National Park Service
U.S. Department of the Interior
Zion National Park
Springdale, Utah

Environmental Assessment

Zion Canyon South Entrance Redesign (PEPC 104914)

March 2024

Zion National Park
South Entrance Fee Station

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CHAPTER 1: PURPOSE AND NEED

Background

The Zion Canyon South Entrance is in the southern portion of Zion National Park (ZION, park) and includes the South Entrance Fee Station, Zion Canyon Visitor Center, Watchman Campground Road, Watchman Campground Bridge, large vehicle parking, shuttle facility, and employee parking, and provides access to the Zion-Mt. Carmel Highway, South Campground, Watchman Campground, and the southern portion of the park (Project Area; Figure 1). About 70 percent of visitors to ZION enter through the Zion Canyon South Entrance. Much of this traffic crosses the Watchman Campground Bridge, a two-lane bridge across the North Fork of the Virgin River, to access the Visitor Center, parking, and other park amenities on the south side of the river.

Increases in visitation levels and changes in visitor use patterns over time, combined with the limitations of a road and bridge designed in the 1950s for much less intensive use, have made the Zion Canyon South Entrance a congested area. Visitors to the Zion Canyon South Entrance area use multiple forms of travel, which results in safety challenges. From 2018 through 2023, the park documented nine motor vehicle crashes in the Zion Canyon South Entrance area (National Park Service (NPS) 2024a). At the time the Watchman Campground Bridge was completed in 1965, the park had considerably less visitation, did not operate a public transportation system, and was designed with no sidewalks or bike lanes. The Zion Canyon Visitor Center was constructed in 2000, at a time when visitation and traffic congestion were much lower than current levels. The recent South Entrance Fee Station configuration increased the number of traffic lanes, which allows more vehicles to enter the park at a faster rate. Current conditions in the Project Area result in a variety of user group conflicts. Often, traffic congestion due to the current design temporarily delays shuttles from accessing or departing the Visitor Center shuttle stop, located just beyond the Watchman Campground Bridge. Pedestrians and cyclists may be delayed in crossing the road by vehicles that do not yield at crosswalks, and vehicles in turn may be delayed due to high traffic in crosswalks.

The Zion Canyon Transportation System began operating propane-powered shuttle buses in 2000 to reduce congestion on Zion Canyon Scenic Drive. Many of the propane shuttles are aged and require frequent maintenance. Ultimately, because of a scarcity of repair parts (the shuttles built for this unique transportation system are no longer manufactured), each out-of-commission shuttle bus can no longer be repaired and must be replaced. In 2023, ZION began taking delivery of an electric-powered shuttle bus fleet. The replacement buses include state-of-the-industry accessibility features but also have a larger size and turning radius and cannot easily navigate the existing shuttle facility, nor can the existing facility accommodate parking for the larger buses once the transition to an electric fleet is complete.

Purpose and Need

The purpose of the proposed Zion Canyon South Entrance Redesign (project) is to improve road circulation and safety for vehicular, bicycle, and pedestrian traffic on roads and trails in the Project Area; create pedestrian and bicycle connections and intuitive wayfinding; and

modernize ZION facilities and utility infrastructure to support current and future visitation levels. Additionally, the purpose of the project is to bring the Project Area into compliance with the Architectural Barriers Act (ABA) and Americans with Disabilities Act (ADA) while reducing user group conflicts, improving visitor safety, and protecting natural and cultural resources. The project is needed because visitation levels have outgrown the existing road facilities and alignments, creating dangerous and confusing traffic situations with potentially harmful interactions between vehicles and more vulnerable road users such as bicyclists and pedestrians.

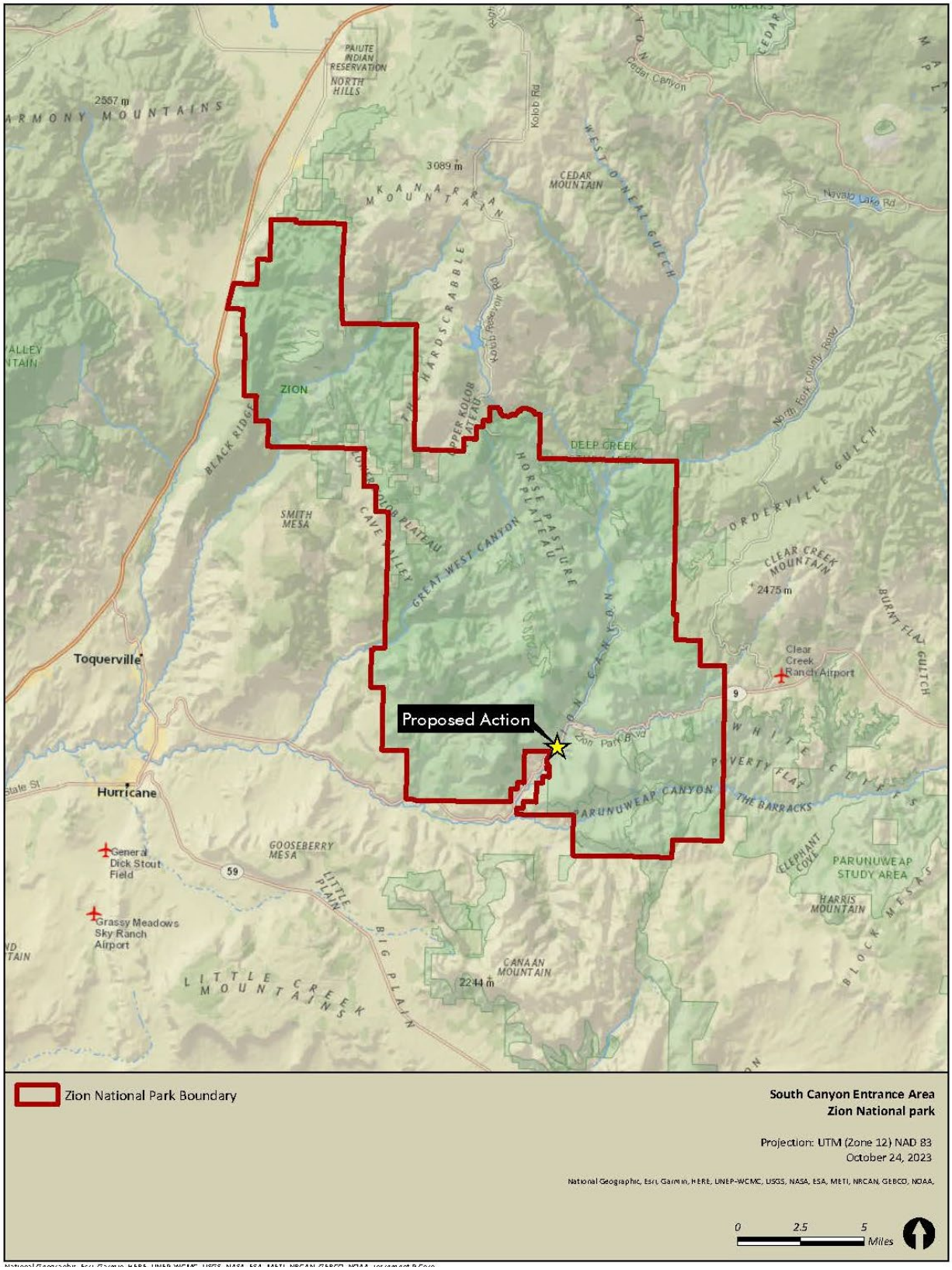

Figure 1. Zion Canyon South Entrance

CHAPTER 2: ALTERNATIVES

Two alternatives, no action and the proposed action/preferred alternative, are being carried forward. Alternatives considered and dismissed are described in Appendix A, which provides a detailed description of suggestions and alternate designs that have been deliberated throughout the National Environmental Policy Act (NEPA) process.

Alternatives Carried Forward

Alternative A – No Action-Continue Current Management

Under Alternative A, no modifications to Zion Canyon South Entrance area infrastructure (Figure 2) would occur, although routine maintenance would continue.

ROADS

Under Alternative A, the existing two-lane road and two-lane vehicular bridge (Watchman Campground Bridge) would continue to provide the primary entrance and egress to the Zion Canyon Visitor Center and other facilities on the east side of the North Fork of the Virgin River, and issues with safety concerns for visitors and multimodal conflicts would continue. The current configuration of turn lanes and pedestrian crossings would remain unchanged. Routine maintenance of roads and parking areas under current management would continue.

SHUTTLE FACILITY, LARGE VEHICLE PARKING, AND EMPLOYEE PARKING

Under Alternative A, the recently expanded shuttle bus lot would not be paved and the large vehicle parking lot and employee parking lot would not be expanded or reconfigured. Routine maintenance of these facilities would continue.

Alternative B – Zion Canyon South Entrance Redesign (Proposed Action and Preferred Alternative)

To provide solutions to the needs associated with traffic congestion and user group conflicts, the National Park Service (NPS) is proposing to redesign the Zion Canyon South Entrance. Elements of the proposed action would include realigning the road to the Zion Canyon Visitor Center accessed from the South Entrance Fee Station, paving the ZION Shuttle Maintenance Facility, expanding employee parking and large vehicle parking, improving circulation of and installing intuitive wayfinding for pedestrian and bicycle trails, and improving accessibility throughout the Zion Canyon South Entrance area (Figure 3). Each of these project components is described in greater detail below.

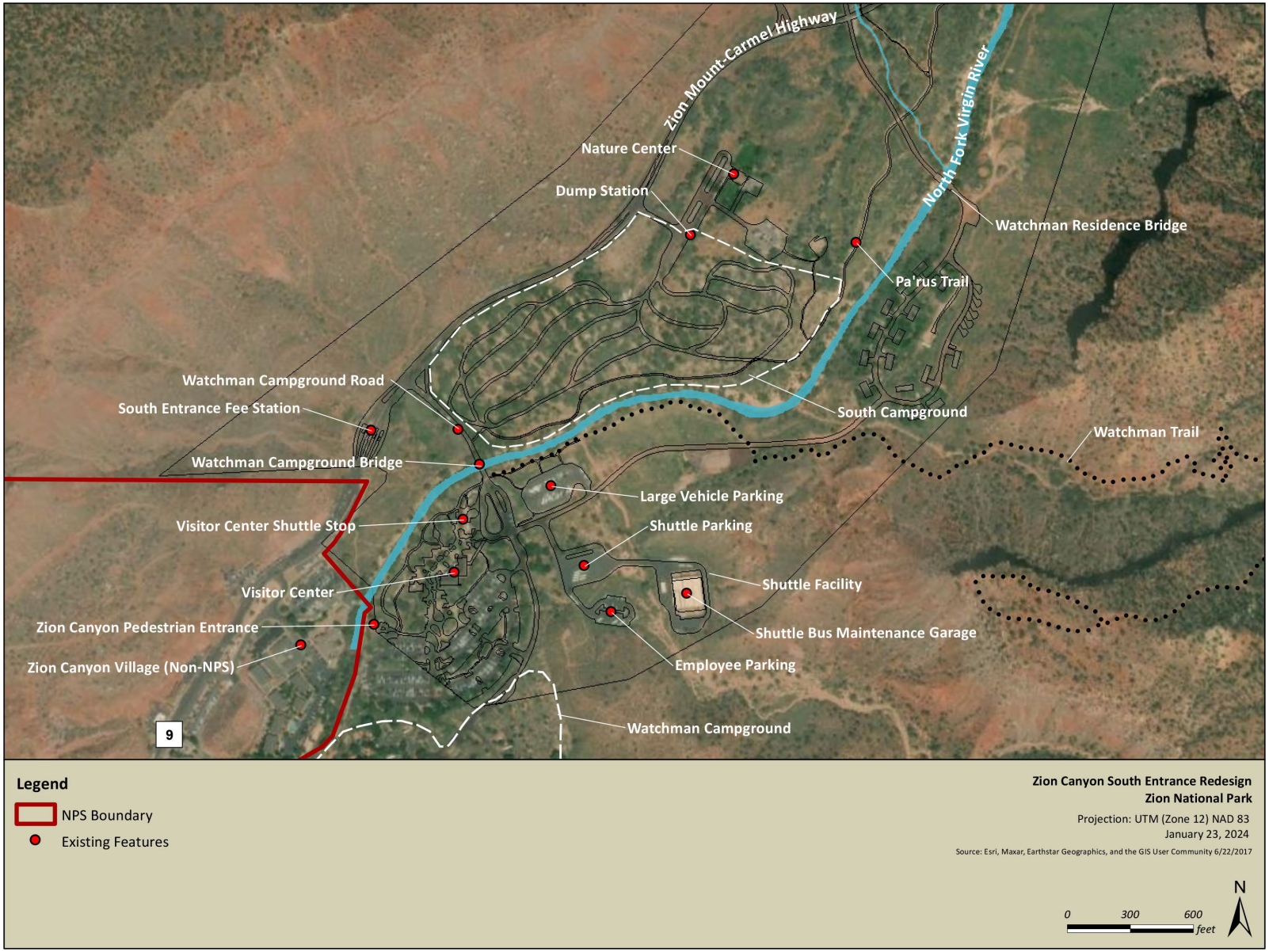

Figure 2. Alternative A – Existing Conditions (No Action Alternative)

Figure 3. Alternative B – Zion Canyon South Entrance Redesign (NPS Proposed Action and Preferred Alternative)

ROAD IMPROVEMENTS

Road improvements would be implemented at the Zion Canyon South Entrance area to improve safety, reduce multimodal conflicts, improve wayfinding, and reduce traffic congestion. ZION would notify the public of any road closures in advance of construction on ZION's website, through social media, and through press releases to inform the media so that visitors are aware of the work and can make appropriate plans. Road improvements would include the following proposed elements (Figure 3):

- Construct a new roundabout north of the existing South Entrance Fee Station (with an associated new road alignment).
- Construct a short-term pullout and bypass lanes to facilitate traffic flow at the roundabout just past the South Entrance Fee Station.
- Realign the Watchman Campground Road running southeast from the entrance roundabout and restore the old roadbed to natural conditions with native vegetation.
- Construct a new road configuration east of the new vehicular bridge (described below).
- Construct a second new roundabout to facilitate traffic flow to the large vehicle parking lot, Visitor Center parking lot, shuttle bus parking lot, and Watchman Campground.
- Add new traffic signage at the new roundabouts.
- Construct a road connection to the shuttle bus parking lot.
- Reconfigure and enlarge the large vehicle parking lot from about 1 acre to about 1.73 acres.
- Create road and trail connections to the shuttle stop area as needed.
- Grade all areas adjacent to the Project Area to connect to existing grades.
- Install culverts as needed.
- Demolish and revegetate sections of the existing road that are no longer needed.
- Install bioswales for natural filtration of contaminants from all new and expanded parking areas.
- Construct trail connections to the adjacent campground as needed.
- Replace and modernize utility infrastructure where appropriate.
- Add signage, fencing, and dark-sky compliant path lighting to better define pedestrian routes.

WATCHMAN CAMPGROUND BRIDGE REPLACEMENT

The Watchman Campground Bridge across the North Fork of the Virgin River would be removed and replaced. Bridge replacement would include the following proposed elements:

- Remove the existing Watchman Campground Bridge and restore the river channel in the same location to natural freer-flowing conditions.
- Construct a new four-lane vehicular bridge with a longer span upstream of the existing Watchman Campground Bridge.
- Construct a pedestrian trail underpass at the new bridge to connect to the Pa'rus Trail, which runs north-south along the east side of the North Fork of the Virgin River.

The new four-lane bridge across the North Fork of the Virgin River would be designed to pass the 100-year flood, plus 2 feet of freeboard. The abutments of the new bridge would be outside

the 100-year floodplain, as modeled, based on removal of the existing Watchman Campground Bridge (HDR 2023).

The existing Watchman Campground Bridge across the river would be demolished, and the section of the river channel at the bridge would be restored.

SHUTTLE FACILITY

The shuttle facility improvements would include the following proposed elements (Figure 3):

- Pave the recently expanded shuttle bus parking lot.
- Realign the entrance of the administrative access road to access the bus charging parking area and ZION Shuttle Maintenance Facility.
- Expand existing employee parking to include concessioner, partner, and NPS employee parking in a single location separate from visitor parking. The employee parking lot would be expanded from about 0.22 acre (34 spaces) to about 1.30 acres (87 spaces).
- Remove existing Zion Canyon Visitor Center employee parking. A portion of this area would be part of the new entrance road, and a portion would be revegetated.
- Add an accessible route from employee parking to the Zion Canyon Visitor Center.

ACCESS, STAGING, AND CONSTRUCTION METHODS

Access for construction would be from the Zion–Mount Carmel Highway. Access to the large vehicle parking lot, shuttle bus parking lot, and employee parking lot would be disrupted during construction activities. Construction staging areas would include existing parking lots and previously disturbed areas. The primary staging area would be the large vehicle parking lot (Figure 3). To reduce the risk of pollutants entering waterways, fuel storage and hazardous waste storage would be at least 3 feet above the regulatory floodplain elevation.

Grading would occur throughout the Project Area. Specifically, the new bridge would require extensive grading for installation and to connect adjacent roads and parking areas. The shuttle bus parking lot would require fill to tie into adjacent roads. Construction of the bridge and trail underpass may require placement of riprap embankment protection or other fill to protect the bridge from scour. All fill, rock, or other earth materials would be obtained from the Project Area or nearby areas whenever possible. Soil and fill material would be weed free and from a source approved by the NPS. Visible fill, rock, or other earth materials would be of a compatible color to the surrounding landscape.

Equipment used for the road improvements would include skidsteers, graders, medium and large loaders, backhoes, trackhoes, trenchers, belly dumps, water trucks, compacters, concrete trucks, cranes, large dump trucks (material hauling), asphalt milling machines, paving machines, medium and large asphalt rollers, curbing machines, and various handheld medium and large power equipment (saws, drills, etc.). Pile-driving equipment would be used during installation of the bridge abutments. Standard workdays and times are anticipated during construction. Some weekend work may be required and would be reviewed by the park's Superintendent before approval. Construction would occur only during daylight hours.

The total anticipated disturbance area for the project would be about 11.8 acres. Portions of the existing road, large vehicle parking lot, shuttle bus parking lot, and trails that do not align with the new orientation would be demolished and restored. All temporary disturbances would be restored following construction. After restoration, there would be a net increase in paved area, and thus a permanent disturbance, of about 2.5 acres.

Bioswales, which are channels designed to convey stormwater while removing sediment and pollutants, would be installed for natural filtration of contaminants from all new and expanded parking areas. The bioswales would be designed as vegetated, shallow, landscaped depressions that would capture, treat, and infiltrate stormwater runoff as it moves downstream from the parking areas.

Restoration and revegetation would include placing topsoil, reseeding with native seed, and container plantings as described in the Mitigation Measures (Appendix B).

Overall construction is anticipated to begin in the fall of 2024 and last for approximately 24 months. The following timing restrictions would be implemented to reduce impacts on wildlife and visitor experience. These mitigation measures are described in detail in Appendix B.

- In-water work would not occur from April 1 to July 31 to protect sensitive fish species.
- The hours of operation of motorized equipment would vary by season to protect dawn, dusk, and nighttime quiet (8:00 a.m. to 5:00 p.m. during Standard Time and 8:00 a.m. to 6:00 p.m. during Daylight Savings Time).
- Migratory bird nests would be protected by timing the project outside of the annual nesting period, which is March 1 to September 15. If timing as such is not possible, visual inspections of vegetation marked for removal would be required.
- Clearing and grubbing activities would occur only during November through February to avoid the migratory bird season (March 1–September 15) and the monarch butterfly active season (April through October).
- Tree removal would occur only in October and November to protect nesting migratory birds and roosting bats. If this is not possible, visual inspections of vegetation marked for removal would be required each day prior to tree removal.
- From April through October, construction personnel would be briefed to check underneath vehicles for tortoises before driving.

Impact Topics Retained for Further Analysis

The following topics are carried forward for further analysis:

- Vegetation
  - Native Vegetation
  - Invasive and Nonnative Vegetation
- Mexican Spotted Owl
- Cultural Resources
  - Cultural Landscape and Historic District
  - Historic Buildings and Structures
- Visitor Use and Experience

- Water Resources
  - Floodplains and Wetlands
  - Wild and Scenic Rivers

Impact topics considered and dismissed from detailed analysis are described in Appendix C, along with the reason for dismissal.

CHAPTER 3: AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Introduction

This chapter describes the affected environment consisting of the existing, or baseline, conditions and expected future conditions and analyzes the potential beneficial and adverse environmental consequences (impacts or effects) that could occur when implementing the alternatives.

Cumulative Impact Scenario

Cumulative impacts are defined as "effects on the environment that result from the incremental effects of the action when added to the effects of other past, present, and reasonably foreseeable actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 Code of Federal Regulations (CFR) 1508.1(g)(3)). In determining cumulative impacts, this document examines past, present, and reasonably foreseeable future actions at ZION. Cumulative impacts are considered for the No Action Alternative and the Preferred Alternative. A list of projects identified for the purpose of conducting the cumulative effects analysis is in Appendix D.

Vegetation

Affected Environment

NATIVE VEGETATION

The Project Area includes a complex mix of developed areas, disturbed grasslands, and native vegetation communities. Vegetation communities in the Project Area include rabbitbrush (*Chrysothamnus viscidiflorus* and *Ericameria nauseosa*) shrubland complex, Fremont cottonwood (*Populus fremontii*) woodland, Fremont cottonwood – velvet ash (*Fraxinus velutina*) woodland, big sagebrush (*Artemisia tridentata*) shrubland complex, and cheatgrass (*Bromus tectorum*) annual disturbed grassland (Cogan et al. 2004). The Freemont cottonwood woodland complex is common in the Virgin River floodplain and along other prominent drainages. The Fremont cottonwood – velvet ash woodland community is found in riparian areas and in the floodplain of the North Fork of the Virgin River. The understory in the Fremont cottonwood – velvet ash woodland community mostly consists of the nonnative species cheatgrass and great brome (*Bromus diandrus*). The big sagebrush shrubland complex is widespread in ZION and in the Project Area. The cheatgrass annual disturbed grassland community is found throughout the Project Area in previously disturbed areas. Additional plant communities covering smaller areas in the Project Area include blackbrush (*Coleogyne ramosissima*) shrubland complex, littleleaf mountain mahogany (*Cercocarpus intricatus*), slickrock sparse vegetation, and perennial disturbed grassland complex, which comprises mostly nonnative grasses such as smooth brome (*Bromus inermis*). Detailed descriptions of plant communities in ZION are summarized in Cogan et al. (2004).

Future trends that could affect vegetation in the Project Area include increased wildland fires, drought, and potential increases in invasive and nonnative vegetation. In the western U.S., wildland fires can result in changes to vegetation communities, and the overall area burned as well as burn severity are predicted to increase under projected climate change (Littell et al. 2018, p. 11770–11775; Abatzoglou et al. 2016, p. 1). Climate change could also lead to changes in the prevalence of invasive and nonnative species over time (Tercek et al. 2021, p. 13). Planned actions that could affect vegetation in the Project Area include future maintenance activities and vegetation management such as control of invasive species and removal of hazard trees. Vegetation management and invasive species control would help to reduce the potential for invasive species to increase in the Project Area.

INVASIVE AND NONNATIVE VEGETATION

Numerous invasive and nonnative plant species are present in the Project Area. The Project Area has higher densities of nonnative vegetation than other areas of ZION due to the presence of roads, trails, and other human-caused disturbance. The most prevalent nonnative species is cheatgrass, which dominates large areas in previously disturbed grasslands and is also present in the understory of shrub communities and riparian areas. Russian thistle (*Salsola tragus*) is also extremely prevalent across the entirety of the Project Area. Other prevalent nonnative plant species in the Project Area include little bur clover (*Medicago minima*), Russian olive (*Eleaegnus angustifolia*), and bulbous bluegrass (*Poa bulbosa*; Washuta and Perkins 2018, p. 12). Mediterranean grass (*Schismus* sp.), which is a new species for ZION, was discovered in the Project Area in March 2022 and is confined to a small area near the employee parking and large vehicle parking lots.

