beneficial impact on the cultural landscape that would result from the presence of the site steward providing historic context to visitors and a limited degree of oversight under the no-action alternative would also be true under alternative 1. In addition, the implementation of the guided-only trail segment under alternative 1 would introduce monument staff or other NPS-trained local community volunteers and/or commercial guides to Tsankawi at designated times. The presence of monument staff or other NPS-trained local community volunteers and/or commercial guides would provide an additional opportunity to inform and reinforce appropriately sensitive visitor behavior and provide a limited degree of oversight. Trail guides would also be able to monitor the condition of cultural and natural resources and report to monument staff when impacts are observed. It is

anticipated that the increased presence of monument staff or other NPS-trained local community volunteers and/or commercial guides would be limited and therefore would result in a long-term minor beneficial impact to the cultural landscape. No adverse effect would result.

Adaptive Management Strategy. Under alternative 1, the integration of an adaptive management strategy into the resource monitoring program would allow monument staff to implement and/or adjust management strategies to better achieve desired resource conditions, as necessary, in order to help meet goals of resource and visitor use management.

The 2005 Cultural Landscape Inventory identifies several key contributing landscape elements that need to be preserved in order to retain Tsankawi's historic integrity, including but not limited to: masonry pueblos, cavates, and incised trails clustered on mesa tops and south slopes; Duchess Castle and the underlying "Little Tsankawi" pueblo; petroglyphs, rock features, and pottery shards and lithics, among others; and native vegetation communities (see "Chapter 3: Affected Environment"). As a result, potential management strategies would be designed to help preserve and protect archeological resources and support appropriately sensitive visitor behavior that would minimize impacts to natural resources, all of which would benefit the cultural landscape and preserve the features that contribute to the historic integrity of the national register-eligible cultural landscape.

Because archeological resources are features contributing to the historic integrity of the national register-eligible cultural landscape, resource monitoring, indicators, metrics, and potential management strategies identified as part of the adaptive management strategy are the same as those described above for archeological resources.

Desired conditions for archeological resources would demonstrate that unauthorized visitor access along the guided-only trail segment is diminished; unauthorized visitor presence within cavates is diminished to negligible; material is stable or rate of loss is negligible and biofilms have reestablished on feature surfaces of ancestral hand-and-toeholds; the current condition of the ancestral hand-carved trail system is maintained, accepting the effects of natural weathering; and unused trail segments demonstrate reestablished biofilms. Achieving desired conditions for archeological resources would help preserve some of the features that contribute to the historic integrity of the national register-eligible cultural landscape. Additional interpretive messaging that may be implemented to help preserve and protect archeological resources would be designed to be compatible with the Tsankawi setting, using natural materials that fit unobtrusively into the existing landscape.

In order to help segregate effects of weathering and climate change from those of visitation, monitoring activities would help determine if additional management strategies would be necessary to help protect the cultural landscape. In areas with little to no visitation and those where visitation is concentrated, monitoring of standing masonry and cavates would help determine the cause of deteriorating resource conditions. Where visitation is concentrated, potential management strategies may include reducing visitation in areas where standing masonry has collapsed and redirecting water to drainage routes that avoid cavate openings. Care would be taken to ensure that the redirecting of water does not affect other features that contribute to the cultural landscape.

Also in areas of concentrated visitation, accelerated erosion and rock fall may indicate that additional minor trail improvements may be necessary to ensure visitor and monument staff safety. In these areas, visitors may use or create social trails in order to avoid areas that are viewed as unsafe. The implementation of additional minor trail improvements and/or other management strategies designed to encourage visitors to stay within designated trails would help preserve features that contribute to the historic integrity of the national register-eligible cultural landscape. Trail improvements would be integrated into the landscape in such a way as to minimize their intrusion into the setting.

Monitoring of vegetation conditions alongside trails would identify signs of trampling and off-trail movement by visitors. Should the loss of vegetation density and vigor demonstrate that desired outcomes are not being met, additional management strategies may be implemented. Potential management strategies include reclaiming social trails with available on-site organic material, revising or amplifying interpretive and resource protection messaging, and/or increasing the definition of trail edges.

Under the resource monitoring program and adaptive management strategy, if desired resource conditions are being met and visitor surveys indicate there is sufficient demand, a connector route from Tsankawi Mesa to Duchess Castle may be implemented. The trail's defining features to control visitor movement and interpretive messaging would be designed to be compatible with the Tsankawi setting, using natural materials that fit unobtrusively into the existing landscape. The implementation of this trail with features and messaging that would result in minimal intrusion into the setting would not diminish the overall integrity of the landscape.

The implementation of any one or combination of these management strategies is anticipated to help preserve and protect archeological resources, to minimize the physical destruction of or damage to the cultural landscape, and to preserve the features that contribute to the historic integrity of the national register-eligible cultural landscape. No adverse effect on historic properties would result.

Cumulative Impacts. Past, present, and reasonably foreseeable future actions in the monument and areas adjacent to Tsankawi under alternative 1 would be the same as those described for the no-action alternative. However, the proposed on-site parking area would be designed to allow for a shuttle drop-off lane near the proposed kiosk should a bus route and shuttle stop be implemented as part of the transportation plan/environmental assessment. As a result, no additional ground disturbance would be required. Any signage or furnishings introduced to support a shuttle stop would be minimal and made of materials that fit harmoniously and unobtrusively into the cultural landscape. Impacts would be long-term localized negligible adverse. No adverse impact to the historic property would result.

Alternative 1 has been designed to reduce impacts to cultural and natural resources while enhancing visitor experience. Realignment of existing and implementation of new trails would help ensure that visitors stay on designated trails which would help preserve and protect sensitive resources that contribute to the historic integrity of the national register-eligible cultural landscape. Interpretive messaging would reinforce the message of a sensitive and living landscape that requires visitors to be stewards of the environment. Implementation of alternative 1 would result in long-term moderate

beneficial impacts to the cultural landscape. Beneficial impacts associated with alternative 1, in combination with the long-term and widespread minor to moderate beneficial impacts and long-term yet localized negligible to minor adverse impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term moderate beneficial impact on the cultural landscape. Beneficial impacts of alternative 1 would represent a notable share of the beneficial cumulative impact.

Conclusion. Under alternative 1, changes to the trail system would result in long-term moderate beneficial impacts on the cultural landscape. New interpretive messaging, which would promote an ethic of cultural and natural resource preservation, and addition of a site steward, monument staff or other NPS-trained local community volunteers and/or commercial guides leading tours along the guided-only trail segment would result in a long-term moderate beneficial impact. Potential management strategies that may be implemented as part of the adaptive management strategy would be designed to help preserve and protect cultural and natural resources that contribute to the cultural landscape and are anticipated to result in a long-term beneficial impact on the cultural landscape should any one or combination of thereof be implemented. Construction and presence of new facilities into the setting would result in a minor adverse impact on the setting of the cultural landscape. Overall, alternative 1 would result in a long-term moderate beneficial impact on the cultural landscape. Beneficial impacts associated with alternative 1, in combination with the long-term and widespread minor to moderate beneficial impacts and long-term yet localized negligible to minor adverse impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term moderate beneficial impact on the cultural landscape. Beneficial impacts of alternative 1 would represent a notable share of the beneficial cumulative impact. Overall, alternative 1 would result in no adverse effect.

Impacts of Alternative 2: Looped Entry Roadway

Analysis. The proposed trails and visitor services would be the same as under alternative 1. The difference between the two action alternatives includes the siting of the proposed trailheads, kiosk and relocated restrooms, on-site parking area, and entry roadway—all of which have been designed to avoid known archeological and ethnographic resources. Best management practices would be implemented during construction activities to control erosion, and monitoring would identify any erosional problems to be addressed. Vegetation would be replaced in areas used for construction staging (see "Appendix F"). A site steward, monument staff or other NPS-trained local community volunteers and/or commercial guides leading tours on the guided-only trail segment, and integration of an adaptive management strategy into the resource monitoring program would also be implemented.

As discussed above, these actions together under alternative 2 would result in long-term moderate beneficial impacts on the character-defining cultural and natural resources of the cultural landscape and no adverse effect to this historic property. Similar to alternative 1, construction and the addition of facilities or features would be controlled by parameters for construction materials and design that would protect the landscape setting and views. Even with these parameters in place, construction and presence of new facilities under alternative 2 would result in no more than a permanent minor adverse impact to the cultural landscape setting and no adverse effect on this historic property.

Adaptive Management Strategy. The integration of an adaptive management strategy into the resource monitoring program would be the same as under alternative 1. This would allow monument staff to implement and/or adjust management strategies to better achieve desired resource conditions, as necessary, in order to help meet goals of resource and visitor use management.

Desired conditions for archeological resources would demonstrate that unauthorized visitor access along the guided-only trail segment is diminished; unauthorized visitor presence within cavates is diminished to negligible; material is stable or rate of loss is negligible and biofilms have reestablished on feature surfaces of ancestral hand-and-toeholds; the current condition of the ancestral hand-carved trail system is maintained, accepting the effects of natural weathering; and unused trail segments demonstrate reestablished biofilms. Achieving desired conditions for archeological resources would help preserve some of the features that contribute to the historic integrity of the national register-eligible cultural landscape. Additional interpretive messaging that may be implemented to help preserve and protect archeological resources would be designed to be compatible with the Tsankawi setting, using natural materials that fit unobtrusively into the existing landscape.

In order to help segregate effects of weathering and climate change from those of visitation, monitoring activities would help determine if additional management strategies would be necessary to help protect the cultural landscape. In areas where visitation is concentrated and resources demonstrate deteriorating conditions, management strategies may be implemented to help protect the cultural landscape. Potential management strategies may include reducing visitation in areas where standing masonry has collapsed; redirecting water to drainage routes that avoid cavate openings where water intrusion has been demonstrated; implementing minor trail revisions where soils are showing signs of accelerated erosion and rock fall; and/or reclaiming social trails with available on-site organic material, revising or amplifying interpretive and resource protection messaging, and/or increasing the definition of trail edges in areas showing signs of trampling and off-trail movement by visitors. The introduction of new manmade features into the landscape would be designed to be compatible with the Tsankawi setting, using natural materials that fit unobtrusively into the existing landscape.

Under the resource monitoring program and adaptive management strategy, if desired resource conditions are being met and visitor surveys indicate there is sufficient demand, a connector route from Tsankawi Mesa to Duchess Castle may be implemented. The trail's defining features to control visitor movement and interpretive messaging would be designed to be compatible with the Tsankawi setting, using natural materials that fit unobtrusively into the existing landscape. The implementation of this trail with features and messaging that would result in minimal intrusion into the setting would not diminish the overall integrity of the landscape.

The implementation of any one or combination of these management strategies is anticipated to help preserve and protect archeological resources, to minimize the physical destruction of or damage to the cultural landscape, and to preserve the features that contribute to the historic integrity of the national register-eligible cultural landscape. No adverse effect on historic properties would result.

Cumulative Impacts. Past, present, and reasonably foreseeable future actions in the monument and areas adjacent to Tsankawi under alternative 2 would be the same as those described for the no-action alternative. However, the proposed on-site parking area would be designed to allow for a shuttle drop-off lane near the proposed kiosk should a bus route and shuttle stop be implemented as part of the transportation plan/environmental assessment. As a result, no additional ground disturbance would be required. Any signage or furnishings introduced to support a shuttle stop would be minimal and made of materials that fit harmoniously and unobtrusively into the cultural landscape. Impacts would be long-term localized negligible adverse. No adverse impact to the historic property would result.

Alternative 2 has been designed to reduce impacts to cultural and natural resources while enhancing visitor experience. Realignment of existing and implementation of new trails would help ensure that visitors stay on designated trails, which would help preserve and protect sensitive resources that contribute to the historic integrity of the national register-eligible cultural landscape. Interpretive messaging would reinforce the message of a sensitive and living landscape that requires visitors to be stewards of the environment. Implementation of alternative 2 would result in long-term moderate beneficial impacts to the cultural landscape. Beneficial impacts associated with alternative 2, in combination with the long-term and widespread minor to moderate beneficial impacts and long-term yet localized negligible to minor adverse impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term moderate beneficial impact on the cultural landscape. Beneficial impacts of alternative 2 would represent a notable share of the beneficial cumulative impact.

Conclusion. Under alternative 2, changes to the trail system would result in long-term moderate beneficial impacts on the cultural landscape. New interpretive messaging, which would promote an ethic of cultural and natural resource preservation, and addition of a site steward, monument staff or other NPS-trained local community volunteers and/or commercial guides leading tours along the guided-only trail segment would result in a long-term moderate beneficial impact. Potential management strategies that may be implemented as part of the adaptive management strategy would be designed to help preserve and protect cultural and natural resources that contribute to the cultural landscape and are anticipated to result in a long-term beneficial impact on the cultural landscape should any one or combination of thereof be implemented. Construction and presence of new facilities into the setting would result in a minor adverse impact on the setting of the cultural landscape. Overall, alternative 2 would result in a long-term moderate beneficial impact on the cultural landscape. Beneficial impacts associated with alternative 2, in combination with the long-term and widespread minor to moderate beneficial impacts and long-term yet localized negligible to minor adverse impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term moderate beneficial impact on the cultural landscape. Beneficial impacts of alternative 2 would represent a notable share of the beneficial cumulative impact. Overall, alternative 2 would result in no adverse effect.

ETHNOGRAPHIC RESOURCES

Methods and Assumptions

Due to the nature of ethnographic resources and other culturally sensitive areas within Tsankawi, and the concerns of the affiliated pueblos that information about these resources not be revealed to the general public, the impact analysis presented here is more qualitative in nature, and does not identify specific resources. The following analysis discusses the anticipated impacts of project alternatives on ethnographic resources, which can include both archeological and natural resources. Potential impacts were assessed based on the level of anticipated disturbance to the physical integrity of ethnographic resources, and changes in access to or use of such resources by pueblo members, that may result from construction activities and/or visitor use. The analysis is based on information about resources and previous disturbance provided by monument staff, and the professional judgment of subject-matter experts.

As described in "Chapter 3: Affected Environment," no ethnographic resources within Tsankawi have been or will be evaluated for eligibility for the national register as traditional cultural properties. As a result, an assessment of effect to historic properties under section 106 is not presented in this analysis. While there are no ethnographic historic properties within Tsankawi, the section 106 Criteria of Adverse Effects still provide a comprehensive list of types of potential adverse impacts that are applicable to ethnographic resources. These criteria are used in this analysis and include:

- physical destruction of or damage to all or part of a property
- physical alteration of a property
- removal of a property from its historic location
- change in the character of a property's use or of physical features within a property's setting that contribute to its historic significance
- introduction of visual, atmospheric, or auditory elements that diminish the integrity of a property's significant historic features
- neglect of a property that causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance
- transfer, lease, or sale of property out of federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of a property's historic significance (36 CFR 800.5(a)(2))

NPS staff would rely on continued communication and consultation with the six affiliated pueblos regarding the selected alternative, seeking their advice and recommendations to ensure that any potential impacts on the integrity of or access to ethnographic resources would be avoided, minimized, or mitigated. The National Park Service is committed to working with tribal communities regarding the protection of these places to help preserve a traditional way of life.

Study Area

The study area for the ethnographic resources analysis includes all areas within Tsankawi. This study area also constitutes the area considered for cumulative impact analysis.

Impact Definitions

The following definitions are used to assess the intensity of beneficial and adverse impacts on ethnographic resources that may result from the project alternatives and the duration at which point impacts would be either short or long term.

Negligible. The impact, either adverse or beneficial, would be barely perceptible and would neither alter resource conditions nor the relationship between the resource and the affiliated group's beliefs and practices. There would be no change to a group's beliefs and practices.

Minor Adverse Impact. The impact would be slight but noticeable and would neither appreciably alter resource conditions nor the relationship between the resource and the affiliated group's beliefs or practices.

Minor Beneficial Impact. The action would allow resources to be preserved in their natural state.

Moderate Adverse Impact. The impact would be apparent and would alter resource conditions. The alternative would not result in a significant loss so as to have a major impact on the affiliated group's cultural beliefs or practices; however, it would require a change in the group's behavior with regard to traditional activities and practices.

Moderate Beneficial Impact. The action would allow resources to be preserved in their natural state and would facilitate retention of the affiliated community's cultural beliefs or continuance of ongoing traditional activities and practices.

Major Adverse Impact. The impact would alter resource conditions. The alternative would result in the disturbance or loss of the ethnographic resources and would have a substantial effect on the affiliated group's ability to access or use these resources, resulting in an inability to participate in their cultural beliefs and practices. This has the potential to result in affects to the affiliated group's cultural identity.

Major Beneficial Impact. The action would result in active intervention to preserve resources and would result in restoration of jeopardized beliefs or traditional activities and practices of an affiliated community.

Duration. Adverse and beneficial impacts may be short term in duration if the effects are only sustained for up to 10 years. Long-term adverse and beneficial impacts are those sustained for greater than 10 years. Due to the nonrenewable nature of many ethnographic resources, some adverse impacts on ethnographic resources are permanent.

Impacts of the No-Action Alternative

Analysis. Under the no-action alternative, visitor facilities and interpretive messaging would remain as under existing conditions. Trails and subsequently visitors would continue to traverse and cause damage to Tsankawi Pueblo and other resources. Visitor use would continue to erode and damage cavates, prehispanic trails, hand-and-toeholds, and rock art. Natural erosion of these resources, which may be further influenced by climate change, would be exacerbated by visitor-induced impacts. Compaction of soils from visitor foot traffic on social trails would potentially result in an associated increase in runoff and erosion. The rate of erosion would increase appreciably and spread over a relatively wide area over time, causing damage to ethnographic resources.

Interpretive messaging would remain as under existing conditions. This messaging does not inform visitors of the fragile nature of the area's ethnographic resources (both archeological and natural), need for resource protection, and sensitivity and significance of Tsankawi to present-day pueblo communities, particularly San Ildefonso Pueblo. As a result, visitor decisions on how to visit Tsankawi and treat the resources would not be influenced by an ethic of preservation, and would result in continued use of social trails. The current pattern of degradation of archeological resources would continue. Increased soil erosion and trampling by visitors would result in direct vegetation losses and a decrease in the ability of soils to support native vegetation. Impacts associated with visitation, erosion, and soil loss as experienced under existing conditions would continue under the no-action alternative. As a result, the no-action alternative would result in a permanent (to archeological resources) and long-term (to soils and vegetation) moderate adverse impact on potential ethnographic resources and on the affiliated group's ability to use these resources. Damage to archeological and natural resources would likely result in a change in some of the affiliated group's cultural beliefs and practices, and subsequently result in potential adverse impacts on their cultural identity.

Access to Tsankawi would continue as under existing conditions. Pueblo members conducting ceremonies or other activities at ethnographic resources within Tsankawi would have no way to ensure privacy or solitude for these activities. Members would be required to alter the conduct of these activities to ensure they are not observed by the public. Because the no-action alternative limits the affiliated group's behavior with regard to traditional activities and practices, this would result in a long-term moderate adverse on ethnographic resources.

Under the no-action alternative, a site steward would be located within Tsankawi to provide historical context to visitors and a limited degree of oversight. The presence of someone within Tsankawi to monitor visitors would help ensure that visitors stay on designated paths and do not harm cultural and natural resources, either inadvertently or intentionally. However, the site steward(s) would not be expected to constantly be on trails or speak with all visitors. Introduction of a site steward would have a long-term minor beneficial impact because it would help reduce visitor-induced impacts through visitor education and increased awareness of the sensitivity and significance of the resources. This would reduce some of the adverse impacts noted above.

Monument staff is in the process of implementing a resource monitoring program to document and determine the level of erosion and wear occurring to fragile cultural and natural resources within

Tsankawi from visitor use and natural erosion processes. At select areas of Tsankawi, baseline resource conditions would be documented and condition assessments conducted. Monitoring activities would help identify areas where deterioration has increased and/or those areas where deterioration has slowed due to no or little visitor impacts. While monitoring efforts would help identify the extent to which resources are being affected by visitor use and natural erosion processes, no measures or treatments would be implemented to help reduce impacts. A more comprehensive understanding as to how resources are being affected would result in a long-term negligible to minor beneficial impact on ethnographic resources because monument staff would better understand the cause of resource deterioration, which could benefit future planning efforts. The adverse effect from the no-action alternative on ethnographic resources would remain.

Cumulative Impacts. The current fire management plan and 2013 update currently underway detail strategies and actions to be implemented to attain fire management objectives at the monument. The actions conducted in accordance with the fire management plans are and would continue to be designed and implemented to minimize undesirable impacts of fire, such as loss of vegetation and soil erosion, while attaining the objectives of improved ecosystem management. It is anticipated that avoidance of ethnographic resources is and would be conducted during implementation of these activities. The resulting improved ecosystem benefits the condition of ethnographic resources by implementing actions designed to mitigate accelerated soil erosion and maintaining intact archeological resources and healthy vegetation communities. The actions associated with the fire management plans would result in a long-term minor beneficial impact to ethnographic resources.

Ecological restoration treatments—which were analyzed in the 2000 *Environmental Assessment Regarding the Management of the Tsankawi Unit* and *2007 Ecological Restoration Plan/Environmental Impact Statement*—were applied to all of the woodland area in Tsankawi suitable for restoration. Between fall 2007 and spring 2010, a total of 472 acres, excluding only mesa tops and adjacent steep rocky slopes, were treated. This included cutting live juniper and dead pinyon less than six to eight inches in diameter, and lopping and scattering the cut trees onto bare soil spaces between the former canopy mounds. Restoration actions are expected to mitigate accelerated soil erosion and the grounds ability to support native vegetation. Observations at five years post-treatment suggest the response to restoration at Tsankawi is generally robust and comparable to other restoration locations with monitoring data. Data from those other locations have documented several-fold increases in understory cover and one-two fold reductions in runoff and sediment loss. The resulting improved ecosystem benefits the condition of ethnographic resources by reducing erosion and maintaining healthy vegetation communities. Restoration efforts would result in a long-term minor to moderate beneficial impact to ethnographic resources.

The transportation plan/environmental assessment currently being prepared will evaluate a number of actions and may ultimately include improvements to parking, road, and trail infrastructure. It is anticipated that the majority of activities recommended as part of this plan would be located in the main unit of the monument and would not affect ethnographic resources within Tsankawi. Potential actions at Tsankawi may include a bus route and shuttle stop. Access to Tsankawi via the existing roadside parking area would require that the shuttle stop be located outside Tsankawi. As a result, it is not anticipated that this action would result in the physical destruction, damage, or alteration of ethnographic resources or a change in some of the affiliated group's cultural beliefs and practices.

Therefore, no change in the affiliated group's cultural identity is anticipated, and no adverse impact to ethnographic resources would result.

Proposed interim improvements to the existing roadside parking area would be limited to previously disturbed areas. Identified improvements would include the siting of a crashworthy barrier system adjacent to the existing paved shoulder. New material introduced to the area to support these improvements would be limited, and no ground-disturbing activities would occur. Through ground-disturbing activities, the widening of State Road 4 would have the potential to adversely impact ethnographic resources if the project extends into Tsankawi. However, it is anticipated that the widening would be limited to lands currently under the auspices of the Department of Energy; would not affect lands within Tsankawi; and would not affect the affiliated group's cultural beliefs, practices, or identity. No adverse impacts to ethnographic resources would result.

As described above, implementation of the no-action alternative would result in long-term to permanent moderate adverse impacts to ethnographic resources because visitor facilities and interpretive messaging would remain as under existing conditions and the current pattern of degradation of the integrated cultural and natural resource systems would continue. The fire management plan would have long-term widespread minor beneficial impacts, ecological restoration efforts would have long-term widespread minor to moderate beneficial impacts, and the various transportation-related activities are not anticipated to result in adverse impacts. Adverse impacts associated with the no-action alternative, in combination with the long-term and widespread minor to moderate beneficial impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term minor beneficial impact on ethnographic resources. Adverse impacts of the no-action alternative would reduce the overall benefit of the cumulative impact.

Conclusion. Under the no-action alternative, maintaining existing visitor facilities and interpretive messaging as under existing conditions would result in a long-term to permanent moderate adverse impact on ethnographic resources because the current pattern of degradation of the integrated cultural and natural resource systems would continue. The reintroduction of a site steward(s) to provide historic context to visitors and a limited degree of oversight would result in a minimal reduction in this impact. Adverse impacts associated with the no-action alternative, in combination with the long-term and widespread minor to moderate beneficial impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term minor beneficial impact on ethnographic resources. Adverse impacts of the no-action alternative would reduce the overall benefit of the cumulative impact. Overall, the no-action alternative would result in an adverse impact on ethnographic resources and on the affiliated group's cultural beliefs, practices, and identity.

Impacts of Alternative 1: Two-Directional Entry Roadway (Preferred Alternative)

Analysis. Under alternative 1, modification of existing and introduction of new trails would occur. New interpretive messaging would also be introduced to the unit. Trail modifications would include closure of social trails, reroute of the existing Tsankawi Mesa Trail south of Tsankawi Pueblo, conversion of the current return section of the Tsankawi Mesa Trail to a guided-only trail segment, construction of the ABA Walk with the trailhead sited near existing and proposed visitor facilities, a

new trail to Duchess Castle, and a possible future connector route from the new Duchess Castle Trail to Tsankawi Mesa if resource conditions are met and with sufficient visitor demand.

Abandoned trails would be obscured and rehabilitated to a natural state. New trails would be designed to avoid disturbance to archeological resources. A "Stay on Trails" message would be conveyed through signage at various locations along trails, and would be constructed of natural materials or materials that fit unobtrusively into the setting. These changes would reduce the impacts caused by visitors to sensitive ethnographic resources through wear and damage, minimize the contribution of visitors to natural erosion and impacts to native vegetation, and preserve these ethnographic resources, while minimizing visual intrusion into the natural setting. These protective actions would result in a long-term moderate beneficial impact on the ethnographic resources. Preservation of these archeological and natural resources would likely facilitate participation in some of the affiliated group's cultural beliefs and practices, and subsequently result in potential strengthening of the affiliated group's cultural identity.

Under alternative 1, interpretive messaging introduced to Tsankawi would stress the sensitivity of resources, need for protection, and historical context and traditional importance of ethnographic resources to present-day pueblo communities, particularly San Ildefonso Pueblo. Signage, furnishings, pamphlets, brochures, digital displays, and electronic downloads for handheld devices would be designed to promote a new message to "Respect this Sacred Site," with the intention of making all visitors stewards of the landscape. The proposed kiosk—which would include much of this information—would be located next to the existing visitor contact station and near the main trailhead. Adjacent to the proposed kiosk, a cast metal scale model or planimetric view of the pueblo would be sited, which may help reinforce the Tsankawi message. As a result, visitor decisions on how to visit the unit and treat ethnographic resources would be influenced by an ethic of preservation, thereby reducing the visitor-induced impacts, either inadvertent or intentional. Through the reduction of visitor-induced impacts, new interpretive messaging would result in a long-term moderate beneficial impact on ethnographic resources, and facilitation of the affiliated group's cultural beliefs and practices.

A new entry roadway from the State Road 4 and East Jemez Road intersection and new on-site parking area would be implemented under this alternative. Improvements would also be made for housing of a site steward at Tsankawi. The construction and operation of these manmade features could have an impact on the visual setting of ethnographic resources. To address this potential impact, new surfaces would be selected to blend into the landscape to the greatest extent feasible, with colors chosen to avoid contrast with adjacent soils and vegetation. Sufficient existing vegetation, such as trees, would be maintained to shield the view of new features and structures from trails and other locations within Tsankawi. The proposed 150 square-foot kiosk would be sited adjacent to the existing visitor contact station and designed to be lower than the 15-foot height of surrounding junipers. Naturally occurring colors and nonreflective materials would be used in its construction (see "Appendix F"). Noise from construction activities would be intrusive to the setting, but this intrusion would be short-term, lasting only during construction activities.

New facilities would be sited and construction staging areas would be located to avoid known archeological resources, and additional surveys would be conducted in advance of construction to

ensure that significant archeological resources are avoided. In the unlikely event that previously unknown archeological resources (e.g., subsurface artifacts or features) are encountered during construction activities, monument staff would stop work in the area of the discovery and consult with New Mexico SHPO staff and the six affiliated pueblos regarding appropriate treatment of identified resources. A small vegetated area would be replaced with an impermeable surface; however, those areas only used for construction staging would be reseeded with native species once construction activities are complete. During construction activities, best management practices would be implemented to control erosion, and monitoring would identify any erosional problems to be addressed (see "Appendix F"). With these parameters in place, potential impacts to the physical integrity of ethnographic resources, as well as intrusions into the setting of these resources, would be minimized. The presence of new facilities would result in a long-term minor adverse impact on the setting of ethnographic resources, and would not alter the relationship between the resources and the affiliated group's beliefs or practices.

Construction of the entry roadway from State Road 4 to the on-site parking area would include installation of an automated gate to restrict access to the unit when needed. This gate could be used to restrict access to the unit when solitude is required for pueblo ceremonial activities at ethnographic resources within Tsankawi. Monument staff would consult with the six affiliated pueblos to identify appropriate times for such restrictions. The ability to provide necessary solitude to pueblo practitioners would result in a long-term moderate beneficial impact on ethnographic resources, and facilitation of the affiliated group's beliefs and practices.

Under alternative 1, a site steward would be reintroduced within Tsankawi. The long-term minor beneficial impact on ethnographic resources that would result from the presence of the site steward under the no-action alternative would also be true under alternative 1. In addition, the implementation of the guided-only trail segment under alternative 1 would introduce monument staff or other NPS-trained local community volunteers and/or commercial guides at designated times. The presence of monument staff or other NPS-trained local community volunteers and/or commercial guides would provide an additional opportunity to inform and reinforce appropriately sensitive visitor behavior and provide a limited degree of oversight. It is anticipated that the increased presence of monument staff or other NPS-trained local community volunteers and/or commercial guides would be limited and therefore would result in a long-term minor beneficial impact on ethnographic resources.

Adaptive Management Strategy. Under alternative 1, the integration of an adaptive management strategy into the resource monitoring program would allow monument staff to implement and/or adjust management strategies to better achieve desired resource conditions, as necessary, in order to help meet goals of resource and visitor use management.

Consultation with the six affiliated pueblos, particularly San Ildefonso Pueblo, has clearly revealed places of cultural significance within the monument, including within Tsankawi. Traditional associations with Tsankawi are historic, geographic, contemporary, and religious in nature. The resources of Tsankawi are of critical importance to the cultural heritage, beliefs, customs, and practices of the people of San Ildefonso Pueblo. These resources include both archeological and natural resources. While the pueblos have communicated that they do not want these places revealed

to the general public, NPS staff relies on continued communication with the six affiliated pueblos about proposed actions within Tsankawi and the rest of the monument in order to minimize any impacts on the integrity of these important places.

Monitoring activities, indicators, metrics, potential management strategies, and desired outcomes described above for archeological and cultural resources would also be applicable for ethnographic resources. Subsequently, potential management strategies that may be implemented as part of the adaptive management strategy would be designed to reduce the impacts caused by visitors to sensitive ethnographic resources through wear and damage, minimize the contribution of visitors to natural erosion and impacts to native vegetation, and preserve ethnographic resources, while minimizing visual intrusion into the natural setting. It is anticipated that management strategies implemented as part of the adaptive management strategy would help preserve and protect ethnographic resources that contribute to the affiliated group's beliefs and practices.

Cumulative Impacts. Past, present, and reasonably foreseeable future actions in the monument and areas adjacent to Tsankawi under alternative 1 would be the same as those described for the no-action alternative. However, the proposed on-site parking area would be designed to allow for a shuttle drop-off lane near the proposed kiosk should a bus route and shuttle stop be implemented as part of the transportation plan/environmental assessment. As a result, no additional ground disturbance would be required. Any signage or furnishings introduced to support a shuttle stop would be minimal and made of materials that fit harmoniously and unobtrusively into the landscape. The presence of this feature would result in a long-term localized negligible adverse impact on the setting of ethnographic resources, and would not alter the relationship between the resources and the affiliated group's beliefs or practices.

Alternative 1 was designed to reduce impacts to cultural and natural resources while enhancing visitor experience. Realignment of existing and implementation of new trails would help ensure that visitors stay on designated trails, which would help preserve and protect ethnographic resources that contribute to the affiliated group's beliefs and practices. Interpretive messaging would reinforce the message of a sensitive and living landscape that requires visitors to be stewards of the environment. Implementation of alternative 1 would result in long-term minor to moderate beneficial impacts to ethnographic resources. Beneficial impacts associated with alternative 1, in combination with the long-term and widespread minor to moderate beneficial impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term moderate beneficial impact on ethnographic resources. Beneficial impacts of alternative 1 would represent a notable share of the beneficial cumulative impact.

Conclusion. Under alternative 1, changes to the trail system would help reduce impacts on sensitive resources and result in a long-term moderate beneficial impact on ethnographic resources. New interpretive messaging, which would promote an ethic of preservation, and addition of a site steward, monument staff or NPS-trained local community volunteers and/or commercial guides leading tours along the guided-only trail segment would result in a long-term moderate beneficial impact. Introduction of new facilities and subsequently visual features into the setting would result in a long-term minor adverse impact to ethnographic resources. Potential management strategies that may be implemented as part of the adaptive management strategy would be designed to reduce the

impacts caused by visitors to sensitive ethnographic resources through wear and damage, minimize the contribution of visitors to natural erosion and impacts to native vegetation, and preserve ethnographic resources, while minimizing visual intrusion into the natural setting. Construction noise would result in a short-term localized minor adverse on ethnographic resources; however, the new automated access gate would have a long-term moderate beneficial impact. Beneficial impacts associated with alternative 1, in combination with the long-term and widespread minor to moderate beneficial impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term moderate beneficial impact on ethnographic resources. Beneficial impacts of alternative 1 would represent a notable share of the beneficial cumulative impact.

Impacts of Alternative 2: Looped Entry Roadway

Analysis. Under alternative 2, the proposed trails and visitor services would be the same as under alternative 1. The difference between the two action alternatives includes the siting of the proposed trailheads, kiosk and relocated restrooms, on-site parking area, and entry roadway—all of which have been designed to avoid known ethnographic resources. Best management practices would be implemented during construction activities to control erosion, and monitoring would identify any erosional problems to be addressed. Vegetation would be replaced in areas used for construction staging (see "Appendix F"). The reintroduction of a site steward, monument staff or other NPS-trained local community volunteers and/or commercial guides leading tours on the guided-only trail segment, and integration of an adaptive management strategy into the resource monitoring program would also be implemented under this alternative.

Actions proposed under alternative 2 would result in long-term minor to moderate beneficial impacts to ethnographic resources. Similar to alternative 1, construction would be controlled by parameters for construction materials and design that would protect the setting of these resources. Even with these parameters in place, construction of new facilities under alternative 2 would result in a long-term minor adverse impact to the setting of ethnographic resources. However, this impact would not alter the relationship between the resources and the affiliated group's beliefs or practices.

Adaptive Management Strategy. The integration of an adaptive management strategy into the resource monitoring program would be the same as under alternative 1. This would allow monument staff to implement and/or adjust management strategies to better achieve desired resource conditions, as necessary, in order to help meet goals of resource and visitor use management.

Monitoring activities, indicators, metrics, potential management strategies, and desired outcomes described above for archeological and cultural resources would also be applicable for ethnographic resources. Subsequently, potential management strategies that may be implemented as part of the adaptive management strategy would be designed to reduce the impacts caused by visitors to sensitive ethnographic resources through wear and damage, minimize the contribution of visitors to natural erosion and impacts to native vegetation, and preserve ethnographic resources, while minimizing visual intrusion into the natural setting. It is anticipated that management strategies implemented as part of the adaptive management strategy would help preserve and protect ethnographic resources that contribute to the affiliated group's beliefs and practices.

Cumulative Impacts. Past, present, and reasonably foreseeable future actions in the monument and areas adjacent to Tsankawi under alternative 2 would be the same as those described for the no-action alternative. However, the proposed on-site parking area would be designed to allow for a shuttle drop-off lane near the proposed kiosk should a bus route and shuttle stop be implemented as part of the transportation plan / environmental assessment. As a result, no additional ground disturbance would be required. Any signage or furnishings introduced to support a shuttle stop would be minimal and made of materials that fit harmoniously and unobtrusively into the landscape. The presence of this feature would result in a long-term localized negligible adverse impact on the setting of ethnographic resources, and would not alter the relationship between the resources and the affiliated group's beliefs or practices.

Alternative 2 has been designed to reduce impacts to cultural and natural resources while enhancing visitor experience. Realignment of existing and implementation of new trails would help ensure that visitors stay on designated trails, which would help preserve and protect ethnographic resources that contribute to the affiliated group's beliefs and practices. Interpretive messaging would reinforce the message of a sensitive and living landscape that requires visitors to be stewards of the environment. Implementation of alternative 2 would result in long-term minor to moderate beneficial impacts to ethnographic resources. Beneficial impacts associated with alternative 2, in combination with the long-term and widespread minor to moderate beneficial impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term moderate beneficial impact on ethnographic resources. Beneficial impacts of alternative 2 would represent a notable share of the beneficial cumulative impact.

Conclusion. Similar to alternative 1, changes to the trail system would help reduce impacts on sensitive resources and result in a long-term moderate beneficial impact on ethnographic resources. New interpretive messaging, which would promote an ethic of preservation, and addition of a site steward, monument staff or other NPS-trained local community volunteers and/or commercial guides leading tours along the guided-only trail segment would result in a long-term moderate beneficial impact. Introduction of new facilities and subsequently visual features into the setting would result in a long-term minor adverse impact to ethnographic resources. Potential management strategies that may be implemented as part of the adaptive management strategy would be designed to reduce the impacts caused by visitors to sensitive ethnographic resources through wear and damage, minimize the contribution of visitors to natural erosion and impacts to native vegetation, and preserve ethnographic resources, while minimizing visual intrusion into the natural setting. Construction noise would result in a short-term localized minor adverse impact on ethnographic resources; however, the new automated access gate would have a long-term moderate beneficial impact. Beneficial impacts associated with alternative 2, in combination with the long-term and widespread minor to moderate beneficial impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term moderate beneficial impact on ethnographic resources. Beneficial impacts of alternative 2 would represent a notable share of the beneficial cumulative impact.

IMPACTS ON NATURAL RESOURCES

SOILS

Methods and Assumptions

Potential impacts that may result from project alternatives were assessed based on the extent of disturbance to soils, including natural undisturbed soils, soil erosion resulting from disturbance, and limitations associated with soils. The analysis is based on information provided by monument staff, other agencies, and the professional judgment of subject-matter experts.

Study Area

The study area for the soils impact analysis includes those areas within Tsankawi where project-related activities would occur. The analysis assumes that project-related activities would not occur outside of this area. Management actions in the main unit of the monument have the potential to affect visitation to Tsankawi. As a result, the main unit of the monument, those areas within Tsankawi where project-related activities would occur, and lands adjacent to Tsankawi constitute the cumulative impact study area.

Impact Definitions

The following definitions were used to assess the intensity of beneficial and adverse impacts on soils that may result from the project alternatives and the duration at which point impacts would be either short or long term.

Negligible. The impact is not detectable or measurable and causes very little or no physical disturbance, compaction, or unnatural erosion as compared to existing conditions.

Minor. The impact would be slight but detectable. There would be few perceptible changes to the physical disturbance, compaction, or unnatural erosion of soils that would affect, either negatively or positively, the ability of the soil to support native vegetation. These effects would be confined to a small geographic area with little, if any, improvement or loss in soil production. Mitigation may be necessary to offset adverse effects and would be relatively simple to implement and likely be successful.

Moderate. The impact would be readily apparent and have a measurable effect to the physical disturbance, compaction, or unnatural erosion of soils. The change would occur over a significant portion of study area. The rate of soil erosion would increase or decrease appreciably, and the ability of the soil to support native vegetation would decline or increase accordingly. Mitigation measures would be necessary to offset adverse impacts and would likely be successful.

Major. The impact would be readily apparent and have a substantial effect on the physical disturbance, compaction, or unnatural erosion of soils. The alternative would result in highly

noticeable increases or decreases in the rate of soil erosion or the ability of the soil to support native vegetation. Extensive mitigation measures to offset adverse impacts would be necessary, and their success would not be guaranteed.

Duration. Short-term impacts would be those in which soils recover within one year from the completion of construction activities. Long-term impacts would result should soil recovery extend beyond one year from the completion of construction activities.

Impacts of the No-Action Alternative

Analysis. Under the no-action alternative, no improvements would be made to existing trails, roadside parking area, or visitor facilities. In the absence of these activities, soils would not be impacted from ground disturbances due to site grading, cut and fill operations, or other mechanical alterations of the landscape.

Continuing disturbances to soils from social trail use and along the Tsankawi Mesa Trail would result in compaction and associated increased potential for runoff and erosion, particularly near areas of frequent use. On Tsankawi Mesa and in undeveloped backcountry locations that are highly susceptible to erosion, continued visitor foot traffic would result in increased rates of erosion over time and adverse effects of greater severity. Disturbances to soils in these areas would be readily apparent and, if unmitigated, could extend to a relatively wide geographic area over time. The rate of soil erosion would increase appreciably, and the ability of the soil to support native vegetation would decline. As a result, the no-action alternative would result in long-term moderate adverse impacts on soils in localized areas.

Cumulative Impacts. The fire management plan and 2013 update currently underway are and would continue to be designed to minimize undesirable environmental impacts of fire, such as soil erosion and loss of vegetation, to ensure the safety and protection of resources and facilities, and to restore and perpetuate natural processes given the current understanding of the complex relationships in natural ecosystems.

The plan considers advances in fire science knowledge, new technologies and fire-fighting techniques, long-term solutions to new and current resource challenges, and the most up-to-date science-based research and monitoring (NPS 2005c). Fire prevention or the ability to limit the extent to which resources are affected by fire would also minimize potential adverse impacts to soils. Actions identified in the current and update to the fire management plan would help restoration efforts and implementation of protection measures, both of which would result in a long-term widespread minor beneficial impact on soils.

Ecological restoration treatments—which were analyzed in the 2000 *Environmental Assessment Regarding the Management of the Tsankawi Unit* and *2007 Ecological Restoration Plan/Environmental Impact Statement*—were applied to all of the woodland area in Tsankawi suitable for restoration. Between fall 2007 and spring 2010, a total of 472 acres, excluding only mesa tops and adjacent steep rocky slopes, were treated. This included cutting live juniper and dead pinyon less than six to eight inches diameter, and lopping and scattering the cut trees onto bare soil spaces between the former

canopy mounds. Restoration actions are expected to mitigate accelerated soil erosion within the monument, which would also help restore understory vegetation and return a more natural fire cycle to woodland areas. Observations at five years post-treatment suggest the response to restoration at Tsankawi is generally robust and comparable to other restoration locations with monitoring data. Data from those other locations have documented several-fold increases in understory cover and one-two fold reductions in runoff and sediment loss. Because actions undertaken as part of ecological restoration efforts have helped mitigate soil erosion and restore understory vegetation, they have and are anticipated to continue to result in long-term widespread moderate beneficial impact on soils.

The proposed interim improvements would eliminate left turn movements into and out of the existing roadside parking area and create a single entry and single exit point. Open access would be limited, and a crashworthy barrier system would be installed adjacent to the existing paved shoulder to protect the roadside parking area. These project elements as well as others identified to support safer and more streamlined access to Tsankawi would be limited to previously disturbed areas and are not expected to include ground-disturbing activities. As a result, it is not anticipated that adverse impacts on soils would result.

The potential widening of State Road 4 in the area currently used for roadside parking would increase the amount of impervious surface in areas adjacent to Tsankawi. This has the potential to affect nearby soils and their ability to support native vegetation due to erosion and storm runoff patterns. It is anticipated that the widening would be designed to allow storm runoff to follow existing drainage patterns along State Road 4 and therefore minimize adverse impacts.

The implementation of the widening would require the disturbance of soils present within the NMDOT transportation easement area to facilitate paving and other actions necessary to support the widening. The soil layer structure would be disturbed and modified, and soils would be exposed, increasing the potential for erosion. Prior to construction activities, a construction action plan would be designed to avoid or minimize potential adverse effects to soils, vegetation, and other resources adjacent to the project area. Because of soil disturbance within the project area, short-term localized minor adverse impacts to soils may result. Over the long term, impacts to soils from the operation of the abovementioned transportation actions would be localized and minor adverse.

Implementation of the no-action alternative would result in long-term moderate adverse impacts on soils in localized areas. Long-term moderate adverse impacts of the no-action alternative, in combination with the long-term and widespread minor to moderate beneficial and long-term yet localized minor adverse impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term minor to moderate beneficial cumulative impact on soils. The no-action alternative would reduce the overall benefit of the cumulative impact.

Conclusion. Under the no-action alternative, the continued use of the Tsankawi Mesa Trail and social trails would result in long-term moderate adverse impacts on soils in localized areas. Long-term moderate adverse impacts of the no-action alternative, in combination with the long-term and widespread minor to moderate beneficial and long-term yet localized minor adverse impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term minor to

moderate beneficial cumulative impact on soils. The no-action alternative would reduce the overall benefit of the cumulative impact.

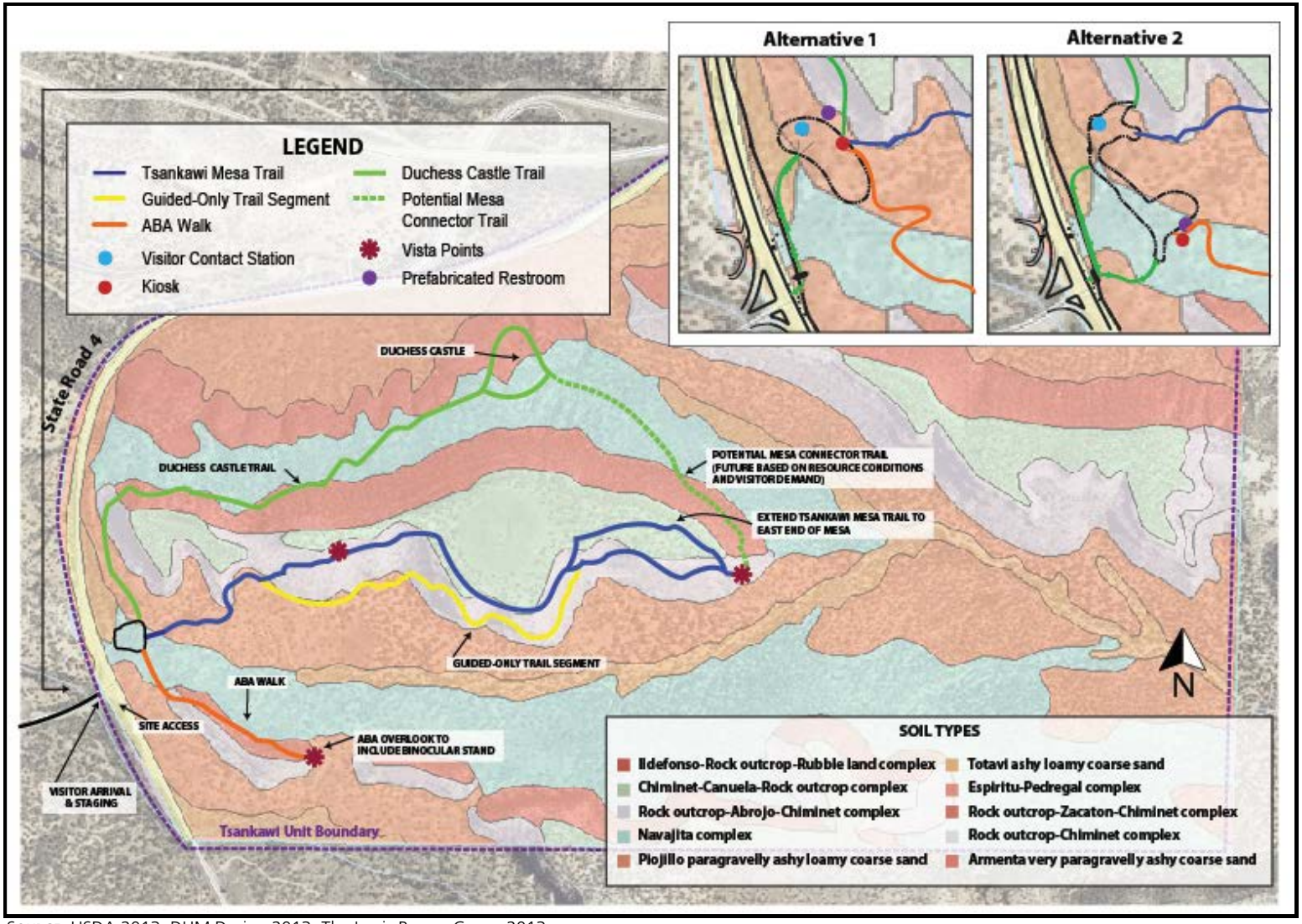
Impacts of Alternative 1: Two-Directional Entry Roadway (Preferred Alternative)

Analysis. Under alternative 1, approximately 14,679 linear feet would be disturbed to support the realignment of existing and implementation of new trails. Of this, approximately 1,779 linear feet would be a hardened surface to support the function of the ABA Walk as an ABA-accessible and -compliant trail. The additional disturbance of approximately 29,400 square feet would be necessary to support the proposed entry roadway and on-site parking area (see figure 17). The siting of the proposed kiosk next to the Tsankawi Mesa, Duchess Castle, and ABA Walk trailheads would require the removal of approximately 150 square feet of permeable soil surface. A small amount of soil disturbance would be required to support new interpretive messaging that would be introduced at various locations throughout Tsankawi to reinforce the message of a sensitive and living landscape.

During construction activities, which would be primarily limited to those areas east of State Road 4 and near the existing visitor contact station, the soil layer structure would be disturbed and modified, and soils would be exposed, increasing the potential for erosion. Resource protection measures would include the employment of best management practices, including the use of silt fencing to prevent and control soil erosion and sedimentation. Additionally, construction activities would adhere to an approved erosion and sediment control plan, which would be developed when the selected alternative is further refined. Disturbed areas adjacent to proposed construction activities would be rehabilitated using methods consistent with the monument's vegetation management plan (Jacobs 2006) to stabilize soils and allow native ground cover to reestablish (see "Appendix F").

While effects on soils would be detectable in this area, a portion of the affected area has been previously disturbed and impacted from years of use. Because the exact footprint of the entry roadway and on-site parking area has yet to be defined (this would occur during the design phase), the amount of previously disturbed soils is not known at this time. Additionally, there may be opportunities to minimize or avoid undisturbed soils along portions of the ABA Walk, particularly the trailhead, and kiosk due to their proposed siting adjacent to the existing visitor contact station. Because implementation of these elements of alternative 1 would increase the amount of impermeable surface in this area over the long term, both short- and long-term impacts to soils would result. These effects would be both short- and long-term minor adverse and would be associated with the construction and operation of the proposed entry roadway, on-site parking area, kiosk, and ABA Walk. The majority of this would be associated with the proposed entry roadway and on-site parking area.

Both designated (Tsankawi Mesa Trail) and social trails exist and are heavily used in areas where sensitive soils are present. These trails currently transect Tsankawi Mesa, and provide access to Duchess Castle and other undeveloped backcountry areas. Soils in these areas tend to be moderately susceptible to erosion. Under alternative 1, the reroute of the Tsankawi Mesa Trail would result in the reclamation of approximately 1,408 linear feet of trail that currently traverses the center of the pueblo. An additional 2,231 linear feet would be required to support a new portion of the trail that would run south of the pueblo.



SOURCE: USDA 2013; DHM Design 2013; The Louis Berger Group 2013

FIGURE 17. PROPOSED ACTION ALTERNATIVES AND SOIL TYPES

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The existing route from State Road 4 to Duchess Castle would be obscured. This would result in the reclamation of approximately 2,667 linear feet. The trailhead for the proposed Duchess Castle Trail—which would be approximately 5,524 linear feet—would be sited next to the existing visitor contact station and main trailhead. This would minimize impacts on sensitive soils by containing disturbances to designated corridors that could be maintained through regular maintenance activities conducted by monument staff.

Removal and reclamation of the portion of the Tsankawi Mesa Trail that currently crosses the pueblo and social trails in areas characterized by moderately erodible soils would result in negligible to minor short-term adverse impacts from temporary disturbances and the treatments necessary to stabilize portions of the trail. Trail removal and reclamation would also contribute to long-term moderate beneficial impacts on soils by reducing potential for erosion in these areas. Improvements to soils would be readily apparent over time, and changes to soil character would occur over a relatively wide geographic area. There would be perceptible declines in the rates of soil erosion and compaction, and the ability of the soil to support native vegetation would improve. Overall, the implementation of alternative 1 would result in long-term moderate beneficial impacts on soils.

Adaptive Management Strategy. The resource monitoring program has been designed to help monument staff determine whether visitor use, natural erosion processes, or some combination thereof are the cause(s) of deteriorating resource conditions at Tsankawi. Under alternative 1, the integration of an adaptive management strategy into the resource monitoring program would allow monument staff to implement and/or adjust management strategies to better achieve desired resource conditions, as necessary.

Management strategies that may be implemented to facilitate safe use by visitors and monument staff have the potential to result in indirect benefits on soils. For example, monitoring activities may reveal that accelerated erosion and rock fall in areas of concentrated visitation necessitate additional minor trail improvements to stabilize soils. Accelerated erosion and rock fall may cause some visitors to use or create social trails in areas they view as unsafe. The use or creation of social trails would result in adverse impacts on soils in localized areas. The implementation of additional minor trail improvements would encourage visitors to stay within designated trails, reducing adverse impacts on soils in localized areas.

Under the resource monitoring program and adaptive management strategy, if desired resource conditions are being met and visitor surveys indicate there is sufficient demand, a connector route from Tsankawi Mesa to Duchess Castle, approximately 2,123 linear feet, may be implemented. Because the connector route would only be implemented if resource conditions are being met and, subsequently, if there is sufficient visitor demand, it is anticipated that overall soil conditions would be improved prior to the introduction of the connector route. Monitoring activities would help determine if visitors are accessing Tsankawi with an understanding and appreciation of the sensitive landscape to an extent that the introduction of the connector route would result in minimal impacts on soils in localized areas. During the siting of the connector route, preference would be given to alignments on native rock rather than soils that may contain cultural deposits. Impacts on soils would be contained within designated corridors that could be maintained through regular maintenance activities conducted by monument staff.

Cumulative Impacts. Past, present, and reasonably foreseeable future actions in the monument and areas adjacent to Tsankawi under alternative 1 would be the same as those described for the no-action alternative. Implementation of alternative 1 would result in perceptible declines in the rates of soil erosion and compaction, and the ability of the soil to support native vegetation would improve. Implementation of alternative 1 would result in long-term moderate beneficial impacts on soils. Beneficial impacts associated with alternative 1, in combination with the long-term and widespread minor to moderate beneficial and long-term yet localized minor adverse impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term minor to moderate beneficial impact on soils. Beneficial impacts of alternative 1 would represent a notable share of the beneficial cumulative impact.

Conclusion. Alternative 1 would result in short-term minor adverse impacts on soils from activities associated with the implementation of the proposed entry roadway, on-site parking area, kiosk, and new trails. The removal of the portion of the Tsankawi Mesa Trail traversing the center of the pueblo and social trails in areas of Tsankawi that are characterized by moderately erodible soils would contribute to long-term moderate beneficial impacts on soils by reducing the potential for erosion in these areas. It is anticipated that management strategies that may be implemented as part of the adaptive management strategy would result in beneficial impacts on soils or minimal adverse impacts in localized areas should overall soil conditions demonstrate improvement that would facilitate the implementation of the connector route. Beneficial impacts associated with alternative 1, in combination with the long-term and widespread minor to moderate beneficial and long-term yet localized minor adverse impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term minor to moderate beneficial impact on soils. Beneficial impacts of alternative 1 would represent a notable share of the beneficial cumulative impact.

Impacts of Alternative 2: Looped Entry Roadway

Analysis. Under alternative 2, approximately 14,256 linear feet would be disturbed to support the realignment of existing and implementation of new trails. Of this, approximately 1,158 linear feet would be a hardened surface to support the function of the ABA Walk as an ABA-accessible and -compliant trail. The additional disturbance of an approximately 42,792 square-foot area would be necessary to support the proposed entry roadway and on-site parking area. While the relocation of the restroom would result in zero net loss of permeable soil surface, the removal of approximately 150 square feet of soil surface would be necessary to accommodate the proposed kiosk located next to the ABA Walk trailhead (see figure 17). A small amount of soil disturbance would be required to support new interpretive messaging that would be introduced throughout Tsankawi to reinforce the message of a sensitive and living landscape.

During construction activities, the soil layer structure would be disturbed and modified, and soils would be exposed, increasing the potential for erosion. Resource protection measures would include the employment of best management practices, including the use of silt fencing to prevent and control soil erosion and sedimentation during construction activities associated with these elements of the proposed project. Additionally, construction activities would adhere to an approved erosion and sediment control plan, which would be developed when the selected alternative is further refined. Disturbed areas adjacent to proposed construction activities would be rehabilitated using

methods consistent with the monument's vegetation management plan (Jacobs 2006) to stabilize soils and allow native ground cover to reestablish (see "Appendix F").

While effects on soils would be detectible in this area, a portion of the affected area has been previously disturbed and impacted from years of use. Because the exact footprint of the entry roadway and on-site parking area has yet to be defined (this would occur during the design phase), the amount of previously disturbed soils is not known at this time. However, implementation of these elements of alternative 2 would increase the amount of impermeable surface in this area over the long term. As a result, both short- and long-term minor adverse impacts on soils would result from the construction and operation of the proposed entry roadway, on-site parking area, kiosk, ABA Walk, and restroom relocation. The majority of this would be associated the proposed entry roadway and on-site parking area.

Both designated (Tsankawi Mesa Trail) and social trails exist and are heavily used in parts of Tsankawi where sensitive soils are present. These trails currently transect Tsankawi Pueblo and several undeveloped backcountry areas to the north and south of the mesa. Soils in these areas tend to be moderately susceptible to erosion. Similar to alternative 1, the reroute of the Tsankawi Mesa Trail would result in the reclamation of approximately 1,408 linear feet of trail that currently traverses the center of the pueblo. An additional 2,231 linear feet would be required to support the realigned trail at a designated lower elevation. This would reduce impacts on soils at the pueblo.

At backcountry locations, a designated trail providing access to Duchess Castle Trail would be established, where 5,387 linear feet of trail would be created. This would minimize impacts on sensitive soils by containing disturbances to designated corridors that could be maintained through regular maintenance activities conducted by monument staff.

Removal and reclamation of the portion of the Tsankawi Mesa Trail that currently crosses the pueblo, and social trails in areas of Tsankawi characterized by moderately erodible soils would result in negligible to minor short-term adverse impacts from temporary disturbances and the implementation of treatments necessary to stabilize portions of the trail. However, the removal of social trails characterized by moderately erodible soils would contribute to long-term moderate beneficial impacts on soils by reducing the potential for erosion in these areas. Improvements to soils would be readily apparent over time, and changes to soil character would occur over a relatively wide geographic area. There would be perceptible declines in the rates of soil erosion and compaction, and the ability of the soil to support native vegetation would improve. Overall, implementation of alternative 2 would result in long-term moderate beneficial impacts on soils; however, the total disturbance to soils would be greater than under alternative 1. This is largely attributable to the configuration of the proposed entry roadway.

Adaptive Management Strategy. The integration of an adaptive management strategy into the resource monitoring program would be the same as under alternative 1. This would allow monument staff to implement and/or adjust management strategies to better achieve desired resource conditions, as necessary, in order to help meet goals of resource and visitor use management.

Management strategies that may be implemented to facilitate safe use by visitors and monument staff have the potential to result in indirect benefits on soils. Accelerated erosion and rock fall may cause some visitors to use or create social trails in areas they view as unsafe, which would result in adverse impacts to soils in localized areas. The implementation of additional minor trail improvements would encourage visitors to stay within designated trails, reducing adverse impacts on soils in localized areas.

The potential implementation of the connector route from Tsankawi Mesa to Duchess Castle would be based on resource conditions and visitor demand. It is anticipated that overall soil conditions would be improved prior to assessing visitor demand for the connector route. Additional management strategies to assess visitor enjoyment may indicate that visitors are accessing Tsankawi with an understanding and appreciation of the sensitive landscape to an extent that the introduction of the connector route would result in minimal impacts on soils in localized areas. During the siting of the connector route, preference would be given to alignments on native rock rather than soils that may contain cultural deposits. Impacts on soils would be contained within designated corridors that could be maintained through regular maintenance activities conducted by monument staff.

Cumulative Impacts. Past, present, and reasonably foreseeable future actions in the monument and areas adjacent to Tsankawi under alternative 2 would be the same as those described for the no-action alternative. Implementation of alternative 2 would result in perceptible declines in the rates of soil erosion and compaction, and the ability of the soil to support native vegetation would improve. Implementation of alternative 2 would result in long-term moderate beneficial impacts on soils. Beneficial impacts associated with alternative 2, in combination with the long-term and widespread minor to moderate beneficial and long-term yet localized minor adverse impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term minor to moderate beneficial impact on soils. Beneficial impacts of alternative 2 would represent a notable share of the beneficial cumulative impact.

Conclusion. Alternative 2 would result in short-term minor adverse impacts on soils from activities associated with the implementation of the proposed entry roadway, on-site parking area, kiosk, and new trails. These adverse impacts would be slightly greater than under alternative 1 because of the area required to support the proposed entry roadway. The removal of the portion of the Tsankawi Mesa Trail traversing the center of the pueblo and social trails in areas of Tsankawi that are characterized by moderately erodible soils would contribute to long-term moderate beneficial impacts on soils by reducing the potential for erosion in these areas. It is anticipated that management strategies that may be implemented as part of the adaptive management strategy would result in beneficial impacts on soils or minimal adverse impacts in localized areas should overall soil conditions demonstrate improvement that would facilitate the implementation of the connector route. Beneficial impacts associated with alternative 2, in combination with the long-term and widespread minor to moderate beneficial and long-term yet localized minor adverse impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term minor to moderate beneficial impact on soils. Beneficial impacts of alternative 2 would represent a notable share of the beneficial cumulative impact.

VEGETATION

Methods and Assumptions

Potential impacts were assessed based on the extent of disturbance to vegetation that would result from the implementation of the action alternatives. The analysis is based on information provided by the National Park Service, other agencies, and professional judgment of subject-matter experts. All available information on vegetation within Tsankawi was compiled, and site-specific information identified. Where possible, information from field studies of vegetation was used. Predictions about short- and long-term site impacts were based on previous studies of visitor impacts on vegetation.

Study Area

The study area for the vegetation impact analysis includes those areas within Tsankawi where project-related activities would occur. The analysis assumes that project-related activities would not occur outside of this area. Management actions in the main unit of the monument have the potential to affect visitation to Tsankawi. As a result, the main unit of the monument, those areas within Tsankawi where project-related activities would occur, and lands adjacent to Tsankawi constitute the cumulative impact study area.

Impact Definitions

The following definitions were used to assess the intensity of beneficial and adverse impacts on vegetation that may result from the project alternatives and the duration at which point impacts would be either short or long term.

Negligible. The impact would not result in measurable or perceptible changes in the natural function and character of the plant community in terms of growth, abundance, reproduction, distribution, structure, or diversity of native species.

Minor. The impact would be measurable or perceptible. The natural function and character of plant communities in terms of growth, abundance, reproduction, distribution, structure, or diversity of native species would only be perceptible in small, localized areas. Mitigation to offset adverse effects may be required and would be effective.

Moderate. The impact would affect the natural function and character of plant communities in terms of growth, abundance, reproduction, distribution, structure, or diversity of native species, but not to the extent that plant community properties (i.e., size, integrity, or continuity) change. Mitigation to offset adverse effects may be extensive, but would likely be successful.

Major. The impact on the natural function and character of plant communities in terms of growth, abundance, reproduction, distribution, structure, or diversity of native species would substantially change and effects to plant community properties (i.e., size, integrity, or continuity) would be readily apparent. Mitigation measures to offset adverse effects would be required, extensive, and success would not be guaranteed.

Duration. Short-term impacts would be those in which vegetation would recover within one year from the completion of construction activities. Long-term impacts would result should vegetation recovery extend beyond one year from the completion of construction activities.

Impacts of the No-Action Alternative

Analysis. Under the no-action alternative, no improvements would be made to existing trails, roadside parking area, or visitor facilities. Continuing disturbances to vegetation from social trail use and along the Tsankawi Mesa Trail would result in direct vegetation losses from trampling and indirect effects stemming from increased soil erosion. As more soils are disturbed within and outside of the trail prism, erosion may harm smaller shrubs and trees by removing stabilizing soils and exposing roots.

In undeveloped backcountry locations, vegetation would be especially impacted. Disturbances from social trail use would result in adverse effects on individual native plants, resulting in impacts on a relatively minor portion of that species' population. As a result, adverse impacts on vegetation under the no-action alternative would be long-term minor to moderate adverse in localized areas.

Cumulative Impacts. The fire management plan and 2013 update currently underway are and would continue to be designed to minimize undesirable environmental impacts of fire, such as soil erosion and loss of vegetation, to ensure the safety and protection of resources and facilities, and to restore and perpetuate natural processes given the current understanding of the complex relationships in natural ecosystems.

The plan considers advances in fire science knowledge, new technologies and fire-fighting techniques, long-term solutions to new and current resource challenges, and the most up-to-date science-based research and monitoring (NPS 2005c). Fire prevention or the ability to limit the extent to which resources are affected by fire would also minimize potential adverse impacts to vegetation. Actions identified in the current and update to the fire management plan would help restoration efforts and implementation of protection measures, both of which would result in a long-term widespread minor beneficial impact on vegetation.

Ecological restoration treatments—which were analyzed in the 2000 *Environmental Assessment Regarding the Management of the Tsankawi Unit* and *2007 Ecological Restoration Plan/Environmental Impact Statement*—were applied to all of the woodland area in Tsankawi suitable for restoration. Between fall 2007 and spring 2010, a total of 472 acres, excluding only mesa tops and adjacent steep rocky slopes, were treated. This included cutting live juniper and dead pinyon less than six to eight inches in diameter, and lopping and scattering the cut trees onto bare soil spaces between the former canopy mounds. Restoration actions are expected to mitigate accelerated soil erosion and the ground's ability to support native and restore understory vegetation. Observations at five years post-treatment suggest the response to restoration at Tsankawi is generally robust and comparable to other restoration locations with monitoring data. Data from those other locations have documented several-fold increases in understory cover and one-two fold reductions in runoff and sediment loss. Because actions undertaken as part of ecological restoration efforts have helped mitigate soil erosion

and restore understory vegetation, they are anticipated to continue to provide a long-term widespread moderate beneficial impact on vegetation.

The proposed interim improvements would eliminate left-turn movements into and out of the existing roadside parking area and create a single entry and single exit point. Open access would be limited, and a crashworthy barrier system would be installed adjacent to the existing paved shoulder to protect the roadside parking area. These project elements as well as others identified to support safer and more streamlined access to Tsankawi would be limited to previously disturbed areas and are not expected to include ground-disturbing activities. As a result, it is not anticipated that adverse impacts on vegetation would result.

The potential widening of State Road 4 in the area currently used for roadside parking would increase the amount of impervious surface in areas adjacent to Tsankawi. This has the potential to affect nearby soils and their ability to support native vegetation due to erosion and storm runoff patterns. The implementation of the widening would require the disturbance of limited vegetation present within the NMDOT transportation easement area to facilitate paving and other actions necessary to support the widening. The soil layer structure would be disturbed and modified, and soils would be exposed, increasing the potential for erosion and decreasing the ground's ability to support native vegetation. Prior to construction activities, a construction action plan would be designed to avoid or minimize potential adverse effects to soils, vegetation, and other resources adjacent to the project area. Because of disturbance to soils and vegetation communities within the project area, localized short- and long-term negligible to minor adverse impacts to vegetation would result from the construction and operation of a widened State Road 4.

As mentioned above, implementation of the no-action alternative would result in minor to moderate adverse impacts on vegetation. Long-term localized minor to moderate adverse impacts of the no-action alternative, in combination with the long-term widespread minor to moderate beneficial and short- and long-term localized negligible to minor adverse impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term minor beneficial cumulative impact on vegetation. Adverse effects of the no-action alternative would be more localized while cumulative actions would be more widespread. The no-action alternative would reduce the overall benefit of the cumulative impact.

Conclusion. Under the no-action alternative, continued use of the Tsankawi Mesa Trail and social trails would result in long-term moderate adverse impacts on vegetation in localized areas. Long-term localized minor to moderate adverse impacts of the no-action alternative, in combination with the long-term widespread minor to moderate beneficial and short- and long-term localized negligible to minor adverse impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term minor beneficial cumulative impact on vegetation. Adverse effects of the no-action alternative would be more localized while cumulative actions would be more widespread. The no-action alternative would reduce the overall benefit of the cumulative impact.