A reasonably foreseeable trend that could affect invasive and nonnative vegetation in the Project Area is an increase in the frequency and intensity of wildland fires as a result of climate change, which could facilitate the spread of invasive species. Invasive species are also more fire-prone, which could reinforce this trend. This could impact future control efforts by ZION to reduce the severity of infestations. ZION actively monitors and manages populations of invasive plants to control and reduce populations. Monitoring by the Northern Colorado Plateau Network found that densities of invasive and nonnative vegetation in the Project Area, while still higher than other areas of ZION, declined from 2013 to 2018 (Washuta and Perkins 2018, p. 21). This decline is likely the result of park actions to manage invasive species. Planned actions that could affect invasive and nonnative vegetation in the Project Area include future maintenance activities and park vegetation management activities to control invasive species. These activities would help to reduce the potential for invasive species to increase in the Project Area.

Impacts of Alternative A—No Action

Under the No Action Alternative, no project-related impacts on vegetation would occur. Vegetation impacts from maintenance activities, such as removal of hazard trees, would continue unchanged. Existing infestations of invasive and nonnative vegetation would continue to be monitored and controlled by the ZION Vegetation Program. Existing infestations would continue to be managed, and new infestations would be identified and potentially eliminated, which would result in benefits to vegetation in the Project Area.

Cumulative Impacts

Although other past, present, and reasonably foreseeable future actions have affected, or could have the potential to affect, vegetation in the Project Area (Appendix D), the No Action Alternative would have no new impacts and, therefore, there would be no cumulative impacts.

Impacts of Alternative B—Zion Canyon South Entrance Redesign (Proposed Action and NPS Preferred)

Road and trail improvements would result in vegetation removal to construct the new roundabout, new road alignments, new vehicular and pedestrian bridge, and reconfigured large vehicle lot. Clearing and grading for the road improvements would permanently affect about 3.5 acres of vegetation and would temporarily affect about 2.6 acres of vegetation. Expanding the large vehicle and employee parking areas would also result in permanent and temporary impacts on vegetation. Clearing and grading for these facilities would permanently remove about 4.5 acres of vegetation and temporarily impact about 1.2 acres of vegetation. The total impacted area of vegetation would be about 11.8 acres. Temporarily impacted areas would be restored with native species, as described in Appendix B. When restoration of temporary impacts and obliteration and restoration of removed roads are accounted for, the net permanent loss of vegetation would be about 2.5 acres.

An estimated 120 trees would be removed for the road alignment in the Project Area. The estimate is based on a 20-foot buffer around proposed roads and represents a worst-case scenario. Trees removed would include several species, such as velvet ash, Fremont cottonwood, box elder, hackberry, Siberian elm, and mulberry. Trees would also be trimmed by removing selected limbs. Many of the trees that would be removed or trimmed are dead, dying, or near the end of their natural lifespan, and some would present a safety hazard if not removed or treated. Wherever possible, and as long as they do not pose a safety hazard, dead trees would remain to provide wildlife habitat. Tree removal and treatment would occur in October and November to avoid impacts on nesting migratory birds and roosting bats (Appendix B). Trees would be retained wherever possible, and new trees would be planted in the Project Area. These measures would reduce impacts on trees from the project; however, replacement trees would be smaller in size, resulting in a net loss of mature trees. All planted trees would be species native to ZION.

Tree removal would result in a net loss of large trees, and several decades would pass as the newly planted trees grow to mature size. Grassland vegetation would be expected to recover within a few years with implementation of post-installation restoration, as described in Appendix B. Woody vegetation, such as sagebrush, rabbitbrush, and cottonwood communities, would take longer to recover, potentially returning to conditions similar to those of surrounding undisturbed areas in years or decades.

Ground disturbance has the potential to spread invasive nonnative plant species. Manual or chemical treatments would be used to control invasive nonnative species as necessary in the entirety of the Project Area. Additional mitigation measures would be implemented as described in Appendix B to prevent the spread of invasive plant species as the result of vegetation and soil disturbance and to avoid or minimize impacts on existing vegetation near the Project Area. After construction is complete, ZION expects fewer nonnative plant species in the Project Area.

Overall, project activities would result in temporary loss of vegetation on about 11.8 acres from construction of new facilities, such as roads, trails, and parking areas, which would result in an adverse effect on vegetation. Revegetation efforts throughout the Project Area would be accomplished in accordance with a revegetation plan using native plant species and native seed mixes, as described in Appendix B. After revegetation, removal, and restoration of existing roads, the net permanent loss of vegetation would be about 2.5 acres. The proposal would affect less than 0.01 percent of the entire park's vegetation. Invasive and nonnative plant species would be controlled as described above, which would reduce impacts and benefit vegetation after construction is complete.

Cumulative Impacts

Past, present, and reasonably foreseeable actions that have affected or could affect vegetation in the Project Area include past construction of ZION infrastructure and maintenance in the Project Area, which removed vegetation to construct and maintain roads, parking areas, and other facilities, and projects listed in Appendix D which may have affected vegetation. The projects have resulted in and would result in adverse impacts by removing native vegetation and potentially enabling the spread of nonnative plant species. Ongoing activities conducted by the ZION Vegetation Program include monitoring and management of invasive and nonnative plant species, and revegetation of areas previously disturbed by construction and trampling. ZION Vegetation Program activities have resulted in beneficial impacts on vegetation in the Project Area by reducing the spread of nonnative plants and restoring previously disturbed areas with native vegetation. Future projects, such as rehabilitation of South Campground and rehabilitation of Watchman Campground, could result in adverse effects by removing native vegetation and facilitating the spread of nonnative vegetation, although these projects include plans to restore and revegetate disturbed areas with native vegetation. As previously described, the impacts of Alternative B on vegetation would be adverse from removal of vegetation during construction activities and permanent loss of vegetation from the increased footprint of paved surfaces. When the effects of Alternative B are combined with other past, present, and reasonably foreseeable impacts, the total cumulative impacts on vegetation would continue to be both adverse and beneficial. The adverse incremental impacts of Alternative B would contribute to, but would not substantially change, the effects already occurring.

Mexican Spotted Owl

Affected Environment

Mexican spotted owls (MSO) are listed as threatened under the Endangered Species Act (ESA). MSO nest in steep-sided canyons with old-growth mixed-conifer forests, nesting on cliff ledges or caves along canyon walls in deep, shady/cool canyons. MSO have been observed in ZION since 1928 (Wauer 1997). ZION is designated as critical habitat for this species.

A territory is an area occupied by an individual owl and defended against other individuals of the same species. As defined by the 2012 Mexican Spotted Owl Recovery Plan, MSO protected activity centers (PACs) are "a minimum area of 600 acres surrounding the 'activity center,' which includes the nest site, a roost grove commonly used during the breeding season in the absence of a verified nest site, or the best roosting/nesting habitat if both nesting and roosting information are lacking" (USFWS 2012). As of 2021, 40 suspected or known MSO territories

were wholly or mostly in ZION, and 31 PACs have been delineated (Stroud-Settles and Reimer 2021). Within each PAC are core areas that are established as 100 acres surrounding known nest or roost sites (USFWS 2004).

The three closest PACs to the Zion Canyon South Entrance area are Oak Creek, Pine Creek, and Lady Mountain. The edge of the Oak Creek PAC is about 0.8 mile from the Zion Canyon South Entrance area, and the core of this PAC is about 2.0 miles from the Zion Canyon South Entrance area. The edge of the Pine Creek PAC and its core area are about 1.8 miles and 1.9 miles from the Zion Canyon South Entrance area, respectively. The edge of the Lady Mountain PAC and its core area are about 2.1 miles and 2.8 miles from the Zion Canyon South Entrance area, respectively.

Existing impacts on MSO in the Project Area include disturbance from recreational use or maintenance activities and from ongoing non-NPS aviation flights. Future trends affecting this species could include habitat loss in ZION from increased wildland fires due to climate change. Planned actions that could affect MSO in the Project Area include future maintenance activities and vegetation management such as control of invasive plant species and removal of hazard trees. These planned actions could help benefit MSO habitat in the Project Area by reducing the potential for habitat impacts from invasive plant species.

Impacts of Alternative A—No Action

Under the No Action Alternative, no new project-related impacts on MSO or its habitat would occur. Existing impacts from human presence and recreational activities would continue. Regular maintenance activities with impacts on habitat, such as hazard tree removal, would continue and could result in potential disturbance to MSO. Tree removal and other maintenance activities would be timed to minimize disturbance to MSO.

Cumulative Impacts

Although other past, present, and reasonably foreseeable future actions have affected, or could have the potential to affect, MSO in the Project Area (Appendix D), the No Action Alternative would have no new impacts and, therefore, there would be no cumulative impacts.

Impacts of Alternative B—Zion Canyon South Entrance Redesign (Proposed Action and NPS Preferred)

The NPS prepared a Biological Assessment (BA) analyzing the potential effects of a collection of proposed projects in the vicinity of the Zion Canyon South Entrance, including the proposed action as well as a proposed renovation of the South Campground and rerouting pedestrian trails. The BA was submitted to the U.S. Fish and Wildlife Service (USFWS) on April 11, 2023, as part of formal consultation under the ESA. The BA concluded that the proposed action *may affect, and is likely to adversely affect*, MSO and its critical habitat. The USFWS concurred with this determination in their Biological Opinion dated August 8, 2023 (see Appendix E).

Direct effects on MSO could result from impacts on foraging and roosting habitat. As described above in the *Vegetation* section, about 11.8 acres of new disturbance would occur, including vegetation removal to construct the new roundabout, new road alignments, new vehicular and pedestrian bridge, and reconfigured large vehicle lot. Expanding the large vehicle and employee parking areas would also result in permanent and temporary impacts on vegetation. When

restoration of temporary impacts and obliteration and restoration of removed roads are accounted for, the net permanent loss of vegetation would be about 2.5 acres. An estimated 120 trees would be removed for the road alignment in the Project Area. Components of the proposed action, including tree removal, soil compaction, paving, and heavy equipment operation, would directly kill rodents, reptiles, and bats and temporarily degrade their habitat, thus reducing MSO prey availability. Prey populations are expected to return to preconstruction levels over a period of several years, thus resulting in an adverse effect on MSO for several years after construction.

Direct effects on MSO would result from disturbance from increased noise and human presence during construction. The proposed action would result in a temporary increase in human activity and noise from construction equipment in the Project Area during construction (proposed to begin fall 2024 and continue for 24 months). Currently, noise and human activity in the Project Area occurs due to frequent automobile, bus, and motorcycle traffic and visitor use of trails, parking areas, and visitor facilities. Estimated noise levels for construction equipment are shown in Appendix C Table C-2.

Studies have determined that noise-related disturbance can affect nesting, roosting, and feeding activities of MSO (Delaney et al. 1999; Delaney and Grubb 2004; USFWS 2006b). Reactions of birds to noise are complex and depend on multiple variables, including topography, vegetation type, noise levels and distance to receptors, and the life stage of the species. Behavioral and physiological responses to noise disturbance have been reported in the literature (Delaney et al. 1999; Delaney and Grubb 2004; USFWS 2012). Breeding season restrictions within a PAC should be considered when noise levels within 165 feet of known nest sites, or within the entire PAC if nest sites are unknown, exceed 69 dBA (1) more than twice per hour or (2) for more than 1 hour (USFWS 2012). Studies cited in the recovery plan indicate that noise exceeding this level causes owls to flush from nests, disrupting breeding activity (USFWS 2012). Behavioral responses may include increased alertness, turning toward the sound of the disturbance, fleeing the disturbance, changes in activity patterns, changes in habitat use, and nest abandonment. Physiological effects could include increased respiration and heart rate as well as temporary or permanent hearing threshold shifts and masking of auditory signals.

The Project Area contains the physical and biological features that could support roosting and foraging for MSO, but not nesting. The nearest MSO nesting core areas are about 2 miles from the Project Area, and therefore noise impacts on nesting MSO are extremely unlikely, given noise attenuation and absorption. For example, the loudest equipment the proposal suggests for use in the Project Area is a pile driver, which has a maximum noise level of 95 dBA at 50 feet (Appendix C Table C-2). Because noise levels attenuate exponentially over distance, the expected noise level from a milling machine at 2 miles would be about 48.5 dBA, which is lower than the level expected to cause adverse effects, 69 dBA. The maximum noise level at the edge of the nearest PAC, about 0.8 mile from the Project Area, would be about 56.5 dBA. The presence of trees and other vegetation is expected to absorb and reduce the noise levels further. After construction is complete, noise levels in the Project Area would return to existing ambient levels.

Although the Project Area is 0.8 mile from the edge of the nearest PAC, MSO could roost or forage in the Project Area before or during construction, so it is possible MSO could be displaced from the Project Area by the increased noise and human activity resulting from

construction. These effects would last only during construction, however. Project activities could cause MSO to avoid the immediate Project Area during periods of active construction.

Temporarily disturbed areas would be planted and seeded with native vegetation after construction is complete, and portions of abandoned roads would be obliterated and revegetated. Over the long term, there is potential that vegetation restoration and invasive plant management would improve habitat for MSO, compared with current conditions. Improvement may occur over a period of decades, as planted trees mature. The potential for adverse impacts would be further reduced by implementing the conservation measures described in Appendix B. Tree removal would occur in October and November to avoid impacts on migratory birds and eliminate the possibility that a tree would be removed while being used for roosting by MSO during their breeding season. If MSO are identified in the Project Area during construction, work would stop, and the Project Area would be resurveyed daily until MSO are confirmed to have left the area. Additionally, to reduce potential for disturbing foraging MSO, construction would occur only during daylight hours, when MSO usually are not foraging.

Effects on MSO critical habitat would result from temporary impacts on about 11.8 acres of vegetation, including removal of 120 trees, which would temporarily alter portions of riparian habitat, a primary constituent element related to MSO canyon habitat. Impacts on vegetation are described in detail in the *Vegetation* section, above. A small amount of critical habitat (about 2.5 acres) would be permanently removed and may alter MSO use of the Project Area. The entirety of ZION is MSO critical habitat, so the loss of 2.5 acres of critical habitat would be less than 0.01 percent of the available critical habitat at ZION. None of the existing PACs overlap the Project Area, and therefore habitat in these PACs would be unchanged. Over the long term, the proposed action would have beneficial effects on critical habitat by reducing the number of dead or dying trees, reducing nonnative plants prone to fire, and increasing down or dead material to increase prey habitat.

A BA has been prepared and found the proposed action *may affect, and is likely to adversely affect*, MSO and *may affect, and is likely to adversely affect,* MSO critical habitat. The finding means that MSO are likely to be exposed to the action or its environmental consequences and would respond in a negative manner to the exposure. Impacts would be reduced but not eliminated by implementing conservation measures such as revegetating temporarily disturbed areas and implementing limitations on timing of construction and tree removal in MSO critical habitat (Appendix B).

Cumulative Impacts

Past, present, and reasonably foreseeable actions that have affected or could affect MSO in the Project Area include past construction of roads, parking areas, and other infrastructure in the Project Area, which resulted in removal and fragmentation of MSO foraging habitat. Ongoing activities of the ZION Vegetation Program—monitoring and managing nonnative plant species and revegetating previously disturbed areas with native vegetation in the Project Area—benefits MSO by restoring its habitat. Activities of the ZION Wildlife Program would benefit MSO by monitoring and managing human-wildlife interactions and conducting research to better understand MSO movements and impacts from humans. Future projects, such as rehabilitation of South Campground, rehabilitation of Watchman Campground, and projects listed in Appendix D, would result in adverse effects on MSO from vegetation removal during

construction, including removal of mature trees that could provide roosting habitat, although these impacts would be mitigated by implementing revegetation plans.

Overall, the impacts of past, present, and reasonably foreseeable actions have had and could continue to have both adverse and beneficial effects on MSO. As previously described, Alternative B would result in adverse impacts on MSO from increases in noise disturbance during the 24-month construction period, disturbance of foraging and roosting habitat in the Project Area during construction, reduction in prey availability during construction and for several years afterward, and removal of mature trees within potential foraging and roosting habitat. When the effects of Alternative B are combined with other past, present, and reasonably foreseeable impacts, the total cumulative impacts on MSO would be both adverse and beneficial. The adverse incremental impacts of Alternative B would contribute to, but would not substantially change, the effects already occurring.

Cultural Resources

Affected Environment

Although lower Zion Canyon had been the home of Indigenous peoples for thousands of years, the first non-Indigenous people to settle lower Zion Canyon were members of the Church of Jesus Christ of Latter-Day Saints (LDS) in 1859. The transformation of lower Zion Canyon began immediately with the development of agriculture and associated infrastructure such as roads, rock walls, and ditches to convey water to fields, including some of the ditches that now extend through the Project Area. The Crawfords and Schiefers were LDS families who settled lower Zion Canyon around what is now the Zion Canyon South Entrance area (Engleman et al. 2022). Their property was acquired by the park to eventually develop the Zion Canyon South Entrance area.

Following LDS settlement, the Zion Canyon South Entrance area went through three phases of development under the NPS: Early Development, New Deal Era, and Mission 66, which spans a period from 1909 when the national monument was established through 1966 when the Mission 66 program ended. Little development occurred during the Early Development period (1909-1933), but it was during this period that the Zion-Mt. Carmel Highway was completed in 1933, providing the first formal vehicular access to the entire Zion Canyon.

Formal development of the Zion Canyon South Entrance began with the New Deal Era and the Civilian Conservation Corps (CCC). South Campground was constructed by the CCC from 1933 to 1936. With the start of World War II, development projects ended and even after the war, development was slow to resume. However, development began in earnest under the Mission 66 program, which began in 1956 and was intended to last 10 years until 1966 upon the 50th anniversary of the NPS. Mission 66 was intended to modernize NPS infrastructure to accommodate increasing numbers of visitors. The Schiefer Homestead was acquired in 1960 to develop the Zion Canyon South Entrance, including Watchman Campground and employee housing. It was during the Mission 66 program that the current roads and bridges, including the Watchman Campground Bridge and Watchman Residences Bridge, were constructed. The northern portion of Watchman Campground was removed to accommodate the new Zion Canyon Visitor Center constructed from 1998 to 2000 (Engleman et al. 2022; GWWO Architects 2022).

The NPS defined the project's area of potential effects (APE) as the Zion Canyon South Entrance and Visitor Center areas (Figure 4), which extends from the entrance station north along Zion-Mt. Carmel Highway to Watchman Campground Road and across the North Fork of the Virgin River to the shuttle bus parking lot. A cultural resource survey of Lower Zion Canyon was undertaken in 2022 to identify potential historic properties within the APE (Engleman et al. 2022). The 2022 cultural resources inventory documented 4 cultural resources within the APE, including segments of the Oak Creek Canal (42WS4781), Watchman Trail (42WS6579), and Flanigan Ditch (42WS3019). The Watchman Campground Bridge (42WS6673), constructed during the Mission 66 program, was also documented (Engleman et al. 2022). The park has also recently documented the Zion-Mt. Carmel Highway, a segment of which is in the APE (42WS6679). The western portion of the South Campground boundary is also in the APE and would be impacted by construction of the new four-lane Watchman Campground Road; however, the South Campground was recently redesigned as a separate project and no elements are now within the South Entrance Redesign Project Area. The South Campground is eligible for listing in the National Register of Historic Places (NRHP), and impacts are being resolved through a separate project undertaking.

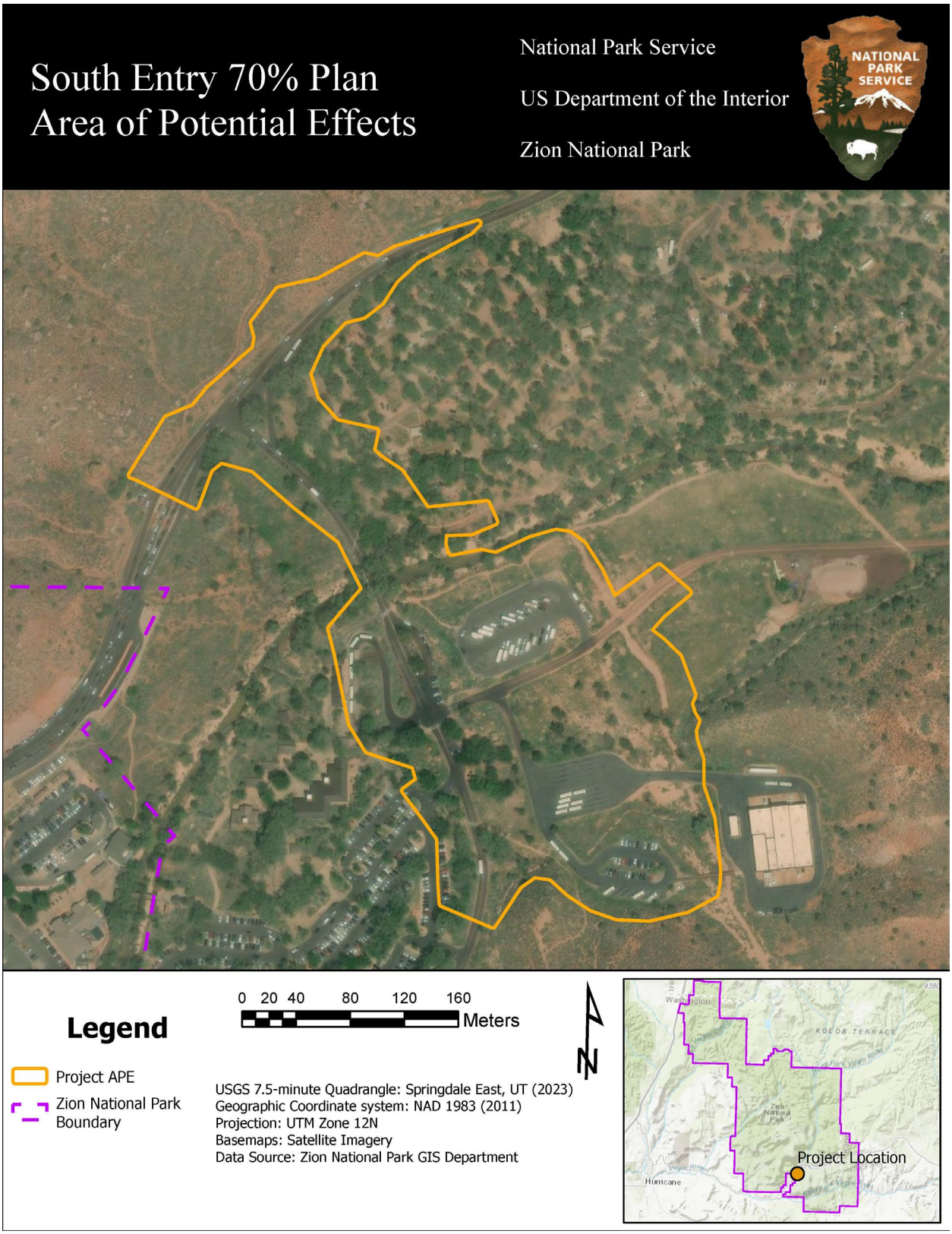

Figure 4. Area of Potential Effects for Cultural Resources

CULTURAL LANDSCAPE AND HISTORIC DISTRICT

A cultural landscape report (CLR) was recently prepared for Zion Canyon (GWWO Architects 2022). The defined cultural landscape includes the entirety of Zion Canyon, from the South Entrance Station to the Gateway to the Narrows, encompassing a historic district comprised of 24 historic properties listed in the NRHP and other potential historic properties that have either yet to be evaluated or are in the process of being evaluated for listing in the NRHP (Engleman et al. 2022). Archeological sites and ethnographic resources were not evaluated for the CLR. Four periods of significance are defined under the CLR:

- Pioneer Settlement by members of the Church of Jesus Christ of Latter-Day Saints (1862-1909)
- Early Park Development (1909-1933)
- New Deal Era Park Development (1933-1942)
- Mission 66 (1945-1967)

The Zion Canyon Cultural Landscape Historic District is significant at the national and state levels under Criteria A and C for association with the four periods of significance defined above (Criterion A) and for embodying distinctive architectural style: NPS Rustic and Mission 66 Modern (Criterion C). Areas of significance include Agriculture, Architecture, Commerce, Engineering, Entertainment/Recreation, Exploration/Settlement, Invention, Landscape Architecture, Park Development History, Politics/Government, Social History, and Transportation.