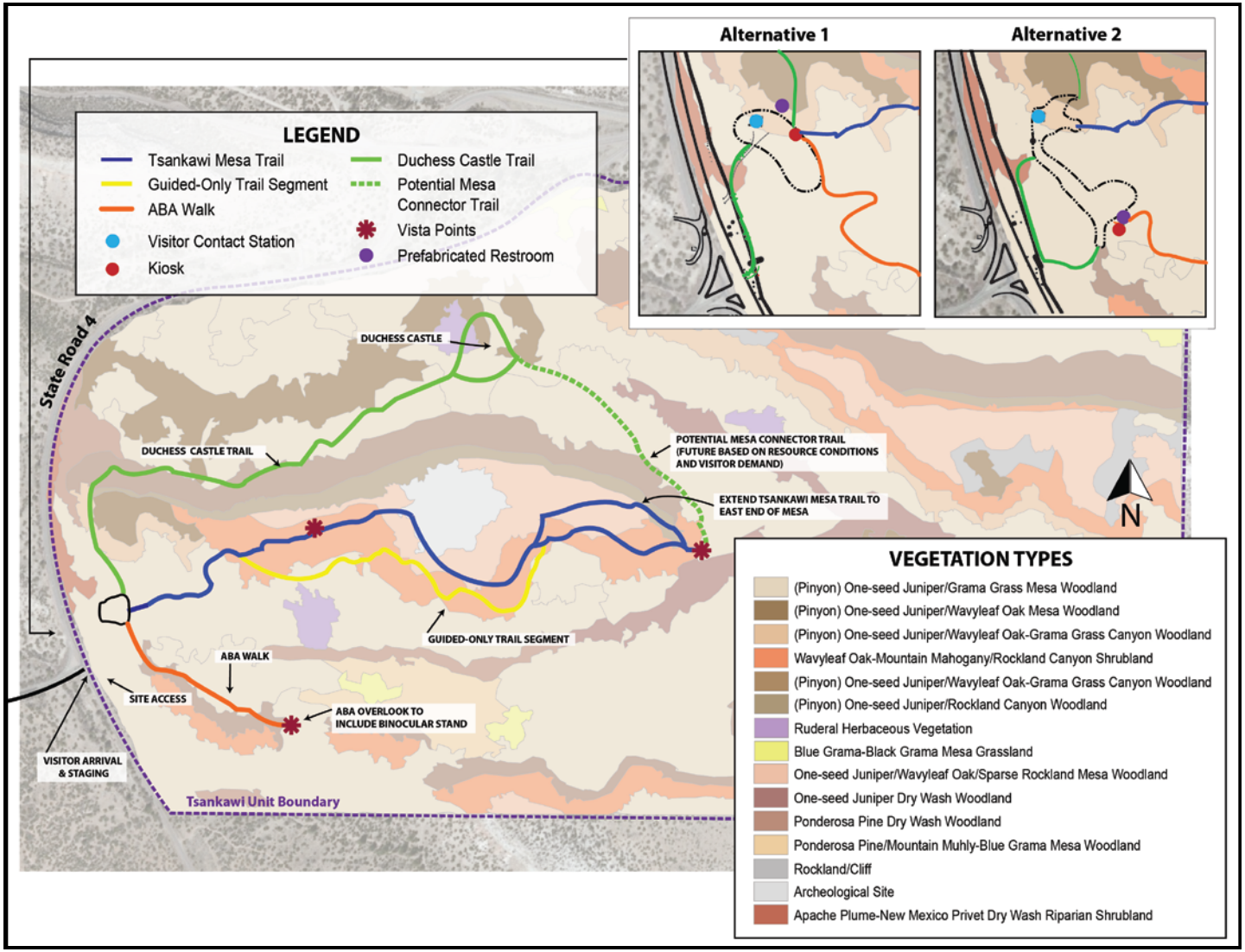
Impacts of Alternative 1: Two-Directional Entry Roadway (Preferred Alternative)

Analysis. Under alternative 1, approximately 14,679 linear feet would be disturbed to support the realignment of existing and implementation of new trails. Of this, approximately 1,779 linear feet would be a hardened surface to support the function of the ABA Walk as an ABA-accessible and -compliant trail. The additional disturbance of approximately 29,400 square feet would be necessary to support the proposed entry roadway and on-site parking area (see figure 18). The siting of the proposed kiosk next to the Tsankawi Mesa, Duchess Castle, and ABA Walk trailheads would require the removal of approximately 150 square feet of permeable soil surface.

During construction activities, existing vegetation would be removed and replaced with an impermeable surface, which would accelerate storm runoff and increase the potential for erosion and further damages to vegetation at the edge of the disturbance. Resource protection measures would include the employment of best management practices, including adherence to an approved erosion and sediment control plan, which would be developed as the selected alternative is further refined. Disturbed areas adjacent to proposed construction activities would be rehabilitated using methods consistent with the monument's vegetation management plan (Jacobs 2006) to stabilize soils and allow native ground cover to reestablish (see "Appendix F").

While effects on vegetation would be detectable in this area, a portion of the affected area has been previously disturbed and impacted from years of use. Because the exact footprint of the entry roadway and on-site parking area has yet to be defined (this would occur during the design phase), the amount of vegetation disturbance is not known at this time. Additionally, there may be opportunities to avoid or minimize vegetation disturbance along portions of the ABA Walk, particularly the trailhead, and kiosk due to their proposed siting adjacent to the existing visitor contact station and in areas that have been previously disturbed with little vegetation. Because implementation of these elements of alternative 1 would increase the amount of impermeable surface in this area over the long term, both short- and long-term impacts to vegetation would result. These effects would be both short- and long-term minor adverse and would result from the construction and operation of the proposed entry roadway, on-site parking area, kiosk, and ABA Walk. The majority of this would be associated the proposed entry roadway and on-site parking area.

Both designated (Tsankawi Mesa Trail) and social trails exist and are heavily used in areas of Tsankawi where sensitive vegetation is present. These trails currently transect Tsankawi Mesa and several undeveloped backcountry areas north of the mesa. These areas are populated by pinyon-juniper and wavyleaf oak woodlands, with grama grass and various shrub communities present. Under alternative 1, 1,408 linear feet of trail that currently crosses the center of the pueblo would be reclaimed, reducing impacts on vegetation in this area. The trail would be replaced with an approximately 2,231 linear foot trail just south of the pueblo. The realignment of the trail would introduce a new designated corridor, which may require the removal of some vegetation, but would reduce overall impacts currently experienced along the portion of the Tsankawi Mesa Trail traversing the pueblo and social trails.



SOURCE: USGS 2013, DHM Design 2013, The Louis Berger Group 2013

FIGURE 18. PROPOSED ACTION ALTERNATIVES AND VEGETATION TYPES

At backcountry locations, a designated route would be established to bring visitors to Duchess Castle, where 5,524 linear feet of trail would be created. Establishing designated backcountry trails in areas where vegetation is currently prone to impacts from social trail use would contribute to long-term minor beneficial impacts on vegetation by reducing potential for trampling and erosion in those areas. Improvements to vegetation would be detectible and occur in confined areas within Tsankawi.

Disturbed areas next to proposed construction activities would be actively reseeded to stabilize soils and allow native ground cover to reestablish. New interpretive messaging would be located to avoid existing vegetation and reinforce the sensitive and living landscape message. Overall, implementation of alternative 1 would result in long-term minor to moderate beneficial impacts on vegetation.

Adaptive Management Strategy. The resource monitoring program has been designed to help monument staff determine whether visitor use, natural erosion processes, or some combination thereof are the cause(s) of deteriorating resource conditions at Tsankawi. Under alternative 1, the integration of an adaptive management strategy into the resource monitoring program would allow monument staff to implement and/or adjust management strategies to better achieve desired resource conditions, as necessary, in order to help meet goals of resource and visitor use management.

Monitoring of vegetation conditions alongside trails would identify signs of trampling and off-trail movement by visitors. Should the loss of vegetation density and vigor exceed metrics identified in the adaptive management strategy, additional management strategies may be implemented. Potential management strategies include reclaiming social trails with available on-site organic material, revising or amplifying interpretive and resource protection messaging, and/or increasing the definition of trail edges. The implementation of any one or combination of these management strategies is anticipated to benefit vegetation communities that are showing signs of trampling and off-trail movement by visitors.

Management strategies that may be implemented to facilitate safe use by visitors and monument staff have the potential to result in indirect benefits on vegetation. For example, monitoring activities may reveal that accelerated erosion and rock fall in areas of concentrated visitation necessitate additional minor trail improvements to stabilize soils. Accelerated erosion and rock fall may cause some visitors to use or create social trails in areas they view as unsafe. The use or creation of social trails would result in adverse impacts on soils and their ability to support native vegetation in localized areas. Additionally, the use or creation of social trails may cause vegetation communities in localized areas to show signs of trampling. The implementation of additional minor trail improvements would encourage visitors to stay within designated trails, reducing adverse impacts on vegetation in localized areas.

Under the resource monitoring program and adaptive management strategy, if desired resource conditions are being met and visitor surveys indicate there is sufficient demand, a connector route from Tsankawi Mesato Duchess Castle, approximately 2,123 linear feet, may be implemented. Because the connector route would only be implemented if resource conditions are being met and, subsequently, if there is sufficient demand, it is anticipated that overall vegetation conditions would be improved prior to the introduction of the connector route. Monitoring activities would help

determine if visitors are accessing Tsankawi with an understanding and appreciation of the sensitive landscape to an extent that the introduction of the connector route would result in minimal impacts on vegetation in localized areas. The connector route would be sited to minimize impacts to existing vegetation. Impacts on vegetation would be contained within designated corridors that could be maintained through regular maintenance activities conducted by monument staff.

Cumulative Impacts. Actions that would contribute to cumulative impacts on vegetation under alternative 1 would be similar to those described under the no-action alternative. The implementation of alternative 1 would introduce clearly designated trails and interpretive messaging to reinforce the message of a sensitive and living landscape, which would contribute to long-term benefits on vegetation. Over the long term, the removal of social trails in parts of Tsankawi populated by pinyon-juniper and wavyleaf oak woodlands, with grama grass and various shrub communities present, would contribute to minor beneficial impacts on vegetation by reducing the potential for trampling and erosion in these areas. Implementation of alternative 1 would result in perceptible declines in soil erosion and compaction rates, and ability of the soil to support native vegetation would improve. Long-term minor to moderate beneficial impacts on vegetation would result. These impacts, in combination with the long-term widespread minor to moderate beneficial and short- and long-term localized negligible to minor adverse impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term moderate beneficial cumulative impact on vegetation. Because benefits associated with alternative 1 would be more localized, its overall contribution to the beneficial cumulative impact, which is widespread, would be relatively small.

Conclusion. Alternative 1 would result in short-term minor adverse impacts on vegetation from construction activities associated with the implementation of the proposed entry roadway, on-site parking area, kiosk, and new trails. The removal of social trails in parts of Tsankawi populated by pinyon-juniper and wavyleaf oak woodlands, with grama grass and various shrub communities present, would contribute to long-term minor beneficial impacts on vegetation by reducing the potential for trampling and erosion in these areas. It is anticipated that management strategies implemented as part of the adaptive management strategy would result in beneficial impacts or minimal adverse impacts on vegetation in localized areas should overall resource conditions demonstrate improvement that would facilitate the implementation of the connector route. These impacts, in combination with the long-term widespread minor to moderate beneficial and short- and long-term localized negligible to minor adverse impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term moderate beneficial cumulative impact on vegetation. Because benefits associated with alternative 1 would be more localized, its overall contribution to the beneficial cumulative impact, which is widespread, would be relatively small.

Impacts of Alternative 2: Looped Entry Roadway

Analysis. Under alternative 2, approximately 14,256 linear feet would be disturbed to support the realignment of existing and implementation of new trails. Of this, approximately 1,158 linear feet would be a hardened surface to support the function of the ABA Walk as an ABA-accessible and -compliant trail. The additional disturbance of an approximately 42,792 square-foot area would be necessary to support the proposed entry roadway and on-site parking area (see figure 18). The

looped entry roadway configuration would require more land area than the entry roadway proposed under alternative 1.

During construction activities, existing vegetation would be removed and replaced with an impermeable surface, which would accelerate storm runoff and increase the potential for erosion and further damages to vegetation at the edge of the disturbance. Resource protection measures would include the employment of best management practices, including adherence to an approved erosion and sediment control plan that would be developed as the selected alternative is further refined. Disturbed areas adjacent to proposed construction activities would be rehabilitated using methods consistent with the monument's vegetation management plan (Jacobs 2006) to stabilize soils and allow native ground cover to reestablish (see "Appendix F").

While effects on vegetation would be detectable in this area, a portion of the affected area has been previously disturbed and impacted from years of use. Because the exact footprint of the entry roadway and on-site parking area has yet to be defined (this would occur during the design phase), the amount of vegetation disturbance is not known at this time. The proposed kiosk and relocated restrooms next to the ABA Walk trailhead would be sited to avoid existing vegetation to the greatest extent feasible.

However, implementation of these elements of alternative 2 would increase the amount of impermeable surface in this area over the long term. As a result, both short- and long-term minor adverse impacts on vegetation would result from the construction and operation of the proposed entry roadway, on-site parking area, kiosk, ABA Walk, and restroom relocation. Disturbed areas adjacent to proposed construction activities would be actively reseeded to stabilize the soils and allow native ground cover to reestablish.

Under alternative 2, the Tsankawi Mesa Trail would be rerouted south of the pueblo similar to alternative 1. The realignment of the trail would include the reclamation of 1,408 linear feet that currently crosses the pueblo and introduction of a new 2,231 linear foot trail to the south. The realignment of the trail would introduce a new designated corridor, which may require the removal of some vegetation but would reduce overall impacts currently experienced along the portion of the Tsankawi Mesa Trail traversing the pueblo and social trails.

A designated 5,387-linear-foot trail beginning near the main trailhead would lead visitors to backcountry areas, including Duchess Castle. The trail would be slightly shorter than the trail proposed under alternative 1. Establishing designated backcountry trails in areas where vegetation is currently prone to impacts from social trail use would contribute to long-term minor beneficial impacts on vegetation by reducing the potential for trampling and erosion in those areas. Improvements to vegetation would be detectible and occur in confined areas within Tsankawi.

New interpretive messaging also would be located to avoid existing vegetation and reinforce the message of a sensitive and living landscape. Overall, implementation of alternative 2 would result in long-term minor to moderate beneficial impacts on vegetation.

Adaptive Management Strategy. The integration of an adaptive management strategy into the resource monitoring program would be the same as under alternative 1. This would allow monument staff to implement and/or adjust management strategies to better achieve desired resource conditions, as necessary, in order to help meet goals of resource and visitor use management.

Monitoring of vegetation conditions alongside trails would identify signs of trampling and off-trail movement by visitors. Should the loss of vegetation density and vigor exceed metrics identified in the adaptive management strategy, additional management strategies may be implemented. Potential management strategies include reclaiming social trails with available on-site organic material, revising or amplifying interpretive and resource protection messaging, and/or increasing the definition of trail edges. The implementation of any one or combination of these management strategies is anticipated to benefit vegetation communities that are showing signs of trampling and off-trail movement by visitors.

Management strategies that may be implemented to facilitate safe use by visitors and monument staff have the potential to result in indirect benefits on vegetation. Accelerated erosion and rock fall may cause some visitors to use or create social trails in areas they view as unsafe, which would result in adverse impacts on soils and their ability to support native vegetation in localized areas. Additionally, the use or creation of social trails may cause vegetation communities in localized areas to show signs of trampling. The implementation of additional minor trail improvements would encourage visitors to stay within designated trails, reducing adverse impacts on vegetation in localized areas.

The potential implementation of the connector route from Tsankawi Mesa to Duchess Castle would be based on resource conditions and visitor demand. It is anticipated that overall vegetation conditions would be improved prior to assessing visitor demand for the connector route. Additional management strategies to assess visitor enjoyment may indicate that visitors are accessing Tsankawi with an understanding and appreciation of the sensitive landscape to an extent that the introduction of the connector route would result in minimal impacts on vegetation in localized areas. Impacts on vegetation would be contained within designated corridors that could be maintained through regular maintenance activities conducted by monument staff.

Cumulative Impacts. Actions that would contribute to cumulative impacts on vegetation under alternative 2 would be similar to those described under the no-action alternative. The implementation of alternative 2 would introduce clearly designated trails and interpretive messaging to reinforce the message of a sensitive and living landscape, which would contribute to long-term benefits on vegetation. Over the long term, the removal of social trails in parts of Tsankawi populated by pinyon-juniper and wavyleaf oak woodlands, with grama grass and various shrub communities present, would contribute to minor beneficial impacts on vegetation by reducing the potential for trampling and erosion in these areas. The implementation of alternative 2 would result in perceptible declines in the rates of soil erosion and compaction, and the ability of the soil to support native vegetation would improve. Long-term minor to moderate beneficial impacts on vegetation would result under alternative 2. These impacts, in combination with the long-term widespread minor to moderate beneficial and short- and long-term localized minor adverse impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term minor to moderate beneficial

cumulative impact on vegetation. Because benefits associated with alternative 2 would be more localized, its overall contribution to the beneficial cumulative impact, which is widespread, would be relatively small.

Conclusion. Alternative 2 would result in short-term minor adverse impacts on vegetation from construction activities associated with the implementation of the proposed entry roadway, on-site parking area, kiosk, and new trails. The removal of social trails in parts of Tsankawi populated by pinyon-juniper and wavyleaf oak woodlands, with grama grass and various shrub communities present, would contribute to long-term minor to moderate beneficial impacts on vegetation by reducing the potential for trampling and erosion in these areas. It is anticipated that management strategies implemented as part of the adaptive management strategy would result in beneficial impacts or minimal adverse impacts on vegetation in localized areas should overall resource conditions demonstrate improvement that would facilitate the implementation of the connector route. These impacts, in combination with the long-term widespread minor to moderate beneficial and short- and long-term localized minor adverse impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term minor to moderate beneficial cumulative impact on vegetation. Because benefits associated with alternative 2 would be more localized, its overall contribution to the beneficial cumulative impact, which is widespread, would be relatively small.

WILDLIFE AND WILDLIFE HABITAT

Methods and Assumptions

Information on wildlife species occurring within Tsankawi is based on consultation with monument staff, review of existing literature on the area, and consideration of common wildlife species likely to occur based on best professional judgment. Analysis of potential impacts on wildlife and wildlife habitat is based on the anticipated presence of these species within Tsankawi. This section assesses the potential effects of project alternatives on wildlife and wildlife habitat.

As described in “Chapter 1: Purpose of and Need for Action”, federal and state endangered and threatened species are not likely to be affected by project alternatives beyond a negligible degree, and are therefore not analyzed in this chapter. However, migratory birds protected by federal mandates occasionally breed within Tsankawi. Therefore, potential impacts on migratory birds are evaluated in this analysis.

Study Area

The study area for impacts on wildlife and wildlife habitat, including migratory birds, includes all land within Tsankawi. However, the analysis pays particular attention to those areas where project alternatives would be implemented because construction activities would not occur outside these areas. The study area for cumulative impact analysis includes Tsankawi, the main unit of the monument, and areas adjacent to Tsankawi.

Impact Definitions

The impact intensities for wildlife and wildlife habitat, including migratory birds, are defined as follows.

Negligible. The impact would not result in measurable or perceptible changes to a population or individuals of a species or a resource.

Minor. The impact would affect a population or individuals of a species or a resource. The change would be small, localized, and of little consequence. An action that could result in slight increases to viability of a population or individuals of a species as species limiting factors (e.g., habitat loss, competition, and mortality) is limited. Mitigation to offset adverse effects may be required and would be effective.

Moderate. The impact would result in a measurable change to a population or individuals of a species or resource. The change would be detectible over a larger area. The alternative would affect the viability of a species, population structure, and species population levels in the monument, including species-limiting factors (e.g., habitat loss, competition, and mortality). Mitigation to offset adverse effects may be extensive, but would likely be successful.

Major. The impact would result in a noticeable change to a population or individuals of a species or resource. The change would be measurable and result in a severely adverse or beneficial impact, and possible permanent consequence, on the species or resource. The alternative would result in a highly noticeable change to species viability, population structure, and species population levels in the monument, including species-limiting factors (e.g., habitat loss, competition, and mortality). Mitigation measures to offset adverse effects would be required, extensive, and their success would not be guaranteed.

Duration. Short-term impacts would be those in which wildlife recovers within one year from the end of the construction period. Long-term impacts would result should wildlife recovery extend beyond one year from the end of the construction period.

Impacts of the No-Action Alternative

Analysis. Under the no-action alternative, existing management policies regarding site access, visitor use, and interpretive messaging within Tsankawi would continue. There would be no change to existing site access and trails within the unit, which would have long-term negligible to minor adverse effects on wildlife and wildlife habitat in the area from continued habitat avoidance and deterioration in high visitation areas.

Interpretive messaging would remain as under existing conditions, which could contribute to indirect minor adverse impacts on wildlife and wildlife habitat over the long term from lack of visitor compliance and knowledge of sensitive resources and native habitat. The reintroduction of a site steward would provide a limited degree of oversight, potentially resulting in indirect long-term negligible to minor benefits on wildlife and wildlife habitat, including migratory birds. Overall, the

no-action alternative would result in long-term negligible to minor adverse impacts on wildlife and wildlife habitat, including migratory birds.

Cumulative Impacts. The monument's fire management plan and 2013 update currently underway define levels of protection necessary to ensure the safety and protection of resources, including wildlife and wildlife habitat, to restore and perpetuate natural processes within the monument. Short-term negligible to minor adverse impacts can result from actions related to fire management, including staff presence in species habitat due to research and monitoring, and prescribed fires. However, direct and indirect long-term widespread minor benefits to wildlife and wildlife habitat, including migratory birds, have resulted and would continue from actions undertaken as part of the fire management plan and 2013 update are and would be designed to consider advances in fire science knowledge, long-term solutions to new and current resource challenges, the most up-to-date science-based research and monitoring, and new information about species.

Ecological restoration treatments—which were analyzed in the 2000 *Environmental Assessment Regarding the Management of the Tsankawi Unit* and *2007 Ecological Restoration Plan/Environmental Impact Statement*—were applied to all of the woodland area in Tsankawi suitable for restoration. Between fall 2007 and spring 2010, a total of 472 acres, excluding only mesa tops and adjacent steep rocky slopes, were treated. This included cutting live juniper and dead pinyon less than six to eight inches diameter, and lopping and scattering the cut trees onto bare soil spaces between the former canopy mounds. Restoration actions are expected to mitigate accelerated soil erosion within the monument, which would also help restore understory vegetation and return a more natural fire cycle to woodland areas. Observations at five years post-treatment suggest the response to restoration at Tsankawi is generally robust and comparable to other restoration locations with monitoring data. Data from those other locations have documented several-fold increases in understory cover and one-two fold reductions in runoff and sediment loss. These actions have and are anticipated to continue to provide long-term protection for wildlife species that inhabit pinyon-juniper woodlands within Tsankawi, including migratory birds such as the juniper titmouse and black-throated gray warbler. Therefore, ecological restoration treatments in Tsankawi as well as the main unit of the monument are anticipated to result in long-term widespread moderate beneficial impacts to wildlife and wildlife habitat, including migratory birds.

Future transportation-related actions near Tsankawi would likely result in both adverse and beneficial impacts on wildlife and wildlife habitat within Tsankawi. Interim improvements are not anticipated to require ground disturbance but would likely result in a short-term localized negligible to minor noise increase when implementation activities are ongoing. No long-term impacts, beneficial or adverse, are anticipated.

Short-term disturbance and species displacement would likely result from construction-related noise associated the potential widening of State Road 4. The movement of heavy material haul trucks associated with anticipated construction activities at Los Alamos National Laboratory is likely to periodically affect traffic patterns throughout the construction period, resulting in short-term localized minor adverse impacts on wildlife and wildlife habitat. Because roadway improvements would likely improve traffic flow along State Road 4, it is anticipated that there would be a minor

beneficial impact to wildlife in the area (particularly birds that fly overhead) by improving air quality and reducing traffic-related noise.

As mentioned above, the implementation of the no-action alternative would result in long-term negligible to minor adverse impacts on wildlife and wildlife habitat, including migratory birds. Long-term negligible to minor adverse impacts associated with the no-action alternative, in combination with the long-term and widespread minor to moderate beneficial and short-term yet localized negligible to minor adverse impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term minor to moderate beneficial cumulative impact on wildlife and wildlife habitat, including migratory birds. The no-action alternative would reduce some of the overall benefit of the cumulative impact.

Conclusion. The continuation of existing management policies at Tsankawi would result in negligible to minor adverse effects on wildlife and wildlife habitat from limited noise disturbance, damage to native vegetation (i.e., suitable habitat), and habitat avoidance. Long-term negligible to minor adverse impacts associated with the no-action alternative, in combination with the long-term and widespread minor to moderate beneficial and short-term yet localized negligible to minor adverse impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term minor to moderate beneficial cumulative impact on wildlife and wildlife habitat, including migratory birds. The no-action alternative would reduce the overall benefit of the cumulative impact.

Impacts of Alternative 1: Two-Directional Entry Roadway (Preferred Alternative)

Analysis. Under alternative 1, approximately 14,679 linear feet would be disturbed to support the realignment of existing and implementation of new trails. The additional disturbance of an approximately 29,400 square-foot area would be necessary to support the proposed entry roadway and on-site parking area at the western boundary of Tsankawi, adjacent to State Road 4. During construction activities, existing vegetation would be removed and replaced with an impermeable surface that would eliminate vegetation cover for wildlife species in the area. However, tree canopy in this area is not extensive and due to its proximity to State Road 4, does not represent high habitat suitability for wildlife occurring within Tsankawi. Moreover, the part of Tsankawi that would be affected by these components of alternative 1 accounts for a small fraction of the entire unit (less than 0.09%). Nonetheless, general wildlife impacts occurring as a result of alternative 1 would arise from disturbances to habitat. These impacts would be both short- and long-term localized and negligible to minor adverse.

Mammals, reptiles, and amphibians occurring within the area of anticipated disturbance would be forced to relocate. Impacts on migratory birds that are occasional, but uncommon breeders within Tsankawi, such as the juniper titmouse and black-throated gray warbler, would be short term and minor as a result of construction-related activities. Mitigation measures implemented as a component of the selected alternative would result in protections to migratory bird species, including limiting the removal of vegetation to time periods outside of breeding seasons for migratory bird species. For pinyon-juniper nesting birds, breeding can start in mid-April and continue through mid-July. Therefore, mitigation would prohibit the removal of vegetation necessary to support the implementation of the proposed actions from April 15 through July 15 each

year (see "Appendix F"). With the implementation of these mitigation measures, impacts on migratory bird species are not anticipated.

The reintroduction of a site steward would provide a limited degree of oversight, potentially resulting in indirect long-term negligible to minor benefits for wildlife and wildlife habitat, including migratory birds. Once in operation, new interpretive messaging and increased monument staff or other NPS-trained local community volunteers and/or commercial guides leading tours would facilitate a greater understanding of wildlife and wildlife habitat for visitors. This would result in long-term negligible to minor beneficial impacts on wildlife and wildlife habitat.

Adaptive Management Strategy. Under alternative 1, the implementation of potential management strategies identified in the adaptive management strategy related to soils, vegetation, and interpretation may result in indirect benefits on wildlife and wildlife habitat. The implementation of these management strategies has the potential to further benefit wildlife and wildlife habitat through enhanced visitor understanding, appreciation, and education of the surrounding environment.

Cumulative Impacts. Past, present, and reasonably foreseeable future actions under alternative 1 would be the same as those described for the no-action alternative. The implementation of alternative 1, particularly the introduction of new interpretive messaging and monument staff or other NPS-trained local community volunteers and/or commercial guides to facilitate a greater understanding of wildlife and wildlife habitat for visitors, would result in long-term negligible to minor beneficial impacts on wildlife and wildlife habitat, including migratory bird species. Long-term beneficial impacts associated with alternative 1, in combination with the long-term and widespread minor to moderate beneficial and short-term yet localized negligible to minor adverse impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term minor to moderate beneficial cumulative impact on wildlife and wildlife habitat, including migratory birds. Beneficial effects associated with alternative 1 would represent a small portion of the overall long-term minor to moderate beneficial cumulative impact.

Conclusion. Under alternative 1, short-term negligible to minor adverse impacts would likely result from noise disturbance and destruction of habitat associated with construction activities. Mitigation measures would be in place to minimize habitat loss and avoid construction activities during breeding seasons for migratory birds. Long-term negligible to minor beneficial effects on wildlife and wildlife habitat would result from improvements to interpretive messaging, as well as increased presence of monument staff and other NPS-trained local community volunteers and/or commercial guides. Indirect benefits may also result from the implementation of potential management strategies identified in the adaptive management strategy. The implementation of alternative 1 would result in long-term negligible to minor beneficial impacts on wildlife and wildlife habitat, including migratory bird species. Long-term beneficial impacts associated with alternative 1, in combination with the long-term and widespread minor to moderate beneficial and short-term yet localized negligible to minor adverse impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term minor to moderate beneficial cumulative impact on wildlife and wildlife habitat, including migratory birds. Beneficial effects associated with alternative 1 would represent a small portion of the overall long-term minor to moderate beneficial cumulative impacts.

Impacts of Alternative 2: Looped Entry Roadway

Analysis. Under alternative 2, approximately 14,256 linear feet would be disturbed to support the realignment of existing and implementation of new trails. The additional disturbance of an approximately 42,792 square-foot area would be necessary to support the proposed entry roadway and on-site parking area at the western boundary of Tsankawi adjacent to the State Road 4 and East Jemez Road intersection. During construction activities, existing vegetation would be removed and replaced with an impermeable surface that would eliminate vegetation cover for wildlife species in the area. However, tree canopy in this area is not extensive and, due to its proximity to State Roadway, does not represent high habitat suitability for wildlife occurring within Tsankawi. Moreover, the part of Tsankawi that would be affected by the proposed actions accounts for a small fraction of the entire unit (less than 0.13%). Nonetheless, general wildlife impacts occurring as a result of alternative 2 would occur as a result of disturbances to habitat. These impacts would be both short- and long-term localized and negligible to minor adverse.

Mammals, reptiles, and amphibians occurring within the area of anticipated disturbance would be forced to relocate. Impacts on migratory birds that are occasional but uncommon breeders within Tsankawi, such as the juniper titmouse and black-throated gray warbler, would be short term and minor as a result of construction-related activities. Mitigation measures implemented as a component of the selected alternative would result in protections to migratory bird species, including limiting the removal of vegetation to time periods outside of breeding seasons for migratory bird species. For pinyon-juniper nesting birds, breeding can start in mid-April and continue through mid-July. Therefore, mitigation would prohibit the removal of vegetation necessary to support the implementation of the proposed actions from April 15 through July 15 each year (see "Appendix F"). With the implementation of these mitigation measures, impacts on migratory bird species are not anticipated.

The reintroduction of a site steward would provide a limited degree of oversight, potentially resulting in indirect long-term negligible to minor benefits for wildlife and wildlife habitat, including migratory birds. Once in operation, new interpretive messaging and increased monument staff or other NPS-trained local community volunteers and/or commercial guides leading tours would facilitate a greater understanding of wildlife and wildlife habitat for visitors. This would result in long-term negligible to minor beneficial impacts on wildlife and wildlife habitat.

Adaptive Management Strategy. The integration of an adaptive management strategy into the resource monitoring program would be the same as under alternative 1. Benefits on wildlife and wildlife habitat would be the same as those described under alternative 1 above.

Cumulative Impacts. Past, present, and reasonably foreseeable future actions under alternative 2 would be the same as those for the no-action alternative. Implementation of alternative 2, particularly introduction of new interpretive messaging and monument staff or other NPS-trained local community volunteers and/or commercial guides to facilitate a greater understanding of wildlife and wildlife habitat for visitors, would result in long-term minor beneficial impacts on wildlife and wildlife habitat, including migratory bird species. Long-term beneficial impacts associated with alternative 2, in combination with the long-term and widespread minor to moderate

beneficial and short-term yet localized minor adverse impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term minor to moderate beneficial cumulative impact on wildlife and wildlife habitat, including migratory birds. Beneficial effects associated with alternative 2 would represent a small portion of the overall long-term minor to moderate beneficial cumulative impacts.

Conclusion. Under alternative 2, short-term negligible to minor adverse impacts would likely result from noise disturbance and destruction of habitat associated with construction activities. Mitigation measures would be in place to minimize habitat loss and avoid construction during breeding seasons for migratory birds. Long-term negligible to minor beneficial effects on wildlife and wildlife habitat would result from improvements to interpretive messaging, as well as increased presence of monument staff and other NPS-trained local community volunteers and/or commercial guides. Indirect benefits may also result from the implementation of potential management strategies identified in the adaptive management strategy. Implementation of alternative 2 would result in long-term negligible to minor beneficial impacts on wildlife and wildlife habitat, including migratory bird species. Long-term beneficial impacts associated with alternative 2, in combination with the long-term and widespread minor to moderate beneficial and short-term yet localized minor adverse impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term minor to moderate beneficial cumulative impact on wildlife and wildlife habitat, including migratory birds. Beneficial effects associated with alternative 2 would represent a small portion of the overall long-term minor to moderate beneficial cumulative impacts.

IMPACTS ON VISITOR USE AND EXPERIENCE

METHODS AND ASSUMPTIONS

Impacts on visitor use and experience were determined by considering the continuation of current management policies and comparing them to the action alternatives. The action alternatives were developed by a multidisciplinary group of NPS subject-matter experts and other members of the project team to offer a range of visitor opportunities while enhancing measures to protect sensitive cultural and natural resources.

STUDY AREA

The study area for visitor use and experience includes all land within Tsankawi. However, the analysis focuses on those areas that would be affected by the proposed action alternatives. The cumulative impacts analysis considers plans and actions in Tsankawi, the main unit of the monument, and areas adjacent to Tsankawi.

IMPACT DEFINITIONS

The following definitions are used to assess the intensity of adverse and beneficial impacts on visitor use and experience and duration of impacts.

Negligible

Visitors would likely be unaware of any change in management policies and regulations. There would be no noticeable change in visitor use and experience or in any defined indicators of visitor satisfaction or behavior.

Minor

Changes in visitor use or experience would be slight and detectable, but would not appreciably limit or enhance any critical characteristics of the visitor experience. Visitor satisfaction would remain stable.

Moderate

A few characteristics of the existing visitor experience would change, and the ability of visitors to engage in specified activities would be altered. Visitor satisfaction would begin to either decline or increase.

Major

The impact would be highly apparent and long term. Visitor use and experience would be measurably affected and may either preclude future generations from enjoying park resources and values or enhance the ability for future generations to enjoy these resources.

Duration

Short-term impacts are defined as impacts that would occur during the implementation and construction of the proposed action alternative. Long-term impacts extend beyond the implementation of the action alternatives.

IMPACTS OF THE NO-ACTION ALTERNATIVE

Analysis

Under the no-action alternative, existing management policies regarding site access, visitor use, and interpretive messaging within Tsankawi would continue. The existing visitor contact station would remain and continue to be inaccessible for persons with limited mobility. Interpretive messaging—primarily located at the visitor contact station—would remain unchanged. The fee collection station—which does not take credit cards and provides limited information about payment—would remain in its current location. Tsankawi Mesa Trail would continue to traverse the pueblo and

visitors would still be able to access Duchess Castle from an area further north on State Road 4. It is anticipated that visitors would continue to park in the commuter lot across State Road 4 when accessing this area. When combined, these components would result in a long-term minor to moderate adverse impact on visitor use and experience.

The reintroduction of a site steward would provide a limited degree of oversight. The site steward would also be able to provide some interpretive information; however, this person(s) would not be expected to speak with all visitors to Tsankawi. The presence of the site steward would result in a long-term minor beneficial impact on visitor use and experience; however, when combined with the abovementioned features that would remain unchanged from existing conditions, the no-action alternative would result in long-term minor to moderate adverse impacts on visitor use and experience.

Cumulative Impacts

The transportation plan/environmental assessment currently underway will evaluate actions for improving transportation management in the monument. The monument is currently partnering with Los Alamos County and Atomic City Transit to provide temporary and seasonal shuttle service from the White Rock Visitor Center to Frijoles Canyon; however, long-term strategies to address the monument's transportation issues have not yet been developed and implemented. The study will analyze the environmental effects of a range of alternatives (including both transit and nontransit options) designed to address the existing transportation challenges at the monument.

While the exact nature of the strategies to reduce transportation issues have not yet been developed, some visitors may feel that new management measures would restrict their movement or change their experience in the main unit of the monument. Those visitors may elect to visit Tsankawi rather than the main unit of the monument should they feel adversely impacted by limitations such as to when and how they can access the area. However, actions identified in the study are intended to improve visitor use and experience by making it easier to move around the monument. It is not anticipated that a change in access to the main unit of the monument would result in changes to overall visitor use and experience and subsequently result in a notable change in visitation to Tsankawi. Additionally, there may be an opportunity to incorporate a bus route and shuttle stop at Tsankawi as part of this study, which would result in a long-term minor beneficial impact on visitor use and experience. Private vehicle access to Tsankawi would not be restricted should a transit option to Tsankawi become available. Overall, actions identified as part of the transportation plan/environmental assessment are anticipated to result in long-term minor to moderate beneficial impacts on visitor use and experience.

Another transportation project that could impact visitor use and experience is the proposed interim improvements to the existing roadside parking area. These improvements would eliminate left-turn movements into and out of the existing roadside parking area and create a single entry and single exit point. Open access would be limited, and a crashworthy barrier system would be installed adjacent to the existing paved shoulder to protect the parking area. With the implementation of these improvements, some visitors may choose to make dangerous maneuvers (i.e., U-turns) to avoid traveling further south on State Road 4 to turn around and return to the designated entry area.

However, safety would be increased for those who comply with the designated improvements, anticipated to be the majority of visitors, and entry would be easier for visitors and staff traveling north on State Road 4. Interim improvements would likely result in a short-term minor beneficial impact on visitor use and experience by improving accessibility and increasing visitor safety.

The land currently used as the roadside parking area for Tsankawi is located on DOE lands and is subject to a transportation easement held by the New Mexico Department of Transportation. This segment of State Road 4 may be impacted by developments at Los Alamos National Laboratory that have been proposed in recent years. Because delivery traffic is routed through the State Road 4 and East Jemez Road intersection for security screening, and Los Alamos National Laboratory development opportunities are concentrated on the Pajarito Road corridor that is accessed through this intersection, construction and development activities at Los Alamos National Laboratory have the potential to create additional traffic near the access point for Tsankawi, resulting in a minor to moderate adverse impact on visitor use and experience. Continued heavy traffic volumes coupled with the movement of heavy material haul trucks to support developments at Los Alamos National Laboratory may generate the need to widen State Road 4 on lands currently used for roadside parking at Tsankawi, which is permitted by the NMDOT transportation easement. Should this widening occur, the existing roadside parking area for Tsankawi would be displaced, resulting in a long-term moderate adverse impact on visitor use and experience.

Because existing visitor opportunities to experience Tsankawi and interpretive messaging would remain as under existing conditions, implementation of the no-action alternative would result in long-term minor to moderate adverse impacts on visitor use and experience. While interim improvements would result in a short-term minor beneficial impact, and the potential introduction of a bus route and shuttle stop as part of the transportation plan/environmental assessment would result in a long-term minor beneficial impact to visitor use and experience, other past, present, and reasonably foreseeable actions, specifically the potential widening of State Road 4, would result in long-term minor to moderate adverse impacts. Adverse impacts associated with the no-action alternative, in combination with the long-term moderate adverse and short- and long-term minor beneficial impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term minor to moderate adverse cumulative impact on visitor use and experience. Adverse impacts associated with the no-action alternative would represent a notable share of the adverse cumulative impact.

Conclusion

While the site steward would minimally enhance visitor use and experience, current management policies at Tsankawi would remain in place. Overall, because existing visitor opportunities to experience Tsankawi and interpretive messaging would remain as under existing conditions, the no-action alternative would result in long-term minor to moderate adverse impacts on visitor use and experience. Adverse impacts associated with the no-action alternative, in combination with the long-term moderate adverse and short- and long-term minor beneficial impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term minor to moderate adverse cumulative impact on visitor use and experience. Adverse impacts associated with the no-action alternative would represent a notable share of the adverse cumulative impact.

IMPACTS OF ALTERNATIVE 1: TWO-DIRECTIONAL ENTRY ROADWAY (PREFERRED ALTERNATIVE)

Analysis

Under alternative 1, improvements and enhancements proposed at various locations within Tsankawi would benefit visitor use and experience. The existing roadside parking area would be relocated onto NPS lands. Visitors and monument staff would enter Tsankawi from the reconfigured four-way signalized intersection at State Road 4 and East Jemez Road. Access to Tsankawi would be greatly improved, and safety issues regarding the existing roadside parking area would decrease. The new on-site parking area would provide 20 spaces for car parking including two spaces for persons with limited mobility, a feature not supported by the no-action alternative. Two additional spaces would be available for shuttles and RVs. Increased ease at which visitors and staff would be able to access Tsankawi because of the improved intersection and on-site parking area would result in a long-term moderate beneficial impact on visitor use and experience.

The configuration of the on-site parking area and siting of the proposed kiosk and new trailheads would greatly increase the functionality of the visitor arrival area. Under alternative 1, the proposed kiosk and new trailheads would be located next to the existing visitor contact station. The kiosk—which would address some of the deficiencies of the visitor contact station—is proposed as a 150-square-foot open air shaded structure that would include, but not be limited to: an automated fee collection station; safety and interpretive guidance; a drinking fountain; data link for electronic downloads; first aid; and an emergency phone. It would serve as a collection point for tours and be ABA-accessible. The increased ease at which visitors can access and receive safety and interpretive guidance would result in a long-term moderate beneficial impact on visitor use and experience.

The upgraded fee collection station would take credit cards and be located where visitors would see it. Accompanying instructions would reduce confusion regarding payment. Additionally, because the fee collection station would be automated it would provide monument staff with valuable information regarding the daily, weekly, and seasonal distribution of visitors. Electronic downloads for handheld devices would allow visitors to listen to prerecorded information about select locations within Tsankawi. The introduction of safety guidance regarding weather conditions and the environment, first aid, and an emergency phone would provide a sense of ease for some visitors. These features would result in a long-term minor to moderate beneficial impact on visitor use and experience.

Messaging at the visitor arrival area would help lead visitors into the Tsankawi experience with a sense of care and understanding of the fragility of the unit and how their personal responsibility is paramount to protecting the unit and the features contained there. At this location, messaging would be large and more complex and likely include a cast metal scale model or planimetric view of the pueblo, allowing visitors to visualize the pueblo from another perspective. Other interpretive features would include limited understated site signage, furnishings, pamphlets, and brochures. Signage and furnishings would be introduced at select locations along trails to reinforce the human values of Tsankawi and encourage visitors to be stewards of the environment. The introduction of

new interpretive messaging would result in a long-term moderate beneficial impact on visitor use and experience.

Changes to existing and implementation of new trails would provide a diverse visitor experience for persons with varying mobility. The Tsankawi Mesa Trail would be rerouted south of the pueblo to protect the resource, but also to provide visitors a new opportunity to understand more about the Ancestral Pueblo people. Interpretive messaging would reinforce this message. A new trail segment bringing visitors to a vista point overlooking the immediate area (San Ildefonso Pueblo and Rio Grande/White Rock Canyon) and a distant view of the Sangre de Cristo Mountains would be introduced. The new segment would form a loop at the end of Tsankawi Mesa, allowing visitors to use existing social trails to lead them to spectacular views and isolation from State Road 4. This new trail segment would provide an opportunity to interpret cavate villages that are visible at portions of Tsankawi Mesa, including the guided-only trail segment (currently the return loop), North Mesa, and elsewhere. Visitors would encounter lengths of the Ancestral Pueblo trail system, petroglyphs, hand-and-toeholds, grinding stones, and views of cavate villages and agricultural fields, among other features.

The current return portion of the Tsankawi Mesa Trail would be converted to a guided-only trail segment. The goal of guided visitation would be to inform and reinforce appropriately sensitive visitor behavior while allowing continued access to the area. The frequency and intensity of visitation would be reduced, but visitors with a specific interest in this particular area would be able to access the resource. Monument staff or other NPS-trained local community volunteers and/or commercial guides would lead tours. At this time, group size has not yet been established. Groups would convene at the existing visitor contact station and proposed kiosk. Localized, small-scale landscape structures would be needed at both ends of the guided-only trail segment to ensure that unsupervised visitation does not occur. The existing ladder 3 would be removed for safety and to better manage access to the cavate village. Similar to the no-action alternative, a site steward would also be reintroduced under alternative 1, providing additional interpretive information and a limited degree of oversight.

The introduction of the ABA Walk and Duchess Castle Trail would offer new opportunities for visitors to experience Tsankawi. Both trailheads would be next to the existing visitor contact station, proposed kiosk, and main trailhead. The ABA Walk would be constructed on level terrain to a vista point that encompasses views of cavate villages at Tsankawi Mesa and a vista east/south of the surrounding landscape. The trail would be ABA-compliant and serve visitors with limited mobility as well as those who are reluctant to use ladders, can only spend a limited amount of time at Tsankawi, or are only equipped to traverse well-developed trails (e.g., families with baby strollers). The proposed trail is likely to be quite popular and has the potential to alleviate some visitation impacts on Tsankawi Mesa Trail.

The Duchess Castle Trail would be constructed on level terrain, leading from the site of the existing visitor contact station and main trailhead. The trail would create a small loop in the vicinity of Duchess Castle and visitors would return to the trailhead and on-site parking area using the same trail. The trail would allow for safe visits to a portion of the site currently with unsafe visitor access conditions and allow for interpretation of cultural resources and historic land uses that are not

present elsewhere in Tsankawi. The introduction of a designated trail to Duchess Castle and obscuring of the existing social trail from State Road 4 to Duchess Castle would enhance visitor experience as well as safety. A more detailed discussion of the proposed on-site parking area, interpretive messaging, and trail improvements is presented in "Chapter 2: Alternatives."

During construction activities associated with alternative 1, particularly the entry roadway and on-site parking area, localized short-term minor adverse impacts on visitor use and experience due to increased noise and air particulates would result. Construction activities would be primarily located in areas adjacent to State Road 4 and would not likely adversely affect visitor use and experience once visitors are further away from these activities. Construction of the ABA Walk and Duchess Castle Trail would occur in areas where few visitors currently visit and therefore short-term adverse impacts would likely be negligible to minor. A construction action plan would be developed that would identify measures to minimize short-term adverse impacts (see "Appendix F"). This would likely include construction during off-peak hours and fencing to contain fugitive dust and noise.

Once in operation, alternative 1 would result in long-term moderate beneficial impacts on visitor use and experience. The new entry roadway, on-site parking area, kiosk, and interpretive messaging would greatly enhance the visitor arrival area. The realignment of existing and introduction of new trails would provide visitors with a range of opportunities to explore archeological, historic, and natural resources, allow them to experience these resources in context, and gain an understanding of contemporary ethnographic context. Alternative 1 would help the National Park Service achieve two of the main interpretive goals identified in the monument's foundation statement (below) as well as interpretive themes identified in the monument's 2001 comprehensive interpretive plan.

- Provide interpretive opportunities for the public to experience, understand, appreciate, and protect the monument's cultural and natural resources and values.
- Link the past with the present and future in a living, dynamic, cultural and natural landscape, perpetuating and honoring traditional ties of pueblo people (NPS 2008).

Adaptive Management Strategy

The resource monitoring program has been designed to help monument staff determine whether visitor use, natural erosion processes, or some combination thereof are the cause(s) of deteriorating resource conditions at Tsankawi. Under alternative 1, the integration of an adaptive management strategy into the resource monitoring program would allow monument staff to implement and/or adjust management strategies to better achieve desired conditions, as necessary, in order to help meet goals of resource and visitor use management.

Monitoring activities and identified metrics would help determine if additional management strategies are needed to achieve desired conditions with respect to archeological resources. Potential management strategies identified to help protect and preserve archeological resources as described under archeological resources above, including seasonal standing tour times and limits on group size, have the potential to reduce visitor enjoyment or visitation by those who wish to experience Tsankawi as a self-guided experience with limited interaction of other visitors.

As part of the resource monitoring program, monument staff would use photo-documentation to establish baseline conditions along the mesatop and established trail segments, monitor the condition of vegetation along trails for indication of trampling and off-trail movement, and observe and/or participate in group tours and independent visits. Should monitoring activities demonstrate that desired conditions are not being met, additional management strategies may be implemented to help reinforce appropriately sensitive visitor behavior. Management strategies may include one or more of the following: reclamation of social trails using organic matter; revision/amplification of interpretive and resource protection messaging; more defined trail edges; and increased presence of on-site staff or the site steward(s). Desired conditions would indicate that visitors generally stay on trail with few exceptions, no new social trails appear and restored social trails remain reclaimed, and visitor behavior reflects respect for sensitive cultural resources present within Tsankawi. It is not anticipated that the implementation of one or a combination of the abovementioned potential management strategies would result in adverse impacts on visitor use and experience.

In addition to the upgraded fee collection station, mechanical/electronic trail monitors would be implemented to provide an additional source of visitor data collection along trails. During peak season, the number of NPS visitor contacts as well as programs offered and attendance at those programs would be recorded. The desired outcome of these monitoring activities would include complete visitation datasets that are robust and reliable. Recorded information would be used to determine if current visitation falls within a 75% to 125% range of historic average annual visitation between 2000 and 2012. Should data collection efforts reveal visitor use numbers that fall outside the historic range, collection methods may be analyzed, revised, and improved.

Visitor survey cards are currently provided at the main unit of the monument to help monument staff assess visitor enjoyment. Under the resource monitoring program, the monument's visitor survey card would be revised to include a subcomponent specific to Tsankawi to assess visitor satisfaction with their experience and demonstrated understanding of Tsankawi's history. Should monitoring activities demonstrate that visitor satisfaction with facilities and visitor services does not meet desired conditions, additional management strategies may be implemented. Potential management strategies would include revised and/or new approaches to be used by monument staff to identify ways to increase visitor understanding and appreciation of Tsankawi, implementation of an approved visitor survey to collect data from visitors regarding their experience at Tsankawi, and assurance that all guides have current training and are provided with additional training, as needed. It is anticipated that potential management strategies designed to enhance visitor satisfaction with facilities and visitor services would result in beneficial impacts on visitor use and experience.

Under the resource monitoring program and adaptive management strategy, if desired resource conditions are being met and visitor surveys indicate there is sufficient demand, a connector route from Tsankawi Mesa to Duchess Castle may be implemented. The implementation of the connector route would provide additional opportunities for visitors to experience and appreciate the cultural and natural resources present within Tsankawi. The introduction of the connector route would result in beneficial impacts on visitor use and experience.

Cumulative Impacts

Past, present, and reasonably foreseeable future actions in the monument and areas adjacent to Tsankawi under alternative 1 would be the same as those described for the no-action alternative. However, because alternative 1 includes the relocation of parking facilities onto NPS lands, long-term moderate adverse effects associated with the displacement of the existing roadside parking area that would result under the no-action alternative due to the potential widening of State Road 4 would be diminished should this alternative be implemented prior to the widening. Actions identified in the transportation plan/environmental assessment would result in long-term minor beneficial impacts, and the proposed interim improvements would result in short-term minor beneficial impacts.

Because of the range of visitor opportunities, improved site access, and implementation of new interpretive messaging that would be introduced, implementation of alternative 1 would result in a long-term moderate beneficial impact on visitor use and experience. Long-term moderate beneficial impacts associated with alternative 1, in combination with the long-term moderate adverse and short- and long-term minor beneficial impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term minor to moderate beneficial cumulative impact on visitor use and experience. Beneficial impacts associated with alternative 1 would represent a notable share of the beneficial cumulative impact.

Conclusion

Alternative 1 has been designed to enhance visitor use and experience while protecting sensitive cultural and natural resources within Tsankawi. As a result, measures identified as part of alternative 1 would result in long-term moderate beneficial impacts on visitor use and experience. Management strategies identified in the adaptive management strategy that may be implemented to help protect sensitive cultural and natural resources have the potential to result in adverse impacts to some visitors. However, overall it is anticipated that management strategies implemented as part of the adaptive management strategy would help enhance visitor use and experience. Moderate beneficial impacts associated with alternative 1, in combination with the long-term moderate adverse and short-and long-term minor beneficial impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term minor to moderate beneficial cumulative impact on visitor use and experience. Beneficial impacts associated with alternative 1 would represent a notable share of the beneficial effect of cumulative impacts.

IMPACTS OF ALTERNATIVE 2: LOOPED ENTRY ROADWAY

Analysis

Improvements and enhancements proposed as part of alternative 2 would benefit visitor use and experience. Alternative 2 includes relocation of the existing roadside parking area onto NPS lands with site access provided via an improved four-way signalized intersection at State Road 4 and East Jemez Road. Visitor access to Tsankawi would be greatly improved, and safety concerns about the

existing roadside parking area would decrease. The new on-site parking area would provide the same number of spaces as under alternative 1; however, the configuration would be different.

Under alternative 2, the proposed kiosk, ABA Walk, and relocated restrooms would be closer to the four-way intersection and away from the existing visitor contact station and main trailhead. While this may increase ease for users of the ABA Walk to access the kiosk and restroom, it may be inconvenient and easily missed by visitors accessing the main trailhead and Duchess Castle Trail.

Alternative 2 includes the introduction of a kiosk with features similar to those presented for alternative 1. Because the kiosk would introduce features designed to address deficiencies associated with the existing visitor contact station (automated fee collection station, safety and interpretive guidance, a drinking fountain, electronic downloads for handheld devices, first aid, and an emergency phone), its location further away from the main trailhead and Duchess Castle Trail may reduce its effectiveness and overall compliance. The introduction of these features would result in long-term minor to moderate beneficial impacts on visitor use and experience. It is anticipated that these benefits may be slightly less than under alternative 1 because of the siting of the proposed kiosk and relocated restrooms.

Initial implementation of interpretive messaging would be the same as under alternative 1. However, because some visitors may not see or visit the kiosk adjacent to the ABA Walk, additional interpretive messaging may be necessary (as part of the adaptive management strategy) along the trails to reinforce the Tsankawi message, enhance visitor experience, and ensure compliance. A site steward would also be reintroduced to provide additional interpretive information and a limited degree of oversight. The implementation of these features to provide historical context and information regarding the significance and sensitivity of resources would result in a long-term minor to moderate beneficial impact on visitor use and experience.

With the exception of the siting of the trailheads for the ABA Walk and Duchess Castle Trail, trail configurations are similar to those presented for alternative 1. Trails proposed as part of alternative 2 would provide visitors with a diverse range of options based on preference and mobility, while also protecting cultural and natural resources. Under alternative 2, the ABA Walk would be shorter than under alternative 1 and therefore reduce some of the benefit from its implementation. Because it would be located further north, the Duchess Castle Trail would also be slightly shorter than under alternative 1. However, the difference between the two action alternatives is so small that it would not likely reduce any benefits from its implementation.

During construction activities associated with alternative 2, particularly the entry roadway and on-site parking area, localized short-term minor adverse impacts on visitor use and experience due to increased noise and air particulates would result. Construction activities would be primarily limited to those areas adjacent to State Road 4 and are not likely to adversely affect visitor use and experience once further away from these activities. Construction of the ABA Walk and Duchess Castle Trail would occur in areas where few visitors currently visit and therefore short-term adverse impacts would likely be negligible to minor. The relocation of the restroom from its current location may result in a minor adverse impact, but the effect would be localized and relatively short in duration. A construction action plan would be developed and identify measures to minimize short-

term adverse impacts, which would likely include construction during off-peak hours and fencing to contain fugitive dust and noise (see "Appendix F").

Once in operation, alternative 2 would result in long-term moderate beneficial impacts on visitor use and experience. The new entry roadway, on-site parking area, kiosk, and interpretive messaging would notably enhance the visitor arrival area. However, the siting of the proposed kiosk and relocated restrooms away from the main trailhead and visitor contact station may slightly reduce some of this benefit as compared to alternative 1.

The realignment of existing and introduction of new trails would provide visitors with a range of opportunities to explore archeological, historic, and natural resources, allow visitors to experience these resources in context, and gain an understanding of contemporary ethnographic context. Alternative 2 would help the National Park Service achieve two of the main interpretive goals identified in the monument's foundation statement (noted above) as well as interpretive themes identified in the monument's 2001 comprehensive interpretive plan.

Adaptive Management Strategy

The integration of an adaptive management strategy into the resource monitoring program would be the same as under alternative 1. This would allow monument staff to implement and/or adjust management strategies to better achieve desired resource conditions, as necessary, in order to help meet goals of resource and visitor use management.

Monitoring activities and identified metrics would help determine if additional management strategies are needed to achieve desired conditions with respect to archeological resources. Potential management strategies identified to help protect and preserve archeological resources as described under archeological resources above, including seasonal standing tour times and limits on group size, have the potential to reduce visitor enjoyment or visitation by those who wish to experience Tsankawi as a self-guided experience with limited interaction with other visitors.

The resource monitoring program would allow monument staff to establish baseline conditions, monitor the condition of vegetation along trails, and observe and/or participate in group tours and independent visits. As necessary, the implementation of potential management strategies identified in the adaptive management strategy may be implemented to help reinforce appropriately sensitive visitor behavior if desired conditions are not being met. Management strategies may include one or more of the following: reclamation of social trails using organic matter; revision/amplification of interpretive and resource protection messaging; more defined trail edges; and increased presence of on-site staff or the site steward(s). It is not anticipated that the implementation of one or a combination of the abovementioned potential management strategies would result in adverse impacts on visitor use and experience.

In addition to the upgraded fee collection station, mechanical/electronic trail monitors would be implemented to provide an additional source of visitor data collection along trails. During peak season, the number of NPS visitor contacts as well as programs offered and attendance at those programs would be recorded. The desired outcome of these monitoring activities would include complete visitation datasets that are robust and reliable. Should data collection efforts reveal visitor

use numbers that fall outside the historic range, collection methods may be analyzed, revised, and improved.

Under the resource monitoring program, the monument's visitor survey card would be revised to include a subcomponent specific to Tsankawi to assess visitor satisfaction with their experience and demonstrated understanding of Tsankawi's history. Should monitoring activities demonstrate that visitor satisfaction with facilities and visitor services does not meet desired conditions, additional management strategies may be implemented. It is anticipated that potential management strategies designed to enhance visitor satisfaction with facilities and visitor services would result in beneficial impacts on visitor use and experience.

If desired resource conditions are being met and visitor surveys indicate there is sufficient demand, a connector route from Tsankawi Mesa to Duchess Castle may be implemented. The implementation of the connector route would provide additional opportunities for visitors to experience and appreciate the cultural and natural resources present within Tsankawi. The introduction of the connect route would result in beneficial impacts on visitor use and experience.

Cumulative Impacts

Past, present, and reasonably foreseeable future actions in the monument and areas adjacent to Tsankawi under alternative 2 would be the same as those described for the no-action alternative. However, because alternative 2 includes the relocation of parking facilities onto NPS lands, long-term moderate adverse effects associated with the displacement of the existing roadside parking area that would result under the no-action alternative due to the potential widening of State Road 4 would be diminished should this alternative be implemented prior to the widening. Actions identified in the transportation plan/environmental assessment would result in long-term minor beneficial impacts, and the proposed interim improvements would result in short-term minor beneficial impacts.

Because of the range of visitor opportunities, improved site access, and implementation of new interpretive messaging that would be introduced, implementation of alternative 2 would result in a long-term moderate beneficial impact on visitor use and experience. However, these benefits may be slightly less than would be experienced under alternative 1 because of the siting of the proposed kiosk and relocated restrooms. Moderate beneficial impacts associated with alternative 2, in combination with the long-term moderate adverse and short- and long-term minor beneficial impact of other past, present, and reasonably foreseeable future actions, would result in a long-term minor to moderate beneficial cumulative impact on visitor use and experience. Beneficial impacts associated with alternative 2 would represent a notable share of the beneficial cumulative impact.

Conclusion

Alternative 2 has been designed to enhance visitor use and experience while protecting sensitive cultural and natural resources within Tsankawi. As a result, measures identified as part of alternative 2 would result in long-term moderate beneficial impacts on visitor use and experience. Management strategies identified in the adaptive management strategy that may be implemented to help protect

sensitive cultural and natural resources have the potential to result in adverse impacts to some visitors. However, overall it is anticipated that management strategies implemented as part of the adaptive management strategy would help enhance visitor use and experience. Moderate beneficial impacts associated with alternative 2, in combination with the long-term moderate adverse and short- and long-term minor beneficial impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term minor to moderate beneficial cumulative impact on visitor use and experience. Beneficial impacts associated with alternative 2 would represent a notable share of the beneficial cumulative impact.

IMPACTS ON PUBLIC HEALTH AND SAFETY

METHODS AND ASSUMPTIONS

Impacts on public health and safety were determined by considering the continuation of current management policies and comparing them to the proposed action alternatives. Impacts for this resource topic were analyzed qualitatively, using information provided by monument staff familiar with current management policies and the objectives of the proposed action alternatives.

STUDY AREA

The study area for this impact analysis includes all land within Tsankawi; however, the analysis pays particular attention to areas frequented by visitors and where the proposed action alternatives would be sited. It is anticipated that effects on public health and safety associated with the proposed action alternatives would be generally limited to these areas. The cumulative impacts analysis considers plans and actions within Tsankawi, the main unit of the monument and areas adjacent to Tsankawi.

IMPACT DEFINITIONS

The following definitions are used to assess the intensity of adverse and beneficial impacts on public health and safety and duration of impacts.

Negligible

The impact on monument visitors or staff safety would not be measurable or perceptible.

Minor

The impact on monument visitors or staff safety would be measurable or perceptible but it would be limited to a relatively small number of visitors. Effects would be beneficial or adverse. Mitigation could be needed, but would include measures relatively easy to implement and likely to be successful.

Moderate

The impact on monument visitors or staff (beneficial or adverse) would be measurable or perceptible and would affect a notable share of monument visitors or employees. Adverse effects would result in an increase in conflicts in areas that currently do not exhibit noticeable accident trends or would create impacts or improvements to safety that are measurable or perceptible to a large portion of monument visitors. Mitigation measures would probably be necessary to minimize adverse effects and would likely be successful.

Major

The impact on monument visitors or staff would be substantial. The potential for additional conflicts in areas that currently do not exhibit noticeable accident trends or to create impacts or improvements to safety that are measurable or perceptible to a large portion of monument visitors would be significant. Current visitor satisfaction would decline and some of the monument's long-term visitor goals would not be achieved should safety issues increase. Extensive mitigation measures would be required and their success would not be guaranteed.

Duration

Short-term impacts are defined as impacts that would occur during implementation and construction of the action alternatives. Long-term impacts would extend beyond the implementation of the action alternatives.

IMPACTS OF THE NO-ACTION ALTERNATIVE

Analysis

Visitors would continue to access Duchess Castle from points further north on State Road 4 and likely use the commuter parking lot. The grade and curvature of the road combined with high traffic volumes make it dangerous for visitors to cross. Additionally, monument staff does not know when people are visiting Duchess Castle if they are parked in the commuter lot. Long-term minor adverse impacts on public health and safety would result from continued access to Duchess Castle from this location.

Increased soil erosion and incising into the tuff geology—which may be further exacerbated by climate change—have the potential to make portions of Tsankawi more difficult to navigate than under existing conditions. The resource monitoring program would help identify changes in the landscape but no measures or treatments would be applied. As a result, a long-term minor adverse impact on public health and safety would result.

The amount of interpretive messaging currently at Tsankawi would continue under the no-action alternative. The rugged landscape that provides a feeling of self-exploration that visitors seek may not be suitable or navigable for all, a message that is not currently conveyed. Messaging also does not inform people of extreme weather conditions or the need for sturdy shoes. The existing visitor

contact station—which would remain unchanged—does not have a water fountain, safety guidance, first aid, or an emergency phone. The continuation of existing conditions under the no-action alternative would result in long-term minor adverse impacts on public health and safety that will become larger over time as climate change proceeds. However, some of this impact may be offset by the reintroduction of a site steward who would provide a limited degree of oversight and safety information regarding access to Tsankawi. While there have been few reported incidents at Tsankawi, the continuation of current management policies would result in long-term minor adverse impacts on public health and safety.

Cumulative Impacts

Interim improvements would be implemented at the existing roadside parking area to improve access to Tsankawi. These improvements would eliminate left-turn movements into and out of the roadside parking area and create a single entry and single exit point. With the implementation of these improvements, some visitors may choose to make dangerous maneuvers (i.e., U-turns) to avoid traveling further south on State Road 4 to turn around and return to the designated entry area. However, safety would be increased for those who comply with the designated improvements, assumed to be the majority of visitors, and entry would be easier for visitors and staff traveling north on State Road 4. Access to Tsankawi may continue to deteriorate if interim improvements are not made, vehicular volumes on State Road 4 continue to increase, and visitation to the unit increases. Interim improvements would likely result in a short-term minor beneficial impact on public health and safety.

The area currently used for roadside parking is located on DOE lands and is subject to a transportation easement held by the New Mexico Department of Transportation. This segment of State Road 4 may be impacted by developments at Los Alamos National Laboratory that have been proposed in recent years. Because delivery traffic is routed through the State Road 4 and East Jemez Road intersection for security screening, and Los Alamos National Laboratory development opportunities are concentrated on the Pajarito Road corridor that is accessed through this intersection, construction and development activities at the Los Alamos National Laboratory have the potential to create additional traffic near the access point for Tsankawi. Continued heavy traffic volumes coupled with the movement of heavy material haul trucks to support developments at Los Alamos National Laboratory may generate the need to widen State Road 4 on lands currently used for roadside parking at Tsankawi, which is permitted by the NMDOT transportation easement. Should this widening occur, the existing roadside parking area for Tsankawi would be displaced. Therefore, while interim improvements would result in a short-term minor beneficial impact, this may be offset by the widening of State Road 4. Because no new parking facilities would be implemented under the no-action alternative, a long-term moderate adverse impact on public health and safety would result should the widening be implemented.

Under the no-action alternative, continued use of the existing roadside parking area and commuter parking lot to access Duchess Castle and lack of interpretive messaging and safety guidance would result in a long-term minor adverse impact on public health and safety. Minor adverse impacts associated with the no-action alternative, in combination with the short-term minor beneficial and long-term moderate adverse impacts of other past, present, and reasonably foreseeable future

actions, would result in a long-term minor to moderate adverse impact on public health and safety. Adverse impacts associated with the no-action alternative would represent a small share of adverse cumulative impacts.

Conclusion

While there have been few reported incidents at Tsankawi, the continuation of current management policies as climate change proceeds would result in long-term minor adverse impacts on public health and safety. Minor adverse impacts associated with the no-action alternative, in combination with the short-term minor beneficial and long-term moderate adverse impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term minor to moderate adverse impact on public health and safety. Adverse impacts associated with the no-action alternative would represent a small share of adverse cumulative impacts.

IMPACTS OF ALTERNATIVE 1: TWO-DIRECTIONAL ENTRY ROADWAY (PREFERRED ALTERNATIVE)

Analysis

Under alternative 1, new on-site parking would be accessed via a new entry roadway at the State Road 4 and East Jemez Road intersection. Improvements to the State Road 4 and East Jemez Road intersection would be made to accommodate safe entry to Tsankawi. Use of the existing roadside parking area would cease. Once in operation, many of the safety risks associated with accessing the existing roadside parking area would be eliminated. This would result in long-term moderate beneficial impacts on public health and safety.

The proposed kiosk would be located where the three trails converge and would be easy for visitors to find. The kiosk would provide interpretive messaging that includes information about extreme weather conditions and ruggedness of the environment, among other public health and safety concerns. It would also include a water fountain, safety guidance, first aid, and an emergency phone. All of these features would result in long-term minor to moderate beneficial impacts on public health and safety, particularly in light of climate change.

The site steward would also be reintroduced as part of alternative 1. This person(s) would provide a limited degree of oversight and safety information regarding access to Tsankawi. Introduction of the guided-only trail segment would increase the presence of monument staff or other NPS-trained local community volunteers and/or commercial guides at designated times. Tour leaders would provide a limited degree of oversight—particularly along trail segments that can be difficult to navigate—and inform visitors of some of the safety precautions when accessing Tsankawi. Increased staff presence would result in long-term minor to moderate beneficial impacts on public health and safety.