Most of the listed properties were documented under the *Multiple Resources for Zion National Park* NRHP nomination (Jurale and Witherall 1987). Contributing properties to the cultural landscape historic district within the APE include buildings and structures listed in Table 1 (Engleman et al. 2022; GWWO Architects 2022).

Table 1. Contributing and potentially contributing properties documented in the CLR and within the project APE.

Smithsonian / Temporary Number	Resource Name	Period of Significance	NRHP Eligibility
42WS3019	Flanigan Ditch	Pioneer Settlement	Listed 1998
42WS4781	Oak Creek Canal	Pioneer Settlement New Deal Era	Listed 1987
42WS6673	Watchman Campground Bridge	Mission 66	Eligible
42WS6579	Watchman Trail	New Deal Era	Eligible
42WS6679	Zion-Mt. Carmel Highway	Early Park Development New Deal Era Mission 66	Listed 1987; segment within APE noncontributing.

HISTORIC BUILDINGS AND STRUCTURES

Circulation structures in the Project Area include the Zion-Mt. Carmel Highway (Early Development Era through Mission 66 Era) and circulation developed during the Mission 66 program to access the east side of the North Fork of the Virgin River. The Zion-Mt. Carmel Highway was completed in 1933 and has since been affected by several rehabilitation projects, including the addition of entrance kiosks and realignment of the road in the APE. The highway continues to be subject to routine maintenance.

The Zion-Mt. Carmel Highway was listed in the NRHP in 1987, but the segment in the APE is noncontributing. The Watchman Campground Bridge is eligible for listing in the NRHP for its association with the Mission 66 program and Mission 66 Modern style (Engleman et al. 2022) and is identical to the Watchman Residences Bridge (42WS6674), which would not be affected by the proposed action. The Watchman Campground Bridge was designed with a low profile to minimize its intrusion on the landscape.

Three irrigation ditches (often referred to as canals in other documentation) in the Project Area include the Oak Creek Canal (42WS4781), Springdale Ditch (42WS3020), and Flanigan Ditch (42WS3019). These water conveyance structures were developed primarily during the Pioneer Settlement period, some of which were later rehabilitated during the New Deal Era and Mission 66 periods to provide water to South and Watchman Campgrounds (Table 1). Some structures have been abandoned (i.e., Springdale and Flanigan Ditches), while the Oak Creek Canal continues to provide water to South Campground (Engleman et al. 2022). All but the Springdale Ditch (recommended not eligible) are listed in the NRHP (Jurale and Witherall 1987). However, the section of the Oak Creek Canal within the APE does not support the eligibility of the larger resource and the section of the Flanigan Ditch within the APE was unable to be evaluated for integrity due to being covered by sands (Engleman et al. 2022), but it is likely non-supporting of its eligibility since being covered by sand implies that it has been piped and would therefore no longer retain historical integrity.

Impacts of Alternative A—No Action

Under Alternative A, no modifications to ZION infrastructure would occur. Routine maintenance would continue. The Watchman Campground Bridge is near its designed lifespan and would require future repairs and eventual replacement. The current vulnerability of the bridge to loss during a flood event would continue. Redevelopment of the Zion Canyon South Entrance would not take place and there would be no effect on the Zion Canyon Cultural Landscape Historic District and contributing properties.

Foreseeable planned actions that could affect cultural resources in the Project Area include routine maintenance. Roads and parking areas would require maintenance and repairs over time, and some ditches and other water conveyance structures would continue to be used to convey water and would require routine maintenance. Future trends potentially affecting cultural resources could include increased frequency and severity of flooding resulting from climate change. Increased severity of floods could increase scour, potentially threating the Watchman Campground Bridge and other structures in or near the floodplain.

Cumulative Impacts

Although other past, present, and reasonably foreseeable future actions have affected, or could have the potential to affect, cultural resources in the Project Area (Appendix D), the No Action Alternative would have no new impacts and, therefore, there would be no cumulative impacts.

Impacts of Alternative B—Zion Canyon South Entrance Redesign (Proposed Action and NPS Preferred)

The Zion Canyon South Entrance redevelopment would result in an adverse effect on a historic structure with removal of the Watchman Campground Bridge constructed during the Mission 66 period. The proposed project would remove the Watchman Campground Bridge and

construct a new bridge upstream. Watchman Campground Road would be shifted to the north to accommodate the relocation of the Watchman Campground Bridge.

Under Alternative B, the proposed roundabout at the intersection of the Zion-Mt. Carmel Highway and the Watchman Campground Road would affect the Zion-Mt. Carmel Highway, which is eligible under Criterion C for embodying distinctive road design under Mission 66. However, this section of the highway has been realigned since construction during the Mission 66 program and does not contribute to the eligibility of the larger resource. Therefore, there would be no adverse effect on the Zion-Mt. Carmel Highway.

All other historical structures within the APE are either not eligible for listing in the NRHP (i.e., Springdale Ditch) or their sections within the APE are non-supporting of their eligibility due to the loss of historical integrity (i.e., Oak Creek Canal, Flanigan Ditch, Watchman Trail).

Alternative B would result in an adverse effect to the Watchman Campground Bridge, which was constructed during the Mission 66 era and embodies distinctive design from that period. Consultation with the Utah State Historic Preservation Office (SHPO) and other consulting parties would determine the appropriate treatment measure to resolve the adverse effect. Mitigation measures to resolve the anticipated adverse effect on the Watchman Campground Bridge may include a Historic American Engineering Record (HAER). A HAER document includes developing a detailed history of the bridge, as-built drawings if available or new measured drawings if not available, and large-format photography to record the bridge's existing conditions before removal. HAER documentation would preserve existing conditions in the event of a 500-year flood that would likely destroy the current bridge. The effect would also be mitigated by the preservation of an identical Mission 66 era bridge (the Watchman Residences Bridge) in the immediate vicinity of the Watchman Campground Bridge. Mitigation measures would reduce the severity of the impacts to the Zion Canyon Cultural Landscape Historic District, such that the integrity of the historic district would remain, and its listing status would not be affected. Alternative B would not result in adverse impacts on any other historic properties.

Cumulative Impacts

Impacts from past actions on cultural resources have resulted from previous construction of infrastructure at the Zion Canyon South Entrance over time, as summarized in the Cumulative Impact Scenario (Appendix D). Although past projects resulted in the incremental introduction of modern infrastructure to the Zion Canyon Cultural Landscape Historic District and contributing properties (parking lots and sewer, fuel, and electrical systems), including permanent effects on the setting of the district, these projects did not alter character-defining elements of the buildings and structures that contribute to the district. No reasonably foreseeable actions were identified that would adversely affect the Zion Canyon Cultural Landscape Historic District and contributing properties. Collectively, past, present, and reasonably foreseeable future actions have had, and would continue to have, adverse impacts. Alternative B would cause adverse impacts on the Watchman Campground Bridge. When the effects of Alternative B are combined with other past, present, and reasonably foreseeable future impacts, the total cumulative impacts on cultural resources would be adverse. The impacts of Alternative B would contribute incrementally to these adverse impacts.

Visitor Use and Experience

Affected Environment

The Project Area is in the Frontcountry High Development Zone, as described in the park's General Management Plan (NPS 2001). The Frontcountry High Development Zone is intended to provide visitors with highly structured opportunities to learn about the park by means of motorized primary roads. This zone is intended to be a pocket of civilization surrounded by the park's natural beauty (NPS 2001).

ZION has been a sought-after destination for many decades, with visitation steadily increasing in recent years. Visitors come to enjoy a wide variety of experiences and features offered by ZION. Most visitors seek to visit the Zion Canyon area. The lower portion of Zion Canyon (spanning from the Zion Canyon South Entrance to Canyon Junction) includes the South Entrance Fee Station, Zion Canyon Pedestrian Entrance, Zion Canyon Visitor Center, Watchman Campground, South Campground, Nature Center, Zion Human History Museum, and hiking opportunities such as the Pa'rus and Watchman Trails (Figure 2). The middle and upper stretches of Zion Canyon include the majority of the park's frontcountry trails and many visitor services such as restrooms and water stations. Features such as the Zion Lodge and six primary trailheads are accessed through the Zion Canyon Scenic Drive. From approximately March through late-November, access to the Zion Canyon Scenic Drive is by shuttle bus only; private vehicles are allowed to access the scenic drive only when the shuttle buses are not in operation. Park visitors also access other areas of the park such as Kolob Canyons, Kolob Terrace Road, and the East Side (along the Zion-Mt. Carmel Highway east of the Zion-Mt. Carmel Tunnel), which provide access to Wilderness and backcountry areas.

The Zion Canyon Visitor Center was designed and constructed between 1998 and 2000, when ZION recorded about 2.4 million visits per year, on the site of an existing campground (NPS 2023). The Visitor Center is the primary visitor contact station at ZION. The Visitor Center also serves as the hub for the Zion Canyon Transportation System, which operates shuttle buses in Zion Canyon and the adjacent town of Springdale.

South and Watchman Campgrounds are located near the Visitor Center and have tent, RV, and group campsites available by reservation. All sites include a space for a tent and/or RV, a picnic table, and a fire ring. South Campground has 127 sites that are reservable two days ahead of arrival dates. South Campground usually closes seasonally during the winter. Watchman Campground is just south of the Visitor Center and contains 176 campsites that require reservations year-round. Reservations are released on a six-month rolling basis. Demand is high for both campgrounds, with reservations filling quickly when released, particularly for spring to fall dates.

The sounds of civilization (mechanical and other human-created sounds) are generally confined to the Frontcountry Zone, which includes the Project Area (NPS 2010). Within this zone, visitors regularly experience the sounds of automobiles and buses, generators, motorized equipment, and other people, which at times interfere with the natural sounds of ZION.

Currently, sounds in the Project Area occur from frequent automobile, bus, and motorcycle traffic; visitor use of trails, parking areas, and visitor facilities; and natural sources, such as wind. Median ambient noise levels in the Frontcountry Zone were about 37 dBA during the day and

40 dBA to 42 dBA at night when measured in 2010 (NPS 2010, p. 28), and human-caused sounds have likely increased along with increasing visitation over time. The ZION Soundscape Management Plan recommends that human-caused sound levels should not exceed 60 dBA in the Frontcountry Zone during daylight hours (NPS 2010, p. 20). NPS regulations also include prohibitions of audio disturbances greater than 60 dBA at 50 feet (36 CFR 2.12).

Increases in visitation levels and changes in visitor use patterns over time, combined with the limitations of a road and bridge designed for much less intensive use, have made the Zion Canyon South Entrance and Visitor Center a confusing and potentially hazardous area. Currently, after passing through the South Entrance Fee Station, visitors must execute an immediate right turn to access the Visitor Center or proceed north along the Zion-Mt. Carmel Highway. This configuration, which provides only a few seconds for visitors to decide and react, results in confusion and localized congestion as visitors are traveling through multiple entrance lanes and quickly merging while orienting to where they need to go next. Also, vehicles, including shuttle buses, traveling south along the Zion-Mt. Carmel Highway often seek to turn left onto the Watchman Campground Road.

Current conditions in the Project Area result in a variety of user group conflicts. Once visitors make the turn onto the Watchman Campground Road, they are most commonly navigating toward parking areas near the Visitor Center. Simultaneously, a variety of other user groups, including pedestrians, cyclists, exiting passenger vehicles, ZION shuttle buses, large vehicles such as RVs, and road-based tour buses, converge while attempting to cross the narrow two-lane Watchman Campground Bridge. Pedestrians and bicycles may be crossing the road just before or after the bridge in two crosswalks. Traffic congestion and user group conflicts temporarily delay shuttle buses from accessing or departing the Visitor Center shuttle stop, which is located just beyond the Watchman Campground Bridge. Pedestrians and cyclists may be delayed in crossing the road by vehicles that do not yield at crosswalks, and vehicles in turn may be delayed due to high traffic in crosswalks. When this occurs, traffic quickly backs up so that additional vehicles cannot make the turn onto the Watchman Campground Road.

The continued increase in visitation over time is a reasonably foreseeable future trend in the Project Area. Demand for access to ZION and the amenities accessed through the Zion Canyon South Entrance is likely to remain high. Visitation to ZION has grown dramatically over time, increasing from about 2.4 million visits annually in 2000 to about 5.0 million in 2021 and about 4.7 million in 2022; the rapid increase began around 2014 (NPS 2023; Figure 5). About 70 percent of visitors to ZION enter through the Zion Canyon South Entrance. Based on these trends, it is unlikely that visitation would return to a level where current facilities remain adequate. Planned actions in the Project Area that could potentially affect visitor use and experience include initial phases of the transition to electric shuttle buses. The bus system was initially implemented to address road and parking congestion in Zion Canyon. With expected trends for increasing visitation, improved shuttle reliability would provide reliable access to Zion Canyon while continuing to address congestion and parking issues.

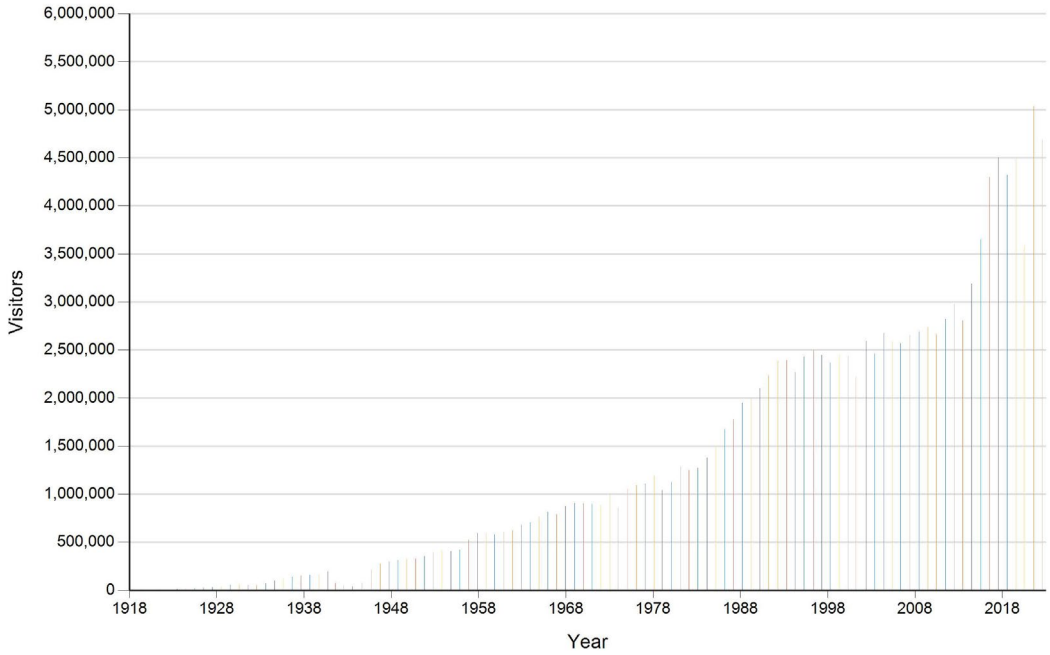

Figure 5. Zion National Park Total Recreation Visits

Impacts of Alternative A—No Action

Under the No Action Alternative, the current conditions would continue, and no modifications to ZION infrastructure would be made. The current conditions with traffic congestion and user group conflicts described above would continue, with resulting adverse effects on the visitor experience. These adverse effects would be expected to continue indefinitely because significant decreases to visitation are not likely, and the variety of visitor transportation modes (vehicular, pedestrian, and bicyclist) would continue in a confined area, especially when ZION shuttle buses are in operation. While these existing effects would continue to detract from the visitor experience, there would be no new impacts under the No Action Alternative.

Cumulative Impacts

Although other past, present, and reasonably foreseeable future actions have affected, or could have the potential to affect, visitor use and experience in the Project Area (Appendix D), the No Action Alternative would have no new impacts and, therefore, there would be no cumulative impacts.

Impacts of Alternative B—Zion Canyon South Entrance Redesign (Proposed Action and NPS Preferred)

Road improvements at the Zion Canyon South Entrance area would improve visitor use and experience after construction is complete by reducing visitor confusion and frustration when travelling through the Zion Canyon South Entrance area. The proposed road improvements would improve traffic flow, reduce congestion, and reduce user group conflicts by improving separation between vehicles and pedestrians and providing a dedicated route for shuttle buses to access the Visitor Center shuttle stop. Construction of new multiuse accessible trails would provide alternative routes for visitors who would otherwise walk or bike along the road. The new pedestrian and vehicular bridge with passage for bicyclists and pedestrians below the

bridge would improve the visitor experience by improving traffic flow and would reduce conflicts among user groups by physically separating bicycles and pedestrians from vehicular traffic. Adding signage, fencing, and dark-sky compliant path lighting would better define pedestrian routes and reduce visitor confusion.

Modernizing utility infrastructure would benefit visitor use and experience by improving reliability of facilities. Similarly, adding accessible trails would address compliance with accessibility standards and would benefit visitor use and experience.

Paving the shuttle bus parking lot would benefit the visitor experience by supporting the park's transition to new electric shuttle buses with state-of-the-industry accessibility features. Expanding the large vehicle parking lot would improve the visitor experience by providing additional space for large vehicles and improving the lot layout to make it easier for large RVs to maneuver. Expanding the employee parking lot would increase designated parking for employees, potentially freeing up more parking for visitors and reducing visitor confusion about where to park because visitors would be less likely to mistake the employee lot for public parking under the new configuration.

During construction, temporary adverse effects on visitor use and experience would occur from disruptions to traffic flow, temporary traffic control, and increased noise from construction equipment. Noise levels would temporarily and noticeably increase during the 24-month construction period because of equipment, vehicular traffic, and construction crews. The loudest equipment the proposal suggests for use in the Project Area is an asphalt milling machine, which has a maximum noise level of 90 dBA at 50 feet, and pile driving equipment, which has a noise level of 95 dBA at 50 feet (Appendix C Table C-2). Pile driving would be used only for brief periods during installation of the bridge abutments. Because noise levels attenuate exponentially over distance, the expected noise level from a milling machine would be about 50 dBA at 1 mile, and for a pile driver, about 55 dBA at 1 mile. Thus, when the asphalt milling machine or pile driver are in use, construction noise would be audible for more than 1 mile, which would encompass the entire Project Area. When pile driving equipment is in use, noise levels would exceed 60 dBA within about 2,800 feet (0.53 mile) of construction work. When milling machines are in use, noise levels would exceed 60 dBA within about 1,500 feet (0.28 mile) of construction work. When graders are in use, noise levels would exceed 60 dBA within about 900 feet (0.17 mile) of construction work. Increased noise levels would be confined mostly to the Frontcountry Zone. The presence of trees and other vegetation is expected to absorb and reduce the noise levels. After construction is complete, noise levels in the Project Area would return to existing ambient levels.

The Project Area is already heavily influenced by anthropogenic activity and noise, and construction is not expected to result in large increases in noise or human activity compared with current conditions. Mitigation measures would reduce impacts from noise during construction by requiring appropriate vehicle mufflers and limiting hours of operation of motorized equipment to 8:00 a.m. to 5:00 p.m. during Standard Time and 8:00 a.m. to 6:00 p.m. during Daylight Savings Time to protect dawn, dusk, and nighttime quiet, as recommended in the Soundscape Management Plan (NPS 2010, p. 8). Noise impacts would be confined to a localized area around the construction zone and would exceed 60 dBA only for limited times within about 0.30 mile of the Project Area, extending up to 0.53 mile during brief periods when pile driving is used. There would be no adverse changes to noise levels after construction is complete.

The Zion Canyon Visitor Center and Watchman Campground would remain open during construction; however, visitors may be adversely affected by more difficult access to these areas due to temporary traffic control measures and work on the roundabouts. Traffic delays are expected to occur throughout the 24-month construction period; the overall duration of delays resulting from construction would be reduced by scheduling multiple crews to work concurrently and through phasing of construction. Work on the large vehicle lot would result in reduced visitor parking availability during construction. Impacts on South Campground are expected to be minimal because South Campground would be closed for rehabilitation as part of the South Campground rehabilitation project for most of the construction period. Adverse effects on visitor use and experience would be temporary and would end after approximately 24 months.

To mitigate the effects on visitors during construction, ZION would notify the public of any temporary closures in advance of construction on the park's website, through social media, and through press releases to inform visitors and help them to make alternate plans. Variable message signs along the route to the park would also be used to keep the public informed of construction-related closures and delays. ZION would provide updates to local community residents and community members by continuing to participate in meetings such as the Zion Canyon Visitors Bureau, in cooperation with partners such as Greater Zion and the Zion Forever Project, and sending other direct communications. ZION may implement temporary measures such as using flaggers or changes to circulation patterns, to proactively manage the timing and routing of traffic to reduce congestion and delays associated with construction. Some visitors may feel their experience visiting ZION is adversely affected by being delayed, needing to plan in advance of their trip, or needing to take an alternative route. Because most visitors either enter or depart through the Zion Canyon South Entrance, these impacts would affect the visitor experience for most visitors to ZION.

Overall, Alternative B would improve the visitor experience by improving road circulation by separating vehicular, bicycle, and pedestrian traffic on roads and trails, creating pedestrian connections and intuitive wayfinding, and modernizing ZION facilities and utility infrastructure. Additionally, the proposal would address compliance with the accessibility standards while reducing user group conflicts and improving visitor safety. The proposal would result in adverse effects on visitor use during construction.

Cumulative Impacts

Past, present, and reasonably foreseeable actions, listed in Appendix D, have affected or could affect visitor use and experience in the Project Area. Work to upgrade the shuttle bus fleet with electric shuttles, rehabilitation of South Campground, rehabilitation of Watchman Campground, improvements to the Zion Canyon Pedestrian Entrance, and the ZION Visitor Use Management Plan would result in benefits to visitor use and experience. Upgrading the shuttle fleet would benefit the visitor experience by reducing noise and air pollution. Transition to electric shuttles would help ensure that transportation services can be provided reliably as potential for breakdowns is reduced by newer shuttles. Rehabilitation of South Campground and Watchman Campground would benefit visitor use and experience by rehabilitating campsites and modernizing facilities such as comfort stations. Improvements to the Zion Canyon Pedestrian Entrance would improve the visitor experience by developing a new visitor plaza and pedestrian routes to maintain connections with Zion Canyon Village and constructing a new, large vehicle visitor drop-off area. The Visitor Use Management Plan seeks to improve

visitor experience by addressing issues such as crowding, congestion, and impacts on resources and visitor experiences by managing the timing and levels of visitor use.

Alternative B would result in adverse effects on visitor use and experience during construction from possible construction-related delays and closures and would result in beneficial effects on visitor use and experience after construction is complete by reducing traffic congestion and user group conflicts, improving the parking facilities, and improving pedestrian circulation. When the impacts of Alternative B are combined with the impacts of other past, present, and reasonably foreseeable future actions, the total cumulative impacts on visitor use would remain adverse during construction and beneficial after construction is complete. The incremental impacts of Alternative B would reduce some and contribute to other impacts that are already occurring.

Water Resources

Affected Environment

FLOODPLAINS

The North Fork of the Virgin River floodplain is adjacent to the river and serves critical functions such as reducing flood risks downstream by absorbing and storing excess water during flood events, improving water quality by filtering contaminants during flood events, providing habitat for riparian plants and animals, and recharging groundwater aquifers. The floodplain natural values in the Project Area have been altered by human activities and modified through past construction actions.