A visit to Tsankawi provides visitors with an opportunity to experience the region's deep and rich history of human occupation. However, few opportunities currently exist for persons with limited mobility. Some visitors may seek to enjoy the cultural and natural resources within Tsankawi but

later realize they are not comfortable along the trail or climbing the ladders. While few incidents have been reported, this does present a public health and safety risk for some visitors. The implementation of the ABA Walk would offer visitors with limited mobility an alternative to the rugged environment further up the Tsankawi Mesa Trail. Therefore, the ABA Walk would result in long-term minor to moderate beneficial impacts on public health and safety.

The introduction of a designated Duchess Castle Trail with its trailhead located next to the existing visitor contact station, proposed kiosk, and other trailheads would allow for the closure of the area visitors currently use to access Duchess Castle and other points north. As a result, visitors would not park in the commuter lot and cross State Road 4 to access these resources. The trail would also be easier for visitors to navigate than the Tsankawi Mesa Trail. This would result in a long-term minor to moderate beneficial impact on public health and safety.

A construction action plan would be prepared that identifies safety measures and protocols to be followed by workers to ensure their and visitor safety when construction activities are ongoing (see "Appendix F"). There would be no short-term adverse impacts on public health and safety as a result of construction activities. Overall, alternative 1 would result in long-term moderate beneficial impacts on public health and safety.

Adaptive Management Strategy

The resource monitoring program has been designed to help monument staff determine whether visitor use, natural erosion processes, or some combination thereof are the cause(s) of deteriorating resource conditions at Tsankawi. Under alternative 1, the integration of an adaptive management strategy into the resource monitoring program would allow monument staff to implement and/or adjust management strategies to better achieve desired conditions, as necessary, in order to help meet goals of resource and visitor use management. It is anticipated that specific management strategies that may be implemented as part of the adaptive management strategy related to visitor use management would also result in benefits on public health and safety because they would be designed, in part, to encourage visitors to stay within designated trails that would be maintained by monument staff.

Monitoring activities may reveal that additional minor trail revisions are necessary in areas of concentrated visitation due to accelerated erosion and rock fall in order to ensure visitor and monument staff safety. The implementation of additional minor trail improvements would encourage visitors to stay within designated trails and away from rock fall areas, resulting in a benefit on public health and safety. The potential introduction of additional interpretive messaging and/or law enforcement as a means to help preserve and protect archeological resources and/or ensure that visitors receive the important message that Tsankawi is a living landscape containing many sensitive cultural and natural resources may indirectly result in benefits on public health and safety. While there have been few reported incidents related to public health and safety at Tsankawi, it is anticipated that any improvement to trail conditions and/or increase in interpretive and safety messaging and/or law enforcement would result in beneficial impacts on public health and safety.

Cumulative Impacts

Past, present, and reasonably foreseeable future actions in the monument and areas adjacent to Tsankawi under alternative 1 would be the same as those described for the no-action alternative. However, because alternative 1 includes the relocation of parking facilities onto NPS lands, long-term moderate adverse effects associated with the displacement of the existing roadside parking area that would result under the no-action alternative due to the potential widening of State Road 4 would be diminished should this alternative be implemented prior to the widening. Interim improvements would address an existing public health and safety concern until parking can be moved onto NPS lands, resulting in a short-term minor beneficial impact on public health and safety.

Implementation of alternative 1 would result in a long-term moderate beneficial impact on public health and safety. Moderate beneficial impacts associated with alternative 1, in combination with the short-term minor beneficial and long-term moderate adverse impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term moderate beneficial impact on public health and safety. Beneficial impacts associated with alternative 1 would represent a notable share of the beneficial cumulative impact.

Conclusion

The introduction of new interpretive messaging, first aid, water fountain, emergency phone, ABA Walk, Duchess Castle Trail, reconfiguration of the State Road 4 and East Jemez Road intersection, and relocation of the existing roadside parking area onto NPS lands would result in long-term moderate beneficial impacts on public health and safety, particularly as climate change proceeds. Potential management strategies that may implemented as part of the adaptive management would likely increase this benefit, directly or indirectly. Moderate beneficial impacts associated with alternative 1, in combination with the short-term minor beneficial and long-term moderate adverse impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term moderate beneficial cumulative impact on public health and safety. Beneficial impacts associated with alternative 1 would represent a notable share of the beneficial cumulative impact.

IMPACTS OF ALTERNATIVE 2: LOOPED ENTRY ROADWAY

Analysis

While the configuration would be different than under alternative 1, the new on-site parking area would be accessed via a new entry roadway at the State Road 4 and East Jemez Road intersection. Improvements to the State Road 4 and East Jemez Road intersection would be made to accommodate safe entry to Tsankawi. Use of the existing roadside parking area would cease. Once in operation, many of the safety risks associated with accessing the existing roadside parking area would be eliminated. This would result in long-term moderate beneficial impacts on public health and safety.

The proposed kiosk would be located next to the ABA Walk trailhead and relocated restrooms. It would provide interpretive messaging that includes information about extreme weather conditions

and ruggedness of the environment, among other public health and safety concerns. It would also include a water fountain, first aid, and an emergency phone. However, its location would be further from the main trailhead and Duchess Castle Trail, which may result in some visitors not being informed of potential public health and safety risks or mechanisms in place in the event of an emergency. While not all visitors would receive this message, the introduction of enhanced safety measures would result in long-term minor to moderate beneficial impacts on public health and safety, particularly in light of climate change.

A site steward would also be reintroduced as part of alternative 2. This person(s) would provide a limited degree of oversight and safety information regarding access to Tsankawi. The introduction of the guided-only trail segment would increase the presence of monument staff or other NPS-trained local community volunteers and/or commercial guides at designated times. Tour leaders would provide a limited degree of oversight—particularly on trail segments that can be difficult to navigate—and inform visitors of some of the safety precautions when accessing Tsankawi. Increased staff presence would result in long-term minor to moderate beneficial impacts on public health and safety.

Similar to alternative 1, the implementation of the ABA Walk would offer visitors with limited mobility an alternative to the rugged environment further up the mesa. The implementation of the Duchess Castle Trail would allow for safe visits to the area and also be easier for visitors to navigate than the Tsankawi Mesa Trail. This would result in a long-term minor to moderate beneficial impact. A construction action plan would be prepared that identifies safety measures and protocols to be followed by workers to ensure their and visitor safety when construction activities are ongoing (see "Appendix F"). There would be no short-term adverse impact on public health and safety as a result of construction activities. Overall, alternative 2 would result in long-term moderate beneficial impacts on public health and safety.

Adaptive Management Strategy

The integration of an adaptive management strategy into the resource monitoring program would be the same as under alternative 1. This would allow monument staff to implement and/or adjust management strategies to better achieve desired resource conditions, as necessary, in order to help meet goals of resource and visitor use management. It is anticipated that specific management strategies that may be implemented as part of the adaptive management strategy related to visitor use management would also result in benefits to public health and safety because they would be designed, in part, to encourage visitors to stay within designated trails that would be maintained by monument staff.

The implementation of additional minor trail revisions would help ensure visitor and monument staff safety and, subsequently, result in beneficial impacts on public health and safety. The potential introduction of additional interpretive messaging and/or law enforcement as a means to help preserve and protect archeological resources and/or ensure that visitors receive the important message that Tsankawi is a living landscape containing many sensitive cultural and natural resources may indirectly result in benefits on public health and safety. While there have been few reported incidents related to public health and safety at Tsankawi, it is anticipated that any improvement to

trail conditions and/or increase in interpretive and safety messaging and/or law enforcement would result in beneficial impacts on public health and safety.

Cumulative Impacts

Past, present, and reasonably foreseeable future actions in the monument and areas adjacent to Tsankawi under alternative 2 would be the same as those described for the no-action alternative. However, because alternative 2 includes the relocation of parking facilities onto NPS lands, long-term moderate adverse effects associated with the displacement of the existing roadside parking area that would result under the no-action alternative due to the potential widening of State Road 4 would be diminished should this alternative be implemented prior to the widening. Interim improvements would address an existing public health and safety concern until parking can be moved onto NPS lands, resulting in a short-term minor beneficial impact on public health and safety.

Implementation of alternative 2 would result in a long-term moderate beneficial impact on public health and safety. Moderate beneficial impacts associated with alternative 2, in combination with the short-term minor beneficial and long-term moderate adverse impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term moderate beneficial impact on public health and safety. Beneficial impacts associated with alternative 2 would represent a notable share of the beneficial cumulative impact.

Conclusion

The introduction of new interpretive messaging, first aid, water fountain, emergency phone, ABA Walk, Duchess Castle Trail, reconfiguration of the State Road 4 and East Jemez Road intersection, and relocation of the existing roadside parking area onto NPS lands would result in long-term moderate beneficial impacts on public health and safety, particularly as climate change proceeds. However, due to the proposed siting of the kiosk, this benefit would likely be less than under alternative 1. Potential management strategies that may be implemented as part of the adaptive management would likely increase the overall benefit on public health and safety, directly or indirectly. Moderate beneficial impacts associated with alternative 2, in combination with the short-term minor beneficial and long-term moderate adverse impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term moderate beneficial cumulative impact on public health and safety. Beneficial impacts associated with alternative 2 would represent a notable share of the beneficial cumulative impact.

IMPACTS ON PARK OPERATIONS AND MANAGEMENT

METHODS AND ASSUMPTIONS

Park operations and management, for this analysis, refers to the quality and effectiveness of monument staff to maintain and administer monument resources and provide for an appropriate visitor experience. The analysis is based on the current description of park operations and management presented in “Chapter 3: Affected Environment.”

STUDY AREA

The study area for this analysis includes all land within Tsankawi; however, the assessment pays particular attention to those areas frequented by visitors and where the proposed action alternatives would occur. It is anticipated that effects on park operations and management associated with the proposed action alternatives would be generally limited to these areas. The cumulative impacts analysis considers plans and actions within Tsankawi, the main unit of the monument, and areas adjacent to Tsankawi.

IMPACT DEFINITIONS

The following definitions are used to assess the intensity of adverse and beneficial impacts on park operations and management and duration of impacts.

Negligible

Monument operations would not be affected, or the effects would be at low levels of detection and would not have an appreciable effect on monument operations.

Minor

The impact on monument operations and management would not be readily apparent and difficult to measure. Any such effects on monument operations and management would have little material effect on other ongoing operations.

Moderate

The impact on monument operations and management (beneficial or adverse) would be readily apparent and measurable by monument staff and visitors. Mitigation measures would likely be necessary to minimize adverse effects and are likely to be successful.

Major

The impact would be readily apparent and would result in a substantial change to current monument operations. Such changes would be noticeable to monument staff and visitors and be markedly different from existing operations. Mitigation measures would be necessary to minimize adverse effects, and their success could not be guaranteed.

Duration

Short-term impacts are defined as impacts that would occur during implementation of the action alternatives. Long-term impacts would extend beyond the implementation of the action alternatives.

IMPACTS OF NO-ACTION ALTERNATIVE

Analysis

Under the no-action alternative, a resource monitoring program would be implemented to document baseline resource conditions, assess current conditions, and monitor them over time to help determine if visitor use, natural erosion processes, or some combination thereof are the cause(s) of deteriorating resource conditions. The identification of the cause(s) of deteriorating resource conditions would likely be challenging, take multiple years, with the pace of progress depending on continued levels of Vanishing Treasures program funding. At this time, however, it is anticipated that staffing levels for the Vanishing Treasures program would remain the same as under existing conditions. Activities conducted as part of the resource monitoring program would be incorporated into current site visits by appropriate staff.

A site steward would be reintroduced under the no-action alternative. This person(s) would be a volunteer and remain on-site for a period of weeks or months. The site steward would provide a limited degree of oversight at Tsankawi. This would be a volunteer position and would therefore have no effect on park operations and management.

No additional monument staff would frequent Tsankawi under the no-action alternative. Current operations and management of Tsankawi would remain relatively unchanged from existing conditions. As a result, no additional staffing costs would be associated with the no-action alternative.

Cumulative Impacts

Current staffing levels at the monument are able to support ongoing activities associated with fire management and monitoring of ecological restoration efforts. It is anticipated that no additional staffing would be necessary to support the continuation of these activities. The ongoing transportation study/environmental assessment may identify transit options to improve traffic conditions at the main unit of the monument as well as a bus route to Tsankawi. This may place additional demand on monument staffing levels; however, it is not known at this time if such recommendations would be made or who would provide transit service if implemented. The potential exists for long-term negligible to minor adverse impacts on park operations and management to result should it be determined that transit options be staffed internally. This may include the need to hire additional staff or reallocate staffing responsibilities.

Implementation of the no-action alternative would not place additional demand on monument staff or resources. Therefore, impacts would be negligible. Negligible impacts associated with the no-action alternative, in combination with the long-term negligible to minor adverse impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term negligible to minor adverse cumulative impact on park operations and management. The no-action alternative would not contribute to the overall cumulative impact.

Conclusion

Under the no-action alternative, a site steward would be reintroduced to Tsankawi. No staffing costs would be associated with their presence on-site. No other changes to park operations or management would occur under the no-action alternative. Therefore, this alternative would result in long-term negligible impacts on park operations and management. Negligible impacts associated with the no-action alternative, in combination with the long-term negligible to minor adverse impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term negligible to minor adverse cumulative impact on park operations and management. The no-action alternative would not contribute to the overall cumulative impact.

IMPACTS OF ALTERNATIVE 1: TWO-DIRECTIONAL ENTRY ROADWAY (PREFERRED ALTERNATIVE)

Analysis

Under alternative 1, the resource monitoring program and site steward would also be implemented. The introduction of the guided-only trail segment would require additional monument staff or other NPS-trained local community volunteers and/or commercial guides to lead tours. A determination as to who would lead these tours has yet to be made. However, this analysis assumes that interpretive staff hours would increase to facilitate these tours. Under existing conditions, interpretive staff spends approximately eight hours at Tsankawi on a biweekly basis. Alternative 1 assumes that this would increase to eight hours weekly.

The number of hours that law enforcement spends on-site may need to be adjusted based on the introduction of a variety of trail options. This would depend on need and available funds. Tribal liaison hours would also increase.

There may be a need to increase the frequency at which staff collects money from the fee collection station. However, this would be an automated machine that takes credit cards so the increase in staffing may not be necessary. Monument staff would adjust the frequency at which fees are collected, as necessary. Under alternative 1, upkeep and maintenance of new trails would be necessary. Monument staff estimate this would require an additional six hours weekly by maintenance staff over the no-action alternative.

Under alternative 1, staffing needs at Tsankawi would increase to 5,232 hours over the 4,641 hours estimated under the no-action alternative. This represents approximately 3.0 full-time staff equivalents and approximately 5.0% of annual operational costs (NPS 2012a). Overall, the increase in staff at Tsankawi would result in long-term negligible to minor adverse impacts on park operations and management as a result of increased staffing needs and associated costs.

Adaptive Management Strategy

The resource monitoring program has been designed to help monument staff determine whether visitor use, natural erosion processes, or some combination thereof are the cause(s) of deteriorating resource conditions at Tsankawi. Under alternative 1, the integration of an adaptive management strategy into the resource monitoring program would allow monument staff to implement and/or adjust management strategies to better achieve desired conditions, as necessary, in order to help meet goals of resource and visitor use management.

Law enforcement may be increased and a reservation system implemented if monument staff determine that archeological resources are in need of greater protection and/or trailside vegetation and social trailing indicate that visitors require increased oversight in order to receive the important message that Tsankawi is a living landscape containing many sensitive cultural and natural resources. Subsequently, this would increase the number of hours that monument staff spend at Tsankawi on a given day or week.

The potential implementation of the connector route from Duchess Castle to the eastern edge of Tsankawi Mesa may also warrant additional staff. However, the connecter loop would make it easier for law enforcement and other monument staff to patrol the area. At this time, it is not known how the introduction of additional law enforcement and/or other monument staff would affect overall park operations and management. Should funding levels remain as under existing conditions, it is anticipated that the increased presence of law enforcement and/or other monument staff and associated staffing hours at Tsankawi would result in minimal adverse impacts on park operations and management.

Cumulative Impacts

Past, present, and reasonably foreseeable future actions in the monument and areas adjacent to Tsankawi under alternative 1 would be the same as those described for the no-action alternative. Implementation of alternative 1 would result in a small increase in staffing needs at Tsankawi. Such impacts are anticipated to be long-term negligible to minor adverse. Long-term negligible to minor adverse impacts associated with alternative 1, in combination with the long-term negligible to minor adverse impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term negligible to minor adverse cumulative impact on park operations and management. The adverse effects of alternative 1 would represent a small portion of the adverse cumulative impact.

Conclusion

Under alternative 1, a site steward and additional staff to support the guided-only trail segment would be introduced to Tsankawi. The site steward would be a volunteer position while other staffing needs would require additional monument staff or other NPS-trained local community volunteers and/or commercial guides. This may increase staffing costs, but would also improve unit operations. The potential introduction of additional staffing under the adaptive management strategy would result in minimal adverse impacts on park operations and management. Therefore, alternative 1 would result in long-term negligible to minor adverse impacts on park operations and

management. Long-term negligible to minor adverse impacts associated with alternative 1, in combination with long-term negligible to minor adverse impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term negligible to minor adverse cumulative impact on park operations and management. Adverse effects of alternative 1 would represent a small portion of the adverse cumulative impact.

IMPACTS OF ALTERNATIVE 2: LOOPED ENTRY ROADWAY

Analysis

Under alternative 2, the resource monitoring program and site steward would also be implemented. Similar to alternative 1, the introduction of the guided-only trail segment would require additional monument staff or other NPS-trained local community volunteers and/or commercial guides to lead tours. A determination as to who would lead these tours has yet to be made. However, this analysis assumes that interpretive staff hours would increase to facilitate these tours. Under existing conditions, interpretive staff spend approximately eight hours at Tsankawi on a biweekly basis. Alternative 1 assumes that this would increase to eight hours weekly.

The number of hours that law enforcement spends on-site may need to be adjusted based on the introduction of a variety of trail options. This would depend on need and available funds. Tribal liaison hours would also increase.

There may be a need to increase the frequency at which staff collects money from the fee collection station. However, this would be an automated machine that takes credit cards so the increase in staffing may not be necessary. This would be determined closer to the time the alternative is implemented. Monument staff would adjust the frequency at which fees are collected, as necessary. Under alternative 2, upkeep and maintenance of new trails would be necessary. Monument staff estimate this would require an additional six hours weekly by maintenance staff.

Under alternative 2, staffing needs at Tsankawi would increase to 5,232 hours over the 4,641 hours estimated under the no-action alternative. This represents approximately 3.0 full-time staff equivalents and approximately 5.0% of annual operational costs (NPS 2014a). Overall, the increase in staff at Tsankawi would result in long-term negligible to minor adverse impacts on park operations and management as a result of increased staffing needs and associated costs.

Adaptive Management Strategy

The integration of an adaptive management strategy into the resource monitoring program would be the same as under alternative 1. This would allow monument staff to implement and/or adjust management strategies to better achieve desired resource conditions, as necessary, in order to help meet goals of resource and visitor use management.

Law enforcement may be increased and a reservation system implemented if monument staff determine that archeological resources are in need of greater protection and/or trailside vegetation and social trailing indicate that visitors require increased oversight in order to receive the important

message that Tsankawi is a living landscape containing many sensitive cultural and natural resources. Subsequently, this would increase the number of hours that monument staff spend at Tsankawi on a given day or week.

The potential implementation of the connector route from Duchess Castle to the eastern edge of Tsankawi Mesa may also warrant additional staff. However, the connecter loop would make it easier for law enforcement and other monument staff to patrol the area. At this time, it is not known how the introduction of additional law enforcement and/or other monument staff would affect overall park operations and management. Should funding levels remain as under existing conditions, it is anticipated that the increased presence of law enforcement and/or other monument staff and associated staffing hours at Tsankawi would result in minimal adverse impacts on park operations and management.

Cumulative Impacts

Past, present, and reasonably foreseeable future actions in the monument and areas adjacent to Tsankawi under alternative 2 would be the same as those described for the no-action alternative. Implementation of alternative 2 would result in a small increase in staffing needs at Tsankawi. Such impacts are anticipated to be long-term negligible to minor adverse. Long-term negligible to minor adverse impacts associated with alternative 2, in combination with the long-term negligible to minor adverse impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term negligible to minor adverse cumulative impact on park operations and management. The adverse effects of alternative 2 would represent a small portion of the adverse cumulative impact.

Conclusion

Under alternative 2, a site steward and additional staff to support the guided-only trail segment would be introduced to Tsankawi. The site steward would be a volunteer position while other staffing needs would require additional monument staff or other NPS-trained local community volunteers and/or commercial guides. This may increase staffing costs, but would also improve unit operations. The potential introduction of additional staffing under the adaptive management strategy would result in minimal adverse impacts on park operations and management. Therefore, alternative 2 would result in long-term negligible to minor adverse impacts on park operations and management. Long-term negligible to minor adverse impacts associated with alternative 2, in combination with the long-term negligible to minor adverse impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term negligible to minor adverse cumulative impact on park operations and management. The adverse effects of alternative 2 would represent a small portion of the adverse cumulative impact.

IMPACTS ON SOCIOECONOMICS

METHODS AND ASSUMPTIONS

Socioeconomic data and planned and proposed actions in and near Tsankawi were considered in identifying and discussing the potential for socioeconomic effects of project alternatives. Planning team members applied experience and professional expertise and judgment to analyze potential impacts that would result from project alternatives on the existing social and economic conditions near Tsankawi.

STUDY AREA

The study area for the socioeconomic impact analysis includes Los Alamos County, particularly those communities near Tsankawi, such as White Rock and Los Alamos. These communities are most likely to experience a change in economic activity as a result of visitation, increased or decreased, to Tsankawi.

IMPACT DEFINITIONS

The following definitions are used to assess the intensity of adverse and beneficial impacts on socioeconomics and duration of impacts.

Negligible

There would be very little change in economic activity (increase or decrease). Impacts would be nonexistent, barely detectable, or detectable only through indirect means and with no discernible impact on local or regional economic conditions.

Minor

There would be a slight change in economic activity (increase or decrease) that would affect few individuals, businesses, or government entities. Impacts would be small but detectable, limited to a small geographic area, comparable in scale to typical year-to-year or seasonal variations, and not be expected to substantively alter economic conditions over the long term.

Moderate

There would be a notable change in economic activity (increase or decrease) that would affect many individuals, businesses, or government entities. Impacts would be readily apparent and detectable across a wider geographic area and may have a noticeable effect on economic conditions over the long term.

Major

There would be a significant change in economic activity (increase or decrease) that would affect a large number of individuals, businesses, or government entities. Impacts would be readily detectable and observed, extend across much of the study area, and would have a substantial influence on economic conditions over the long term.

Duration

Short-term impacts are defined as impacts that would occur during the construction and implementation of the proposed action alternatives. Long-term impacts would extend beyond the implementation of the proposed action alternatives.

IMPACTS OF THE NO-ACTION ALTERNATIVE

Analysis

Under the no-action alternative, no new trails or interpretive messaging would be introduced to Tsankawi. Future visitation to Tsankawi is anticipated to resemble current visitation trends. Therefore, it is not anticipated that there would be a considerable change in visitor spending in local and regional markets. However, fluctuating visitation numbers (increase or decrease) does have the potential to result in a change in visitor spending. Because local visitors already support local and regional economic activity, the share of nonlocal visitors would likely need to change for any notable change in visitor spending to occur. Overall, it is anticipated that the no-action alternative would result in a long-term negligible impact on socioeconomic conditions. The effects of which would be dependent on a positive or negative change in visitation and share of nonlocal visitors.

Cumulative Impacts

Past, present, and reasonably foreseeable future actions in the monument and areas adjacent to Tsankawi identified for inclusion in this environmental assessment would not result in any change and, therefore, no effect on socioeconomic conditions over the long term. However, workers brought to the area for construction activities associated with the possible widening of State Road 4 may introduce a short term and likely negligible increase in economic activity in local and regional markets. It is anticipated that the implementation of interim improvements to the existing roadside parking area would be of relatively short duration and would not result in a change in economic activity in local and regional markets.

The no-action alternative is not anticipated to result in any notable change in socioeconomic conditions over the short or long term. Therefore, the no-action alternative, in combination with the negligible short-term beneficial impacts of other past, present, and reasonably foreseeable future actions, would result in a short-term negligible beneficial cumulative impact on socioeconomics. No long-term cumulative impacts would result.

Conclusion

Under the no-action alternative, current visitor opportunities would continue. Because Tsankawi represents such a small share of overall monument visitation, any change in visitation to Tsankawi, increase or decrease, is not anticipated to affect local or regional markets beyond a negligible degree. Negligible impacts associated with the no-action alternative, in combination with the short-term negligible beneficial impacts of other past, present, and reasonably foreseeable future actions, would result in a short-term negligible beneficial cumulative impact on socioeconomics. Because the no-action alternative would have no effects during the short term, it would not contribute to short-term negligible beneficial cumulative impacts. No cumulative impacts would result in the long term.

IMPACTS OF ALTERNATIVE 1: TWO-DIRECTIONAL ENTRY ROADWAY (PREFERRED ALTERNATIVE)

Analysis

Under alternative 1, workers brought on-site to support construction activities have the potential to increase spending in local markets while activities are ongoing. Because of the small scale of alternative 1, it is not anticipated that many workers would be necessary to support construction activities. Therefore, some local vendors may experience increased patronage but the effects would not likely be more than short term, negligible, and beneficial.

Once in operation, alternative 1 would support a new range of visitor opportunities at Tsankawi. Similar to the no-action alternative, future visitation to Tsankawi is anticipated to resemble current visitation trends, and there is no certainty as to how the implementation of alternative 1 would affect visitation numbers. However, enhanced visitor opportunities have the potential to increase visitation beyond what would occur under the no-action alternative. This increase may result in additional visitor spending in local and regional markets; however, it is not anticipated to result in effects beyond a negligible degree. Any notable change would be the result of more nonlocal visitors as compared to local users who already support local and regional economic activity. Therefore, it is anticipated that socioeconomic impacts would be long-term negligible beneficial should nonlocal visitation increase.

Adaptive Management Strategy

Potential management strategies identified in the adaptive management strategy are related to resource and visitor use management and do not make specific reference to socioeconomics. Indirect socioeconomic effects may result should management strategies implemented as part of the adaptive management strategy result in a change visitor use and experience and, subsequently, affect visitation numbers (increase or decrease).

Cumulative Impacts

Past, present, and reasonably foreseeable future actions in the monument and areas adjacent to Tsankawi identified for inclusion in this environmental assessment would not result in any change and, therefore, no effect on socioeconomic conditions over the long term. However, workers brought to the area for construction activities associated with the possible widening of State Road 4 may introduce a short term and likely negligible increase in economic activity in local and regional markets. It is anticipated that the implementation of interim improvements to the existing roadside parking area would be of relatively short duration and would not result in a change in economic activity in local and regional markets.

Over the short-term, local spending by workers brought on-site to support construction activities associated with alternative 1 would result in negligible beneficial impacts. Short-term negligible beneficial impacts associated with alternative 1, in combination with the short-term negligible beneficial impacts of other past, present, and reasonably foreseeable future actions, would result in a short-term negligible beneficial cumulative impact on socioeconomics. The contribution of alternative 1 to these effects would be minimal. Cumulative impacts over the long term would be negligible, beneficial, and associated with the increase in nonlocal visitation (should one result) due to enhanced visitor opportunities under alternative 1.

Conclusion

Under alternative 1, enhanced visitor opportunities have the potential to increase visitation to Tsankawi. However, Tsankawi represents a small share of overall monument visitation and any change in visitation, increase or decrease, is not anticipated to affect local or regional markets beyond a negligible degree. Over the short term, local spending by workers brought on-site to support construction activities associated with alternative 1 would result in negligible beneficial impacts. Any change in visitation and, subsequently, visitor spending as an indirect result of potential management strategies implemented under the adaptive management strategy is anticipated to be negligible. Short-term negligible beneficial impacts associated with alternative 1, in combination with the negligible short-term beneficial impacts of other past, present, and reasonably foreseeable future actions, would result in a short-term negligible beneficial cumulative impact on socioeconomics. The contribution of alternative 1 to these effects would be minimal. Cumulative impacts over the long term would be negligible, beneficial, and associated with the increase in nonlocal visitation (should one result) due to enhanced visitor opportunities under alternative 1.

IMPACTS OF ALTERNATIVE 2: LOOPED ENTRY ROADWAY

Analysis

Under alternative 2, socioeconomic impacts would be similar to those described under alternative 1. Workers brought on-site to support construction activities have the potential to increase spending in local markets while activities are ongoing. However, the small scale of construction activities is not anticipated to require many workers. Therefore, some local vendors may experience increased

patronage while construction activities are ongoing but the effects would not likely be more than short-term negligible beneficial.

Once in operation, alternative 2 would support a new range of visitor opportunities at Tsankawi. Similar to the no-action alternative, future visitation to Tsankawi is anticipated to resemble current visitation trends, and there is no certainty as to how the implementation of alternative 2 would affect visitation numbers. However, enhanced visitor opportunities have the potential increase visitation beyond what would occur under the no-action alternative. This increase may result in additional visitor spending in local and regional markets; however, it is not anticipated to result in effects beyond a negligible degree. Any notable change would be the result of more nonlocal visitors as compared to local users who already support local and regional economic activity. Therefore, it is anticipated that socioeconomic impacts would be long-term negligible beneficial should nonlocal visitation increase.

Adaptive Management Strategy

The integration of an adaptive management strategy into the resource monitoring program would be the same as under alternative 1. Potential management strategies identified in the adaptive management strategy are related to resource and visitor use management and do not make specific reference to socioeconomics. Indirect socioeconomic effects may result should management strategies implemented as part of the adaptive management strategy result in a change visitor use and experience and, subsequently, affect visitation numbers (increase or decrease).

Cumulative Impacts

Past, present, and reasonably foreseeable future actions in the monument and areas adjacent to Tsankawi identified for inclusion in this environmental assessment would not result in any change and, therefore, no effect on socioeconomic conditions over the long term. However, workers brought to the area for construction activities associated the possible widening of State Road 4 may introduce a short-term and likely negligible increase in economic activity in local and regional markets. It is anticipated that the implementation of interim improvements to the existing roadside parking area would be of relatively short duration and would not result in a change in economic activity in local and regional markets.

Over the short-term, local spending by workers brought on-site to support construction activities associated with alternative 2 would result in negligible beneficial impacts. Short-term negligible beneficial impacts associated with alternative 2, in combination with the short-term negligible beneficial impacts of other past, present, and reasonably foreseeable future actions, would result in a short-term negligible beneficial cumulative impact on socioeconomics. The contribution of alternative 2 to these effects would be minimal. Cumulative impacts over the long term would be negligible, beneficial, and associated with the increase in nonlocal visitation (should one result) due to enhanced visitor opportunities under alternative 2.

Conclusion

Under alternative 2, enhanced visitor opportunities have the potential to increase visitation to Tsankawi. However, Tsankawi represents a small share of overall monument visitation and any change in visitation, increase or decrease, is not anticipated to affect local or regional markets beyond a negligible degree. Over the short term, local spending by workers brought on-site to support construction activities associated with alternative 2 would result in negligible beneficial impacts. Any change in visitation and, subsequently, visitor spending as an indirect result of potential management strategies implemented under the adaptive management strategy is anticipated to be negligible. Short-term negligible beneficial impacts associated with alternative 2, in combination with the short-term negligible beneficial impacts of other past, present, and reasonably foreseeable future actions, would result in a short-term negligible beneficial cumulative impact on socioeconomics. The contribution of alternative 2 to these effects would be minimal. Cumulative impacts over the long term would be negligible, beneficial, and associated with the increase in nonlocal visitation (should one result) due to enhanced visitor opportunities under alternative 2.

Chapter 5

Consultation and Coordination

THE SCOPING PROCESS

One of the primary objectives of the National Environmental Policy Act of 1969 is to encourage participation in the planning process by appropriate federal and state agencies and interested members of the public. This chapter describes consultation that occurred during development of this plan/environmental assessment. It also includes a description of public involvement processes employed to engage the abovementioned parties and a list of the recipients of the document.

The National Park Service divides the scoping process into two parts: internal and external (or public) scoping. Internal scoping involves discussions among NPS staff regarding the purpose of and need for management actions, issues and objectives, management alternatives, mitigation measures, the appropriate level of documentation, and available references and guidance, among other topics.

External (or public) scoping is the early involvement of the interested and affected public in the planning effort. This ensures that people have an opportunity to comment and contribute early in the decision-making process. For this planning document, project information was distributed to individuals, agencies, and organizations in the earliest stages of the decision-making process. Interested parties and individuals were given the opportunity to express concerns or views regarding the project, including identification of important issues and proposal of other project alternatives or components. These processes, internal and external (or public) scoping, are essential elements of the NEPA planning process. The following sections describe the various ways scoping was conducted for this environmental assessment.

INTERNAL SCOPING

An internal scoping meeting was held on November 21 and 22, 2011. During this meeting, the interdisciplinary team defined the purpose of and need for action, and objectives of the plan; identified potential issues; discussed preliminary alternatives; and defined data needs. Meeting results were captured in a report now on file as part of the administration record for this environmental assessment.

PUBLIC SCOPING

A number of media sources were used to inform the public, interest groups, and local public entities that a plan/environmental assessment was going to be prepared regarding management policies at Tsankawi and provide opportunities for them to become involved in the planning process. In April 2012, NPS staff initiated public scoping for the plan/environmental assessment by issuing a scoping newsletter that provided a brief summary of the environmental assessment process, project background, purpose of and need for action, and objectives and issues to be addressed through the planning process. The newsletter also provided information about upcoming public scoping meetings and ways to provide comment regarding the project. It was sent to a mailing list that included tribal governments, posted to the monument's Planning, Environment and Public

Comment website at http://parkplanning.nps.gov/Tsankawi, and an announcement was sent to numerous media outlets throughout the Los Alamos and Santa Fe area.

The release of the public scoping newsletter initiated the minimum 30-day public scoping period in accordance with the National Environmental Policy Act of 1969 and Director's Order 12. Two public scoping meetings were held on May 9, 2012, at the Fuller Lodge in Los Alamos. After all comments—both verbal and written—were received from the general public and interested parties, NPS staff determined that it would be appropriate to extend the public scoping period to 60 days. Also during this period, NPS staff held a consultation meeting with affiliated pueblos and another meeting with New Mexico SHPO staff. A summary of comments received during the public scoping period is presented below.

PUBLIC SCOPING COMMENTS

During the public scoping period, a total of 24 pieces of correspondence were received, one of which was a duplicate. Because issues associated with resource protection and visitor experience are interrelated for this project, information presented immediately below provides a general summary of comments received. Specific project elements are presented separately, where feasible.

The significance and beauty of the site means that many people—both from the pueblos and the general public—have deep connections to the landscape, which need to be protected. This includes appropriate interpretive messaging to inform all visitors of the significance and fragility of Tsankawi. Additionally, people expressed the need for signage or other interpretive features, potentially even the presence of NPS staff, alerting people about the difficulty of traversing some of the trails, the unforgiving sun, history of the site, best time to see petroglyphs because of sun angles, and animal habitats, among others.

Commenters also expressed the desire for an improved visitor contact station at the unit. One comment suggested the presence of volunteer staff and/or increased presence of staff during the peak season. Other comments suggested that a visitor contact station or other system be put into place to collect fees because the current fee station is confusing. However, another stated that a fee system is not consistent with ancient values of Tsankawi. One commenter suggested the possibility of managing the area in a fashion similar to the Gila Cliff Dwellings where NPS staff provide information and are also there to monitor visitor use.

Working with local pueblos was mentioned as critically important to the continued protection of the site. The potential to provide cultural interpretation should be explored. This includes tours facilitated by pueblo representatives. It is also important to engage the pueblos to determine if they feel there are certain areas that should be closed to the public or require a permit for entry. One commenter stated that the entire area should be permit-access only and that the most "pristine sites" should be limited to staff led visits only.

Some commenters expressed concern that Tsankawi does not receive as much protection or oversight as the main unit of the monument. Misuse and vandalism of the unit is of concern to people because it has the appearance of neglect. Some commenters said they believe that

unexcavated sites should be cordoned off from visitor access to protect resources from human exposure and vandalism, including the removal of pottery. Commenters also noted a decrease in upkeep and that resource conditions have declined since they began visiting Tsankawi. However, they feel that the "ruggedness is part of the charm. . .but the site must also be well-maintained to preserve its beauty and uniqueness." The need for a protection plan to help slow erosion processes of the pumice rock was also expressed.

Multiple commenters stated they would like Tsankawi to remain as an undeveloped area, favor no or minimal development, and/or ask that access not be further restricted. One commenter stated, "the best approach is to leave it undeveloped thereby allowing access only for those who can withstand the rigors of a "wilderness" site." Another wrote, "the absence of modern improvement allows the visitor to imagine the Anasazi way of life. I would urge you retain this undeveloped experience at Tsankawi and direct the visitor for a more developed and guided experience at Frijoles Canyon."

Access

Commenters stated that trails should remain unpaved but be better maintained and allow for self-guided experiences. More developed areas and guided experiences should be limited to areas such as Frijoles Canyon. One commenter stated that trails showing wear should be filled in or rerouted. Another stated that trails should be paved where erosion is a problem or wheelchair access is currently not feasible, other areas should continue to be unpaved. One proposed the installation of a boardwalk made from recycled plastic lumber in places to protect rock from wear.

Commenters said that their favorite things about the site are the ladders, footpaths, and petroglyphs. One stated that the trail should be extended to the east after the ladder descent into the cavate section (what this commenter calls the "condos"). This was seconded by another commenter who stated that the trail could emphasize flora and the geology of the plateau, Rio Grande Rift, and Sangre de Cristo Mountains.

Another stated that they do not want to see railings added to the cliff climbing trails "as it would detract from the realization that one is walking in an ancient trail" while a citizen's group in northern New Mexico proposed a new trail. This trail would follow the current access to the top of the mesa to minimize impacts to cultural resources and would include steps and railings, using as much natural material as possible, to provide safer access and help prevent resource erosion. This group further suggests, while not preferred, that access to the mesa top be closed.

Additionally, part of the experience is getting "up close" to petroglyphs but it also puts them at risk. One commenter stated he/she did not know how to protect them while still allowing viewing access. Another proposed the possibility of zones that regulate use patterns in various parts of the unit. Areas undergoing archeological/anthropologic evaluation should be closed to the public. Visitors should be directed to the main Tsankawi entrance but should be allowed to access to the north side of Tsankawi and Duchess Castle. The castle homestead is part of the regional history and should also be showcased through interpretive opportunities. Appropriate signage and trails should be provided to North Mesa and Duchess Castle. One commenter stated that he/she would like to see a trail around the west end of Tsankawi Mesa to Duchess Castle and North Mesa. The trespassing sign should be removed.

Some commenters who have a dedicated commitment to protecting Tsankawi's resources are unhappy that the misuse of others has taken away some of their ability to enjoy the unit. While it may not be feasible, they have asked for "special treatment" or "exemption" to access currently closed off resources because of their proven care for the landscape.

Parking and Roadway Improvements

Commenters expressed the need for better parking options but also stressed the importance of not increasing lot size too much so that high visitation during peak hours takes away from the solitary experience currently enjoyed. One commenter said they see nothing wrong with the existing roadside parking area. Another stated "any safety concerns about the present parking arrangement are based more on perception than fact. . . .if there were unlimited funds for development, add another entrance to the State Road 4 junction with East Jemez Road, but there aren't, and so it should not have high priority." One stated that a parking lot at the intersection of State Roads 4 and 502 appears feasible. Any reconfiguration of this area should also address congestion issues. Connections with Atomic City Transit should be explored.

Persons with Limited Mobility

While some people expressed the need to improve site access for persons with limited mobility, one commenter stated that the main unit of the monument should accommodate people with these needs and leave Tsankawi in its more rustic fashion. Another indicated that possibly a movie or slideshow at a visitor station would be nice for persons with limited mobility whose family or friends are visiting other parts of the unit.

General Comments

One commenter indicated that burn areas need to be carefully evaluated. Protection of native plants is important and the significance of these resources to the pueblos should also be provided as part of interpretive features. Another stated that noise affects visitor experience. One commenter stated that as technology allows, a touch screen tool should be implemented that allows visitors to indicate where in the unit they had been.

CONSULTATION WITH THE SIX AFFILIATED PUEBLOS

Many Native American pueblos and tribes continue their traditional cultural association with NPS lands, including the monument and particular places or features within it. There are six pueblos affiliated with the monument, including San Ildefonso, Cochiti Pueblo, San Felipe Pueblo, Santa Clara Pueblo, Santo Domingo Pueblo, and Zuni Pueblo. Tribal consultation with the affiliated pueblos is an ongoing effort by NPS staff with participation in scheduled meetings determined by the pueblos themselves. A current Memorandum of Understanding regarding consultation between the National Park Service and the six affiliated pueblos requires the National Park Service to regularly and actively consult with these pueblos regarding monument management, fire planning, and operational decisions that affect sacred materials or places, or other ethnographic resources with

which they are historically associated. Communication occurs through a Consultation Committee comprised of tribal representatives from the six affiliated pueblos (NPS 2007a).

On November 30, 2011, a meeting between monument staff and pueblo representatives in attendance discussed various management actions proposed at the monument, including this plan/environmental assessment. During the public scoping period in May 2012, a meeting was held with the pueblos to specifically discuss their concerns and ideas for appropriate management of Tsankawi. Monument staff met with representatives from Cochiti Pueblo on June 28, 2012, and San Ildefonso Pueblo on January 9, 2013, to discuss project alternatives for this plan/environmental assessment in their current state of development. San Ildefonso Pueblo requested additional meetings with the tribal leadership and the people of the pueblo.

Overall, the ideas and concerns expressed by the pueblos focused on protection of cultural resources and maintaining respect for the site, Tsankawi Pueblo in particular. There is concern that infrastructure enhancements at Tsankawi would result in increased visitation and impacts on cultural resources. The pueblos indicated that new structures, interpretive messaging, and other infrastructure should use natural materials, to the greatest extent possible, to fit harmoniously into the visual landscape and support continuing traditional uses of the area. They requested that the existing Tsankawi Mesa Trail be moved away from the center of the pueblo to protect it from further degradation and suggested a series of measures specific to vegetation that could be effective for keeping visitors in designated areas. The pueblos emphasized that reinforcing the significance of the area through education is paramount to the success of management actions to preserve and protect cultural resources.

They also reiterated the importance of monitoring activities to determine the success of management actions to preserve and protect cultural resources and adjust these measures should they not be achieving desired results. San Ildefonso Pueblo expressed a desire to close the area to visitation and to return the unit to pueblo ownership.

The most recent meeting with San Ildefonso Pueblo was held on May 8, 2013. During the meeting, the pueblo stated they would like some type of messaging to be installed indicating that it is illegal to walk and dig on pueblo lands. This could be in the vicinity of the parking area, along Tsankawi Mesa Trail, or the boundary that the unit shares with San Ildefonso. Pueblo representatives would like to participate in future meetings where interpretive messaging for Tsankawi is developed.

Access to the dance platform—an area along Tsankawi Mesa Trail—needs to be available for tribal elderly, children, and others who cannot use the ladder. Additionally, it was recommended that monument staff consider activities that would include traditional dances on the dance platform and provide monetary compensation to participants as well as the extension of the monument's cultural demonstration program that takes place at Frijoles Canyon to Tsankawi. Other possible employment opportunities at Tsankawi for members of San Ildefonso were discussed.

AGENCY CONSULTATION

In accordance with section 5.5 of Director's Order 12, coordination with federal and state agencies was initiated early in the decision-making process. As required by NPS policies and planning documents, it is the monument's objective to work with state, federal, and local governments and private organizations to ensure the monument and its programs are coordinated with theirs, are supportive of their objectives, and that their programs are similarly supportive of monument programs.

There have been numerous meetings with federal, state, and local agencies since the preparation of this plan/environmental assessment began. The New Mexico State Historic Preservation Office was informed of the proposed action through outreach beginning with the June 13, 2012, annual consultation between Bandelier National Monument and the New Mexico State Historic Preservation Office. During that meeting, monument staff presented their intention to engage in a planning process that weighed the need to protect resource values, reduce visitation impacts on cultural and natural resources, improve visitor understanding of site resources, and improve visitor safety. The public scoping newsletter developed for this project was provided to New Mexico SHPO staff as background regarding the proposed action. The planning effort was discussed again at the next annual consultation meeting, held on July 29, 2013. During that meeting, monument staff presented progress made in the last year toward alternatives development; concept plans for alternative 1 (the preferred alternative) were distributed and reviewed. Monument staff emphasized the continued focus of the planning process on the protection of cultural and natural resources and the need for new development features at the unit to ensure visitor safety and accessibility. Actions described in the draft plan/environmental assessment are subject to section 106 of the National Historic Preservation Act, as amended in 1992 (16 United States Code, section 470 et seq.). Consultation with New Mexico SHPO staff will be ongoing during review of the plan/environmental assessment, and the National Park Service will fulfill its obligations under section 106.

In October 2012, FHWA staff provided preliminary design renderings of proposed interim improvements to the existing roadside parking area and those improvements that have been identified for the State Road 4 and East Jemez Road intersection to facilitate high traffic volumes and left-turn movements onto NPS lands. Proposed improvements are presented in figures 11 and 16, respectively. These renderings have been used to help facilitate dialogue between and among the parties mentioned below. An overview of those in attendance and topics discussed during each of these meetings is provided below.

- On August 9, 2012, monument staff attended the Los Alamos County Transportation Board meeting to provide an overview of recent developments. The meeting was open to the public. The meeting primarily focused on current safety concerns and need for improvements to the State Road 4 and East Jemez Road intersection, interest in these improvements occurring simultaneous to those proposed under the action alternatives, and siting of the proposed on-site parking areas.

- On September 5, 2012, a meeting was held to discuss draft intersection improvements, management of the existing traffic signal at the State Road 4 and East Jemez Road

intersection, and the potential need to relocate utilities to support the proposed intersection improvements. In attendance at the meeting was staff from FHWA's Central Federal Lands Highway Division, numerous divisions from DOE's National Nuclear Security Administration, and the monument.

- On February 22, 2013, a meeting with Los Alamos National Laboratory, DOE's National Nuclear Security Administration, New Mexico Department of Transportation, and monument staff was held. During the meeting, both short- and long-term improvements to deal with safety issues associated with the existing roadside parking area were discussed. Improvements to the State Road 4 and East Jemez Road intersection to facilitate left-turn movements in and out of NPS lands would need to be coordinated and approved by multiple agencies. Other issues discussed include how anticipated future developments at Los Alamos National Laboratory would affect traffic conditions, continuation of partnerships to further refine the design of intersection improvements, and signage that would be necessary once parking is moved onto NPS lands. During this meeting, monument staff asked staff in attendance from DOE's National Nuclear Security Administration to provide a letter of support for proposed improvements to the State Road 4 and East Jemez Road intersection. This letter was received by NPS staff on April 10, 2013.

- On June 6, 2013, monument staff attended another Los Alamos County Transportation Board meeting to provide an update on the plan/environmental assessment. Monument staff provided an overview of improvements that would be made to the State Road 4 and East Jemez Road intersection and how cameras would be used to trigger the new traffic light to facilitate left-turn movements into Tsankawi. The disruption to current traffic patterns would be minimal. Should one of the action alternatives be selected for implementation, design of the proposed on-site parking area would consider the set back of the automated gate to allow for bus turnarounds.

The following federal departments and state and local agencies were consulted during the preparation of this environmental assessment:

- Department of Energy, National Nuclear Security Administration
- Federal Highway Administration, Central Federal Lands Highway Division
- Los Alamos National Laboratory
- Los Alamos County Transportation Board
- New Mexico Department of Transportation
- New Mexico Governor's Commission on Disability
- New Mexico State Historic Preservation Office

RECIPIENTS OF THE ENVIRONMENTAL ASSESSMENT

To inform the public of the availability of the environmental assessment, NPS staff will distribute a notification letter to local businesses and land owners; federal, state, and county agencies; affiliated pueblos; representatives of educational institutions; nongovernmental organizations; and members of the public on the project mailing and e-mail lists. The environmental assessment will also be available electronically on the monument's Planning, Environment and Public Comment website. Copies of the document will also be provided upon request. The following provides an overview of agencies receiving the notification letter.

FEDERAL AGENCIES

- Department of Energy, National Nuclear Security Administration
- Federal Highway Administration, Central Federal Lands Highway Division
- Los Alamos National Laboratory
- U.S. Fish and Wildlife Service

NEW MEXICO STATE AND LOCAL AGENCIES

- Los Alamos County Transportation Board
- New Mexico Department of Game and Fish
- New Mexico Department of Transportation
- New Mexico Governor's Commission on Disability
- New Mexico State Historic Preservation Office

CONSULTED PUEBLOS

- Cochiti Pueblo
- Kewa (Santo Domingo) Pueblo
- San Felipe Pueblo
- San Ildefonso Pueblo
- Santa Clara Pueblo
- Zuni Pueblo

Appendixes and Index

APPENDIX A: REFERENCES

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APPENDIX C: ACRONYMS AND ABBREVIATIONS

ABA	Architectural Barriers Act
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
DO	Director's Order
DOE	U.S. Department of Energy
EA	environmental assessment
EO	Executive Order
FHWA	Federal Highway Administration
LANL	Los Alamos National Laboratory
NAICS	North American Industry Classification System
national register	National Register of Historic Places
NEPA	National Environmental Policy Act of 1969, as amended
NMDOT	New Mexico Department of Transportation
NPS	National Park Service
SHPO	State Historic Preservation Office
The monument	Bandelier National Monument
The plan	Tsankawi Unit Management Plan
USC	United States Code
USGS	U.S. Geological Survey

APPENDIX D: GLOSSARY OF TERMS

Adaptive Management	A continuing iterative process where a problem is assessed, potential management actions are designed and implemented, those actions and resource responses are monitored over time, continuous data is evaluated, and actions are adjusted, as necessary, to better achieve desired management outcomes.
Cavate	A class of prehispanic habitations of the southwestern U.S. consisting of an excavated cave in the cliff face with the entrance often enclosed or surrounded with masonry. They were carved from the volcanic tuff of the canyon wall by the Ancestral Pueblo people and served as dwellings, kivas, and storage sites.
Cavate Village	A group of cavates close to one another and associated with the remains of exterior masonry rooms, architectural features, and artifacts. Many cavates within Tsankawi are located close to others, which increases their significance and information value.
Duchess Castle	Built atop and adjacent to a 50-room pueblo, Duchess Castle was constructed by San Ildefonso Pueblo craftsmen using shaped masonry blocks scavenged from the prehispanic pueblo. It was built for Madame Vera von Blumenthal and Rose Dugan as a home and pottery making school in 1918. The school was opened to help revive pottery making and other crafts native to pueblo peoples. Currently, the partial walls and foundation of the house, several outbuildings, an enclosed courtyard, and a single cistern remain.
Hand-and-toeholds	Hand-and-toeholds are small holes chipped into the cliff face that were used for climbing.
Kiva	A kiva is a room used for religious rituals. Some cavates are considered kivas because of their size, shape, and architectural features. There are several kivas that are part of Tsankawi Pueblo.
Pajarito Plateau	A volcanic plateau that is part of the Jemez Mountains, and bounded on the west by the Valles Caldera and on the east by the White Rock Canyon of the Rio Grande. Elevations range from about 5,600 feet (1,700 meters) at the river to about 7,800 feet (2,300 meters) where the plateau merges into the mountain range.
Petroglyphs	Rock engravings created by removing part of a rock surface by incising, picking, carving, and abrading.

pueblo	A permanent village or community of any of the pueblo peoples, typically consisting of multilevel adobe or stone apartment dwellings of terraced design clustered around a central plaza.
Pueblo	A group of people. There are 19 Pueblos in New Mexico. Pueblo people in this part of the southwest are descendants of a Native American culture that has established itself over many centuries.
Refugia	A geographical region that has remained unaltered by a climatic change affecting surrounding regions and that therefore forms a haven for relict fauna and flora.
San Ildefonso Pueblo	Located adjacent to Tsankawi, San Ildefonso is home to the descendants of the people who inhabited the Tsankawi area. Tsankawi forms a key component in their living cultural system, they believe the area remains alive with the spirits of their ancestors. Ongoing cultural traditions, beliefs, and values are maintained through traditional, religious, and ceremonial uses, and practices within Tsankawi.
Tsankawi Mesa Trail	The Tsankawi Mesa Trail is the existing designated trail within Tsankawi. It is approximately 1.5 miles long and brings visitors to the mesa top and allows for viewing of cavates, petroglyphs, and Tsankawi Pueblo. There are currently three ladders along the trail.
Tsankawi Pueblo	The Ancestral Pueblo village atop Tsankawi Mesa. The majority of the pueblo is unexcavated and it is estimated to be 275 rooms, one and two-stories high arranged around a central plaza with multiple underground kivas. San Ildefonso Pueblo is home to the descendants of the people who inhabited the area now referred to as Tsankawi.
Type B – Minor Trails	Minor trails are marked, improved, and maintained to accommodate foot traffic. These trails serve special scenic areas and access points. The tread does not have to meet the maximum standard and may be limited to the space required to form a single-file trail except on grades where the maximum is justified. The overall grade is less than 15%. For distances less than 150 feet, grade should not exceed 18%.
Type C – Wilderness Trails	Wilderness trails are marked but are generally unimproved except for clearing and some work on dangerous areas. These trails are normally used by experienced wilderness trail users, for access to backcountry campsites and cross-country areas, for certain routes for mountain climbers, and for fire suppression and administrative purposes. Minimum tread width is 18 inches, with an overall grade less than 15%. For distances less than 150 feet, grade should not exceed 20%. Type C trails have the lowest maintenance priority except where safety is concerned.

Type D – Walks	Walks include sidewalks, boardwalks, gravel trails that interconnect developed areas, or serve as short scenic walks, and interpretive trails. These walks are normally for foot and wheelchair travel and are usually built to high standards.

APPENDIX E: FEDERALLY LISTED, STATE LISTED, AND SPECIAL STATUS SPECIES KNOWN TO OCCUR IN BANDELIER NATIONAL MONUMENT

Common Name	Scientific Name	Federal Status[1]	State Status	Comments Regarding Habitat and Species Range	Determination of Effect[2]	Reason(s) for Determination of Effect
Southwestern willow flycatcher	*Empidonax traillii extimus*	Endangered	Endangered	Breeding habitat typically contains riparian shrubs, such as willows, which are old enough to have a complex branching pattern to support nest and are in close association with water. Within New Mexico, significant populations occur along the Rio Grande and Gila drainages.	No effect	Habitat for this species does not exist within Tsankawi.
Mexican spotted owl	*Strix occidentalis lucida*	Threatened	Threatened	Breeding requirements generally include mixed-conifer forest habitat associated with relatively steep-walled canyons. Douglas-fir (*Pseudotsuga menziesii*) is the most common tree used for nesting. This species is a biological indicator of old growth habitat, and consistently avoids managed forests.	No effect	Habitat for this species does not exist within Tsankawi.
Jemez mountains salamander	*Plethodon neomexicanus*	Proposed	Endangered	This species is endemic to north-central New Mexico where it is found only in the Jemez Mountains in Sandoval, Rio Arriba, and Los Alamos counties. It occurs from 6,998 to 11,254 feet elevation in mixed conifer habitat with abundant rotted logs and surface rocks. It is most often encountered under and inside well-rotted Douglas-fir logs, under rocks, or underground in moist soils.	No effect	Generally this species can only be found in the Jemez Mountains above 7,000 feet elevation.

Common Name	Scientific Name	Federal Status[1]	State Status	Comments Regarding Habitat and Species Range	Determination of Effect[2]	Reason(s) for Determination of Effect
Bald eagle	*Haliaeetus leucocephalus*	Delisted	Endangered	In New Mexico, nests are placed in large cottonwoods or ponderosa pines, typically in the vicinity of water. It migrates and winters in suitable habitat throughout New Mexico. By 2012, a total of nine nesting sites in five counties were identified in New Mexico: three sites in Colfax, one in Sierra, two in Catron, two in Rio Arriba, and one in Union County.	Negligible Not a federally listed species so the determination is not related to the Endangered Species Act of 1973, as amended.	This species likely occasionally to rarely uses Tsankawi; however, no breeding habitat exists within the unit.
Peregrine falcon	*Falco peregrinus*	Delisted	Endangered	In New Mexico, this species breeds locally in mountainous areas and can be found statewide in migration and in the winter. Breeding sites are on cliffs in wooded and forested habitats.	Negligible Not a federally listed species so the determination is not related to the Endangered Species Act of 1973, as amended.	This species rarely uses Tsankawi, and typically only as a flyover bird. No breeding habitat exists within the unit.
Spotted bat	*Euderma maculatum*	—	Threatened	This species occurs in a wide variety of habitats, including riparian communities, pinyon-juniper woodlands, and ponderosa pine and spruce-fir forests, and in burned areas of ponderosa pine forest. This species is scarce throughout its range, but has been found at higher elevations in the monument.	Negligible Not a federally listed species so the determination is not related to the Endangered Species Act of 1973, as amended.	This species likely occasionally to rarely uses Tsankawi, and is scarce throughout its range.

Common Name	Scientific Name	Federal Status[1]	State Status	Comments Regarding Habitat and Species Range	Determination of Effect[2]	Reason(s) for Determination of Effect
Gray vireo	*Vireo vicinior*	—	Threatened	This species occurs in the dry foothills and bajadas west of the Great Plains. It lives in areas heavy with juniper, pinyon pine, and oak trees. There is a small reliable breeding population of about 25 pairs on the east side of the Rio Grande between Santa Fe and the monument.	Negligible Not a federally listed species so the determination is not related to the Endangered Species Act of 1973, as amended.	There have been no reliable reports of this species within Tsankawi or the main unit of the monument. A recovery plan was prepared by the New Mexico Department of Game and Fish in 2007. No gray vireos have been recorded since its publication.
Yellow-billed cuckoo	*Coccyzus americanus*	Candidate	Candidate	Neotropical migrant birds that nest in large, dense patches of riparian vegetation, particularly with a cottonwood/Goodding's willow overstory. In New Mexico, habitat is generally within the San Marcial Reach of the Rio Grande.	No effect	Habitat for this species does not exist within Tsankawi.
Whooping Crane	*Grus americana*	Endangered	Experimental, Non-essential Population	Typically migrate between Canada and coastal Texas. Natural occurrence in New Mexico is unproven. Experimental populations were infrequently reported wintering in the Rio Grande Valley until 2002. Rarely seen in New Mexico.	No effect	Habitat for this species does not exist within Tsankawi.
New Mexican meadow jumping mouse	*Zapus hudsonius luteus*	Candidate	Endangered	This species nests in dry soils but uses moist, streamside, dense riparian/wetland vegetation up to an elevation of about 8,000 feet.	No effect	Habitat for this species does not exist within Tsankawi.
Black-footed ferret	*Mustela nigripes*	Endangered	Endangered	This species is native to shortgrass and mixed grass prairie. They largely prey on prairie dogs and are nocturnal animals spending most time in vacant prairie dog burrows. They are only found in areas where they have been introduced after being nearly extinct.	No effect	Habitat for this species does not exist within Tsankawi.

Common Name	Scientific Name	Federal Status[1]	State Status	Comments Regarding Habitat and Species Range	Determination of Effect[2]	Reason(s) for Determination of Effect
Rio Grande cutthroat trout	*Oncorhynchus clarki virginalis*	Candidate	Candidate	Populations are found in New Mexico and Colorado drainages of the Rio Grande and other rivers. Occupy about 10% of historical habitat, and populations are fragmented and isolated from each other. Usually occur in high-elevation streams. Warmer water temperatures and drought affect populations.	No effect	Habitat for this species does not exist within Tsankawi.
Rio Grande silvery minnow	*Hybognathus amarus*	Endangered	Endangered	These species formerly occupied main-stem habitats of the Rio Grande, primarily between Cochiti Pueblo and Elephant Butte Reservoir, and in the Pecos River between Fort Sumner and Carlsbad. Currently occupies 5% of its historical range.	No effect	Habitat for this species does not exist within Tsankawi.

SOURCE: Fettig, pers. comm. 2013a, 2013b, 2013c; New Mexico Department of Game and Fish 1993, 2002, 2007, 2012; USFWS 2010, 2012, 2013; Government Printing Office 2012; Bureau of Reclamation 2010; Black-footed Ferret Recovery Implementation Team 2011

Note: Determination of effect based on comments by monument resource staff and knowledge of habitat within Tsankawi.

1. The terms threatened and endangered describe the official federal status of certain species in the park as defined by the ESA. The term candidate is used officially by the U.S. Fish and Wildlife Service when describing species it has sufficient information on biological vulnerability and threats to support issuance of a "proposed rule to list," but issuance of the proposed listing rule is precluded by higher listing priorities. Proposed species are those candidate species that were found to warrant listing as either threatened or endangered and were officially proposed as such in a Federal Register notice after the completion of a status review and consideration of other protective conservation measures.

2. Section 7 determination of no effect means there will be no impacts, positive or negative, to listed or proposed resources. Generally, this means no listed resources will be exposed to action and its environmental consequences. Concurrence from the U.S. Fish and Wildlife Service is not required. See "Chapter 4: Environmental Consequences" for impact definitions.

APPENDIX F: MITIGATION MEASURES

The following identifies mitigation measures that have been identified to date. Measures will be further refined during the design phase.

DEVELOPMENT OF DESIGN

The proposed action shall include sufficient submittals during the design phase to ensure that potential effects on cultural resources are identified and the design is modified to ensure avoidance of impacts. The NPS project manager would continue consultation with the monument's cultural resources staff during design and construction phases of the project, to assure that the project has sufficient advice and guidance to avoid adverse effects on cultural resources. Cultural resource team members would review and comment on design phase submittals to assure that all cultural resources mitigations are implemented. During the design phase, if there is a planned adverse effect on cultural resources, then consultation with New Mexico SHPO staff would be resumed to achieve a design with no adverse effect. The NPS project manager would consult with the monument's chief of resources to develop approved treatments for potential impacts on cultural resources additional to those indicated in the preferred alternative as described in the environmental assessment.

PROTECTION OF ARCHEOLOGICAL RESOURCES

Ground-disturbing activities would be monitored under the direction of the monument's archeologist during the entire duration of ground-disturbing activity. Prior to undertaking ground-disturbing activities, boundaries of sensitive resource areas would be marked by pin flags or by lath and flagging tape or by T-posts and wire or equivalent, to avoid inadvertent trespass.

If previously undiscovered archeological resources are uncovered during construction, all work in the immediate vicinity of the discovery would be halted until the resources could be identified and documented, and an appropriate mitigation strategy developed in consultation with New Mexico SHPO staff. In the event that human remains, funerary objects, sacred objects, or objects of cultural patrimony are discovered during construction, provisions outlined in the Native American Graves Protection and Repatriation Act (25 United States Code 3001) of 1990 would be followed.

PROTECTION OF ETHNOGRAPHIC RESOURCES

Ethnographic resources located within the project area, including those that are already known and any identified through the ongoing tribal consultation process, would be flagged for avoidance during construction activities. Traditional plant collection areas would be flagged for avoidance, to minimize adverse impacts on plant health during the project.

PROTECTION OF THE CULTURAL LANDSCAPE

The proposed action would select new site furnishings that are compatible with the Tsankawi setting, responding to and blending with the scale, color, texture, nonreflectivity, and natural materials established by native trees and geology that are character-defining features of the landscape.

The proposed action would minimize the addition of interpretive signage on the site. Signage placement along interpretive trails would be effectively placed outside of key viewsheds, using design and materials that are well integrated to the setting. In depth interpretation would be provided in web and published media.

The proposed action would use locally-collected natural materials where ever possible to mitigate the visual effects of social trailing and associated trampling of off-trail areas. Examples of minimal mitigations would include: limited regrading of less than six inches change in level, applications of soil and litter, along with small diameter slash (no more than 12-inch diameter material) to impacted areas, or other understated means.

The proposed action would introduce new trail defining features using designs that are compatible with the Tsankawi setting. Designs would use local stone blending with the existing surroundings that is compatible with the color, texture, and materials of the existing landscape. Stone would come from the surrounding area but not be retrieved from within Tsankawi or would come from the site itself under the direction of an archeologist to avoid moving stone that could be associated with the site. Use of wood, where needed to create required features, would use uncoated natural wood to the greatest extent feasible. Introduction of nonlocal, engineered concrete materials would be avoided. Use of painted wood surfaces would be avoided to the greatest extent feasible.

The proposed action would mitigate the increased visibility of new areas of paved and graded parking area and trails by taking measures to improve compatibility with the Tsankawi setting. Surfacing materials would be selected to blend into the landscape as much as possible, with a color chosen to avoid contrast with the adjacent soil and vegetation and with a nonreflective surface. Final design would maintain sufficient existing vegetation to break up the views of new features; new parking spaces would be designed around existing trees.

The proposed action would introduce a new site structure within the project area that would be designed for compatibility with the Tsankawi setting. Introduction of a structure that is taller than the 15-foot height of surrounding juniper vegetation would be avoided. New forms would be understated; introduction of novel shapes would be avoided. Introduction of new reflective materials would be avoided for all structures throughout the project site. Mimicry of the Pueblo Revival aesthetic of the Bandelier CCC historic district and of Ancestral Pueblo-era styles would be avoided.

PROTECTION OF BIOLOGICAL RESOURCES

Construction vehicles and workers would use existing pullouts, side-roads, and other approved locations for parking and walking to minimize disturbance to vegetation. The amount of vegetation clearing during construction activities would be minimized in order to protect the soil cover and minimize erosion risks. Disturbed areas would be restored to natural contours to the extent possible to reduce the potential for erosion. Revegetation with native species would use genetic stocks originating in the monument or from plants previously removed from the construction area whenever possible. Revegetation efforts would be designed to reconstruct the natural spacing, abundance, and diversity of native plant species. Compacted soil to be revegetated would be ripped to a depth of at least 12 inches. Subsequent to project completion, monument staff would monitor and require removal of any invasive species observed. Gravel and fill for construction or maintenance would be obtained from certified noxious weed-free sources. Gravel pits and fill sources would be inspected to identify weed-free sources. There would be no quarrying of construction materials from inside the monument. Limit introduction and enhancement of nonnative plant populations by procurement of clean fill, use of cached salvaged fill from gravel yard, and washing equipment and vehicles used in construction projects. Avoid driving equipment through undisturbed areas including off established road shoulders. Salvage existing plant materials and do not introduce plant materials.

PROTECTION OF MIGRATORY BIRDS

In accordance with the Migratory Bird Treaty Act (1918) and EO 13186: Responsibilities of Federal Agencies to Protect Migratory Birds, any and all removal of vegetation should take place outside of the migratory bird breeding season. For pinyon-juniper nesting birds, breeding can start in mid-April and continue into mid-July. Avoid all removal of vegetation for new facilities including trails, walkways, or parking areas, from April 15 through July 15 each year.

CONTAMINATION PREVENTION AND CONTROL

No application of emulsions or tack coat would be performed within one day of a predicted significant storm event (i.e. runoff is likely). The contractor must have contingency plans to protect drainages in the case of unpredicted snow or rainstorms. The monument would conduct all construction activities in accordance with its established safety protocols and the Stormwater Pollution Prevention Permit.

All fuels would be stored and maintained in a designated equipment staging area to reduce the potential for soil contamination. Fuel would be stored in fuel trucks or in above-ground storage tanks in accordance with State regulations. Fueling and maintenance areas would maintain secondary containment or other measures that would prevent soil contamination and runoff. Petroleum product storage areas at a minimum would be lined with plastic or similar material. Tanks are to be located off the ground and lids would be securely fastened.

Construction vehicles could leak fluids into the soil, introduce noise pollution, and emit pollutants to the atmosphere. To minimize this possibility, equipment would be checked frequently to identify and repair any leaks, mufflers would be checked for proper operation, and only equipment that is within proper operating specifications would be used. Spill contingency materials, such as absorbent booms, would be immediately available throughout the construction area should any fuel, petroleum oils, or hydraulic materials spill outside containment structures. All spills must be reported immediately to the construction supervisor and monument staff.

Fuel and oil services for construction machinery would be provided in a designated area away from channels or drainages. This would include secondary containment for all fuel storage tanks and on-site availability of a specialized spill kit to contain fuel spills. Milled or pulverized asphalt may be temporarily stored only at the staging area. Excess asphalt, masonry, and other associated construction debris would not be disposed of on monument lands. Grading of pulverized asphalt (if performed) would be done in a manner to prevent overflow of asphalt outside the existing shoulder. Parking area stone curbing and sidewalks would be protected from paving emulsion overspray.