The Project Area is partially within the base elevation for 100-year flooding (Wood 2022). Portions of the Project Area are also within the 500-year floodplain (Figure 6). The floodplain natural values in the Project Area have been altered by human activities, such as construction of the Watchman Campground Bridge and installation of impervious surfaces for roads, parking areas, and trails. Infrastructure in the floodplain has necessitated that the park prevent channel migration through the construction of channelizing revetments and levees made of rock riprap, wire rock-filled gabions, and concrete. Modifications of the floodplain have resulted from construction of drainage swales and irrigation ditches.

The existing Watchman Campground Road, Watchman Campground Bridge abutments, large vehicle parking lot, shuttle bus parking lot, and employee parking lot are within or partially within the regulatory floodplain defined as 2 feet above the base 100-year flood elevation. Portions of the Zion-Mt. Carmel Highway, which provides access into and out of the Zion Canyon South Entrance, are in the regulatory floodplain. Visitors to the Project Area frequently travel in and through flood hazard areas. Modeling shows that Watchman Residences Bridge, the other vehicular bridge located upstream of the proposed bridge, would not convey regulatory flood flows. Three pedestrian bridges along the Pa'rus Trail are designed to convey the regulatory flood flow and could convey pedestrians across the river during a flood event. The Project Area is on land adjacent to the North Fork of the Virgin River and Sammy's Canyon. No existing or newly constructed buildings would be within the regulatory floodplain in the Project Area after the project is complete. The 100-year and 500-year floodplain elevations in the Project Area are shown on Figure 6.

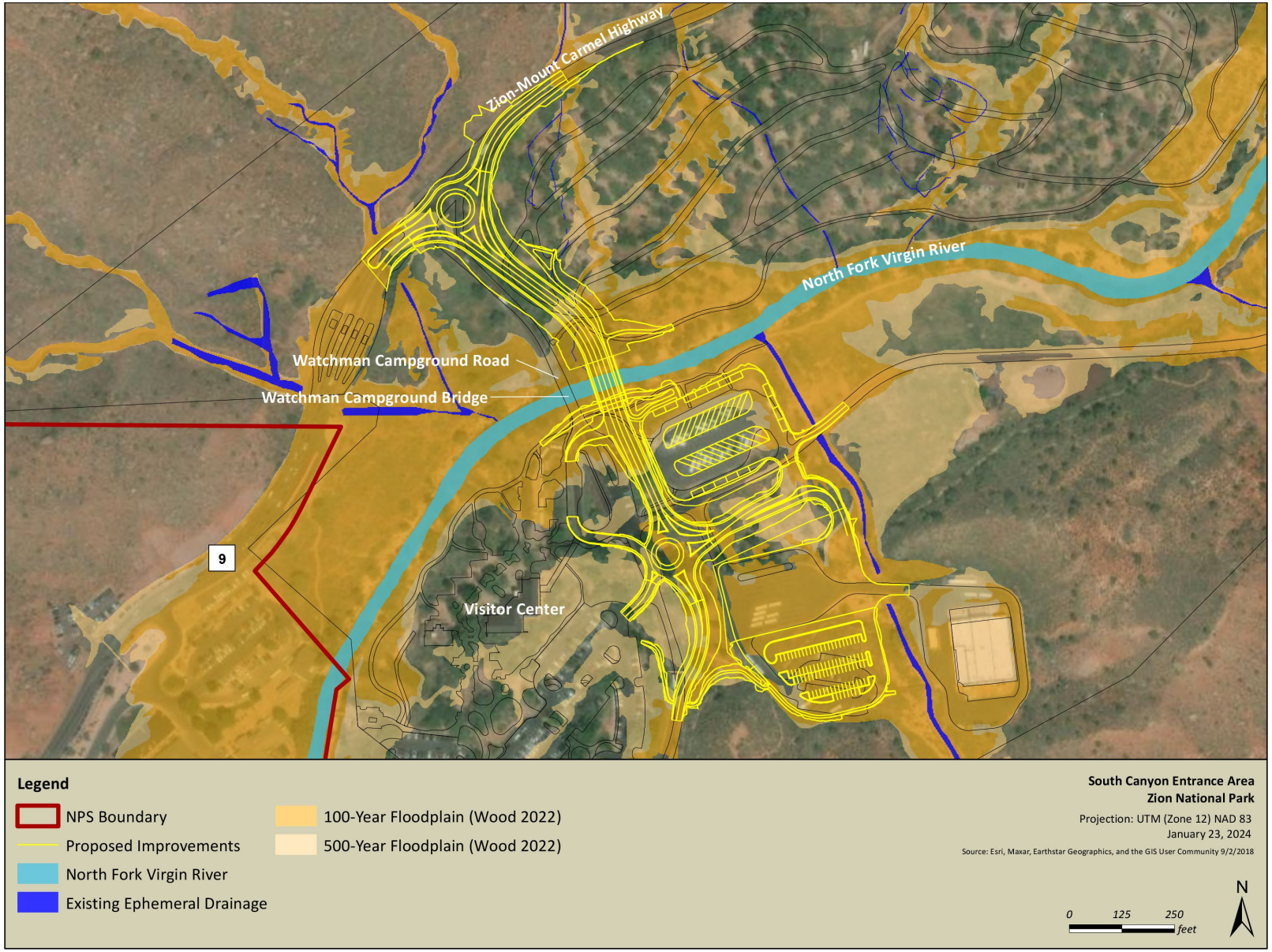

Figure 6. Zion Canyon South Entrance Redesign 100-Year and 500-Year Floodplain

The watershed area that could contribute flows from the North Fork of the Virgin River at the Project Area is 354 square miles. Precipitation anywhere within this watershed has the potential to cause flooding in the North Fork of the Virgin River. The watershed area for Sammy's Canyon is about 1 square mile. Flood risks associated with the proposed action include risk to human health and life and risk to capital investment resulting from damage to existing and expanded infrastructure. Destructive flash floods have occurred periodically in ZION, including in the Project Area. The history of flooding and flood risk in ZION is described in Lund et al. (2010, p. 16–27) and summarized below. Lund et al. (2010, p. 21) estimated the 100-year flood discharge on the North Fork of the Virgin River at the Springdale gauge at 9,020 cubic feet per second (cfs) and the 500-year flood at 13,500 cfs. Major floods in the Project Area include a flood in December 1966 that produced a maximum flow of 9,150 cfs on the North Fork of the Virgin River just outside ZION near Springdale, and a flood in January 2005 that produced a maximum flow of 5,450 cfs on the North Fork of the Virgin River near Springdale. In 1998, a flash flood and debris flow inundated the current location of the Zion Canyon Visitor Center and the shuttle bus maintenance facility. In recent years, floods in the Project Area included a flash flood in June 2021, when ZION received more than an inch of rain in one hour. This flood required the temporary closure of the Zion Canyon South Entrance and evacuation of visitors.

Future trends affecting floodplains in the Project Area could include changes in the frequency, duration, and intensity of flash floods in the Project Area. Flash floods in the western U.S. are predicted to become more frequent and more extreme in the future due to changes in precipitation resulting from climate change (Li et al. 2022, p.1). Other planned actions in the Project Area that are expected to impact floodplains include replacement of a culvert on Sammy's Canyon Wash. The Sammy's Canyon Wash culvert replacement would improve resiliency to future flood events.

WETLANDS

Wetland resources in the Project Area comprise the North Fork of the Virgin River. The water source for the river is primarily surface flow from surrounding uplands and tributaries. No vegetated wetlands are in the Project Area. Wetland boundaries are shown in *Wetland and Jurisdictional Waters Report* (ERO 2022), which also describes the wetlands in detail.

The North Fork of the Virgin River is a perennial riverine wetland. The river is an unvegetated wetland, as defined by NPS policy (NPS 2016), with a bed consisting of unconsolidated cobble-gravel and sand, containing perennial flows. Vegetated wetlands upstream and downstream from the Project Area occur as narrow fringes along the North Fork of the Virgin River. These palustrine wetlands include both emergent and scrub-shrub wetlands. Wetland plants present include dagger leaf rush (*Juncus ensifolius*), Arctic rush (*Juncus arcticus*), alkali muhly (*Muhlenbergia asperifolia*), common threesquare (*Schoenoplectus pungens*), softstem bulrush (*Schoenoplectus tabernamontani*), and panicled bulrush (*Scirpus microcarpus*) in emergent wetlands; and Fremont cottonwood, sandbar willow (*Salix exigua)*, willow baccharis, velvet ash, dagger leaf rush, creeping bentgrass (*Agrostis stolonifera*), common reed (*Phragmites australis*), smooth horsetail (*Equisetum laevigatum*), softstem bulrush, and Arctic rush in scrub-shrub wetlands.

The wetland communities in Zion Canyon provide numerous wetland functions and values, including hydrologic functions, biotic functions, and cultural values. The wetlands and intermittent spring flows provide multiple hydrologic functions in the Project Area. The wetland and riparian areas also serve to disperse larger flow events and dissipate energy as flows move

through the dense vegetation. The wetland communities provide habitat to a variety of wildlife species. While not uncommon in Zion Canyon, wetland and riparian areas are two of the rarest and most biologically diverse habitat types in ZION. The wetlands and riparian areas in the Project Area provide habitat to multiple wildlife species and are reliable water sources for larger mammals. Many plant and animal species have physiological or life-history traits that force them to reside in or directly adjacent to permanent water sources.

Future trends that could affect wetlands in the Project Area include development in wetlands; and changes in the frequency, duration, and intensity of flash floods in the Project Area, which could result in impacts on wetlands from increased erosion or deposition. Future changes in precipitation could also result in changes to the extent of plant communities in wetlands along the river. Other planned actions in the Project Area that are expected to impact wetlands include replacement of a culvert on Sammy's Canyon, which would improve wetland functions and reduce scour by replacing the culvert with a larger culvert with less restrictive flow.

WILD AND SCENIC RIVERS

The Virgin River and its tributaries, including the North Fork of the Virgin River in the Project Area, are Congressionally designated as Wild and Scenic Rivers under the Wild and Scenic Rivers Act (WSRA). The designated Wild and Scenic River corridor extends 0.25 mile from the river on either side. The WSRA prohibits federal agencies from assisting in the construction of any water resources project (such as dams, diversions, channelization, or riprapping) that would have direct and adverse effects on a designated river. The WSRA also includes a standard that governs projects below, above, or on a stream tributary to the river. Designated wild and scenic rivers are further classified as wild, scenic, or recreational, as defined in the WSRA. The section of the North Fork of the Virgin River in the Project Area is classified as recreational.

The WSRA also requires the protection of Outstanding Remarkable Values (ORVs) in a designated Wild and Scenic River for the benefit of present and future generations. The North Fork of the Virgin River provides cultural, geologic, recreational, scenic, wildlife, and fish ORV attributes, as described in the Virgin River Comprehensive Management Plan/Environmental Assessment (NPS and BLM 2013, p. 20).

Future trends that could affect the Wild and Scenic River in the Project Area include changes in recreational use resulting from increased visitation. As described in the Visitor Use and Experience section, ZION has experienced large increases in the number of visitors in recent years. If current visitation trends continue, the Wild and Scenic River ORV of recreation could be affected by reduced opportunities for solitude and recreational enjoyment along the river. Other planned actions in the Project Area that are expected to impact the Wild and Scenic River include replacement of a culvert on Sammy's Canyon Wash, an ephemeral tributary to the North Fork of the Virgin River, which would benefit the Wild and Scenic River by improving free-flowing conditions.

Impacts of Alternative A—No Action

Under the No Action Alternative, there would be no project-related change to existing floodplains, wetlands, and the Wild and Scenic River in the Project Area. There would be no new construction within the 100-year floodplain, wetlands, or Wild and Scenic River corridor, and existing floodplain and wetland functions and values would be unchanged. Existing facilities within the floodplain would continue to be at risk from flash floods. No within-water work in the Wild and Scenic River would occur. Ongoing impacts on the scenic and recreational

ORVs from undefined pedestrian trails and social trails would continue; impacts on access to river-related recreation from poor traffic circulation would continue. Overall, impacts on water resources under Alternative A would be adverse.

Cumulative Impacts

Although other past, present, and reasonably foreseeable future actions have affected, or could have the potential to affect, water resources in the Project Area (Appendix D), the No Action Alternative would have no new impacts and, therefore, there would be no cumulative impacts.

Impacts of Alternative B—Zion Canyon South Entrance Redesign (Proposed Action and NPS Preferred)

FLOODPLAINS

Portions of the project would be constructed within the floodplain of the North Fork of the Virgin River. Measures would be implemented to minimize adverse effects on floodplains; these measures are discussed in the Mitigation Measures section of this Environmental Assessment (EA; Appendix B) and in the Floodplain Statement of Findings (Appendix F). Impacts on floodplains are summarized below and are described in detail in Appendix F.

The floodplain would be negatively impacted during construction due to the presence of staging areas, construction equipment, and materials in the floodplain and possible erosion from bare soils prior to revegetation. However, construction activities would be monitored, and erosion and sediment control best management practices (BMPs) would be implemented to minimize erosion and sediment movement. These impacts would be temporary, lasting during the 24-month construction period. Disturbed areas would be revegetated with native species following construction.

After removal of the Watchman Campground Bridge, restoration of the river channel, and construction of a new bridge with a longer span, the post-project floodplain along the North Fork of the Virgin River would be less constricted because the new bridge would have a longer span and elevated low chord height (lowest portion of the superstructure), compared to the Watchman Campground Bridge. The new four-lane bridge across the North Fork of the Virgin River would be designed to pass the 100-year flood plus 2 feet added to the base flood elevation. The abutments of the new bridge would be outside the 100-year floodplain, as modeled, based on removal of the Watchman Campground Bridge (HDR 2023). The proposed concrete tread trail that passes under the new bridge would be located within the regulatory floodplain. Although the trail and associated infrastructure that passes under the bridge would be within the floodplain, the infrastructure associated with the trail would be designed to limit the hydraulic effects on the river during flood events. All structures and facilities would be designed to be consistent with the intent of the standards and criteria of the National Flood Insurance Program (44 CFR Part 60). The proposed action would generally reduce flooding in the Project Area and upstream in the South Campground by removing the existing bridge and replacing it with a new bridge with a larger span, which would result in a beneficial effect on the floodplain.

The proposal would also reduce risks to human health and safety from flooding by improving traffic circulation and improving egress from the east side of the North Fork of the Virgin River. This proposed bridge is the only vehicular bridge designed to convey the regulatory flood flows. Construction of a new vehicular bridge over the North Fork of the Virgin River would facilitate

evacuation and emergency response for the areas on the east side of the river, including the Zion Canyon Visitor Center, visitor and employee parking, Watchman Campground, and shuttle bus facility.

Impervious surface in the Project Area would increase following construction. Impervious surfaces in the Project Area would increase from about 5.5 acres to about 8 acres, a net increase in impervious area of about 2.5 acres. Land cover changes would result from increased impervious surface, soil compaction, and changes in existing drainage patterns. Changes in land cover could alter the hydrology of the Project Area and increase the volume of runoff. Impervious areas also collect pollutants, which are then mobilized after rainfall and potentially transported to streams or other waters. Although the overall impervious surface in the Project Area would increase, the amount of impervious surface in the modeled floodplain would decrease from 3.1 to 0.9 acres after construction, after accounting for removal of the existing bridge. Decreases in impervious surface in the floodplain would benefit floodplain functions and values by increasing flood storage capacity and increasing the ability of the floodplain to recharge and infiltrate stormwater. To reduce the risk of pollutants entering waterways, during construction fuel storage and hazardous waste storage would be at least 3 feet above the regulatory floodplain elevation.

This alternative would result in a net increase in impervious surface, which would reduce infiltration during flood events, reduce water quality and recharge of groundwater, and exacerbate impacts downstream by reducing floodwater storage and infiltration. However, the proposal would increase the flood capacity of the river by replacing the Watchman Campground Bridge that constricts the river with a bridge that is designed to convey the regulatory flood flows. The proposal would also improve flood safety by improving egress during a flood event.

WETLANDS

Impacts on unvegetated wetlands would occur from instream work to remove the Watchman Campground Bridge across the North Fork of the Virgin River and from restoration work in the channel under the removed bridge. In-channel work would affect up to 300 linear feet of the bed and bank of the North Fork of the Virgin River. Wetlands would be filled by placing fill dirt and riprap to protect the trail under the bridge. This would result in permanent loss of up to 0.25 acre of streambed. The Proposed Action would use heavy equipment, including excavation within the river channel, to remove the Watchman Campground Bridge and abutments and to regrade and shape the channel to produce a more natural configuration after removal of the bridge. The new vehicle and pedestrian bridge across the river would span the ordinary high water mark (OHWM), and the new bridge abutments would be outside the OHWM. No impacts on vegetated wetlands are expected. Temporary wetland impacts during the 24-month construction period would occur primarily from construction access needed to remove the Watchman Campground Bridge and its abutments, to place riprap protection for the trail underpass, and to restore the river channel at the existing bridge location. All temporary impacts would be restored following construction.

Because the proposal would involve work below the OHWM of the North Fork of the Virgin River, which is a jurisdictional water of the United States, ZION would obtain Section 404 of the Clean Water Act authorization from the U.S. Army Corps of Engineers (USACE). ZION will obtain a Stream Alteration Permit (SAP) from the State of Utah to fulfill requirements to gain

State Engineer approval to alter natural waterbodies, which meeting requirements under Programmatic General Permit 10 would also fulfill USACE Section 404 permitting requirements.

Work in wetlands requires compliance with NPS Director's Order 77-1: Protection of Wetlands. Impacts to the river channel from bridge removal and restoration would occur; however, certain types of activities are excepted from the requirements to compensate for wetland impacts under Director's Order 77-1. Replacement of the bridge is an excepted activity under NPS Procedural Manual #77-1, which allows an exception for bridge replacements, including full reconstruction and up to 0.25 acre of permanent or temporary impacts, provided that the disturbed sites are actively restored to pre-disturbance conditions during, or immediately after, construction (NPS 2015). For these reasons, a Wetland Statement of Findings and compensatory mitigation are not required for this project under NPS policy.

Over the long term, the project would provide benefits to wetlands by restoring the section of channel beneath the existing bridge and replacing the existing bridge with a new bridge with a longer span and elevated low chord height. These changes would provide a small improvement to wetland functions by restoring the riverbed and banks to more natural conditions and facilitating less restrictive river flow.

WILD AND SCENIC RIVERS

The proposal would involve work within and adjacent to the North Fork of the Virgin River, which is a designated Wild and Scenic River. Although the new vehicular bridge would span the North Fork of the Virgin River, including the OHWM, portions of the project would be within the floodplain, as described above. ZION prepared a Wild and Scenic Rivers Act Section 7 Determination in compliance with the WSRA, which determines if there will be direct and adverse impacts on the free-flowing condition, ORVs, or water quality (NPS 2024b).

This project would improve the free-flowing condition of the river by replacing the existing bridge, abutments of which fall within the OHWM of the river and do not convey regulatory flood flows with the bridge designed to convey regulatory flood flows and limit infrastructure below the OHWM.

During construction, the project would have some temporary effects on the recreation ORV from disruptions to traffic flow such as temporary traffic control. During and after construction is complete, activities such as rafting, fishing, artistic endeavors, and camping would continue unabated along this stretch of the North Fork of the Virgin River. The project would benefit the recreation ORV over the long term by improving vehicle circulation and traffic flow, by improving trail connections, and by improving the shuttle bus system. These improvements would improve visitors' access to recreation.

Alternative B proposes to replace existing infrastructure located in the river corridor (roads, parking lots, and bridge). The presence of heavy equipment and work crews would negatively affect the scenic ORV during construction. These impacts would be temporary, lasting only during the 24-month construction period. The project would replace an existing Mission 66 concrete bridge, the Watchman Campground Bridge. The color and design of the new bridge would be selected to blend into the existing landscape and follow NPS Rustic design standards to be visually compatible with existing infrastructure as described in *NPS Reference Manual 46: Wild and Scenic Rivers* (NPS 2021a). Therefore, there would be no direct and adverse effects on the scenic ORV after construction is complete.

Design of the new passenger vehicular bridge and other project components would incorporate both NPS Rustic and Mission 66 design principles to be compatible with current design. Therefore, there would be no direct and adverse impacts on the cultural ORV.

Ground disturbance from construction and staging activities in the Virgin River drainage would expose soils to erosion, which could result in increased sedimentation and turbidity in the North Fork of the Virgin River. Potential impacts on fish ORVs may include sedimentation during construction. However, BMPs would be used to minimize runoff and sediment discharges into the river. Therefore, there would be no adverse impacts on the fish ORV after during construction, including habitat for four native species, Virgin spinedace, flannelmouth sucker, desert sucker, and speckled dace. After removal of the Watchman Campground Bridge, restoration of the river channel, and construction of a new bridge with a longer span, the post-project floodplain along the North Fork of the Virgin River would be less constricted because the new bridge would have a longer span and elevated low chord height. This change to the floodplain could result in benefits to aquatic life, including special status fish, by restoring natural flow patterns.

The geologic ORV would not be adversely affected by the proposed activities because disturbance would not occur to upland and off-site unique geologic landforms such as Navajo sandstone, canyons, and cliffs.

The project would have temporary impacts on the wildlife ORV during construction and may benefit wildlife over the long term due to postconstruction revegetation efforts with native vegetation, which may improve habitat for native wildlife species such as MSO. Impacts on wildlife and MSO are described in Appendix C and the *Mexican Spotted Owl* section above.

Required measures and BMPs for Wild and Scenic Rivers would be implemented, specifically bridge design, from Section 3.3.9 and in *NPS Reference Manual 46: Wild and Scenic Rivers* (NPS 2021a, pp. I-1–I-12). These measures are attached in Appendix G of this EA. The Wild and Scenic Rivers Section 7 Determination (NPS 2024b) further refines and analyzes impacts and describes mitigation measures.

Cumulative Impacts

Past, present, and reasonably foreseeable future actions, listed in Appendix D, have affected or could affect water resources. Actions that have affected or could affect floodplains, wetlands, and the Wild and Scenic River in the Project Area include past construction of ZION roads and other facilities that increased impervious surfaces, altered natural floodplain hydrology, filled wetlands, and adversely affected natural Wild and Scenic River ORVs in the Project Area. Ongoing ZION Vegetation Program activities such as revegetation with native plants and control of invasive vegetation have benefited and would continue to benefit floodplains, wetlands, and the Wild and Scenic River by restoring native plant communities. The South Zion Canyon Post-Flood Response project provided benefits by increasing the size of existing culverts in the southern portion of the canyon, improving resilience against future floods. The future South Campground rehabilitation project and Sammy's Canyon project would have beneficial impacts on floodplains from improving drainage.

Alternative B would have beneficial effects on floodplain values by replacing the existing undersized bridge with a bridge that is designed to pass the 100-year flood event plus 2 feet of

freeboard and by improving egress from flood prone areas, which would reduce flood-related risks to human health and safety. About 2.5 acres of impervious surfaces would be added within the Project Area, reducing natural infiltration and increasing erosion and runoff, which has the potential to transport contaminants into the North Fork of the Virgin River. Although the overall impervious surface in the Project Area would increase, the amount of impervious surface in the modeled floodplain would decrease after construction with the removal of the existing bridge. The proposal is not expected to adversely affect vegetated wetlands. Alternative B would have both beneficial and adverse impacts on unvegetated wetlands consisting of the channel of the North Fork of the Virgin River from temporary disturbance during construction and restoration of the channel following removal of the existing bridge. While there would be temporary impacts associated with demolition of the existing bridge, restoration, and construction, there would be no adverse impacts on the free-flowing condition, ORVs, or water quality of the North Fork of the Virgin River. Beneficial effects on the Wild and Scenic River would result from facilitating access for river-related recreation by improving vehicular access and traffic flow.