Construction areas would be identified by and fenced with construction tape, snow fencing, or some similar material prior to any construction activity. The fencing would define the construction zone and confine activity to the minimum area required for construction. All protection measures would be clearly stated in the construction specifications, and workers would be instructed to avoid construction activities beyond the construction zone, as delineated by the construction zone fencing. Construction materials would be stored in previously disturbed areas.

EROSION PREVENTION AND CONTROL

Erosion control measures would be put in place that prevent asphalt, emulsions, fuels or oil materials from accidentally entering drainages. Those standard erosion control precautions, as outlined under section 204 of Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects would be stipulated in the contract specifications. All storm drain inlets in the project area would be protected so that asphalt oils or emulsions and sediment-laden water would not enter the drainage system. Disposal of removed materials would be the responsibility of the contractor in consultation with the construction supervisor and/or monument staff.

Erosion and sediment control measures such as silt fences, weed-free straw bales, soil moistening, and other temporary measures would be placed along portions of the site perimeter to control erosion during construction activities. These temporary erosion prevention measurements would be maintained in place until the site vegetation is firmly established and soil has stabilized.

Under all circumstances, sediment runoff from the site would be captured and prevented from entering any nearby groundwater. The footprint of disturbance would be limited. For example, heavy construction equipment would be kept on the road surface when placing slope protection or performing excavation adjacent to the roadway, to the extent possible. Regular inspections of the erosion and sediment control measures would be performed after any storm event.

Use standard protocols to mitigate existing runoff-sediment problems, including closing areas to foot traffic and applying coarse woody debris (chips, slash and logs) or erosion fabric (i.e. 1/4 mesh geo-jute) in high value areas.

Retain existing natural drainages. Avoid rerouting drainages into a single route per loop, as this would create unsustainable conditions and increase removal of vegetation. Armor existing drainages in place, without realignment, using local stone.

PROTECTION OF PHYSICAL RESOURCES

Use is limited to the existing footprint of the staging area. There would be no burning, power washes, or disposal in or around the project area. A water-based paint would be used for all pavement markings. Any area with vegetation clearing or construction activities would be a safety closure area requiring the use of hard hats. Topsoil would be removed and stockpiled for reapplication to disturbed areas when construction is complete. Implementation of reasonable measures to minimize fugitive dust emissions, such as applying water to exposed surfaces or stockpiles of dirt, would occur when windy and/or dry conditions promote problematic fugitive dust emissions.

HUMAN SAFETY AND CONVENIENCE MEASURES

Sanitary facilities would be provided for construction workers. A traffic management plan would be developed to prevent traffic congestion in the area. Traffic delays would be kept below 30 minutes except for pre-approved work after normal business hours. Areas where construction is ongoing would be closed while project activities are conducted, so there would be no direct visitor safety concerns as long as signage is clear. Generally accepted methods to protect public health and safety while providing for visitor use and experience include, but would not be limited to: notification to travelers of the benefits of the proposed action to maximize public support and understanding.

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As the nation's principal conservation agency, the Department of the Interior has 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.

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U.S. Department of the Interior
Bandelier National Monument

Tsankawi Unit Management Plan and Environmental Assessment

National Park Service
US Department of the Interior

Bandelier National Monument
Sandoval and Santa Fe Counties, New Mexico

FINDING OF NO SIGNIFICANT IMPACT

TSANKAWI UNIT MANAGEMENT PLAN AND ENVIRONMENTAL ASSESSMENT

The National Park Service (NPS) developed the Tsankawi Unit Management Plan to provide a framework to improve resource protection, address safety concerns, and enhance visitor opportunities in the Tsankawi unit (hereafter referred to as "Tsankawi" or "the unit"). Tsankawi is an 826-acre noncontiguous parcel of Bandelier National Monument, situated approximately 12 miles from the main unit. Located in Santa Fe County, New Mexico, the main visitor arrival area for Tsankawi is just northeast of the intersection of State Road 4 and East Jemez Road.

Tsankawi is home to more than 150 archeological sites dating from Ancestral Pueblo occupancy of the Pajarito Plateau (approximately AD 1150 to 1550). These resources are showing signs of wear that reflect visitor use and natural erosion processes. Tsankawi, the main unit of Bandelier National Monument, and its surrounding areas have a long and rich history of human occupation. Ongoing consultation with federally recognized pueblo groups concluded that there are six pueblos affiliated with the monument—the Cochiti, San Felipe, San Ildefonso, Santa Clara, Santo Domingo, and Zuni. While all of these groups hold some affiliation to the monument, the unit is of critical importance to the cultural heritage, beliefs, customs, practices, and history of the nearby San Ildefonso Pueblo, who are descendants of the people who inhabited the area now referred to as Tsankawi, and whose culture is represented there.

Existing interpretive information and programming, primarily located at the visitor contact station, does not support a full understanding of the history and sensitivity of the cultural and natural resources contained in Tsankawi. Neither parking nor visitor facilities comply with the Architectural Barriers Act (ABA), which details accessibility regulations for persons with limited mobility. Moreover, heavy traffic volumes, poor visibility of oncoming traffic as a result of the roadway's slope and curvature, and the existing roadside parking configuration make access to Tsankawi challenging for visitors. The Tsankawi Mesa Trail, which begins at the visitor contact station and takes visitors to the mesa top where they can view the exposed features of Tsankawi Pueblo, crosses the center of the pueblo. Visitation is eroding the trails used by Ancestral Pueblo residents and incising into the tuff geology. This is also true for cavates (hollowed out spaces within rocks) and other sensitive resources. These impacts also are exacerbated by natural erosion processes. Additionally, no designated trails or parking areas provide access to the rock formations containing cavates, petroglyphs, and other features present at North Mesa and an early 20th century cultural site called Duchess Castle, both of which are located north of Tsankawi. Informal visitation to these destinations presents both

visitor safety and resource protection issues because it is difficult for monument staff to know when visitors are accessing this section of Tsankawi.

The purpose of the proposed action is to provide resource protection, a high quality visitor experience, and efficient unit operation at Tsankawi. The selected alternative will guide management decisions for the next 10 years and provide a framework to help achieve desired resource conditions, a diverse range of visitor opportunities and experiences, and appropriate levels of interpretive messaging to facilitate a better understanding of the sensitivity of cultural and natural resources and ensure their protection and preservation for current and future generations.

The environmental assessment (EA) was prepared in accordance with the National Environmental Policy Act of 1969 (NEPA) and implementing regulations, 40 Code of Federal Regulations (CFR) 1500–1508, the NPS Director's Order 12: *Conservation Planning, Environmental Impact Analysis, and Decision-making*, and the Director's Order 12 Handbook.

SELECTED ALTERNATIVE (ALTERNATIVE 1)

Based on the analysis presented in the environmental assessment, the National Park Service selected alternative 1 for implementation. This alternative is both the environmentally preferable and the NPS preferred alternative. The selected alternative best meets the objectives of the plan and the purpose of and need for action through a series of measures designed to improve resource protection, address safety concerns, and enhance visitor opportunities. It includes the implementation of a resource monitoring program and adaptive management strategy (including a consideration of climate change), site access and intersection improvements, phased trail improvements, an interpretive program, a kiosk accessible for persons with limited mobility, a fee collection program, reintroduction of a site steward, and staffing and personal services. These elements are summarized below; additional details can be found in the environmental assessment in "Chapter 2: Alternatives."

Resource Monitoring Program. The National Park Service will continue efforts through the Vanishing Treasures program to document baseline resource conditions, assess current conditions, determine causes of deteriorating resources, and establish a resource monitoring program at Tsankawi.

Adaptive Management Strategy. The selected alternative will move beyond monitoring resource conditions and use a number of adaptive management strategies to improve the condition of sites and resources. This approach addresses the locations, monitoring activities, desired outcomes/conditions, indicators, metrics, and range of incremental management strategies for protecting archeological resources, and segregates weathering/climate change effects from the effects of visitation.

Climate Change. Monument staff are developing a series of management strategies to proactively identify and manage the potential effects of climate change, consistent with the NPS Climate Change Response Strategy.

Site Access and Intersection Improvements. Vehicular access to Tsankawi will be relocated from the existing roadside parking area along State Road 4. The tee intersection of State Road

4 and East Jemez Road will be modified to become a four-way intersection allowing for site access via a signalized intersection. Intersection improvements in this area will facilitate controlled left-hand turning movements in and out of Tsankawi with a designated lane and eliminate the use of the existing roadside parking area. A designated right-hand turn lane will also be introduced. Cameras will be used to help maintain or improve traffic volumes and facilitate safe entry to Tsankawi. Other improvements will include the installation of new signal poles and supporting features, utility relocation, embankment work, and new lane configurations and pavement markings. Although funding for these improvements is outside the scope of the selected alternative and is not under the jurisdiction of the National Park Service, NPS staff will work with appropriate partners to secure funding for these improvements.

An automated gate will be installed along the entry roadway closer to the four-way intersection, and the fence and "No Trespassing" sign in the vicinity of Duchess Castle will be removed. Signage will inform visitors of the designated entry location, and brush and boulders will be dragged across the trail to indicate route closures. NPS staff will work with the state and county to determine if relocating the commuter parking lot is feasible.

Parking. The exact location of the onsite parking area has yet to be defined; however, the analysis conducted as part of the environmental assessment used a larger area to ensure all potential impacts on resource areas were properly evaluated. The general configuration will be located adjacent to the existing visitor contact station. The parking area will be curvilinear and designed to accommodate a transit/car drop-off area, 20 car parking stalls (including two ABA van stalls), and two oversized vehicle stalls for buses or recreational vehicles (RVs). Visitors and staff will access the onsite parking area via the aforementioned four-way intersection at State Road 4 and East Jemez Road and travel down a two-directional entry roadway running parallel to State Road 4 until reaching the onsite parking area. Approximately 29,400 square feet will be necessary to support the onsite parking area and entry roadway. Siting the onsite parking area in this location will allow the trail leading from the existing roadside parking area to the visitor contact station to be removed and reclaimed. The Tsankawi Mesa Trail, ABA Walk, and Duchess Castle Trail will be accessible from the new onsite parking area. The existing service road will be removed and reclaimed.

Phased Trail Improvements. Trail improvements will occur in three phases, as described below. Once implemented, the Tsankawi Mesa Trail, ABA Walk, and Duchess Castle Trail will converge at the existing visitor contact station and main trailhead.

Phase 1: Reroute Tsankawi Mesa Trail around Tsankawi Pueblo — The Tsankawi Mesa Trail will be rerouted to protect sacred ground and pueblo features. The first part of the trail will follow an alignment similar to existing conditions. Closer to the mesa top, the trail will be routed away from and south of the center of Tsankawi Pueblo. The current trail through the center of Tsankawi Pueblo will be reclaimed and restored to natural conditions. The new route will be wide enough to accommodate multiple visitors and will include one larger area with an interpretive display where groups can gather. Route design will consider a range of configurations.

Phase 1: Tsankawi Mesa Trail Extension to Easternmost Point of Tsankawi Mesa — The new trail segment will bring visitors to a vista point overlooking the immediate area and a distant view of

the Sangre de Cristo Mountains. The new trail segment will form a loop at the end of Tsankawi Mesa, allowing visitors to use an existing social trail that leads to spectacular views and is isolated from State Road 4. This trail extension will provide the National Park Service with an opportunity to interpret cavate villages visible at portions of Tsankawi Mesa, and will give visitors a chance to encounter an array of archeological site features. For this and all mesa top trail segments, new small-scale landscape features will be introduced to define the edges of trails and reinforce site messaging.

Phase 1: Guided-only Trail Segment — When funding to support a trail guide program is available, the existing segment that forms the return segment of Tsankawi Mesa Trail will be converted to a guided-only trail segment. Localized, small scale landscape structures will be added at both ends of the guided-only trail segment to ensure that unsupervised visitation does not occur. The existing ladder 3 will be removed for safety and to better manage access to the cavate village.

Phase 2: Trail for Persons with Limited Mobility — A new, approximately 1,779-foot ABA-compliant Type D trail will be constructed on level terrain to a vista point that encompasses views of cavate villages at Tsankawi Mesa and a vista east/south of the surrounding landscape. Type D trails generally include sidewalks, boardwalks, and gravel trails that interconnect developed areas or serve as short scenic walks and interpretive trails. Site furnishings such as a binocular stand will allow for viewing of archeological and landscape features in greater detail.

Phase 2: Duchess Castle Trail — A new, approximately 5,524-foot trail will be constructed on level terrain, leading from the site of the existing visitor contact station and main trailhead. The trail will create a small loop near Duchess Castle; visitors will return to the trailhead and onsite parking area on the same trail. This will be a Type C trail, except for limited locations where the gradient exceeds 5%. Type C trails are marked but are generally unimproved except for clearing and some work on dangerous areas.

Phase 2: Reclaim Current Duchess Castle Social Trail — The existing social trail from State Road 4 to Duchess Castle will be reclaimed. Signs at the site boundary will advise visitors to use the designated entry, and brush and boulders will be dragged across the trail to indicate its closure.

Phase 3: Future Potential Connector Route from Tsankawi Mesa to Duchess Castle — Monument staff will continue to monitor resources to determine if the implementation of the connector route is feasible based on the change in impacts on resources. If feasible, visitor surveys will be used to gather information about visitor satisfaction with the revised trail system and to assess demand for a connector route. This route will exit Tsankawi Mesa to the canyon bottom below and travel north and west to meet the Duchess Castle Trail as part of the monument's adaptive management strategy.

Interpretive Program. A new interpretive messaging program will be designed to inform visitors of the sensitivity and historical context of the area. Opportunities for visitors to interact with NPS staff, site stewards, or other NPS-trained local community volunteers and/or commercial guides at Tsankawi and along the guided-only trail segment will be provided. Interpretive features will include understated site signage, furnishings, pamphlets, brochures,

digital displays, and electronic downloads for handheld devices. All interpretive materials will be designed to foster a sense of place and value of the landscape. Visitor education will begin at the site arrival area. Messaging at the arrival area will be larger and more complex than that used on the trails and likely include a cast metal scale model or planimetric view of Tsankawi Pueblo. Messaging along the trail will be smaller in scale and reinforce concepts established at the arrival area.

The National Park Service will implement a tiered management approach as part of its adaptive management strategy to identify the number of interpretive features necessary to protect sensitive resources found at Tsankawi. The approach, in part, will be based on findings from visitor surveys that measure visitor understanding of the significance of the site and new management policies. Interpretive features will be added until monument staff is satisfied that they are reasonably effective. The implementation of new interpretive features will depend on funding availability. The design and siting of desired materials may be labor intensive and require assistance from contractors or agency specialists beyond current monument staff.

Kiosk Accessible for Persons with Limited Mobility. An approximately 150-square foot kiosk designed to address some of the deficiencies of the existing visitor contact station will be added. The kiosk will be located adjacent to the existing visitor contact station, restrooms, and trailhead allowing visitors to find all services in one general location. The kiosk will serve as an ABA-accessible open air shade shelter and include a fee collection station, safety and interpretive guidance, a drinking fountain, data link for digital downloads, first aid, and an emergency phone. This location will also be the site of the ABA Walk trailhead and will serve as a collection point for tours.

Fee Collection Program. The fee collection station will be upgraded to accept credit cards, moved to the kiosk or other visible location, and provide instructions for payment. This will allow NPS staff to obtain both daily visitor counts and the hourly and seasonal distribution of people accessing the unit.

Site Steward Area. The site steward program will be reintroduced to Tsankawi. The site steward area will be relocated to provide for privacy and improved to include a small shaded platform, possibly an RV cover and concrete pad, phone/internet hook-ups, and water/electricity/sewer hook-ups.

Staffing and Personal Services. The guided-only trail segment will be led by NPS staff or other NPS-trained local community volunteers and/or commercial guides, potentially including representatives from San Ildefonso Pueblo. The number of staff needed has yet to be determined but will largely depend on the number of guided trips and people permitted per trip per day. The potential to build partnerships for interpretation and site supervision will be pursued by monument staff, particularly given reduced spending budgets. Visitor numbers, compliance, and funding availability may determine if a fulltime NPS staff presence will be introduced at Tsankawi.

OTHER ALTERNATIVES CONSIDERED

In addition to the selected alternative, the environmental assessment analyzed the no-action alternative and one additional action alternative, both of which are described below.

No-Action Alternative

The no-action alternative is defined as the continuation of current policies and management actions regarding site access, visitor use, safety, and interpretive features at Tsankawi. Trails would continue to traverse Tsankawi Pueblo and lead visitors through the highly erodible cavate village. Access to Duchess Castle and North Mesa would continue to be self-guided. The roadside parking area would remain on lands controlled by the Department of Energy, and site access would remain a safety concern. Interpretive features would not be enhanced and staffing levels would not be increased. The site steward program would be reintroduced, but it would not be relocated or improved. The visitor contact station and fee collection station would remain in their current locations without improvements, and there would be minimal access for persons with limited mobility. The resource monitoring program described under the selected alternative would be implemented.

Alternative 2: Looped Entry Roadway

Alternative 2 would include all project elements described under the selected alternative; however, the siting and/or configuration of new facilities, the onsite parking area, and certain trails would be different, as summarized below.

Parking. The site entrance would include a two-way circulation pattern, changing to a one-way circulation loop not long after entering the unit, and onsite parking would be set back farther from State Road 4 and elongated with parking on either end. The exit road would be located closer to the existing visitor contact station and would run east of and parallel to State Road 4 before leaving NPS lands at the four-way intersection. Approximately 42,792 square feet would be necessary to support the onsite parking area and entry roadway.

Facilities. The existing visitor contact station would remain at its current location. Restroom facilities would be relocated adjacent to the kiosk and ABA Walk trailhead. Should there be sufficient demand, a new restroom facility would be installed in the future.

Trails. The ABA Walk trailhead would be located next to the ABA-accessible kiosk and relocated restrooms, in the onsite parking area closer to the new four-way intersection. The ABA Walk would be approximately 600 feet shorter than under the selected alternative. The Duchess Castle Trail trailhead would be located close to the existing visitor contact station and main trailhead and would be approximately 150 feet shorter than under the selected alternative. With the onsite parking area implemented, the trail from the existing roadside parking area to the trailhead would be removed and reclaimed.

ENVIRONMENTALLY PREFERABLE ALTERNATIVE

The National Park Service is required to identify the environmentally preferable alternative in its NEPA documents for public review and comment. The National Park Service, in accordance with the Department of the Interior's NEPA Regulations (43 CFR Part 46) and the Council on Environmental Quality's (CEQ) Forty Questions, defines the environmentally preferable alternative (or alternatives) as the alternative that best promotes the national environmental policy expressed in the National Environmental Policy Act of 1969 (Section 101[b]) (516 DM 4.10). CEQ's Forty Questions (Q6a) further clarifies the identification of the environmentally preferable alternative as "the alternative that causes the least damage to the

biological and physical environment; it also means the alternative which best protects, preserves, and enhances historic, cultural, and natural resources."

Alternative 1 (selected alternative) is the environmentally preferred alternative for several reasons. The rerouting of Tsankawi Mesa Trail would help protect, preserve, and enhance historic, cultural, and natural resources in a way that would not be feasible under the no-action alternative. Although alternative 1 would require a certain amount of ground disturbance, previous archeological surveying near the proposed onsite parking area and visitor facilities, concluded that minimal adverse effects would occur. Alternative 2 would result in the most ground disturbance because of the relocation of the restrooms and the area required to support the entry roadway. Also, careful consideration during the siting of the Duchess Castle Trail would ensure that sensitive resources are avoided. Finally, the adaptive management strategy included in alternative 1 would allow for maximum flexibility during implementation.

By contrast, alternative 2 would require more ground disturbance than either the no action or alternative 1, and would not allow as much flexibility in implementation as alternative 1, so it was not identified as environmentally preferable. Additionally, the no-action alternative was not selected as the environmentally preferable alternative because, while there would be less ground disturbance than under the action alternatives, there would also be fewer opportunities to help protect the fragile cultural and natural resources found in Tsankawi, and there would be no adaptive management strategy to allow for flexibility and improvement in implementation.

MITIGATION MEASURES OF THE SELECTED ALTERNATIVE

To minimize or avoid potential impacts of the selected alternative, particularly during construction activities, monument staff identified a series of mitigation measures, described below.

Development of Design

- Submittals will be required during the design phase to ensure that potential effects on cultural resources are identified, and the design is modified to avoid impacts.
- The NPS project manager will continue to consult with the monument's cultural resources staff during design and construction phases to receive advice and guidance to avoid adverse effects on cultural resources.
- The NPS project manager will consult with the monument's chief of resources to develop approved treatments for potential impacts on cultural resources in addition to those described in the environmental assessment.
- Cultural resource team members will review and comment on design phase submittals to assure that all appropriate cultural resource mitigation measures are implemented.
- If there is a planned adverse effect on cultural resources, consultation with New Mexico State Historic Preservation Office (SHPO) staff will be resumed to achieve a design with no adverse effect.

Protection of Archeological Resources

- Prior to undertaking ground-disturbing activities, boundaries of sensitive resource areas will be marked by pin flags, lath and flagging tape, or T-posts and wire or equivalent to avoid inadvertent trespassing.
- Ground-disturbing activities will be monitored under the direction of the monument's archeologist during the entire duration of ground-disturbing activity.
- If previously undiscovered archeological resources are uncovered during construction, all work in the immediate vicinity of the discovery will be halted until the resources are identified and documented, and an appropriate mitigation strategy developed in consultation with New Mexico SHPO staff.
- In the event that human remains, funerary objects, sacred objects, or objects of cultural patrimony are discovered during construction, provisions outlined in the Native American Graves Protection and Repatriation Act (25 United States Code 3001) of 1990 will be followed.

Protection of Ethnographic Resources

- Ethnographic resources, including those that are already known and any identified through the ongoing tribal consultation process, will be flagged for avoidance during construction activities.
- Traditional plant collection areas will be flagged for avoidance to minimize adverse impacts on plants.

Protection of the Cultural Landscape

- New site furnishings will be selected to be compatible with the Tsankawi setting and to respond to and blend with the scale, color, texture, nonreflectivity, and natural materials established by the native trees and geology that are character-defining features of the landscape.
- The addition of interpretive signage on the site will be minimized. Signage placement along interpretive trails will be effectively placed outside of key viewsheds, using design and materials that are well integrated to the setting. In-depth interpretation will be provided in web-based and published media.
- Locally collected natural materials will be used wherever possible to mitigate the visual effects of social trailing and associated trampling of off-trail areas. Examples of minimal mitigation measures include: limited regrading for less than 6 inches change in level, applications of soil and litter, along with small diameter slash (no more than 12-inch diameter material) to impacted areas, or other understated means.
- New trail-defining features will use designs that are compatible with the Tsankawi setting. Designs will use local stone that blends with the existing surroundings and is compatible with the color, texture, and materials of the existing landscape. Stone will come from the surrounding area, but will not be retrieved from within Tsankawi, or will come from the site itself under the direction of an archeologist to avoid moving stone that could be associated with the site. Wood, where needed to create required features, will be uncoated and natural to the extent feasible. Introduction of nonlocal, engineered concrete materials and painted wood surfaces will be avoided to the extent feasible.

- The increased visibility of new areas of paved and graded parking area and trails will be mitigated by implementing measures to improve compatibility with the Tsankawi setting. Surfacing materials will be selected to blend into the landscape as much as possible, with a color chosen to avoid contrast with the adjacent soil and vegetation and with a nonreflective surface. Final design will maintain sufficient existing vegetation to break up the views of new features; new parking spaces will be designed around existing trees.
- Introduction of a structure that is taller than the 15-foot height of surrounding juniper vegetation will be avoided. New forms will be understated; introduction of novel shapes will be avoided. Introduction of new reflective materials will be avoided for all structures throughout the project site. Mimicry of the Pueblo Revival aesthetic of the Bandelier Civilian Conservation Corps historic district and of Ancestral Pueblo-era styles will be avoided.

Protection of Biological Resources

- Construction vehicles and workers will use existing pullouts, side roads, and other approved locations for parking and walking to minimize disturbance to vegetation.
- Vegetative clearing during construction activities will be minimized to protect soil cover and minimize erosion risks.
- Disturbed areas will be restored to natural contours to the extent possible to reduce the potential for erosion.
- Revegetation with native species will use genetic stocks originating in the monument or from plants previously removed from the construction area whenever possible. Revegetation efforts will be designed to reconstruct the natural spacing, abundance, and diversity of native plant species. Compacted soil to be revegetated will be ripped to a depth of at least 12 inches.
- The introduction and enhancement of nonnative plant populations will be limited by procuring clean fill, using cached salvaged fill from gravel yard, and washing equipment and vehicles used in construction projects. Gravel and fill for construction or maintenance will be obtained from certified noxious weed-free sources; gravel pits and fill sources will be inspected to identify weed-free sources.
- There will be no quarrying of construction materials from inside the monument.
- Driving equipment through undisturbed areas, including off of established road shoulders will be avoided.
- Existing plant materials will be salvaged and new plant materials will not be introduced.
- Subsequent to project completion, monument staff will monitor and require removal of any invasive species observed.

Protection of Migratory Birds

- In accordance with the Migratory Bird Treaty Act (1918) and Executive Order 13186, “Responsibilities of Federal Agencies to Protect Migratory Birds,” any and all removal of vegetation will occur outside of the migratory bird breeding season. For pinyon-juniper nesting birds, breeding can start in mid-April and continue into mid-July. The removal of vegetation for new facilities, including trails, walkways, or parking areas, will not occur from April 15 through July 15 each year.

Contamination Prevention and Control

- No application of emulsions or tack coat will be performed within one day of a predicted significant storm event (i.e., when runoff is likely).
- The contractor must have contingency plans to protect drainages in the case of unpredicted snow or rainstorms.
- All construction activities will be conducted in accordance with the monument's established safety protocols and the stormwater pollution prevention permit.
- All fuels will be stored and maintained in a designated equipment staging area to reduce the potential for soil contamination. Fuel will be stored in fuel trucks or in aboveground storage tanks in accordance with state regulations.
- Fueling and maintenance areas will maintain secondary containment or other measures to prevent soil contamination and runoff. At a minimum, petroleum product storage areas will be lined with plastic or a similar material. Tanks will be located off the ground and lids will be securely fastened.
- To minimize the possibility that construction vehicles could leak fluids into the soil, introduce noise pollution, and emit pollutants to the atmosphere, equipment will be checked frequently to identify and repair any leaks, mufflers will be checked for proper operation, and only equipment with proper operating specifications will be used.
- Spill contingency materials, such as absorbent booms, will be immediately available throughout the construction area should any fuel, petroleum oils, or hydraulic materials spill outside containment structures. All spills will be reported immediately to the construction supervisor and monument staff.
- Fuel and oil services for construction machinery will be provided in a designated area away from channels or drainages, including secondary containment for all fuel storage tanks and onsite availability of a specialized spill kit to contain fuel spills.
- Milled or pulverized asphalt may be stored temporarily only at the staging area. Excess asphalt, masonry, and other associated construction debris will not be disposed of on monument lands.
- Grading of pulverized asphalt (if performed) will be done in a manner to prevent overflow of asphalt outside the existing shoulder. Parking area stone curbing and sidewalks will be protected from paving emulsion overspray.
- Construction areas will be identified by and fenced with construction tape, snow fencing, or some similar material prior to any construction activity. The fencing will define the construction zone and confine activity to the minimum area required for construction.
- All protection measures will be clearly stated in the construction specifications, and workers will be instructed to avoid construction activities beyond the construction zone.
- Construction materials will be stored in previously disturbed areas.

Erosion Prevention and Control

- Erosion control measures will be put in place to prevent asphalt, emulsions, fuels, or oil materials from accidentally entering drainages. Standard erosion control precautions, as outlined under section 204 of *Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects*, will be stipulated in the contract specifications.

- All storm drain inlets in the project area will be protected so that asphalt oils or emulsions and sediment-laden water do not enter the drainage system.
- Disposal of removed materials will be the responsibility of the contractor in consultation with the construction supervisor and/or monument staff.
- Erosion and sediment control measures such as silt fences, weed-free straw bales, soil moistening, and other temporary measures will be placed along portions of the site perimeter to control erosion during construction activities. These temporary erosion prevention measurements will be maintained in place until the site vegetation is firmly established and soil has stabilized.
- Sediment runoff from the site will be captured and prevented from entering any nearby groundwater.
- The footprint of disturbance will be limited. For example, to the extent possible, heavy construction equipment will be kept on the road surface when placing slope protection or performing excavation adjacent to the roadway.
- Regular inspections of the erosion and sediment control measures will be performed after any storm event.
- Standard protocols to mitigate existing runoff-sediment problems, including closing areas to foot traffic and applying coarse woody debris (chips, slash, and logs) or erosion fabric (i.e., 1/4 mesh geo-jute) in high value areas, will be used.
- Existing natural drainages will be retained. Rerouting drainages into a single route per loop will be avoided because this would create unsustainable conditions and increase removal of vegetation. Existing drainages will be armored in place without realignment using local stone.

Protection of Physical Resources

- Use is limited to the existing footprint of the staging area.
- There will be no burning, power washes, or disposal in or around the project area.
- A water-based paint will be used for all pavement markings.
- Any area with vegetative clearing or construction activities will be designated a safety closure area and will require the use of hard hats.
- Topsoil will be removed and stockpiled for reapplication to disturbed areas when construction is complete.
- Implementation of reasonable measures to minimize fugitive dust emissions, such as applying water to exposed surfaces or stockpiles of dirt, will occur when windy and/or dry conditions promote problematic fugitive dust emissions.

Human Safety and Convenience Measures

- Sanitary facilities will be provided for construction workers.
- A traffic management plan will be developed to prevent traffic congestion in the area. Traffic delays will be kept below 30 minutes except for preapproved work after normal business hours.
- Areas where construction is ongoing will be closed while project activities are conducted to avoid direct visitor safety concerns as long as signage is clear.
- Generally accepted methods to protect public health and safety while simultaneously providing for visitor use and experience will be implemented, including notifying

travelers about the benefits of the selected alternative to maximize public support and understanding.

WHY THE SELECTED ALTERNATIVE WILL NOT HAVE A SIGNIFICANT EFFECT ON THE HUMAN ENVIRONMENT

As documented in the environmental assessment, the National Park Service has determined that the selected alternative (also the environmentally preferable alternative) can be implemented without significant adverse effects. As defined in 40 CFR 1508.27, significance is determined by examining the following criteria:

Impacts that may have both beneficial and adverse aspects and which on balance may be beneficial, but that may still have significant adverse impacts that require analysis in an environmental impact statement.

Implementing the selected alternative will result in some adverse impacts on park resources and values; however, the selected alternative will provide overall benefits because it will protect, preserve, and enhance historic, cultural, and natural resources of the monument.

Beneficial impacts are summarized as follows. Long-term, minor to moderate, beneficial impacts will occur on archeological resources, cultural landscapes, ethnographic resources, soils, vegetation, and visitor use and experience as a result of the modification of existing trails and implementation of new trails and access gates. These actions will reduce visitor-induced impacts in this highly sensitive area by keeping visitors on trails and providing new interpretive messaging, which will promote an ethic of cultural and natural resource preservation. Also, the addition of a site steward, monument staff, or other NPS-trained local community volunteers and/or commercial guides leading tours along the guided-only trail segments will result in a long-term, moderate, beneficial impact. Long-term, minor to moderate, beneficial impacts on visitor use will result from improving the intersection and onsite parking area; reconfiguring onsite parking and kiosk siting to improve visitor access to information; upgrading the fee collection station; and providing electronic downloads, safety guidance, first aid, an emergency phone, and messaging at the visitor arrival area. Introducing new interpretive messaging, first aid, a water fountain, emergency phone, the ABA Walk, and the Duchess Castle Trail; reconfiguring the State Road 4 and East Jemez Road intersection; and relocating the existing roadside parking area onto NPS lands will result in long-term, moderate, beneficial impacts on public health and safety. The integration of an adaptive management strategy into the resource monitoring program will allow monument staff to implement and/or adjust management strategies to better achieve desired resource conditions, as necessary, to help meet resource and visitor use management goals. The implementation of any one or combination of potential management strategies to help preserve and protect archeological resources will increase the long-term, beneficial impacts on the resources discussed previously.

Adverse impacts would occur mainly from ground and noise disturbance during the construction and implementation of site improvements, although none of these impacts rise to the level of significance, and many would be minimized by mitigation measures (see "Mitigation Measures of the Selected Alternative," above). The expected adverse impacts are summarized as follows. During construction activities, the soil layer structure will be disturbed and modified, and soils will be exposed, increasing the potential for erosion. Existing vegetation will be removed and replaced with an impermeable surface, which will accelerate

storm runoff and increase the potential for erosion and further damages to vegetation at the edge of the disturbance. In addition, noise disturbance and destruction of habitat associated with construction activities could adversely affect wildlife. Localized short-term, minor, adverse impacts on visitor use and experience will result from increased noise and air particulates. Ground-disturbing activities associated with the construction of new facilities will result in permanent, minor, adverse impacts on archeological resources, if found. Construction and the introduction of new facilities into the setting will result in a minor, adverse impact on the setting of the cultural landscape, and construction noise will result in a short-term, localized, minor, adverse impact on ethnographic resources. Construction will result in an increase in impermeable surfaces, resulting in both short- and long-term, minor, adverse impacts on soils and vegetation that are localized, primarily in the vicinity of the entry roadway and onsite parking area. Because a portion of the affected area has been previously disturbed and impacted from years of use, there may be opportunities to minimize impacts or avoid undisturbed soils and allow native ground cover to reestablish. Additional long-term, negligible to minor, adverse impacts on park operations and management will occur as a result of increased staffing needs and associated costs from implementation and oversight.

Degree of effect on human health or safety.

The selected alternative will not adversely affect human health or safety, and will provide substantial benefits, which include the following. Improvements to the State Road 4 and East Jemez Road intersection and onsite parking area and changes to trailhead locations will allow for safer access, and use of the existing roadside parking area will cease. As a result, many of the safety risks associated with accessing the existing roadside parking area will be eliminated. Introducing new interpretive safety messaging, first aid, a water fountain, and emergency phone will provide additional public health and safety measures. The ABA Walk and Duchess Castle Trail will improve safety conditions for persons with limited mobility and provide easier trail conditions for others. The site steward and other staff and volunteers will provide safety information and oversight. Under the adaptive management strategy, it is anticipated that specific management strategies related to visitor use management that may be implemented will also benefit public health and safety because they will be designed, in part, to encourage visitors to stay on designated trails that will be maintained by monument staff. In addition, minor trail revisions may be necessary in areas of concentrated visitation due to accelerated erosion and rock fall to ensure visitor and monument staff safety. If implemented, this will encourage visitors to stay on designated trails and away from rock fall areas.

No short-term, adverse impacts on public health and safety as a result of construction activities are expected. Prior to the onset of construction activities, a construction action plan will be prepared that identifies safety measures and protocols to be followed by workers to ensure their and visitor safety when construction activities are ongoing (see "Mitigation Measures of the Selected Alternative").

Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, wetlands, prime farmlands, wild and scenic rivers, or ecologically critical areas.

No park lands (other than those in Tsankawi), wetlands, prime farmlands, wild and scenic rivers, or ecologically critical areas will be subject to effects resulting from implementation of the selected alternative.

The entire area contains important historic and cultural resources. As noted in the enabling legislation, certain prehistoric ruins in Tsankawi are of unusual ethnologic, scientific, and educational interest, and the monument contains one of the highest densities of archeological sites from the Ancestral Pueblo period. The selected alternative will have mostly beneficial effects on these resources as discussed previously and later in this document under the criterion that addresses the degree to which the action may adversely affect resources listed on the National Register of Historic Places (national register).

Degree to which effects on the quality of the human environment are likely to be highly controversial.

No highly controversial effects on the human environment as a result of the selected alternative were identified during the preparation of the environment assessment. No controversy was raised during ongoing consultation with the six affiliated pueblos (see "Tribal Consultation" section), or by the public during the public comment period (see "Public Involvement" section).

Degree to which the possible effects on the quality of the human environment are highly uncertain or involve unique or unknown risks.

No highly uncertain, unique, or unknown risks were identified during the preparation of the environment assessment, ongoing consultation with the six affiliated pueblos, or by the public during the public comment period. The improvements and changes proposed for site access, trails, roads, parking, and the interpretive program are explained in a straightforward manner and do not pose uncertainties or unanticipated risks that are not already addressed in the mitigation measures.

Degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.

The selected alternative neither establishes a National Park Service precedent for future actions with significant effects nor represents a decision in principle about a future consideration.

Whether the action is related to other actions with individually insignificant but cumulatively significant impacts.

Cumulative effects were analyzed in the environmental assessment, and no significant cumulative impacts were identified.

Degree to which the action may adversely affect districts, sites, highways, structures, or objects listed on the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.

Under the implementing regulations of section 106, analysis of effects to historic properties is conducted within the area of potential effects. An area of potential effects is defined as:

> . . . the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking (36 CFR 800.16[d]).

To analyze the potential for these effects, the area of potential effects on the archeological, cultural landscape, and ethnographic resources of Tsankawi includes all areas within the 826 acres that comprise Tsankawi.

A total of 157 archeological sites have been recorded in the area of potential effects, including pueblos, cavate structures, lithic scatters, bedrock grinding areas, hearth features, historic structures, storage rooms, trash scatters, rock alignments, rock art, archeological features, trails, animal corrals, campsites, and road segments. Consultation with the New Mexico state historic preservation office has determined that all of these sites are eligible for listing in the national register. The selected alternative has been designed, in part, to help preserve and protect archeological resources present in Tsankawi. The realignment of the Tsankawi Mesa Trail just south of the pueblo and the introduction of the kiosk, interpretive messaging, site steward, and monument staff or other NPS-trained local community volunteers and/or commercial guides leading tours will result in long-term, moderate, beneficial impacts on archeological resources. The new entry roadway from the State Road 4 and East Jemez Road intersection and onsite parking area will be designed to avoid known archeological resources.

Additional surveys will be conducted in advance of construction to ensure that significant archeological resources are avoided. Ground-disturbing activities associated with the construction of new facilities will result in permanent, minor, adverse impacts on archeological resources, if found, and no adverse effect on historic properties because the character-defining features of the national register-eligible resource will not be affected. Under the adaptive management strategy, the implementation of any one or combination of potential management strategies to help preserve and protect archeological resources will increase the long-term, beneficial impact on archeological resources, and will result in no adverse effect on historic properties.

As a cultural landscape, Tsankawi tells the story of more than eight centuries of relationship between people and place. Tsankawi, in its entirety, is a nationally significant cultural landscape that has been determined by the National Park Service as eligible for the national register as a historic district, and the New Mexico state historic preservation office concurs. Integrated cultural and natural resource systems make up the landscape, with evidence of human use throughout. The selected alternative has been designed, in part, to help preserve and protect archeological resources, to minimize the physical destruction of or damage to the cultural landscape, and to preserve the features that contribute to the historic integrity of the national register-eligible cultural landscape. Under the selected alternative, changes to the trail system will result in long-term, moderate, beneficial impacts on the cultural landscape. New interpretive messaging, which will promote an ethic of cultural and natural resource preservation, and the addition of a site steward, monument staff or other NPS-trained local community volunteers, and/or commercial guides leading tours along the guided-only trail segment will result in a long-term, moderate, beneficial impact. Under the adaptive management strategy, the implementation of any one or combination of potential management strategies is anticipated to help further the objectives of the selected alternative, resulting in a

long-term, beneficial impact. No adverse effect on historic properties will result. The construction and introduction of new facilities into the setting will result in a minor, adverse impact on the setting of the cultural landscape. Overall, the selected alternative will result in a long-term, moderate, beneficial impact on the cultural landscape.

NPS staff has conducted ethnographic resource-related studies for the monument and consultation with the six affiliated pueblos is ongoing. The studies were undertaken to document traditional uses of cultural and natural resources; research the ethnographic literature and consult with pueblos potentially affiliated with the monument to document traditional uses; and identify plant, animal, and mineral use of the monument by affiliated pueblos. Under the selected alternative, changes to the trail system will help reduce impacts on sensitive resources and result in a long-term, moderate, beneficial impact on ethnographic resources. New interpretive messaging, which will promote an ethic of preservation, and the addition of a site steward, monument staff or NPS-trained local community volunteers, and/or commercial guides leading tours along the guided-only trail segment will result in a long-term, moderate, beneficial impact. Introduction of new facilities and subsequent visual features into the setting will result in a long-term, minor, adverse impact on ethnographic resources. Under the adaptive management strategy, potential management strategies that may be implemented will be designed to reduce the impacts caused by visitors on sensitive ethnographic resources through wear and damage, minimize the contribution of visitors to natural erosion and impacts on native vegetation, and preserve ethnographic resources, while minimizing visual intrusion into the natural setting. Construction noise will result in a short-term, localized, minor adverse impact on ethnographic resources; however, the new automated access gate will have a long-term, moderate, beneficial impact. Overall, the selected alternative will result in a long-term, minor to moderate, beneficial impact on ethnographic resources.

The New Mexico state historic preservation office was informed of the proposed action through outreach beginning with the June 13, 2012, annual consultation between Bandelier National Monument and the New Mexico state historic preservation office. During that meeting, monument staff presented their intention to engage in a planning process that weighed the need to protect resource values, reduce visitation impacts on cultural and natural resources, improve visitor understanding of site resources, and improve visitor safety. The public scoping newsletter developed for this project was provided to New Mexico SHPO staff as background regarding the proposed action. The planning effort was discussed again at the next annual consultation meeting, held on July 29, 2013. During that meeting, monument staff presented progress made in the last year toward alternatives development, and distributed and reviewed concept plans for alternative 1 (the preferred alternative). Monument staff emphasized the continued focus of the planning process on the protection of cultural and natural resources and the need for new development features at the unit to ensure visitor safety and accessibility. Actions described in the plan/environmental assessment are subject to section 106 of the National Historic Preservation Act, as amended in 1992 (16 United States Code, section 470 et seq.).

On March 10, 2015, the New Mexico SHPO sent a letter to the National Park Service stating support for the preferred alternative (alternative 1). The letter further stated that it could not, "concur with a No Adverse Effect determination at this time because the EA and consultation letter state that the Monument will complete Section 106 Consultation separately from the NEPA EA." Although adverse effects could occur if cultural resources are present during ground-disturbing activities, section 106 consultation would be completed prior to

implementation of these activities; therefore, no significant impacts would occur. Consultation with New Mexico SHPO staff will be ongoing during project planning and implementation, and the National Park Service will fulfill its obligations under section 106 on a case by case basis. The New Mexico SHPO verbally concurred with this approach on July 7, 2015.

Degree to which the action may adversely affect an endangered or threatened species or its critical habitat.

The environmental assessment (appendix E) lists threatened and endangered species found in Santa Fe County, the likelihood of their occurrence in Tsankawi, and the expected effect on the species from the selected alternative. The species were identified from a 2010 US Fish and Wildlife Service listing of New Mexico listed and sensitive species available online at: http://www.fws.gov/southwest/es/NewMexico/SBC.cfm, accessed May 31, 2013, and from the New Mexico Department of Game and Fish, Conservation Services Division, Threatened and Endangered Species of New Mexico, 2012 Biennial Review of October 1, 2012. The species included the following, listed along with their expected effect and reason for that determination. Additional information on habitat and range can be found in appendix E of the environmental assessment.

Common Name	Scientific Name	Federal Status	State Status	Determination of Effect	Reason(s) for Determination of Effect
Southwestern willow flycatcher	*Empidonax traillii extimus*	Endangered	Endangered	No effect	Habitat for this species does not exist within Tsankawi.
Mexican spotted owl	*Strix occidentalis lucida*	Threatened	Threatened	No effect	Habitat for this species does not exist within Tsankawi.
Jemez mountains salamander	*Plethodon neomexicanus*	Proposed	Endangered	No effect	Generally this species can only be found in the Jemez Mountains above 7,000 feet elevation.
Bald eagle	*Haliaeetus leucocephalus*	Delisted	Endangered	Negligible Not a federally listed species so the determination is not related to the Endangered Species Act of 1973, as amended.	This species likely occasionally to rarely uses Tsankawi; however, no breeding habitat exists within the unit.
Peregrine falcon	*Falco peregrinus*	Delisted	Endangered	Negligible Not a federally listed species so the determination is not related to the Endangered Species Act of 1973, as amended.	This species rarely uses Tsankawi, and typically only as a flyover bird. No breeding habitat exists within the unit.
Spotted bat	*Euderma maculatum*	—	Threatened	Negligible Not a federally listed species so the determination is not related to the	This species likely occasionally to rarely uses Tsankawi, and is scarce throughout its range.

Common Name	Scientific Name	Federal Status	State Status	Determination of Effect	Reason(s) for Determination of Effect
				Endangered Species Act of 1973, as amended.	
Gray vireo	*Vireo vicinior*	—	Threatened	Negligible Not a federally listed species so the determination is not related to the Endangered Species Act of 1973, as amended.	There have been no reliable reports of this species within Tsankawi or the main unit of the monument. A recovery plan was prepared by the New Mexico Department of Game and Fish in 2007. No gray vireos have been recorded since its publication.
Yellow-billed cuckoo	*Coccyzus americanus*	Candidate	Candidate	No effect	Habitat for this species does not exist within Tsankawi.
Whooping crane	*Grus americana*	Endangered	Experimental, Non-essential Population	No effect	Habitat for this species does not exist within Tsankawi.
New Mexican meadow jumping mouse	*Zapus hudsonius luteus*	Candidate	Endangered	No effect	Habitat for this species does not exist within Tsankawi.
Black-footed ferret	*Mustela nigripes*	Endangered	Endangered	No effect	Habitat for this species does not exist within Tsankawi.
Rio Grande cutthroat trout	*Oncorhynchus clarki virginalis*	Candidate	Candidate	No effect	Habitat for this species does not exist within Tsankawi.
Rio Grande silvery minnow	*Hybognathus amarus*	Endangered	Endangered	No effect	Habitat for this species does not exist within Tsankawi.

As noted in the appendix, an assessment of effects was completed based on comments by monument staff and knowledge of habitat, including breeding habitat, within Tsankawi. There is no effect expected on any federally listed species, thus no further consultation or concurrence from the US Fish and Wildlife Service is required (see table below). A copy of the environmental assessment was sent to the US Fish and Wildlife Service, and no comments were received. Impacts on state-listed species range from no effect to negligible effects. A copy of the environmental assessment was sent to the New Mexico Department of Game and Fish, and no comments were received.

Whether the action threatens a violation of federal, state, or local environmental protection law.

The selected alternative violates no federal, state, or local environmental protection laws.

TRIBAL CONSULTATION

Consultation with the six affiliated pueblos was initiated at the onset of the decision-making process. A current memorandum of understanding regarding consultation between the National Park Service and the six affiliated pueblos requires the National Park Service to regularly and actively consult with these pueblos regarding monument management, fire

planning, and operational decisions that affect sacred materials or places, or other ethnographic resources with which they are historically associated.

On November 30, 2011, a meeting between monument staff and pueblo representatives discussed various management actions proposed at the monument, including the management plan/environmental assessment. During the public scoping period in May 2012, the National Park Service held a meeting with the pueblos to specifically discuss their concerns and ideas for appropriate management of Tsankawi. Monument staff met with representatives from Cochiti Pueblo on June 28, 2012, and San Ildefonso Pueblo on January 9, 2013, to discuss project alternatives for the management plan/environmental assessment in their current state of development. San Ildefonso Pueblo requested additional meetings with the tribal leadership and the people of the pueblo.

Overall, the ideas and concerns expressed by the pueblos focused on protection of cultural resources and maintaining respect for the site, and for Tsankawi Pueblo in particular. The pueblos were concerned that infrastructure enhancements at Tsankawi would result in increased visitation and impacts on cultural resources. The pueblos indicated that new structures, interpretive messaging, and other infrastructure should use natural materials, to the extent possible, to fit harmoniously into the visual landscape and support continuing traditional uses of the area. They requested that the existing Tsankawi Mesa Trail be moved away from the center of the pueblo to protect it from further degradation and suggested a series of measures specific to vegetation that could be effective for keeping visitors in designated areas. The pueblos emphasized that reinforcing the significance of the area through education is paramount to the success of management actions to preserve and protect cultural resources.

They also reiterated the importance of monitoring activities to determine the success of management actions to preserve and protect cultural resources and adjusting these measures if they do not achieve desired results. San Ildefonso Pueblo expressed a desire to close the area to visitation and return the unit to pueblo ownership.

The most recent meeting with San Ildefonso Pueblo was held on May 8, 2013. During the meeting, the pueblo stated they would like some type of messaging to be installed indicating that it is illegal to walk and dig on pueblo lands. This messaging could be placed near the parking area, along Tsankawi Mesa Trail, or the boundary that the unit shares with San Ildefonso. Pueblo representatives expressed a desire to participate in future meetings where interpretive messaging for Tsankawi is developed.

Access to the dance platform—an area along Tsankawi Mesa Trail—needs to be available for tribal elderly, children, and others who cannot use the ladder. Additionally, at this meeting it was recommended that monument staff consider activities that would include traditional dances on the dance platform that would provide monetary compensation to participants, and extend the monument's cultural demonstration program that takes place at Frijoles Canyon to Tsankawi. Other possible employment opportunities at Tsankawi for members of San Ildefonso were discussed.

PUBLIC INVOLVEMENT

The environmental assessment was made available for public review and comment from December 1, 2014, through March 16, 2015. It was available on the National Park Service's Planning, Environment, and Public Comment website and its availability was announced through a press release. During the public comment period, the National Park Service received five pieces of correspondence from the public and one from the state historic preservation officer. Public comments stated support for the preferred alternative and noted the benefits that would occur to visitor use and experience from the project implementation. Support was also noted for individual project components, including using site stewards and increasing volunteer staff, extending the hiking trail to the point of Tsankawi Mesa, and creating an accessible walkway to provide less mobile visitors with an opportunity to view the site and the Duchess Castle Trail.

Specific substantive comments received and the NPS responses to those comments are listed at the end of this document.

CONCLUSION

The National Park Service has selected alternative 1 for implementation. Using the impacts evaluated in the environmental assessment and with guidance from NPS *Management Policies 2006*, cultural and natural resource information, professional judgment, and in consideration of agency and public comments and consultation with the six affiliated pueblos, the impacts that will result from the selected alternative will not impair any monument resources and values (see attached "Non-Impairment Determination"). The selected alternative does not constitute an action that will require the preparation of an environmental impact statement. The selected alternative will not have a significant effect on the human environment. Adverse environmental impacts on cultural and natural resources that could occur will be short-term and negligible to minor. All resource topics carried forward for further analysis will experience long-term, beneficial impacts from the implementation of the selected alternative with the exception of park operations and management, which will experience negligible to minor, adverse impacts. There are no significant impacts on any of the resource topics carried forward for further analysis in the environmental assessment. No highly uncertain or controversial impacts, unique or unknown risks, significant cumulative effects, or elements of precedence were identified. Implementation of the selected alternative will not violate any federal, state, or local environmental protection law.

Based on the foregoing, an environmental impact statement is not required for this action and will not be prepared. This is a finding of no significant impact.

Approved:

Laura E. Joss — July 21, 2015

for Sue H. Masica — Date
Regional Director, Intermountain Region, National Park Service

RESPONSE TO COMMENTS

The following table summarizes the substantive comments received, along with the NPS response to the comment. If the comment resulted in a change to the environmental assessment, it is so noted after the response, and the change is included in the errata text changes.

COMMENT	RESPONSE
Commenters raised concerns regarding fee collection at the monument, including requesting that fees not be raised and that existing fees are too high.	The environmental assessment includes adding an automated fee collection system, but does not propose an increase in fees. At this time, the National Park Service believes the existing fees are adequate and changes (increases or decreases) to the fee structure are not proposed.
One commenter noted that the San Ildefonso Pueblo should be involved in interpretation.	As stated on page 144 of the environmental assessment, "NPS staff would rely on continued communication and consultation with the six affiliated pueblos regarding the selected alternative, seeking their advice and recommendations to ensure that any potential impacts on the integrity of or access to ethnographic resources would be avoided, minimized, or mitigated. The National Park Service is committed to working with tribal communities regarding the protection of these places to help preserve a traditional way of life." Issues related to implementing interpretative elements under the preferred alternative would be included in these communications.
One commenter requested that visitors not be required to take a bus to access Tsankawi.	Issues related to potential future shuttle stops at Tsankawi are included as part of the ongoing transportation plan/environmental assessment and are outside the scope of this planning process. For more information on the transportation plan, please visit the website at: http://parkplanning.nps.gov/documentsList.cfm?projectID=43749.
One commenter noted that a management plan was already completed in August 2000, with many of those items either not implemented or not maintained. The commenter questioned the need for this new planning effort.	This planning effort builds on and considers the multiple planning efforts that have occurred to date. As stated on page 28 of the environmental assessment, "The current plan builds on and relates to four previous planning efforts within the monument and encompassing Tsankawi: the 1995 *Development Concept Plans for Frijoles Canyon and Tsankawi*, the 2000 *Environmental Assessment Regarding the Management of the Tsankawi Unit*, the 2005 *Bandelier National Monument Fire Management Plan/Environmental Assessment*, and the monument's 2007 *Ecological Restoration Plan/Environmental Impact Statement*." Due to changing site conditions, elements of previous planning efforts have been reconsidered and those that were considered applicable and feasible to current site conditions were carried forward.
One commenter stated support for changes to the parking area, noting that the parking area should be as small as feasible to minimize vegetation impacts. The commenter also suggested that the lot be dirt or gravel and that pavement and striping should not be used due to visual and soil erosion impacts.	As stated in the environmental assessment, it has not yet been determined if the onsite parking area would be paved or gravel. However, the environmental assessment assumes that the entry roadway and onsite parking area in their entirety would be paved to evaluate the highest level of development in the area. Using these assumptions, no significant impacts are expected from the parking area.
One commenter stated a concern with the proposed alternatives' approach to the implementation of trails. Concerns included	While the monument staff appreciate concerns related to a loss in visitor experience, the proposed route realignment would not remove the current viewing opportunities—pueblo masonry features would

COMMENT	RESPONSE
rerouting the trail on top and on the side of Tsankawi Mesa, which would result in visitors not being able to view the Pueblo, which the commenter noted is an expected part of the visitor experience. The commenter noted that in the absence of a formal trail, social trails would likely result. As an alternative, the commenter suggested an offshoot from the proposed trail to allow viewing of the Pueblo that included an elevated vantage point (as proposed in the 2000 management plan), which would be less visually intrusive then originally proposed. The commenter also expressed concern about closing the trail on the south side of the mesa, noting that it has been used by locals and visitors for generations and closing it would not allow visitors to see cavates. Actions to minimize impacts such as additional signage, staff/volunteer contacts, and low impact barriers were suggested as measures that could keep this trail open.	remain in view for the entire length of the proposed reroute alignment. Monument staff recognize the potential for visitors to create social trails, and as stated on page 53 of the environmental assessment, "Reinforcing the resource protection message would require skillful design of the rerouted trail segment. Absent a design that reinforces the message, visitors are likely to wander across the landscape through the site, potentially trampling vegetation and impacting resource integrity." This same approach would apply to all proposed trail changes under this plan. The errata sheet includes a text change that recognizes the suggested alternative and provides the reason why that option was dismissed.
One commenter suggested expanding the interpretative themes at Tsankawi to include the geology of the Pajarito Plateau as well as the Rio Grande Valley and Sangre de Cristo.	As stated on page 57 of the environmental assessment, "All interpretive materials would be designed to foster a sense of place and value of the landscape, so that visitors approach Tsankawi with a sense of care and understanding of the fragility of the site and of the role their personal responsibility plays in protecting the site and every feature contained therein." While the environmental assessment does highlight cultural resources, this would not preclude monument staff from implementing other interpretive messages that provide visitors with a greater understanding of the landscape.

ERRATA SHEET

Tsankawi Unit Management Plan

Bandelier National Monument

According to NPS policy, substantive comments are those that 1) question the accuracy of the information in the environmental assessment, 2) question the adequacy of the environmental analysis, 3) present reasonable alternatives that were not presented in the environmental assessment, or 4) cause changes or revisions in the proposal.

Some substantive comments may result in changes to the text of the environmental assessment, in which case, they are addressed in the *Text Changes* section of the Errata Sheets. Other substantive comments may require a more thorough explanatory response and are addressed in the *Response to Comments* section. The National Park Service responds to all substantive comments in either or both of these sections.

Of the seven substantive comments that were received during public review of the environmental assessment, one of them suggests an alternative that requires a minor change to the text of the document.

TEXT CHANGES

Page 67, Alternatives or Actions Considered but Dismissed from Further Evaluation—an additional entry will be included as follows:

PROVIDE AN OFFSHOOT FROM THE PROPOSED TSANKAWI MESA TRAIL

One commenter was concerned that rerouting the trail on top and on the side of Tsankawi Mesa would result in visitors not being able to view the Pueblo, which the commenter noted is an expected part of the visitor experience. The commenter suggested an alternative to provide an offshoot from the proposed trail to allow viewing of the Pueblo that included an elevated vantage point (as proposed in the 2000 management plan). This option was dismissed from further consideration because the proposed route realignment would not remove the current viewing opportunities—pueblo masonry features would remain in view for the entire length of the proposed reroute alignment.

NON-IMPAIRMENT FINDING

The National Park Service has determined that implementation of the selected alternative will not result in impairment of monument resources and values. Pursuant to the NPS Guidance for Non-Impairment Determinations and the NPS NEPA Process (October 31, 2011), a non-impairment determination for the selected alternative is included here as an appendix to the finding of no significant impact.

The prohibition against impairment originates in the NPS Organic Act of 1916, which directs that the National Park Service shall:

> promote and regulate the use of the...national parks...which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.

According to NPS *Management Policies 2006*, an action constitutes an impairment when its impact "would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values" (section 1.4.5). To determine impairment, the National Park Service must evaluate "the particular resources and values that would be affected; the severity, duration, and timing of the impact; the direct and indirect effects of the impact; and the cumulative effects of the impact in question and other impacts" (section 1.4.5).

As stated in the NPS *Management Policies 2006* (section 1.4.5), an impact on any park resource or value may constitute an impairment, but an impact would be more likely to 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 park; or
- key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or
- identified in the park's general management plan or other relevant NPS planning documents as being of significance

The resource impact topics carried forward and analyzed for the NPS selected alternative in the environmental assessment, and for which an impairment determination is contained in this appendix, are archeological resources, cultural landscapes, ethnographic resources, soils, vegetation, and wildlife and wildlife habitat. The following describes each resource or value for which impairment is assessed and the reasons why impairment will not occur.

ARCHEOLOGICAL RESOURCES

The 157 archeological sites that have been recorded in the 826 acres that comprise Tsankawi and the entire Tsankawi cultural landscape are all eligible for listing in the national register. The prehistoric ruins and archeological sites are specifically mentioned in the enabling legislation for the monument. They are necessary to fulfill the purposes of the monument and are key to the

cultural integrity of the park. Their protection has been the focus of many other park planning efforts.

As previously noted, the selected alternative will provide many benefits to these resources and will be designed and implemented to avoid adverse impacts. The selected alternative will restore abandoned trails to a natural state, and new trails will be designed to avoid disturbance to archeological resources. Final trail alignments will avoid direct impacts on archeological resources by siting alignments on native rock rather than soils that may contain cultural deposits. Additionally, trails will be designed to be offset from cavates, masonry pueblo walls, kivas, and petroglyphs to ensure that visitation will not indirectly create conditions of deterioration. The selected alternative will also introduce interpretive messaging at Tsankawi that will stress the sensitivity of resources, the need for protection, and the historical context and traditional importance of the resources to present-day pueblo communities, with the intention of making all visitors stewards of the landscape. Because new interpretive messaging will be designed to educate visitors and reinforce the message of a sensitive and living landscape, introduction of these features will result in a long-term, moderate, beneficial impact on archeological resources. A small increase in monument staff or other NPS-trained local community volunteers and/or commercial guides at Tsankawi would result in a long-term, minor, beneficial impact on archeological resources.

A new entry roadway and onsite parking area will be implemented with the general configuration designed to avoid known archeological resources. Additional surveys will be conducted in advance of construction to ensure that significant archeological resources are avoided. Ground-disturbing activities associated with the construction of new facilities will result in permanent, minor, adverse impacts on archeological resources, if found, and no adverse effect on historic properties because the character-defining features of the national register-eligible resource will not be affected. Consultation with the New Mexico State Historic Preservation Office, the National Park Service, and/or the NPS regional archeologist will be coordinated to ensure that the protection of resources is addressed.

Because the selected alternative will result in numerous benefits and provide for survey and protection of unknown archeological resources, there will be no impairment to archeological resources.

CULTURAL LANDSCAPES

Tsankawi, in its entirety, is a nationally significant cultural landscape that has been determined by the National Park Service as eligible for listing in the national register as a historic district, a determination that has been concurred by the New Mexico State Historic Preservation Office. The cultural landscape is necessary to fulfill the purposes of the monument and is key to the cultural integrity of the park, as noted in its importance in other park plans.

The construction and introduction of new facilities into the setting will result in a minor, adverse impact on the setting of the cultural landscape, but the changes to the trail system will result in long-term, moderate, beneficial impacts on the cultural landscape. New interpretive messaging, which will promote an ethic of cultural and natural resource preservation, and the addition of a monument staff or other NPS-trained local community volunteers, and/or commercial guides leading tours along the guided-only trail segment will result in a long-term, moderate, beneficial impact. The selected alternative would designate a site steward to provide

historical context to visitors and a limited degree of oversight. This will result in long-term, minor, beneficial impacts on the cultural landscape because it would reduce visitor-induced impacts through visitor education and increased awareness of the sensitivity and significance of cultural and natural resources. The site steward would also monitor the condition of the landscape, report to monument staff when impacts are observed, and help ensure that visitors do not impact the character-defining (national register-contributing) landscape features or patterns and diminish the integrity of the resource.

Because the selected alternative will not inhibit opportunities for the public to experience, understand, and appreciate the park unit in a manner appropriate to the preservation of its cultural landscapes and would have mainly beneficial impacts, there will be no impairment to cultural landscapes.

ETHNOGRAPHIC RESOURCES

The ethnographic resources of the monument are key to its cultural integrity. Its prehistoric aboriginal ruins mentioned in the enabling legislation are an integral part of the pueblo culture in New Mexico.

The selected alternative includes new interpretive messaging, which will promote an ethic of preservation, and the addition of a site steward, monument staff or NPS-trained local community volunteers, and/or commercial guides leading tours along the guided-only trail segment, which will result in a long-term, moderate, beneficial impact. Introduction of new facilities and visual features into the setting will result in a long-term, minor, adverse impact on ethnographic resources, but this change will not be sufficient to cause major, adverse effects on the landscape or decrease its value. Construction noise will result in a short-term, localized, minor, adverse impact on ethnographic resources; however, the new automated access gate will have a long-term, moderate, beneficial impact.

Because the selected alternative will result in only minor adverse effects and overall will result in a long-term, minor to moderate, beneficial impact on ethnographic resources, there will be no impairment to the resource.

SOILS

Tsankawi is well known for its characteristic terrain and prehispanic pattern of human settlement, including manmade features (cavates) carved into the soft tuff material by the Ancestral Pueblo people. Part of the purpose of Bandelier National Monument and Tsankawi is to conserve the scenery and the natural and historic objects therein to provide for the enjoyment of future generations. The preservation and protection of all natural and national register-eligible cultural resources in the park unit includes stabilization of soils that support natural vegetation and reduce the potential for erosion, which can affect these cultural resources and are key to the natural and cultural integrity of the park.

While the realignment of existing trails and implementation of new trails associated with the selected alternative will involve short-term disturbances to soils, the selected alternative will permanently stabilize soils in areas of Tsankawi that have experienced erosion. Although the selected alternative will include vegetation clearing and expose soils, the impacts will be limited to the project areas, and soil productivity and characteristics will not change outside of the limit

of disturbance. Adverse impacts on soils would be both short- and long-term, minor, and adverse and would be associated with the construction and operation of the proposed entry roadway, onsite parking area, kiosk, and ABA Walk. Ground disturbances such as grading, leveling, and filling to support the proposed entry roadway and onsite parking area will also disturb soils. The majority of this disturbance will be associated with the proposed entry roadway and onsite parking area. The use of sediment and erosion control measures will ensure the alternative will not increase sedimentation or lead to additional erosion at Tsankawi. Under the selected alternative, the reclamation of trails that currently traverse the center of the pueblo will minimize impacts on sensitive soils by containing disturbances to designated corridors that can be maintained through regular maintenance. As a result, there will be perceptible declines in the rates of soil erosion and compaction, and the ability of the soil to support native vegetation will improve.

Overall, the selected alternative will have only minor adverse effects that are associated with required construction, and will result in long-term, moderate, beneficial impacts on soils that will enhance the park unit's ability to protect natural scenery and preserve cultural resources. For these reasons, there will be no impairment to soils.

VEGETATION

Natural vegetation is an essential element of the monument's cultural landscape. Vegetation is key to the natural and cultural integrity of the monument, in that the preservation and protection of all natural and national register-eligible cultural resources in the park unit includes stabilization of natural vegetation to reduce the potential for erosion, which can affect sensitive cultural resources.

During implementation of the selected alternative, existing vegetation will be removed and replaced with an impermeable surface, resulting in both short- and long-term, minor, adverse impacts on vegetation. These effects will result from the construction and operation of the proposed entry roadway, onsite parking area, kiosk, and ABA Walk. While effects on vegetation will be detectable in these areas, the affected areas have been previously disturbed and impacted from years of use. Mitigation measures implemented to protect vegetation will include the employment of best management practices, such as adherence to an approved erosion and sediment control plan, which would be developed as the selected alternative is further refined. Furthermore, disturbed areas next to proposed construction activities will be actively reseeded to stabilize soils and allow native ground cover to reestablish. Although the realignment of the trail will introduce a new designated corridor, which may require the removal of some vegetation, it will reduce overall impacts currently experienced along the portion of the Tsankawi Mesa Trail traversing the pueblo and social trails. As a result, implementation of the selected alternative will result in long-term, minor to moderate, beneficial impacts on vegetation.

Although vegetation will be removed and/or disturbed during the construction and implementation of the selected alternative, these adverse impacts will be minor, limited to construction areas, and will be mitigated. Benefits will be derived from the change to trails; therefore, there will be no impairment to vegetation.

WILDLIFE AND WILDLIFE HABITAT

One goal of Bandelier National Monument is to preserve scenery and protect all natural and national register-eligible cultural resources in the park. Wildlife is a natural resource necessary to fulfill the purposes of the monument, is a part of the cultural history and landscape, and is key to the monument's natural integrity.

General wildlife impacts occurring as a result of construction elements associated with the selected alternative will arise from disturbances to habitat. Mammals, reptiles, and amphibians occurring in the area of anticipated disturbance will be forced to relocate. However, adverse impacts will be both short- and long-term, localized, and negligible to minor because of the relatively small area being affected and the ability of adjacent areas to provide adequate habitat. Mitigation measures implemented as a component of the selected alternative will protect migratory bird species, including limiting the removal of vegetation to time periods outside of the breeding seasons for migratory bird species. For pinyon-juniper nesting birds, breeding can start in mid-April and continue through mid-July. Therefore, mitigation measures will prohibit the removal of vegetation necessary to support the implementation of the proposed actions from April 15 through July 15 of each year. With the implementation of these mitigation measures, impacts on migratory bird species are not anticipated. Listed species are either not likely to occur or only rarely to occasionally occur in Tsankawi, and no effects are anticipated on federally listed species. Additionally, new interpretive messaging and the reintroduction of a site steward at Tsankawi will provide a limited degree of oversight, potentially resulting in indirect, long-term, negligible to minor, beneficial impacts.

Because the selected alternative will have mainly long-term, beneficial impacts on wildlife and wildlife habitat, with only negligible to minor, localized adverse effects mainly during construction, and have no adverse effects on listed species, there will be no impairment to wildlife or wildlife habitat.

SUMMARY

The National Park Service has determined that the implementation of the NPS selected alternative will not constitute an impairment of the resources or values of the Tsankawi unit of Bandelier National Monument. As described above, anticipated adverse impacts from the implementation of the selected alternative will be short-term, negligible to minor, and localized. Once in operation, the selected alternative will result in beneficial impacts on park resources and values that will help support the purpose and significance of Bandelier National Monument. As a result, the selected alternative will not result in impairment. This conclusion is based on consideration of the park unit's purpose and significance, a thorough analysis of the environmental impacts described in the environmental assessment, the comments provided by the public and others, and the professional judgment of the decision maker guided by the direction of the NPS *Management Policies 2006*.