Overall, the impacts of past, present, and reasonably foreseeable actions have had, and could continue to result in, both adverse and beneficial effects on water resources. As previously described, the impacts of Alternative B on water resources would be both beneficial and adverse. When the effects of Alternative B are combined with other past, present, and reasonably foreseeable impacts, the total cumulative impact on water resources would continue to be both adverse and beneficial. The adverse incremental impacts of Alternative B would contribute to, but would not substantially change, the effects that are already occurring.

CHAPTER 4: CONSULTATION AND COORDINATION

List of Agencies and Individuals Consulted

The following agencies and organizations were contacted and invited to participate in the planning process. Affiliated tribes were also invited to participate in the planning process, and are listed below under *National Historic Preservation Act and Tribal Consultation*.

- Bureau of Land Management (BLM)
- U.S. Army Corps of Engineers (USACE)
- U.S. Fish and Wildlife Service (USFWS)
- U.S. Forest Service (USFS)
- Utah Department of Environmental Quality
- Utah Department of Natural Resources
- Utah Division of Water Rights
- Utah Division of Wildlife Resources
- Utah Office of Outdoor Recreation
- Utah Office of Tourism
- Utah State Historic Preservation Office
- Utah State Parks
- Utah School and Institutional Trust Lands Administration
- Utah Public Lands Policy Coordinating Office
- Utah Tourism Industry Association
- Utah Tech University
- Southern Utah University
- Utah Five County Association of Governments
- Washington County Water Conservation District
- Utah Counties: Garfield, Iron, Kane, and Washington
- Utah Cities and Towns: Beaver, Brian Head, Cedar City, Enoch, Hurricane, Kanab, Kanarraville, La Verkin, New Harmony, Orderville, Panguitch, Parowan, Rockville, St. George, Springdale, Virgin, Washington
- Zion Canyon Visitors Bureau
- Zion Canyon Village
- Zion Forever Project

Civic Engagement

The NPS consulted and conducted civic engagement activities to ensure public opportunity to provide input on the project. Civic engagement for this project to date included letters sent to the park's affiliated tribes, a press release, and public scoping notices. The specific activities are summarized below.

ZION received input from the public to inform the decision-making process for a large-scale project planned to redesign the Zion Canyon South Entrance. A public comment period was open for 32 days, from May 16 through June 17, 2022. The NPS also hosted a virtual public meeting via Zoom on May 25, 2022. The public was able to submit comments through the NPS Planning, Environmental, and Public Comment (PEPC) website: https://parkplanning.nps.gov/ZIONSEntryRedesign.

The following public notices of the comment period and meeting were distributed or made publicly available:

- A May 17, 2022, news release and letter posted on the following websites:
    - ZION website: https://www.nps.gov/zion/learn/news/national-park-service-assesses-options-to-improve-road-and-trail-circulation-and-reconstruct-zion-national-park-s-south-campground.htm
    - PEPC website: https://parkplanning.nps.gov/ZIONSEntryRedesign
- A news release sent electronically (via email) to various stakeholders, agencies, and media groups
- A news release posted on the park's social media accounts (Facebook, Instagram, and Twitter)
- A project-specific StoryMap: https://storymaps.arcgis.com/stories/1d44e18875a442c6a1bf1af0d8d816a7

The park notified tribal representatives of the proposed project in September 2021. The park invited tribal representatives to the virtual civic engagement meeting in May 2022. The Utah State Historic Preservation Office (SHPO) was invited to the virtual meeting and participated in a Zion Canyon site visit to understand the proposed undertakings.

The park received 49 correspondences (46 from the public and 3 from tribes) during civic engagement, and the comments were reviewed, analyzed, and considered during the development of this EA.

Endangered Species Act

As previously described, the NPS prepared a BA for the proposed project, which was submitted to the USFWS on April 11, 2023, as part of formal consultation under the ESA (NPS 2023). The BA concluded that the proposed project is *likely to adversely affect* MSO and *may affect, but is not likely to adversely affect,* MSO critical habitat. The BA also concluded that the proposal *may affect, but is not likely to adversely affect,* the California condor, southwestern willow flycatcher, yellow-billed cuckoo, Mojave Desert tortoise, and monarch butterfly. The USFWS concurred with the findings of the BA in a Biological Opinion dated August 8, 2023 (Appendix E).

National Historic Preservation Act and Tribal Consultation

As required by Section 106 of the National Historic Preservation Act, the park is consulting with the SHPO and affiliated tribes to assess the effect of the project on historic properties. The

Section 106 consultation process is being conducted separately from, but concurrently with, the NEPA process. Consultation under Section 106 is ongoing, and the park will continue consultation as appropriate during project implementation to ensure that SHPO and tribal perspectives and issues are adequately addressed. The NPS has developed a programmatic agreement with the SHPO to resolve effects to the South Campground. The Park will continue consultation efforts to resolve the adverse effects on the Watchman Campground Bridge by amending the existing programmatic agreement for the South Campground. Initial consultation letters were sent to 37 tribes in September 2021 seeking comment on early planning stages for the project. Additional consultation letters were sent prior to the public virtual meeting and scoping period in April 2022 along with copies of the Cultural Inventory Report (Engleman et al. 2022). Tribal consultation included the following affiliated tribes:

- Chemehuevi Indian Tribe of the Chemehuevi Reservation, California
- Confederated Tribes of Goshute Reservation, Nevada and Utah
- Hopi Tribe of Arizona
- Kaibab Band of Paiute Indians of the Kaibab Indian Reservation, Arizona
- Las Vegas Tribe of Paiute Indians of the Las Vegas Indian Colony, Nevada
- Moapa Band of Paiute Indians of the Moapa River Indian Reservation
- Navajo Nation of Arizona, New Mexico, and Utah
- Ohkay Owingeh, New Mexico
- Paiute Indian Tribe of Utah
- Paiute Indian Tribe of Utah - Cedar Band
- Paiute Indian Tribe of Utah - Indian Peaks Band
- Paiute Indian Tribe of Utah - Kanosh Band
- Paiute Indian Tribe of Utah - Koosharem Band
- Paiute Indian Tribe of Utah - Shivwits Band
- Pueblo of Acoma, New Mexico
- Pueblo of Jemez, New Mexico
- Pueblo of Pojoaque, New Mexico
- Pueblo of San Felipe, New Mexico
- Pueblo of San Ildefonso, New Mexico
- Pueblo of Santa Ana, New Mexico
- Pueblo of Santa Clara, New Mexico
- San Juan Southern Paiute Tribe of Arizona
- Santo Domingo Pueblo
- Skull Valley Band of Goshute Indians of Utah
- Southern Ute Indian Tribe of the Southern Ute Reservation, Colorado
- Ute Indian Tribe of the Uintah & Ouray Reservation, Utah
- Ute Mountain Ute Tribe
- White Mesa Utes
- Zuni Tribe of the Zuni Reservation, New Mexico

CHAPTER 5: REFERENCES

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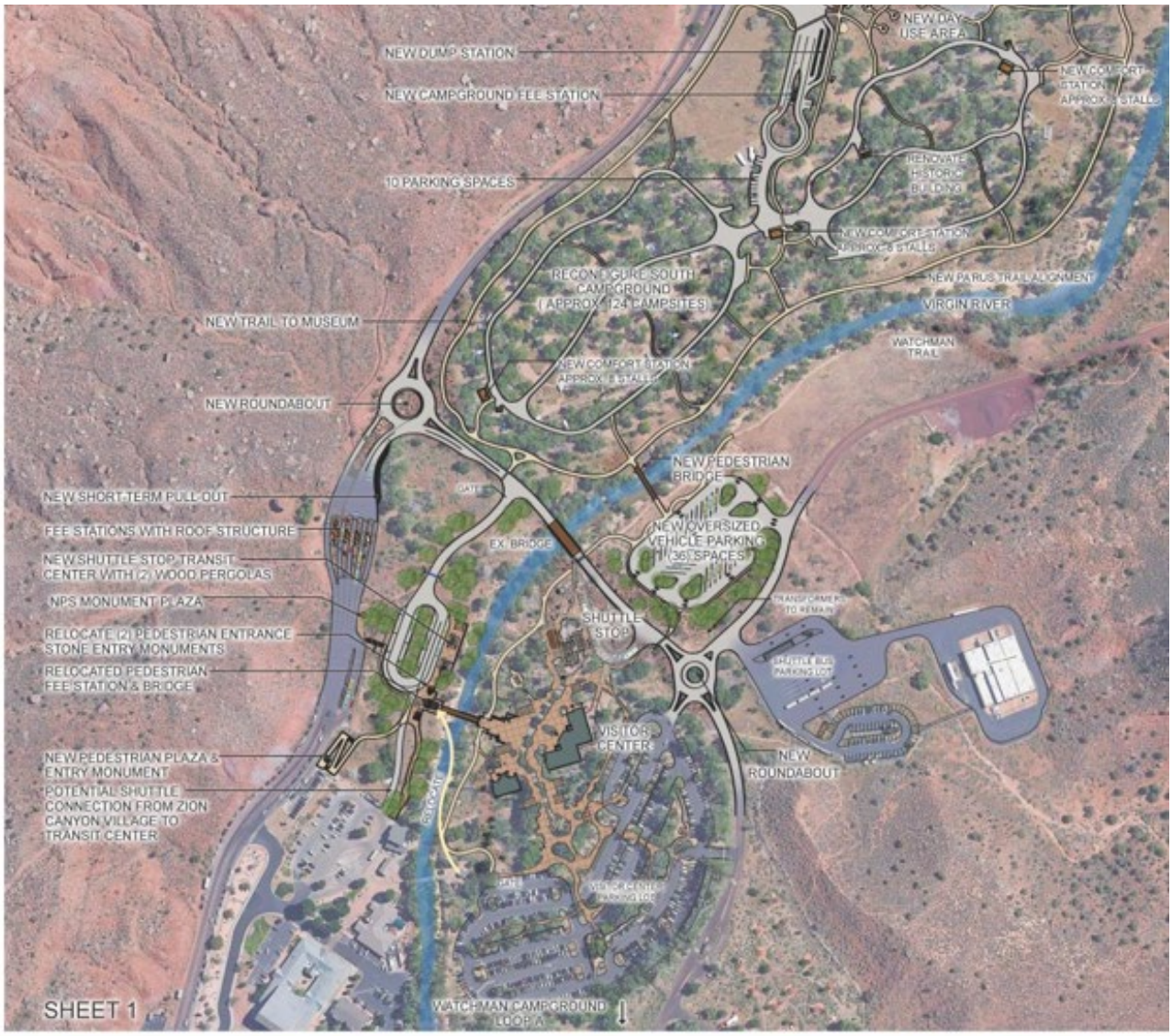
APPENDIX A. ALTERNATIVES CONSIDERED AND DISMISSED

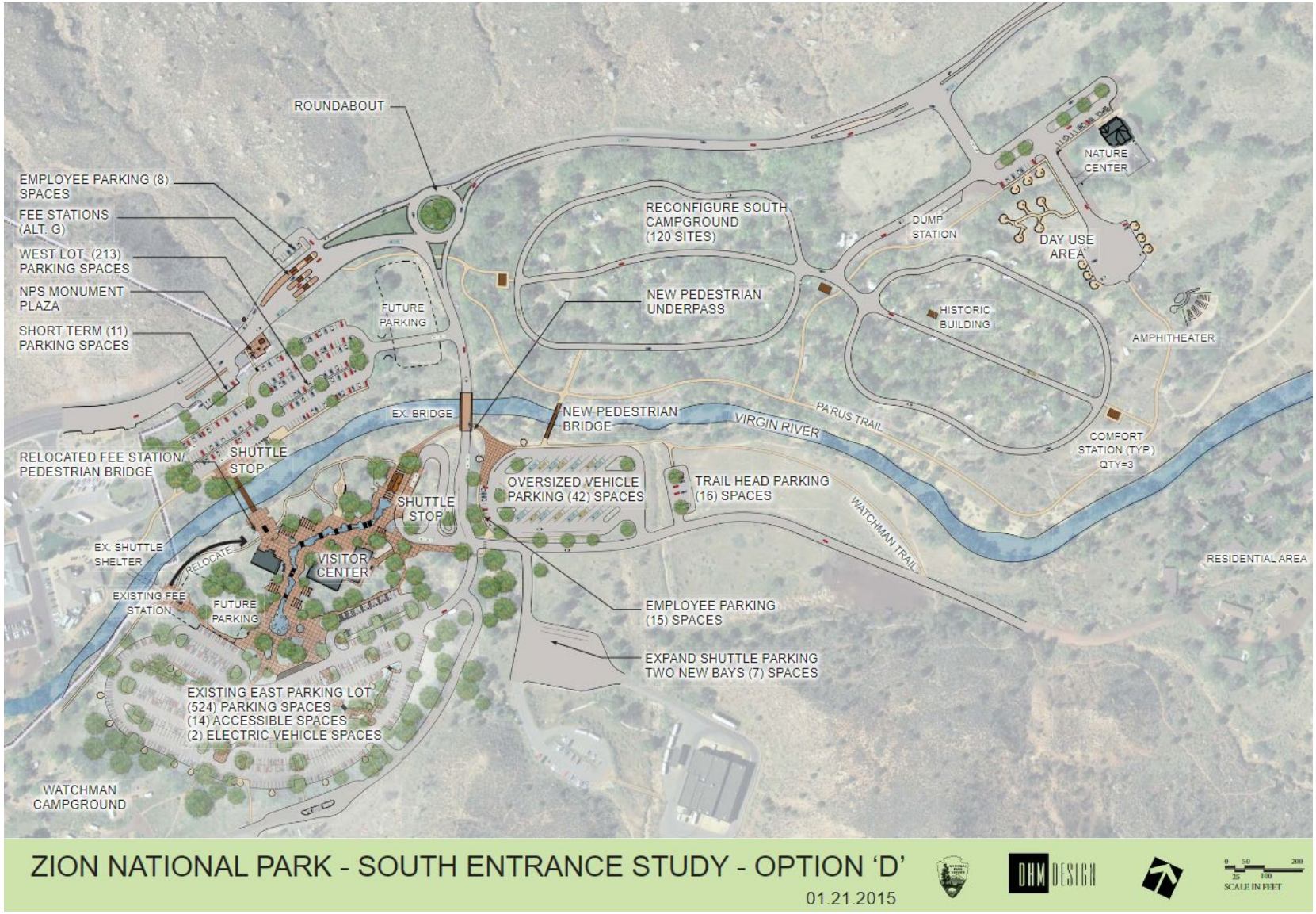
As described in Table A-1, the following alternatives were considered but eliminated from detailed analysis. These alternatives include suggestions from internal planning, civic engagement, and stakeholder and external agency involvement.

Table A-1. Alternatives and proposals dismissed from further consideration.

Alternatives/Proposal	Reason for Dismissal
Continued Use of Existing Bridge: • Different roundabout layout • New pedestrian bridge • No new vehicular bridge	Alternatives with a different circulation pattern and continued use of the existing bridge were considered during the design process, including Alternative B from the Value Analysis Study (NPS 2021c) and Option D from the Transportation Study (NPS 2015). These alternatives would feature a different circulation pattern and roundabout layout from Alternative B as described in the EA and would continue use of the current two-lane vehicular bridge. Continued use of the existing bridge would not meet the purpose and need for the proposal because issues with safety and vehicular, bicycle, and pedestrian circulation would remain unaddressed; as a result, these alternatives were dismissed because they would not meet the purpose and need for the proposal. Retaining only one vehicle access over the narrow existing bridge would not reduce the current vehicular congestion at the Zion Canyon South Entrance. In addition, continued use of the existing bridge would limit options for egress in the event of flooding or other emergencies.
Shift New Bridge East to Bisect Campground: • Construct new vehicle and pedestrian bridge • Shift bridge east to span 100-year floodplain • Construct pedestrian underpass under new vehicle bridge • Reconfigure South Campground	An alternative was considered during design that would construct a new vehicle and pedestrian bridge further north, reconfiguring South Campground (Transportation Study Option B [NPS 2015]). This alternative featured a vehicle circulation pattern that would relocate the primary alignment of the Zion–Mt. Carmel Highway to bisect South Campground before crossing the North Fork of the Virgin River via a new vehicle and pedestrian bridge. The South Campground access road would be reconfigured to accommodate large increases in vehicular traffic. Bisecting the campground with the most popular entry into ZION would shift all the traffic to an overnight use area and may increase unintended pedestrian-vehicle interactions as well as lengthen the estimated drive time to the Zion Canyon Visitor Center or under an evacuation. This alternative would also reduce the number of campsites in South Campground. In this location, the bridge would span the 100-year floodplain; however, the existing bridge would continue to restrict the floodplain. This alternative was dismissed because it would not meet the purpose and need for the proposal because it would contribute to unsafe conditions for campers, and it would not reduce interaction on roads between shuttle vehicles and visitor vehicles.



Value Analysis Study Alternative B (Considered and Dismissed)



Transportation Study Option D (Considered and Dismissed)

Transportation Study Option B (Considered and Dismissed)

APPENDIX B. MITIGATION MEASURES

The following preliminary mitigation measures will minimize the degree and/or extent of adverse impacts and will be implemented during implementation of the proposal.

Air Quality

- A Fugitive Dust Control Plan may be required. The Contractor shall coordinate with the Contracting Officer (CO). Additional information can be found here at https://deq.utah.gov/air-quality/fugitive-dust-control-requirements-for-non-attainment-areas-stationary-source-compliance.
- Dust containment, in accordance with NPS, state, and local regulations, shall be achieved. This shall include, but is not limited to, physical barrier containment and/or water sprinkling dust controls.
- All haul loads will be secured and/or covered within NPS boundaries and in accordance with state regulations.
- Equipment and/or vehicles will not be allowed to idle longer than three minutes when not in use.

Archeology, Historic Preservation, and Cultural Resources

- Infrastructure and site design will be as compatible as practical with the historic architectural characteristics and incorporate similar architectural features, materials, surface finishes, and color.
- Construction staging areas will be restricted to ensure no fill or materials disturb known precontact/historical resources. Site selection will be coordinated with the ZION cultural program manager prior to construction.
- If previously unknown archeological resources are discovered during construction, all work in the immediate vicinity (600 feet) of the discovery shall be halted until the resources are identified and documented and an appropriate mitigation strategy is developed, if necessary, in accordance with pertinent laws and regulations, including the stipulations of the 2008 Programmatic Agreement Among the National Park Service (U.S. Department of the Interior), the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers.
- In the event of the discovery of human remains, all work on the proposal must stop, and the ZION archeologist must be contacted immediately. As required by law, the coroner will be notified first. All provisions outlined in the Native American Graves Protection and Repatriation Act (1990) will be followed.
- All workers will be informed of the criminal penalties for illegally collecting artifacts or intentionally damaging any archeological or historical property. Workers will also be informed of the correct procedures should previously unknown resources be uncovered during construction activities. Data recovery excavations will be carried out under NPS guidance to mitigate adverse effects, as outlined in the section on environmental consequences.

- Museum Collections and Archives: All official and nonofficial records created from this project (textual, electronic, audiovisual, and visual) shall be accessioned and cataloged in ZION's archives collection. Coordinate with the ZION curator to close out the project and submit project deliverables to the archives.

Human Health and Safety

- In developed areas, the presence of underground utilities must be determined and flagged prior to excavation using heavy machinery, handheld tools, or equipment.
- Before any remodel, renovation, demolition, or abatement activity, the proper hazard material testing shall be conducted. For asbestos, an assessment and inspection written report, by a state- certified inspector, will need to be conducted to determine the presence, location, and quantity of asbestos-containing material in and adjacent to the work area at all buildings managed by the NPS. Where there is a possibility of disturbing lead, the presence of existing lead must be determined prior to the undertaking. The report findings shall be submitted to ZION safety manager.
- The project leader shall engage ZION accessibility coordinator in the project design and receive approval before finalizing the project.
- Contractors shall submit a site-specific safety plan to the NPS CO. The site-specific safety plan will be shared with ZION safety manager. Within two weeks, ZION safety manager will accept or reject the plan (with feedback). The site-specific safety plan shall demonstrate compliance with Occupational Safety and Health Administration, other applicable laws, and include an emergency response plan.
- Traffic management shall be planned prior to project implementation to address the location of warning signs, type of signs, placement of flaggers, placement of cones/fencing, barricades, duration of anticipated delays, use of pilot cars, etc. This plan shall address vehicular and pedestrian traffic in the construction zone.
- Contractors and/or NPS staff to include volunteers, interns, etc. shall follow all park safety and health policies and programs. A hierarchy of hazard control shall be implemented. Personal protective equipment is required. Hard hats, safety vests, eye protection, and other personal protective gear, as needed, shall always be worn in the construction zone.
- Any safety violations shall be corrected immediately. If the violation is not corrected immediately, the project shall be postponed until such corrections are made.
- Dust containment, in accordance with NPS, state, and local regulations, shall be achieved. This shall include, but is not limited to, physical barrier containment and/or water sprinkling dust controls.
- The construction zone shall be clearly marked. Fencing or other types of NPS-approved temporary barriers shall be installed. Closures and temporary safety fencing will be required to keep visitors out of construction and staging areas. Spill containment kits and fire extinguishers shall always be available on-site at all times.
- Copies of Safety Data Sheets shall always be available on-site.
- Store hazardous materials in accordance with manufacturer's and Occupational Safety and Health Administration Subpart D requirements. Maintain Safety Data Sheets for each chemical readily available on-site.
  1. Immediately report spills of hazardous materials to the park.

2. Maintain a spill emergency response kit.
3. Train employees how to respond to a spill and use an emergency response kit.
4. Spill containment kits and fire extinguishers shall be available on-site at all times.

Night Sky and Soundscape

- Actions must comply with the Zion National Park Lighting Management Plan (NPS 2021b).
- The hours of outdoor construction will be limited to hours between sunrise and sunset; no artificial lighting will be allowed.
- The hours of operation of motorized equipment will vary by season to protect dawn, dusk, and nighttime quiet (8:00 a.m. to 5:00 p.m. during Standard Time and 8:00 a.m. to 6:00 p.m. during Daylight Savings Time). If the Contractor requests in writing to the CO to work outside these hours, the CO must obtain Park Superintendent approval prior to construction activities.
- All motor vehicles and equipment will have mufflers conforming to original manufacturer specification. Mufflers must be in good working order and in constant operation to prevent excessive or unusual noise.

Paleontological Resources

- All workers will be informed of the potential to encounter paleontological resources in the Project Area, which may be in the form of body fossils, tracks, and burrows, and to remain vigilant for these resources during construction. If paleontological resources are encountered, work will stop, and findings will be reported to the ZION physical scientist.

Soils, Geology, and Hydrology

- The Project Area is in the 100-year or 500-year floodplain or in an area susceptible to geologic hazards. Precipitation may increase the risk of geologic hazards. In the event of flooding or other geologic hazards, NPS staff and contractors will be prepared to move personnel and equipment out of the hazard area immediately.
- Actions occurring in a floodplain, wetland, or area greater than 1 acre shall include erosion-control measures during project planning. This erosion plan shall be reviewed by ZION and approved by the appropriate federal, state, and local review authorities as required. More information on the occurrence of floodplains is located at https://msc.fema.gov/portal/home.
- To minimize the amount of ground disturbance, staging and stockpiling areas shall be in previously disturbed sites, away from visitor use areas to the greatest extent possible. All staging and stockpiling areas shall be returned to preconstruction conditions following construction.
- Obtain all fill, rock, or other earth materials from the Project Area or nearby areas whenever possible. Soil and fill material must be weed free and from a source approved

by the NPS. Visible fill, rock, or other earth materials will be of a compatible color to the surrounding landscape.

- Recontouring of disturbed soils to complement the surrounding landscape is required following the completion of construction.
- Heavy Equipment Use: (1) Use of heavy equipment where soils are wet or extensive compaction could occur shall be avoided; (2) The visible limit of disturbance shall be clearly marked using stakes, flagging, or fencing, and all demarcations must be removed and disposed of properly upon the completion of construction; and (3) Surface soils that have been compacted shall be scarified to slow runoff and promote revegetation.
- All equipment working in a waterway such as a river or tributary shall be inspected and cleared of aquatic invasive species prior to entry on the work site. In-water work may NOT occur annually from April 1 to July 31 to protect sensitive fish species. Supplemental guidance is in the *Utah Aquatic Invasive Species Management Plan* and the *Guide to Preventing Aquatic Invasive Species Transport* by Wildland Fire Operations (https://www.nwcg.gov/sites/default/files/publications/pms444.pdf). (refer to Appendix C for species identification).
- Wildlife-friendly erosion-control products and methods shall be used. These may include, but are not limited to, silt fencing, filter fabric, excelsior or fumigated straw filter logs, temporary sediment ponds, check dams of pea gravel-filled burlap bags or other material, and/or immediate mulching of exposed areas. To prevent import of nonnative plants, straw bales or nonfumigated products shall not be permitted. Silt protection structures must be inspected and cleaned out regularly.
- All erosion- and sediment-control devices shall be adequately maintained to assure continued performance of their intended function. Those that have sustained damage or have reached their capability shall be replaced or have maintenance performed.
- All irrigation and utility lines will be installed according to applicable laws and regulations, especially regarding the proper depth of the lines in the soil column. The project manager shall oversee or inspect this work in time to allow for corrections prior to burial of the lines. Damage to existing lines during construction will be reported or repaired the same day.
- Trash and construction waste, including rubble, concrete, asphalt, broken irrigation pipe, etc., will not be left on-site or buried but will be removed and disposed of in an approved manner.
- All construction equipment must be inspected daily for hydraulic and fuel leaks, and repaired as necessary. When not in use, idle equipment, petrochemicals, and toxic/hazardous materials shall be locked and may not be stored in the 100-year floodplain or near any drainage ways, ditches, or streams; discharge of petroleum products, cement washings, or other construction materials into the river is not permitted.
- Appropriate oil spill kits shall be maintained on-site and readily accessible at all times during construction, and each operator shall be trained in their use.
- All fueling operations, lubricating, hydraulic topping off, fuel tank purging, and equipment maintenance/repairs shall be performed at an upland site outside of the 100-year floodplain. These activities shall take place on an approved pad with spill control/collection devices in place. The use of canola oil or other biodegradable fuels and fluids is recommended when working in sensitive riverine environments.

- To reduce the risk of pollutants entering waterways, fuel storage and hazardous waste storage must be at least 3 feet above the regulatory floodplain elevation.

Vegetation

- The project manager will contact the ZION vegetation program manager at least two weeks in advance to notify of pending actions and the potential for vegetation salvage. If irrigation systems will be shut down during construction, the vegetation program manager or nursery manager will be notified at least one week prior. If existing irrigation systems are damaged and cannot be repaired the same day, the vegetation program manager will be notified within 24 hours to minimize loss of vegetation.
- All vehicles, equipment, and tools shall be cleaned completely prior to entering the work zone to prevent the spreading of noninvasive plant seeds. Daily inspections will occur to identify and prevent any fluids from leaking.
- To avoid introduction of nonnative, invasive plant species into ZION, only certified weed-free materials will be used during construction.
- Construction activities shall be restricted during saturated soil conditions or severe weather conditions to avoid damage to soils and vegetation.
- Vehicle and equipment operations will be limited to paved areas whenever possible. All vehicles will use the same entry, egress, and turnaround areas. Travel corridors will be delineated prior to construction.
- Wherever possible, vehicles and equipment will not be driven within the drip lines of trees and shrubs to minimize soil compaction in the main root zones.
- The number of vehicles and frequency of equipment accessing the Project Area will be restricted to the minimum amount required to successfully complete operations.
- Wherever possible, construction activities, including irrigation and utility line installation, will be planned to avoid damaging tree roots. Supplemental guidance may be found at https://www.dnr.state.mn.us/treecare/maintenance/construction_damage.html.
- Recontouring and soil decompaction of disturbed areas will take place immediately following construction such that the Project Area is readied for revegetation efforts. Weed control will be implemented to minimize the introduction of noxious weeds.
- All disturbed ground shall be reclaimed using appropriate BMPs, which may include planting or seeding with native vegetation or, in the case of small treatment areas, allowing native vegetation to reclaim the area naturally. The ZION project leader shall consult with the vegetation branch to determine the best methods for restoration.
- Revegetation, when implemented, shall use salvaged plants, seeds, or propagules from native species (genetic stocks originating in the Project Area) to the maximum extent feasible. Any revegetation plantings will strive to reconstruct the natural spacing, abundance, and diversity of native plant species.
- Spring seeding shall occur in March. Fall seeding shall occur between late October and mid-November. Fall seeding is preferred.

Visitor Use and Experience

- Variable message signs along the route to the park would also be used to keep the public informed of construction-related closures and delays as needed.
- ZION would provide updates to local community residents and community members by continuing to participate in meetings such as the Zion Canyon Visitors Bureau and sending other direct communications.

Wildlife

- The ZION project manager will contact the ZION wildlife program manager at least two weeks in advance to schedule monitoring activities.
- Care shall be taken not to disturb any wildlife species (reptiles, migratory birds, raptors, or bats) found nesting, hibernating, estivating, or otherwise living in, or immediately nearby, worksites.
- For any actions involving trenching or digging holes, provisions (generally in the form of ramps with a slope less than 45°) will be made every 20 to 50 feet to allow for the escape of animals that may fall into these recesses, or they will be covered in such a way as to prevent animals (vertebrates) from falling in them.
- All gate posts, ground pipes, and bollards will be permanently capped to prevent wildlife entrapment.
- If erosion-control material is used (wattles/fiber rolls, blankets/matting/netting), the materials must be made of 100 percent biodegradable and natural materials (e.g., jute) with large-diameter netting to prevent entrapment of wildlife. Wildlife-friendly erosion-control products and methods shall be used.
- Resource management personnel shall be notified/consulted when any wildlife must be disturbed or handled. They will be available to assist with moving/relocating snakes or any other wildlife, when necessary, or to make recommendations for relocating any disturbed animals.
- If a condor enters the Project Area on the ground, construction will cease until it leaves on its own or until techniques are employed by permitted personnel that result in the condor leaving the area.
- Compliance with food storage and waste disposal will always be maintained. The Project Area will be cleaned up and appropriately secured at the end of each work period daily to reduce the attraction of wildlife.
- ZION staff will continue to contribute to the recovery of federally listed wildlife species by:
    - Monitoring MSO PACs at a minimum once every three years for occupancy and productivity to help track and gauge potential impacts from visitor use.
    - Providing visitors with opportunities to learn about the California condor, the Condor Recovery Program, and how to minimize impacts on condors.
    - Providing visitors with opportunities to learn about the Mojave Desert tortoise, the Desert Tortoise Recovery Program, and how to minimize impacts on the desert tortoise.

- Components of the proposed action within 0.5 mile of a MSO core area will be planned outside of the MSO breeding season, which is March through August, and will occur only during daylight hours, when MSO are not foraging.
- If MSO are identified in the Project Area during construction, work will stop and the Project Area will be resurveyed daily until the MSO are confirmed to have left the area.
- Migratory bird nests shall not be damaged and shall be protected by timing the project outside of the annual nesting period, which is March 1 to September 15. If timing as such is not possible, visual inspections of vegetation marked for removal is required. The ZION wildlife program manager shall be contacted to schedule inspections as needed.
- Clearing and grubbing activities will occur only during November through February to avoid the migratory bird season (March 1–September 15) and the monarch butterfly active season (April through October).
- Tree removal will occur only in October and November to protect nesting migratory birds and roosting bats. If this is not possible, visual inspections of vegetation marked for removal is required each day prior to tree removal. Contact the ZION Wildlife Program Manager two weeks prior to removal to schedule inspections as needed.
- Larger dead/dying trees that are not a hazard to humans or property will be preserved either fully or partially intact (i.e., left standing dead or topped/trimmed and left standing) to provide habitat for wildlife. Where possible, larger logs/woody debris (trunks with greater than 24 inches diameter at breast height) will be left on the ground on-site to provide habitat for rodents, reptiles, and insects.
- If a tortoise is in the Project Area, construction work will immediately cease, and the park Wildlife Biologist will be contacted immediately to move the individual from the site.
- From April through October, construction personnel will be briefed to check underneath vehicles for tortoises before driving.
- Native seed mixes (approved by the NPS) used during revegetation efforts will include flowering plants and milkweed at the biologists' discretion.
- No instream work would be completed during the fish spawning season (April 1 to July 31). Prior to construction activities, the NPS would coordinate with the Utah Department of Natural Resources to provide clearance of fish throughout the Project Area.

Wild and Scenic Rivers

The required measures for bridge construction, removal, or replacement listed in *Reference Manual 46: Wild and Scenic Rivers* (NPS 2021a), Section 3.3.9 and Appendix I will be implemented to reduce impacts. The required mitigation measures are attached as Appendix G to the EA.

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APPENDIX C. IMPACT TOPICS DISMISSED FROM FURTHER ANALYSIS

Based on NPS NEPA policy (National Park Service [NPS] 2015, p. 51), the following issues were dismissed from detailed analysis in the Environmental Assessment because:

- The environmental impacts associated with the issue are not central to the proposal or of critical importance;
- A detailed analysis of environmental impacts related to the issue is not necessary to make a reasoned choice between alternatives;
- The environmental impacts associated with the issue are not a big point of contention among the public or other agencies; or
- There are not potentially significant impacts on resources associated with the issue.

Federally Listed Threatened and Endangered Species, Other than Mexican Spotted Owl

An official federal species list was obtained from the U.S. Fish and Wildlife Service (USFWS) Information Planning and Conservation (IPaC) website (USFWS 2022). The list identified six threatened, endangered, or candidate wildlife species under the Endangered Species Act (ESA) potentially occurring in the Project Area: California condor (*Gymnogyps californianus*), Mexican spotted owl (MSO; *Strix occidentalis lucida*), southwestern willow flycatcher (*Empidonax trailii extimus*), yellow-billed cuckoo (*Coccyzus americanus*), Mojave Desert tortoise (*Gopherus agassizii*), and monarch butterfly (*Danaus plexippus*). In addition, the entirety of ZION, including the Project Area, is designated critical habitat for MSO.

A BA was prepared for the proposal and was submitted to the USFWS on April 11, 2023 (NPS 2023). The BA contains a detailed discussion of habitat and occurrence of federally listed and candidate species in the Project Area. The BA concluded that the proposal *may affect, not likely to adversely affect,* the California condor, southwestern willow flycatcher, western yellow-billed cuckoo, Mojave Desert tortoise, and monarch butterfly. The BA also concluded that the proposal *may affect, not likely to adversely affect*, critical habitat for MSO. These conclusions mean that all effects would be beneficial, insignificant, or discountable. In the context of the ESA, insignificant impacts are so small they cannot be meaningfully measured, and discountable effects are extremely unlikely to occur. These species are not likely to be affected because habitat in the Project Area is highly disturbed by human activity, because no known breeding habitat is present, and because Zion National Park (ZION, park) will implement mitigation measures described in Appendix B to avoid and minimize impacts. Mitigation measures would include ceasing construction if condors or tortoises are in the Project Area, implementing food storage and waste disposal measures to protect condors, continuing programs to educate visitors on how to minimize impacts on threatened and endangered species, and using native plant species in revegetation to benefit monarch butterflies.

Several plant species listed as threatened or endangered under the ESA have the potential to occur in ZION. These species include dwarf bear-poppy (*Arctomecon humilis*), Jones cycladenia (*Cycladenia humilis* var. *jonesii*), Shivwits milkvetch (*Astragalus ampullaroides*), Siler pincushion

cactus (*Pediocactus sileri*), and Ute ladies'-tresses orchid (*Spiranthes diluvialis*). No habitat for these species is present in the Project Area. The BA prepared for the proposal in consultation with the USFWS found that the proposal would have no effect on these species (NPS 2023).

The BA found that the proposal *may adversely affect* MSO. The USFWS concurred with the findings of the BA in a Biological Opinion dated August 8, 2023 (Appendix E). As a result, MSO is carried forward for detailed analysis in the EA; other federally listed threatened, endangered, and candidate species are dismissed from detailed analysis because they are not present in the Project Area or because impacts are not likely to occur.

Native Wildlife

The diverse vegetation communities in ZION support a variety of wildlife species. ZION is home to 7 amphibian species, 30 reptile species, 78 mammal species, 291 bird species, and 8 fish species (NPS 2022b, p. 1). Common wildlife species in the Project Area and surrounding areas include mule deer (*Odocoileus hemionus*), ringtail (*Bassariscus astutus*), rock squirrel (*Spermophilus variegatus*), and various lizards (NPS 2009a, p. 1–2; NPS 2009b, p. 2). Birds potentially occurring in the Project Area include western scrub jay (*Aphelocoma californica*), juniper titmouse (*Baeolophus ridgwayi*), black-throated gray warbler (*Setophaga nigrescens*), and many others (NPS 2011, p. 1–10).

Lands managed by the NPS provide havens for wildlife because they are more protected and generally less developed than privately owned lands. As described in the *Vegetation* section of Affected Environment and Environmental Consequences of the EA, the Project Area is a complex mix of developed areas, disturbed grasslands, and native vegetation communities and experiences a high volume of traffic and human activity. As a result, wildlife habitat in the Project Area is fragmented by development. Because of the high levels of human-caused disturbance, most wildlife species near the Project Area are likely habituated to the existing levels of human activity.

The Project Area contains habitat for special status wildlife species, including birds identified as Birds of Conservation Concern (BCC) by the USFWS, species under a Conservation Agreement to preclude federal listing, and species identified as Species of Greatest Conservation Need (SGCN) by the Utah Division of Wildlife Resources (UDWR). An official Utah species list was obtained from the UDWR on February 23, 2022, and was updated in May 2022. The list identified 16 species identified as SGCN with the potential to occur in the Project Area, not including federally listed species addressed above. The USFWS IPaC website identified an additional seven BCC species that could potentially occur in the Project Area (USFWS 2022). A list of special-status species potentially occurring in the Project Area is presented in Table C-1.

Table C-1. Special status wildlife species potentially occurring in the Project Area.

Species Common and Scientific Names	Status[1]	Habitat Description and Potential Occurrence in the Project Area
Birds of Conservation Concern		
Bald eagle *Haliaeetus leucocephalus*	BCC, SGCN	Breeding habitat is forests near substantial bodies of water and/or riverine systems. Winter habitat is in similar areas but is restricted to lower elevations. Northern bald eagles winter in Utah in the hundreds. A small but increasing population nests in Utah (UDWR 2015). Bald eagles are uncommon in ZION in the winter and rare in other seasons (NPS 2011).
Black-chinned sparrow *Spizella atrogularis*	BCC	Habitat includes arid brushlands on rugged mountain slopes from sea level to 8,800 feet in elevation. Brush is generally 3 to 6 feet tall, moderately dense, of mixed species, and broken by rocky outcrops and scattered large shrubs or trees (Tenney 2020). Black-chinned sparrows are rare in ZION (NPS 2011).
Cassin's finch *Haemorhous cassinii*	BCC	Breeding habitat is coniferous forests and nesting occurs high off the ground in all species of conifer. This species forms loose flocks outside of the breeding season and can be found throughout the region in conifers and occasionally sagebrush.
Evening grosbeak *Coccothraustes vespertinus*	BCC	Breeding habitat is mixed-conifer and spruce-fir forests. This species is less common in pine-oak, pinyon-juniper, ponderosa pine, and aspen forests. Deciduous plant species are also used for nesting and food (Gillihan and Byers 2020).
Ferruginous hawk *Buteo regalis*	BCC, SGCN	Habitat is typically open-country grassland and steppe (Ng et al. 2020). This species nests in solitary trees, on the ground, or on rock outcrops. In Utah, nests in the ecotone between the grassland and shrub steppe habitats and in pinyon-juniper woodlands (Parrish et al. 2002). There have been several e-Bird submissions in recent years for ferruginous hawk in the Project Area during January (2014 and 2016).
Golden eagle *Aquila chrysaetos*	BCC	Roosting and nesting habitat is on cliffs and high steep slopes or tall trees in forested stands (USFWS 2022). Foraging habitat consists of grassland or steppe-like vegetation (Katzner et al. 2020).
Grace's warbler *Dendroica graciae*	BCC	Breeding and foraging habitat consists of tall pines (Staicer and Guzy 2020).
Lewis's woodpecker *Melanerpes lewis*	BCC, SGCN	Primary habitat consists of open ponderosa pine forest, open riparian woodland dominated by cottonwoods, and logged or burned pine forest; however, breeding birds are also found in areas such as oak woodland and pinyon-juniper (Vierling et al. 2020). Primarily nests in cavities in snags (Vierling et al. 2020). This species may be found in the Virgin River corridor.
Olive-sided flycatcher *Contopus cooperi*	BCC	Habitat is primarily montane and northern coniferous forests usually in mid- to high-elevation forests (3,000 to 7,000 feet; Altman and Sallabanks 2012). Nests in trees and feeds almost exclusively on flying insects (Altman and Sallabanks 2012).
Peregrine falcon *Falco peregrinus*	BCC, SGCN	Nesting habitat includes cliffs and occasionally tall buildings. All known peregrine falcon nests are more than 1 mile from the Project Area.
Pinyon jay *Gymnorhinus cyanocephalus*	BCC, SGCN	Habitat includes pinyon pine, pinyon-juniper woodlands and sage-steppe and ponderosa woodlands. This species lives in loose colonies and, when pinyon mast is low, can disperse broadly away from the home range (Johnson and Balda 2020).
Virginia's warbler *Vermivora virginiae*	BCC	Breeding habitat is pinyon-juniper and oak woodlands, but can be found in other vegetation types (Olson and Martin 2020). Nests in fairly open habitat with drought-tolerant deciduous shrubs, pines, and junipers (Olson and Martin 2020).

Species Common and Scientific Names	Status[1]	Habitat Description and Potential Occurrence in the Project Area
Special Status Bats		
Fringed myotis *Myotis thysanodes*	SGCN	Occurs in desert and woodland areas. Day roosts can occur in trees and rock crevices. Maternity roosts occur in caves, mines, and abandoned buildings; feeds on beetles and moths. Hibernates in caves and crevices (Oliver et al. 2008). Maternity colonies of more than 100 individuals have been observed in snags (Lacki and Baker 2007).
Long-legged myotis *Myotis volans*	SGCN	Present in Utah from 3,150 to 10,100 feet in elevation across many habitat types; most applicable are: pinyon-juniper, desert shrub, and lowland riparian (Oliver et al. 2008). In ZION, Taylor et al. (2013) reported captures in Oak Creek Canyon and Many Pools Canyon. Likely uses caves and mines for hibernacula (Oliver et al. 2008). In a South Dakota study, the authors tracked the species to a combination of rock and tree roosts with tree roosts being predominantly decayed ponderosa pines (Cryan et al. 2001).
Townsend's big-eared bat *Corynorhinus townsendii*	SGCN	Occurs in desert scrub to montane forests. Uses caves and mines year-round both for maternity colonies and hibernacula (UDWR 2015). Typically roosts in cliffs, caves, or mines, but may use basal tree hollows formed by rotting (Fellers and Pierson 2002).
Yuma myotis *Myotis yumaensis*	SGCN	Occurs in lowland riparian and desert scrub to montane forest; feeds on moths and flies. Uses mines and buildings for diurnal roosts and attics in buildings for maternity roosts (Oliver et al. 2008). Roosts in buildings and trees, including cottonwoods (Evelyn et al. 2004; Tye and Geluso 2019).
Special Status Fish		
Desert sucker *Catostomus clarkii*	SGCN	Occurs in small to medium sized rivers with gravel substrate, including the Virgin River Basin. Scrapes algae and invertebrates from rocks (UDWR 2015).
Flannelmouth sucker *Catostomus latipinnis*	SGCN, CS	Endemic to the Colorado River Basin (UDWR 2015). This species occurs in the North Fork of the Virgin River.
Virgin spinedace *Lepidomeda mollispinis*	SGCN, CS	Occurs in runs and pools, mostly in deeper water, over sand, and near cover such as boulders or overhanging trees and shrubs. This species is found in the North Fork of the Virgin River and is endemic to the Virgin River Basin (UDWR 2015).
Special Status Reptiles and Amphibians		
Arizona toad *Anaxyrus microscaphus*	SGCN	Occurs in lowland riparian habitat in the Virgin River Basin (UDWR 2015). Arizona toads have been found in Oak Creek and in the Virgin River from the town of Springdale to the confluence with the East Fork of the Virgin River. There are records from the Narrows from the North Fork of the Virgin River downstream through ZION.
Gila monster *Heloderma suspectum*	SGCN	Occurs in deserts, near washes and arroyos, and in semiarid rocky foothills of desert scrub or grasslands. Feeds on eggs, nestlings, or juveniles of small mammals, birds, and reptiles (UDWR 2015).
Northern leopard frog *Lithobates pipiens*	SGCN	This species is highly aquatic and is found in streams, rivers, ponds, lakes, and meadows for breeding and overwintering (UDWR 2015).

[1]**Status Codes**: **SGCN**=Species of Greatest Conservation Need; **BCC**=Bird of Conservation Concern; **CS**=Species managed under multiagency Conservation Agreement to preclude federal listing.

Potential effects on wildlife during construction could include effects from increased noise from construction activities, which could result in changes in normal foraging behavior or displacement outside the Project Area. These effects could adversely affect localized populations in the Project Area. Impacts on wildlife could also occur from destruction of habitat during construction. Removal of vegetation and ground disturbance in the Project Area would degrade the quality of foraging habitat. As described in the *Vegetation* section of the EA, the proposal would result in the temporary impacts on about 11.8 acres of vegetation and the permanent loss of about 2.5 acres of vegetation. Most impacted vegetation would be

reestablished following construction, and thus habitat loss for these species would be limited in the context of the available habitat around the Project Area. Nevertheless, as described in the *Vegetation* section, recovery of woodland habitat could take decades. Given the temporary nature of construction impacts and the availability of extensive habitat nearby, however, the proposal is not expected to have measurable adverse effects on wildlife beyond the permanent loss of about 2.5 acres of habitat. Work during the summer breeding season (from March 1 to September 15 for most species) could disrupt breeding activities with increased noise and human activities; however, the Project Area is heavily used by visitors from spring through fall, and any breeding birds in the Project Area are likely acclimated to some human disturbance. Tree removal activities would occur during the fall months (October and November) to avoid impacts on breeding birds.

Potential impacts on special status bats during roosting could include noise disturbance and tree removal during construction. The primary impact on bat species would be from intermittent noise and increased human activity over the 24-month project duration. Impacts from intermittent noise could include roost abandonment, which could reduce localized populations in the Project Area. Bat species that roost in trees (long-legged myotis, Townsend's big eared bat, and Yuma myotis) could be affected by intermittent construction noise. Repeated disturbance at a roost site may cause bats to abandon the site and move into a less favorable alternative site. Many bat species incorporate multiple roost sites in a specific area; therefore, effects may only last until they relocate to these sites. Removal of trees, specifically removal of trees that provide roosting habitat, could negatively affect tree-roosting bat species. Bats could be directly injured or displaced to alternative roost sites if their roost trees are removed. These impacts would be mitigated by removing trees in the Project Area in October and November, when tree-roosting bats are the least vulnerable to disturbance (i.e., not hibernating and not breeding or caring for bats pups). In addition, standing dead trees would be left wherever possible, removed only where necessary for safety, to serve as bat habitat. As described in the *Vegetation* section, habitat loss would be mitigated by restoring all but about 2.5 acres of removed vegetation. Trees would be planted to replace the lost trees and would mature over a period of several decades.

Special status fish species in the Project Area include the desert sucker (*Catostomus clarkii*), flannelmouth sucker (*Catostomus latipinnis*), and Virgin spinedace (*Lepidomeda mollispinis*). Ground disturbance from construction and staging activities in the Virgin River drainage would expose soils to erosion, which could result in increased sedimentation and turbidity in the North Fork of the Virgin River. However, best management practices would be used to minimize runoff and sediment discharges into the river. The installation of the new vehicular bridge across the North Fork of the Virgin River in the Zion Canyon South Entrance area would have the highest potential for sedimentation and turbidity impacts on fish. Creek-bed disturbance and sedimentation would be limited to less than 300 linear feet, and increased turbidity levels would be temporary. Increased turbidity levels and extent are expected to be low compared to turbidity levels during natural high-flow flood events. No instream work would be completed during the fish spawning season (April 1 to July 31). Prior to construction activities, the NPS would coordinate with the Utah Department of Natural Resources to provide clearance of fish throughout the Project Area. Native fish in the Virgin River are adapted to turbid conditions, and negative impacts on native fish are not expected. Therefore, no adverse impacts on native fish are expected from turbidity and sedimentation. After removal of the Watchman Campground Bridge, restoration of the river channel, and construction of a new bridge with a longer span, the post-project floodplain along the North Fork of the Virgin River

would be less constricted because the new bridge would have a longer span and elevated low chord height. This change to the floodplain could result in benefits to aquatic life, including special status fish, by restoring natural flow patterns.

Special status reptiles and amphibians potentially occurring in the Project Area include Arizona toad (*Anaxyrus microscaphus*), Gila monster (*Heloderma suspectum*), and northern leopard frog (*Lithobates pipiens*). Potential impacts on the Arizona toad, Gila monster, northern leopard frog, and other reptiles and amphibians could include roadkill, crushing by machinery, or falling into excavated areas during construction. Reptiles and amphibians also could be crushed or trapped if they crawl into stored materials at staging areas. These impacts would be limited to the 24-month construction period, and would affect individual animals without resulting population level impacts. After completion of construction, traffic conditions and potential roadkill of reptiles and amphibians would be the same as for current conditions.

No direct impacts on emergent vegetated wetlands that provide habitat for amphibians are expected. Sediment deposition in wetlands and waters downstream from the Project Area and staging areas could adversely affect amphibian habitat. Sediment-related impacts could include infilling of spaces between rocks, where amphibians lay eggs, seek cover, or forage. Also, the growth and development of tadpoles and larvae could be adversely affected by increased sedimentation. These impacts would be limited to the 24-month construction period, and would affect individual animals without resulting population level impacts. The potential for sediment-related impacts would also be reduced by implementing measures to protect water quality, as described in Appendix B.

Overall, impacts on native wildlife, including special-status species, are expected to be limited to the construction period and would be minimized with implementation of mitigation measures, as described above, and native wildlife is dismissed as an impact topic in the EA.

Archeological Resources

Archeological resources are dismissed as an impact topic in the EA because no known sites are at risk of being adversely impacted by proposed ground-disturbing construction activities. A cultural resource survey conducted in 2022 (Engleman et al. 2022) did not identify any archeological resources within the area of potential effects (APE). Indirect impacts on archeological resources outside the APE are dismissed as reconfiguration of infrastructure in the Project Area would not change land use patterns in lower Zion Canyon, thus would not change visual or indirect impacts on archeological sites. An inadvertent discovery plan would be implemented in the event of discovery of archeological sites and resources, which follows all standard protocols and mitigation measures for the treatment of identified sites, including stoppage of work in areas of discovery until resources are assessed in consultation with the Utah State Historic Preservation Office and tribes. In addition, due to the extensive development of the Project Area with the Visitor Center (2000), Watchman Campground (1950s), early NPS infrastructure (1930s), and pioneer homesteads (1860s), it is unlikely that the area has potential to yield archeological evidence.

Ethnographic Resources

Ethnographic resources are dismissed as an impact topic in the EA as no known resources are at risk of being adversely impacted by the proposed undertaking. The NPS defines ethnographic resources as "landscapes, objects, plants and animals, or sites and structures that are important to a people's sense of purpose or way of life." Cultural resource inventories, an ethnographic study (Stoffle et al. 1999), and oral histories provide evidence that Zion Canyon has been occupied for thousands of years. Descendant peoples and communities that recognize the significance of Zion Canyon include the Southern Paiute (Nuwu/Nuwuvi), Ute, Goshute, Hopi, Navajo (Diné), Zuni, and Pueblo Tribes. Zion Canyon is a part of the traditional homeland of the Southern Paiute, and the Hopi recognize Zion Canyon as a traditional cultural property. In addition, the descendants of members of the Church of Jesus Christ of Latter-Day Saints, who settled Zion Canyon in 1861, and the descendants of Civilian Conservation Corps (CCC) workers who labored in Zion Canyon during the New Deal Era (1933-1942) have ties to Zion Canyon.

When the NPS acquired lands in lower Zion Canyon starting in the 1920s, these areas of the park became highly developed into visitor use areas, including a visitor center, campgrounds, picnic areas, park housing, roads, trails, and other infrastructure. Although lower Zion Canyon is part of the larger Zion Canyon Cultural Landscape Historic District, lower Zion Canyon has developed to the degree that ethnographic resources no longer likely exist.

However, the park has been in consultation with descendant communities, including through the public scoping process. At present, no ethnographic resources have been identified within the APE and thus this topic was dismissed from further analysis. If through future consultation efforts new information is presented to the NPS, all efforts will be implemented to avoid adverse effects on ethnographic resources.

Paleontological Resources

The Project Area has low potential for paleontological resources because it is located in alluvial and fluvial deposits far from bedrock outcrops where paleontological resources would be expected to be found intact. No paleontological sites are mapped in ZION's current database in the Project Area. As described in Appendix B, mitigation measures would include informing workers of the possibility of encountering paleontological resources, providing a fossil guide to paleontological resources that may be encountered and instructing them to remain vigilant for these resources. If paleontological resources are encountered, work must stop, and the ZION physical scientist would be notified. For these reasons, this topic was dismissed from detailed analysis.

Soundscapes

ZION has developed a Soundscape Management Plan to protect sound resources in the park (NPS 2010). The Soundscape Management Plan identifies two management zones for the purposes of soundscape management, the Frontcountry Zone, where human-made sounds are dominant, and the Wilderness Zone, where human-made sounds are less prevalent. Natural

sounds such as flowing water, wind blowing through trees, and birds calling dominate in the Wilderness Zone. Visitors have opportunities throughout most of the park to experience natural sounds in an unimpaired condition. The sounds of civilization (mechanical and other human-created sounds) are generally confined to the Frontcountry Zone, which includes the Project Area (NPS 2010). Within this zone, visitors regularly experience the sounds of automobiles and buses, generators, motorized equipment, and other people, which at times interfere with the natural sounds of ZION.

Currently, sounds in the Project Area occur from frequent automobile, bus, and motorcycle traffic; visitor use of trails, parking areas, and visitor facilities; and natural sources, such as wind. Median ambient noise levels in the Project Area and impacts on visitors are described in the *Visitor Use and Experience* section of the EA. Expected noise levels from equipment are summarized in Table C-2.

Table C-2. Estimated noise levels for selected construction equipment provided by Federal Highway Administration Roadway Construction Noise Model (FHWA 2006). For comparison, the sound level for normal conversation at 3 feet is 60 dBA (Occupational Safety and Health Administration 2022).

Equipment Description	Maximum Sound Level, decibels, A-weighted (dBA) at 50 feet	Maximum Sound Level (dBA) at 1 mile	Distance (feet) with Sound Levels Exceeding 60 dBA
Asphalt milling machine	90	50	1,500
Asphalt roller	80	40	500
Backhoe	80	40	500
Belly dump (dump truck)	84	44	800
Chain saw	84	44	800
Compactor	82	42	600
Concrete truck	79	39	450
Crane	81	41	550
Grader	85	45	900
Impact pile driver	95	55	2,800
Medium or large loader	85	45	900
Paving machine	77	37	350
Skid steer loader	85	45	900
Track hoe/excavator	81	41	550
Trencher	80	40	500
Vibratory pile driver	95	55	2,800
Water truck	88	48	1,250

Impacts from noise on MSO are addressed in the *Mexican Spotted Owl* section of the EA. Impacts from noise on visitors are addressed in the *Visitor Use and Experience* section of the EA. There would be no adverse changes to the soundscape after construction is complete. For these reasons, this topic was dismissed from detailed analysis.

Night Sky

As a designated International Dark Sky Park, ZION developed a Lighting Management Plan (NPS 2021b) to preserve ZION's naturally dark night skies. The goal for artificial nighttime lighting in ZION is to provide the minimum amount of artificial light necessary for safe travel in developed areas while preserving and protecting the natural and cultural resources of ZION,

including the dark night sky. The Lighting Management Plan designates three lighting zones in ZION: Standard Lighting Zone (SLZ), Minimal Lighting Zone (MLZ), and Natural Darkness Zone (NDZ).

Most of the Project Area, including the Zion Canyon Visitor Center, shuttle facilities, and parking lots, is within the SLZ: areas that receive the highest visitor and employee use and allow the most use of artificial light. The campgrounds in ZION, including South Campground, which is adjacent to the Project Area, are within the MLZ. The MLZ receives nighttime use but has minimal expectations for artificial lighting at night and greater restrictions on lighting than the SLZ. All new lighting would be compliant with the Lighting Management Plan and would adhere to dark sky mitigation measures described in Appendix B and the Lighting Management Plan. Hours of outdoor construction would be limited to hours between sunrise and sunset; therefore, no artificial lighting would be used during construction. With implementation of these mitigation measures, no adverse impacts on the night sky are expected. For these reasons, this topic was dismissed from detailed analysis.

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APPENDIX D. CUMULATIVE IMPACT SCENARIO

Past Actions

- **NPS 1864:** Zion–Mt. Carmel Highway is established as a Wagon Road.
- **NPS 1911–1917:** Federal improvements to Zion–Mt. Carmel Highway.
- **NPS 1923:** Zion–Mt. Carmel Highway graded and lined with white gravel and two (2)-foot red clay shoulders.
- **NPS 1958:** Realignment of a 1.4-mile section of the Zion–Mt. Carmel Highway from the southern boundary of ZION to the Virgin River Bridge.
- **NPS 1966:** The Watchman Campground Bridge was constructed.
- **NPS 1963–1966:** Relocation of Zion Canyon South Entrance Station. The previous sandstone fee booth was dismantled, and a new booth was constructed. The Zion–Mt. Carmel Highway was also realigned and widened.
- **NPS 1975:** Exiting traffic lane was extended 82 feet at the South Entrance Station.
- **NPS 1988:** Realignment of South Entrance shifted the west pylon to increase road width from 30 feet to 47.5 feet between the two pylons; a retaining wall was installed on the south face of the west pylon to reduce soil erosion alongside the road; and a concrete footing was installed under the west pylon.
- **NPS 1998 - 2000:** Zion Canyon Transportation System and construction of Shuttle Bus Maintenance Facility implemented to facilitate visitor access and alleviate congestion throughout Zion Canyon.
- **NPS 2000:** Zion Canyon Visitor Center opened.
- **Non-NPS 2016–2018:** Utah Department of Transportation State Highway 9 road construction and Town of Springdale paid parking implemented.
- **NPS 2017:** South Entrance Monument Reconfiguration relocated the South Entrance Monument farther to the east, installed a monument plaza, and reconfigured the adjacent parking area to improve visitor safety, mitigate factors contributing to vehicle congestion in the immediate vicinity, and expand cultural resource protection measures.
- **NPS 2018:** ZION South Entrance Fee Station Reconfiguration expanded the South Entrance Fee Stations by increasing the number of vehicle lanes and associated fee booth facilities to decrease ZION entry wait times, reduce localized congestion, improve road drainage, and bolster human health and safety in the area.
- **Non-NPS 2021:** ZION receives $33 million U.S. Department of Transportation grant to replace propane shuttle fleet with electric shuttles.

- **NPS 2021:** ZION Superintendent's Compendium update allowing use of Class I electronic bicycles, or e-bikes, where traditional bicycles are authorized.
- **NPS 2022:** Visitor Center Bicycle Path and Parking Racks installed to better connect the Zion Canyon Visitor Center Shuttle Stop to the Zion Canyon Pedestrian Entrance as provide separate routes for pedestrian and bicycle traffic.
- **NPS:** Human History Museum Comfort Station constructed a new comfort station to expand visitor restroom facilities and improve compliance with ABA and ADA.
- **NPS 2023:** Lava Point Overlook Railing Accessibility Improvements reconstructed the trail and overlook railing to improve visitor accessibility, improve safety, and discourage potential conflicts with condors.

Present Actions

- **NPS:** South Campground Rehabilitation Project – includes improvements and rehabilitation of South Campground, including drainage improvements, changes in traffic circulation patterns, and rehabilitation and replacement of restrooms.
- **NPS:** ZION Vegetation Program – implements monitoring and management of invasive, and nonnative species. Revegetation efforts ongoing to restore areas disturbed by construction and trampling.
- **NPS:** ZION Wildlife Program – implements monitoring and management of human wildlife interactions. Data collection and research ongoing to better understand wildlife movements and impacts from humans.
- **NPS:** ZION Facilities Maintenance – performs cyclic maintenance on buildings, roads, trails, and utilities as well as coordinates fundamental services such as garbage collection.
- **NPS:** South Zion Canyon Post-Flood Response – responds to the 2020 Zion Canyon flood event by replacing and upsizing existing culverts in the southern portion of the canyon.
- **NPS:** Multiple Shuttle Stop Modifications – reconstructs and resizes multiple shuttle stops throughout Zion Canyon to accommodate new, electric shuttle buses and increase efficiency of visitors boarding.
- **NPS:** Angels Landing Day Use Permit Pilot Program – implementation of a formal lottery system that establishes a day use permit for a highly sought-after trail. The system aims to improve visitor experience by reducing crowding and congestion on this strenuous hike while providing opportunities for a high-quality visitor experience.
- **Non-NPS:** Zion Regional Collaborative joins local municipalities, public land management agencies, state agencies, and other interested parties to provide regional planning and coordination in the Zion Canyon area.

- **Non-NPS:** 2019–2050 Regional Transportation Plan developed by the Wasatch Front Regional Council in partnership with local governments, transportation agencies, community organizations, local stakeholders, and residents to develop common goals, planning time horizons, performance measures, and financial assumptions which collectively form Utah's Unified Transportation Plan.

Foreseeable Future Actions

- **NPS:** Transportation Safety Study: Zion Canyon Scenic Drive – the proposed action would research pedestrians, cyclists, motorists, and transit traffic to better understand visitor use patterns and movement throughout ZION.
- **NPS:** Pavement Preservation – the proposal would apply surface treatments, such as chip seal or micro surfacing, to roads and parking lots throughout ZION to maintain pavement infrastructure.
- **NPS:** Temple of Sinawava and Grotto Sewer Systems – the proposed action would delineate viable options to construct a sewer utility connection from the restroom facilities located at the Temple of Sinawava and Grotto to the town of Springdale processing facility.
- **NPS:** Extend Pa'rus Trail to Temple of Sinawava – the proposed action would develop designs to extend the Pa'rus Trail and utility corridor from the current terminus at Canyon Junction to the Temple of Sinawava.
- **NPS:** Repair East Zion Plateau Trails – the proposed action would repair and potentially reroute hiking trails located in designated Wilderness.
- **NPS:** Rehabilitate Watchman Campground - the proposed action would reconstruct drainages and rehabilitate campsites throughout the campground.
- **NPS:** Zion Canyon Pedestrian Entrance Improvements – the proposed action would aim to better define the entrance for pedestrians and construct a new large vehicle drop-off area.
- **NPS:** ZION Visitor Use Management Plan – the proposed action would develop strategies to manage visitor use, including identifying visitor capacities and corresponding actions, and strategies to provide visitor access, protect natural and cultural resources, and enhance visitor experience.
- **NPS and Non-NPS:** East Zion Initiative: Non-Motorized Trail Partnership – the proposed effort would work collaboratively with private landowners and local, state, and federal officials to develop designs for a multijurisdictional trail system on the eastern boundary of ZION.
- **Non-NPS:** St. George-to-Springdale Transit Shuttle.

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APPENDIX E. BIOLOGICAL OPINION

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
2369 W Orton Circle, #50
West Valley City, Utah 84119

In Reply Refer to:
FWS/R6/
06E23000-2023-F-0035336

Memorandum

To: Head of Resource and Research Management, Zion National Park

From: Utah Field Supervisor, Ecological Services, U.S. Fish and Wildlife Service, West Valley City, Utah SONYA DYER Digitally signed by SONYA DYER Date: 2023.08.08 15:25:29 -06'00'

Subject: Final Biological Opinion for Zion National Park Zion Canyon South Entrance Area Redesign Project

In accordance with section 7 of the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. 1531 et seq.), and the Interagency Cooperation Regulations (50 CFR 402), this transmits our final biological opinion (BO) on the National Park Service (NPS) Zion Canyon South Entrance Redesign Project (hereafter, Project). Our BO evaluates the effects of the Project to Mexican spotted owl (*Strix occidentalis lucida*) and its designated critical habitat. Our BO is based on information provided in your final biological assessment (BA) dated April 11, 2023, correspondence between our offices, and other sources of information.

The Western yellow billed cuckoo (*Coccyzus americanus occidentalis*) and Southwestern willow flycatcher (*Empidonax traillii extimus*) were also analyzed as part of the BA. We concur with your determinations of may affect, not likely to adversely affect for both species due to the lack of suitable riparian habitat required for breeding, feeding, or sheltering within the Project area. California condor (*Gymnogyps californianus*) was also analyzed as part of the BA, and we concur with your determination of may affect, not likely to adversely affect for this species because the Project actions will not occur near cliffs containing the species, thus direct and indirect effect are unlikely to occur. Additionally, as stated in the BA, conservation measures such as education programs and trash and food storage requirements in the Park will further minimize potential effects to the species. Lastly, you also analyzed Mojave Desert tortoise (*Gopherus agassizzii*) as part of the BA, and we concur with your determination of may affect, not likely to adversely affect due to the lack of suitable habitat within the Project area.

We also determined the proposed action is not likely to jeopardize the continued existence of the monarch butterfly (*Danaus plexippus*). We expect the implementation of the Project and its associated conservation measures to have discountable effects and to increase the amount of potential habitat for the monarch in the Park through revegetation of disturbed areas with native seed mix.

Consultation History

This section summarizes significant steps in the consultation process:

- June 16, 2022: We met with NPS staff to initiate technical assistance on the Project and discuss the proposed action, timelines, and effects to listed species.
- March 2, 2023: We met with NPS to discuss effects determinations and conservation measures for listed species, particularly Mexican spotted owl.
- March 8, 2023: We received a draft BA from your office and provided feedback.
- March 9, 2023: We met with NPS staff to address questions from the draft BA.
- April 11, 2023: We received transmission of the final BA and initiated formal consultation for the Zion National Park South Entrance Redesign Project.

Biological Opinion

1. Proposed Action

The National Park Service (NPS) Zion National Park (Zion) is proposing to redesign the South Entrance of Zion Canyon. Actions will include realigning the road accessed from the South Entrance Fee Station to the Zion Canyon Visitor Center, expanding the Zion Shuttle Maintenance Facility, reconstructing the South Campground, installing pedestrian trials, and improving accessibility throughout the South Entrance Area. A summary of each of the actions can be found below.

Road and shuttlebus construction:

- Construction of two new roundabouts,
- Construction of new roads, road configurations, and road connections,
- Construction of a new vehicular bridge,
- Upgrading two parking lots and a shuttle bus parking lot,
- Removing and reclaiming an old road,
- Removing an existing bridge,
- Installing culverts, as necessary,
- Replace existing structures with concrete retaining walls and boulder riprap, and
- Tree removal (120) and subsequent revegetation.

Campground construction:

- Demolishing and rehabilitating portions of the S. Entrance campground,
- Construction of a new office building,
- Improving campsite infrastructure and accessibility,
- Construction and renovation of comfort stations,
- Expansion of dump station,
- Construction of new day use picnic areas,
- Construction of short-term parking areas, and
- Removal of 147 to 193 trees and subsequent revegetation.

Pedestrian routes construction:

- Construction of a pedestrian underpass,
- Constructing new trails and trail connections, and
- Realignment and repaving of a trail.

The total area of disturbance is expected to include about 5.6 acres for road improvements, 3.39 acres for upgrading the shuttle facility, 11.92 acres for the campground renovations, and 2.2 acres for pedestrian route improvements. Of this disturbance, about 1.21 acres will be restored after road construction and 13.42 acres will be restored after campground construction. Construction will be phased and is anticipated to last approximately 4 years.

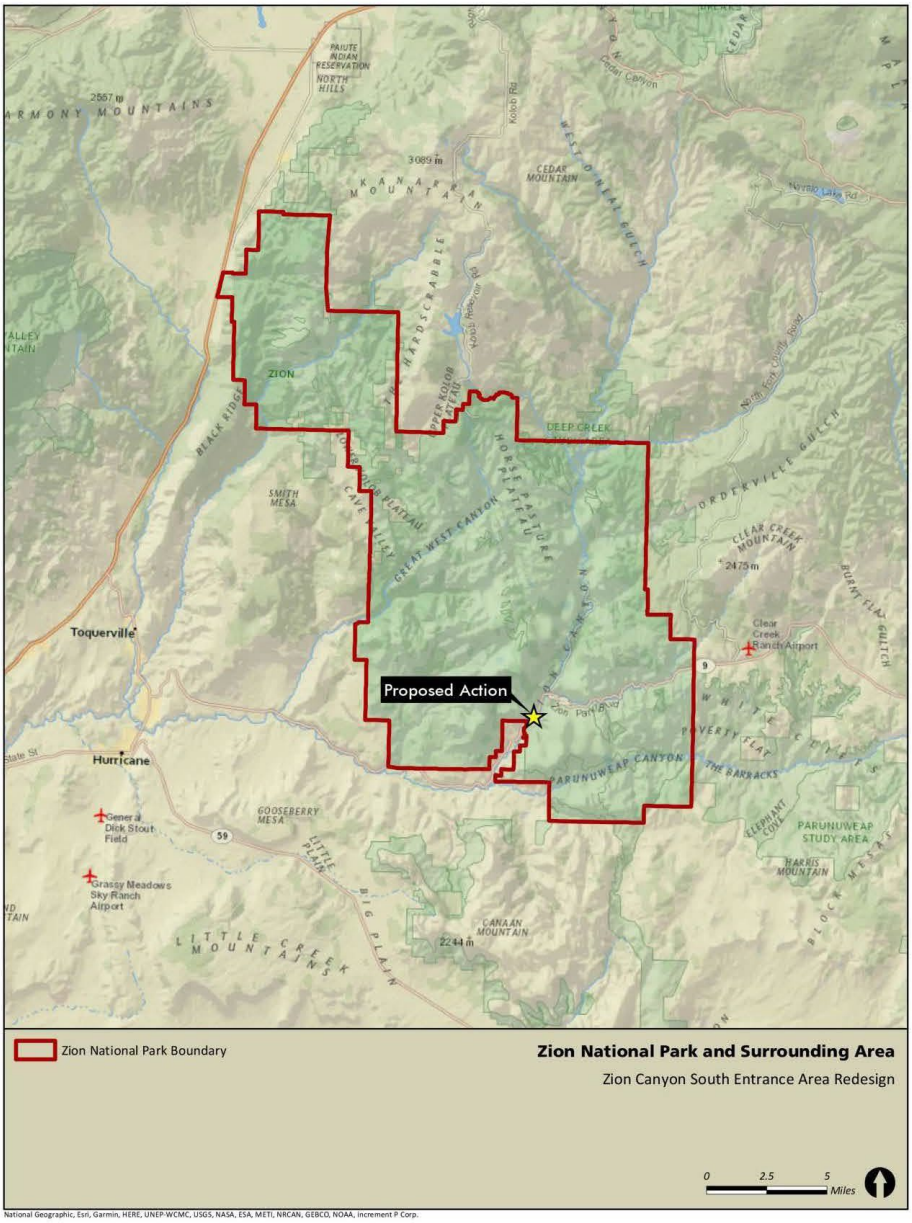

Figure 1. Zion National Park and Surrounding Area.

Figure 1. Proposed action area and Zion National Park boundary as depicted in Figure 1 of the BA (NPS 2023).

1.1. Action Area

The action area occurs in Washington County, Utah, and is located within Zion National Park, which encompasses approximately 148,733 acres of NPS-managed land. The action area encompasses approximately 1,991 acres, which includes the project footprint plus a 0.5 mi buffer based on noise reduction recommendations found in the Mexican spotted owl recovery Plan (USFWS 2012) and distances required to attenuate loud noises generated by motorized equipment.

1.2. Applicant Committed Conservation Measures

To ensure conservation of listed species and to contribute to the recovery of the species, NPS committed to implement species-specific conservation measures for Mexican spotted owl, California condor, Mojave desert tortoise, and Monarch butterfly (NPS 2023). The NPS also identified Standard Operating Procedures and Best Management Practices to be implemented. We summarize the conservation measures, by species, below.

For Mexican spotted owl:

- Components of the proposed action within a Protected Activity Center (PAC) or within 0.5 mi of a core area will be planned outside of the spotted owl breeding season (March 1 through August 31), and will occur only during daylight hours;
- If an owl is identified in the Project area during construction, the Project area will be surveyed daily until the owl is confirmed to have left the area;
- Mexican spotted owl PACs will continue to be monitored at a minimum once every three years for occupancy and productivity to help track and gauge potential impacts from visitor use.
- Tree removal will occur only in October and November;
- Larger dead/dying trees that are not a hazard to humans or property will be preserved either fully or partially intact to provide habitat for wildlife. Larger logs/woody debris will be left on the ground on-site to provide habitat for rodents, reptiles, and insects.

For California condor:

- If a condor occurs at the Project area, construction will cease until it leaves on its own or until techniques are employed by permitted personnel that results in the individual condor leaving the area. A park-employee monitor will be responsible for this task;
- Compliance with food storage and waste disposal will be achieved at all times. The Project area will be cleaned up at the end of each work period (daily) to reduce the attraction of wildlife;
- Exclude any potential for condor trash ingestion at dumpster areas by installing wildlife-proof dumpsters or trash bins and food storage containers at campsites;
- The Division of Interpretation and Education and the Wildlife Program will continue to provide visitors with opportunities to learn about the California condor, the Condor Recovery Program, and how to minimize visitor effects on condors;
- If euthanasia of wildlife in Zion must occur, lead ammunition and toxins that may affect scavengers such as California condor will not be used.

For Mojave desert tortoise:

- The Division of Interpretation and Education will continue to provide visitors with opportunities to learn about the Mojave desert tortoise, the Desert Tortoise Recovery Program, and how to minimize effects on the desert tortoise;
- If a tortoise occurs in the Project area, construction will immediately cease, and the park Wildlife Biologist ill be contacted immediately to move the individual from the site;
- From April to October, construction personnel will be briefed to check underneath vehicles for tortoises before driving vehicle.

For Monarch butterfly:

- Clearing and grubbing activities will occur only during November through February to avoid the monarch active season;
- Noxious weeds will be controlled and managed to reduce their spread by timing weed spraying to avoid the monarch butterfly breeding season and, when feasible, conducting spot spraying to limit effects on flowering nectar plants; and
- Native seed mixes used during revegetation efforts will include flowering plants and milkweed.

2. Species Accounts, Effects, and Conclusions

2.1. Status of the Species: Mexican Spotted Owl

Species Description

A detailed account of the taxonomy, biology, and reproductive characteristics of the Mexican spotted owl (hereafter, referred to as Mexican spotted owl, spotted owl, and owl) is found in the final listing rule (58 FR 14248, March 16, 1993), the original Recovery Plan (USFWS 1995), and in the revised Recovery Plan (USFWS 2012). We completed a five-year status review in 2013 and recommended no change to the Mexican spotted owl's classification as threatened or its recovery priority number of 9C - a subspecies with a moderate degree of threat and a high potential for recovery (USFWS 2013). The information provided in those documents are included herein by reference.

The Mexican spotted owl is one of three subspecies of spotted owl recognized by the American Ornithologists' Union (AOU 1957). The other two subspecies are the northern (*S. o. caurina*) and the California spotted owl (*S. o. occidentalis*). The Mexican spotted owl occurs in forested mountains and canyon lands in Utah, Colorado, Arizona, New Mexico, and the western portions of Texas. The species also occurs in several States of Mexico.

Life History and Population Dynamics

Mexican spotted owls breed sporadically and do not nest every year (Ganey 1988). Courtship begins in March and eggs are laid in late March or, more typically, early April. Incubation begins shortly after the first egg is laid and is performed entirely by the female. Female spotted owls incubate for approximately 30 days and eggs usually hatch in early May (Ganey 1988). Females brood their young almost constantly, leaving their nests for only brief periods during the night (Forsman et al. 1984; Delaney et al. 1999a).

Spotted owls have one of the lowest clutch sizes among North American owls (Johnsgard 1988); females lay one to three eggs, two being the most common. Nestling owls fledge from four to five weeks after hatching, from early to mid-June in most cases (Ganey 1988). Three weeks after leaving the nest owlets can feed on their own (Forsman et al. 1984).

Spotted owls are "perch and pounce" predators (Forsman et al. 1976). Their prey items include woodrats, mice, voles, rabbits, gophers, bats, birds, reptiles, and arthropods. Spotted owls dwelling in canyons of the Colorado Plateau take more woodrats and fewer birds than do spotted owls from other areas (Ward and Block 1995; Willey and Willey 2010).

The Mexican spotted owl's life history is characterized by high and reasonably constant adult survival rates, low juvenile survival rates, and relatively low and highly variable reproductive rates (USFWS 2012). These life history characteristics allow owls to reproduce when conditions are favorable and to survive unfavorable periods with little or no reproduction, a strategy that has been coined "bet-hedging" (e.g., Boyce 1986; Franklin et al. 2000). In the rocky-canyon habitats in southern Utah, Mexican spotted owls exhibit higher occupancy and recolonization rates and lower extirpation rates at mesic (wet) sites (e.g., Cedar Breaks and Zion) than xeric (dry) sites (e.g., Grand Staircase – Escalante or Capitol Reef), suggesting mesic sites are more stable (i.e., constant occupancy) than xeric sites (Willey and Willey 2010; Hockenbary 2011). Mesic habitats may also have more favorable microclimates and habitat structure, roost and nest sites, and diverse habitats for the owl's prey.

Status and Distribution

In 1993, we listed the Mexican spotted owl as threatened under the ESA (58 FR 14248, March 16, 1993). We developed the first recovery plan in 1995, and revised it in 2012 (USFWS 1995, USFWS 2012).

The 2012 Recovery Plan identifies five Ecological Management Units (EMUs; Figure 2) in the United States, based on: physiographic provinces, biotic regimes, perceived threats to habitat or individual birds, administrative boundaries, and owl distribution (USFWS2012). The five EMUs are: Colorado Plateau, Southern Rocky Mountains, Upper Gila Mountains, Basin and Range-West, and Basin and Range-East.

In the U.S., most owls are found on National Forest lands. However, in most areas of the Colorado Plateau EMU, owls are found only in rocky-canyon habitats, which primarily occur on NPS and Bureau of Land Management (BLM) administered lands (USFWS 2012).

The revised Recovery Plan (USFWS 2012) identifies 1,324 known owl sites in the United States. An owl site is an area used by a single or a pair of adult or subadult owls for nesting, roosting, or foraging. There were 758 known owl sites from 1990 to 1993, and 1,222 owl sites from 1990 to 2004 in the United States. The increase in number of known owl sites is mainly a product of new owl surveys being completed within previously un-surveyed areas. Thus, an increase in abundance in the species range-wide cannot be inferred from these data. We estimate owl sites in the United States represent 97 percent of the known total range-wide population (USFWS 2012).

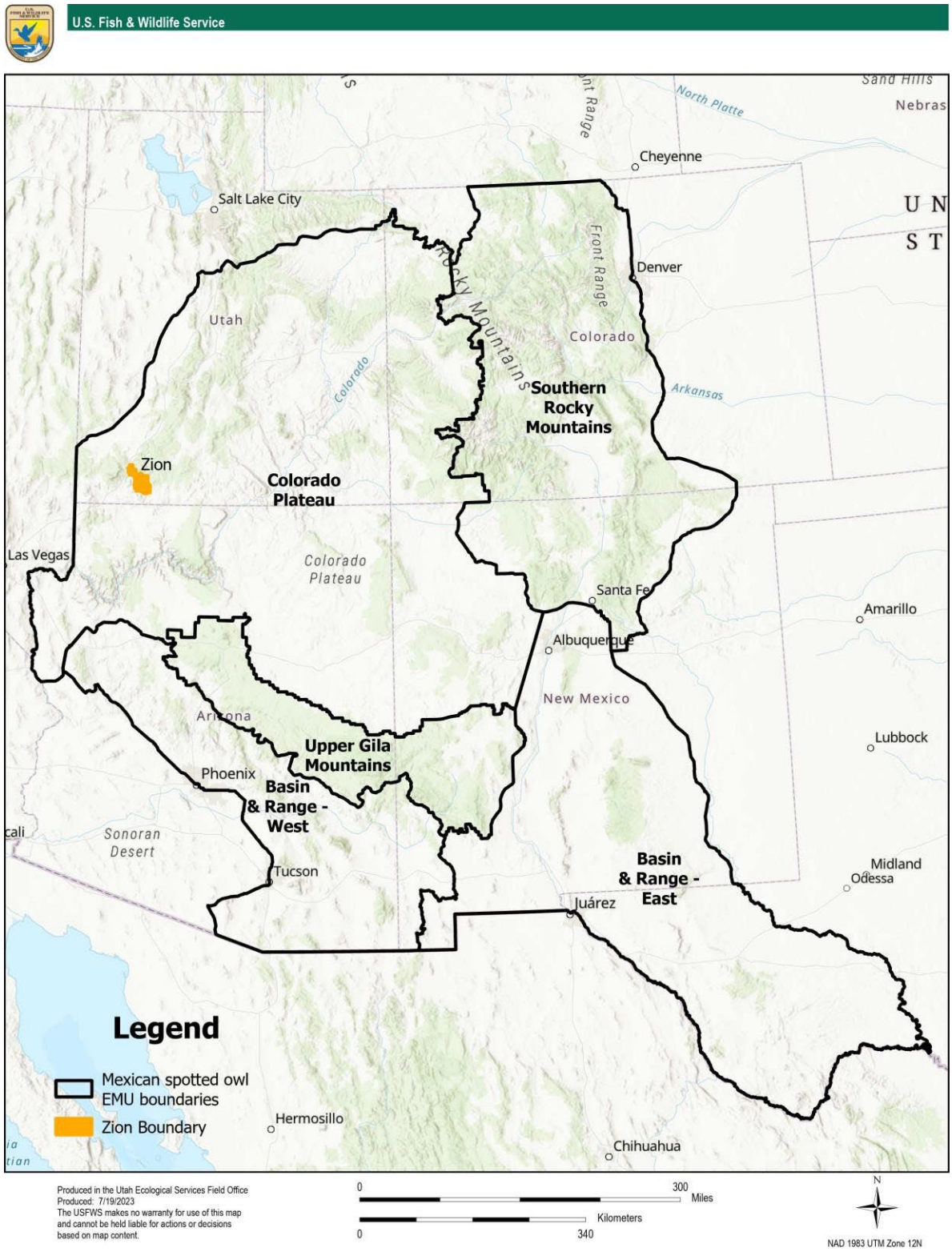

Figure 2. Zion National Park within the Mexican Spotted Owl Ecological Management Unit Boundaries in the United States. Five EMUs wholly within Mexico are not pictured.

The primary threats to the Mexican spotted owl at the time of listing were even-aged timber harvest and catastrophic wildfire (58 FR 14248, March 16, 1993). Grazing, recreation, and other

land uses were also mentioned as possible factors influencing the Mexican spotted owl population. Our most recent threat assessment in the revised Recovery Plan identified large, severe wildfires as the primary threat to the species (USFWS 2012). Historical and current anthropogenic uses of Mexican spotted owl habitat include domestic and wild ungulate grazing, recreation, fuels reduction treatments, resource extraction (e.g., timber, oil, gas), and development (USFWS 2012). These activities have the potential to reduce the quality of owl nesting, roosting, and foraging habitat, and may cause disturbance during the breeding season (USFWS 2012).

Overall, the status and distribution of the Mexican spotted owl has not changed significantly range-wide in the U.S. since the time of listing (which includes Utah, Colorado, Arizona, New Mexico, and extreme southwestern Texas).

Critical Habitat Description

We designated critical habitat for Mexican spotted owl on August 31, 2004 (69 FR 51382). Designated critical habitat includes approximately 8.6 million acres of forested mountain and canyon habitat on Federal lands in Arizona, Colorado, New Mexico, and Utah. Critical habitat continues to support the needs of the Mexican spotted owl throughout all EMUs located in the United States.

The physical and biological features relevant to Mexican spotted owl canyon habitat in the action area are:

- Canyon walls containing crevices, ledges, or caves;
- Presence of water (often providing cooler air temperature and often higher humidity than the surrounding areas);
- Clumps or stringers of mixed-conifer, pine-oak, pinyon-juniper, and/or riparian vegetation; and
- Woody debris to support prey populations.

In the Colorado Plateau EMU, designated critical habitat includes over 3.3 million acres of Federal lands. We designated five separate critical habitat units for Mexican spotted owl in Utah, totaling approximately 2,252,857 acres (69 FR 53182). Of that total, approximately 1,720,727 acres are located on lands administered by NPS (USFWS 2012).

For a more detailed description of Mexican spotted owl critical habitat, see the final listing and critical habitat rule (69 FR 53182).

2.2 Environmental Baseline

Regulations implementing the ESA (50 CFR 402.02) define the environmental baseline as the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present effects of all Federal, state, or private actions and other human activities in the action area, the anticipated effects of all proposed Federal projects in the action that have already undergone formal or early section 7 consultation, and the effects of state or private actions that are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline.

Zion National Park offers a diversity of recreation opportunities for scenic driving, OHV use, camping, and hiking (NPS 2023). Visitor use has grown steadily for many years, and recently the demand for public access has grown exponentially (NPS 2023). The action area has been highly disturbed by human activity and continues to be affected by human activity and exisiting facilitates. These currently include an existing Visitor Center with pedestrian entrance and kiosk, parking areas for visitors and employees, entrance roads, campgrounds, paved and unpaved trails, shuttle routes and facilities, vehicle and pedestrian bridges over the Virgin River, and numerous additional manmade structures. The NPS estimates median ambient noise levels in the action area are about 43 dBA (NPS 2023; NPS 2010 pg. 28).

2.2.1. Mexican Spotted Owl

Status of the Species within the Action Area

The Mexican spotted owl action area includes potential habitat that occurs within 0.5 mi of the proposed Project based on the potential for noise harassment. The entirety of the action area is approximately 1,990.7 acres. Using geospatial models (Willey and Spotskey 1997; Lewis 2014), we identified approximately 1,160 acres of potential habitat in the action area. Our action area and subsequent analysis differs slightly from that stated in the BA as we used a 0.5 mi buffer in our analysis, while NPS used a 1.0 mi buffer.

The action area occurs within the Utah portion of the Colorado Plateau EMU. Approximately 15 percent (206 owl sites) of all known owl sites recorded in the U.S. since 1989 occur in the Colorado Plateau EMU (USFWS 2012). Most owl sites within this EMU are on NPS administered lands (64 percent), followed by BLM administered lands (22 percent), and then Forest Service (FS) administered lands (13.5 percent; USFWS 2012, Appendix B, Table B.1). These numbers are best interpreted as minimum cumulative numbers of locations where at least one owl was recorded during at least one breeding season since 1989. We do not have information on how many of these sites within the Colorado Plateau EMU are currently occupied.

Steep-walled rocky canyon lands provide typical owl habitat in the Colorado Plateau EMU. Canyon habitat is used by owls for nesting, roosting, and foraging and includes landscapes dominated by vertical walled rocky cliffs within complex watersheds, including many tributary side canyons (USFWS 2012). Rock walls must include caves, ledges, and fracture zones that provide protection for nesting and roosting sites. Breeding sites are located below canyon rims; however, it is known that owls use areas outside of canyons (i.e., rims and mesa tops). Owl nests and roosts primarily on cliff faces using protected caves and ledges, and forage in canyon bottoms, on cliff faces and benches, and along canyon rims and adjacent lands. These areas frequently contain small clumps or stringers of mixed-conifer, ponderosa pine, pine-oak, pinyon-juniper, and or riparian vegetation (USFWS 2012). In Utah, owls have been documented using canyon bottoms and adjacent rims for foraging (Willey 1998). Mexican spotted owls typically occur in metapopulations (spatially separated populations; USFWS 2012), and most populations in Utah occupy large canyon complexes.

Mexican spotted owl habitat assessments and surveys within Zion were performed as early as 1987 and have continued regularly through 2021 (the last year of survey data available for the Project). Areas throughout the Zion that models (Willey 1997, Willey 2000, and Lewis 2014) indicate as potential habitat (approximately 69,554 acres) have had various levels of field

evaluations and surveys, as applicable to determine suitability for breeding, roosting, and foraging. Surveyors identify suitable habitat by ground-truthing modeled habitat through field visits to identify likely nesting or roosting habitat. Suitable habitat characteristics include deep, narrow, and long canyon complexes with exposed rocky cliffs or ledges that meets the species needs (USFWS 2012). This is standard practice since we and other species experts recognize that the habitat models over-estimates the amount of potential habitat (USFWS 2002a).

Zion has some of the highest densities of spotted owls known in Utah. As of 2021, there were 39 suspected or known Mexican spotted owl territories in Zion and NPS has delineated 31 PACs (NPS 2023, pg. 27).

There are no Mexican spotted owl PACs within the action area; however, there are three PACs within the vicinity: Oak Creek, Pine Creek, and Lady Mountain PACs. The Oak Creek PAC is closest to the action area, the edge of the PAC is about 0.25 mi from the action area. The edge of the Pine Creek PAC is about 0.8 mi from the action area and the edge of the Lady Mountain PAC is about 0.9 mi from the action area. Core areas for all three PACs are over 2 mi away from the action area. Surveys have identified that all three PACs are regularly occupied, and breeding pairs or individuals were detected in 2021.

Suitable habitat within the action area contains Riparian Recovery Habitat found along Oak Creek and Virgin River. Riparian Recovery Habitat consists of riparian forests outside of PACs that could frequently be used by owls for foraging, roosting, daily movements, and potentially nesting (UWFWS 2012). This habitat type is important for owl recovery, as it can provide stepping stones for movement between population segments or be used by owls during the non-breeding season (USFWS 2012). Additionally, these areas may facilitate gene flow and the survival of owls during the winter (USFWS 2012).

There is the likelihood for spotted owls in PACs located outside of the action area to forage or use suitable habitat within the action area at various times during the year, although we have no documentation of this occurring. Available information suggests that Mexican spotted owls in Utah use relatively large home ranges and movement to peripheral areas in the nonbreeding season are typical (Willey 1998; Willey 2007; USFWS 2012). Suitable habitat within the action area may be used by PACs outside of the action area for foraging and juvenile dispersal; however, we would not expect more than occasional use of the action area by these owls as surveys have not identified any other breeding pairs and the baseline conditions of the action area are heavily disturbed. Annual surveys are needed to monitor the occupancy of the existing PACs and detect new owl sites in suitable habitat.

Status of Critical Habitat within the Action Area

The action area is within critical habitat unit CP-11 of the Colorado Plateau EMU, which covers Federal lands in three Utah counties (Washington, Kane, and Iron) and includes canyon and steep-sloped mixed conifer nesting habitat as well as additional foraging and dispersal habitat (69 FR 51382). The entirety of the action area (approximately 1,990.7 acres) is designated critical habitat for Mexican spotted owl. Furthermore, the entirety of Zion is designated as critical habitat for the species (approximately 148,733 acres). The action area represents approximately 1 percent of the CP-11 unit (260,105 acres) and less than one percent of the Colorado Plateau EMU (3.3 million acres) and the total designated critical habitat for the species (8.6 million acres).

Based on geospatial models (Willey and Spotskey 1997; Lewis 2014), there are approximately 1,160 acres of potential habitat within designated critical habitat in the action area. Of note, the riparian vegetation along Oak Creek and the Virgin River in the action area contain the physical and biological features to support roosting and foraging for spotted owls, but likely not nesting.

Not all acres of designated critical habitat contain the physical and biological features essential to the conservation of the species, such as cooler and often more humid conditions than the surrounding areas; steep canyon walls with crevices, ledges, or caves; high percent of ground litter and woody debris; and riparian or woody vegetation. Critical habitat was designated across large tracks of Federal land with known owl sites where canyon landscapes are common (69 FR 53183), resulting in large polygons that often include suitable and unsuitable habitat for the species, based on expert opinion species experts and more recent habitat models (Willey 1997). Best available information indicates that modeled habitat in conjunction with field assessments provides the best indication of potential occupancy and owl sites inside and outside of critical habitat.

Factors Affecting Species and Critical Habitat within the Action Area

Stressors to Mexican spotted owls and critical habitat in the action area include recreation; road use and development in canyons; and climate change (USFWS 2012). The extent to which these stressors are affecting Mexican spotted owls and critical habitat within the action area is presently unknown. Unlike in other portions of its range, fire is not a landscape-scale threat to Mexican spotted owl habitat in the action area and the Colorado Plateau EMU because the incidence and extent of stand-replacing fires in cliff and canyon habitat is very low (USFWS 2012). Additionally, because of the difficulty in harvesting trees in canyon habitat preferred by Mexican spotted owls in Utah and the lack of active timber harvest within the action area, we do not identify timber harvest as a threat.

Recreation and road use are likely the most important stressors affecting the species and critical habitat within the action area. Recreation ranks as a primary land use within the Colorado Plateau EMU because of high recreation pressure on public lands (USFWS 2012). Recreation intensity is high in this region of Utah, and visitation has increased exponentially in Zion in recent years (NPS 2023). The potential for recreation to affect owl presence and recovery is compounded by the terrain, with owls established in narrow canyons having less opportunity to move away from human activity. Activities such as hiking, camping, and OHV use occur in owl habitat within Zion and Colorado Plateau EMU (USFWS 2012). The action area experiences a high level of human use and human-caused noise (NPS 2023 pg. 44). Currently, noise and human activity in the action area occurs because of frequent automobile, bus and motorcycle traffic and visitor use of trails, parking areas, and visitor facilities. The NPS estimates median ambient noise levels in the Project area are about 43 dBA (NPS 2023; NPS 2010 pg. 28).

Both the Intergovernmental Panel on Climate Change (IPCC) and the U.S. Global Climate Change Research Program (USGCRP) conclude that changes to climatic conditions, such as temperature and precipitation regimes, are occurring and are expected to continue in western North America over the next 100 years (Frankson et al 2017; Gonzalez et al. 2018; IPCC 2021; USGCRP 2017). The Southwestern United States (Southwest) is warmer (an average annual temperature increase of 1.6°F) since 1901, but there hasn't been much change to annual precipitation (Hoerling et al. 2013; Gonzalez et al. 2018). Since 1950, the Southwest was

warmer than any comparable period in the last 600 years; however, recent droughts (between 1901 to 2010) were not as severe or as long lasting as those experienced in the last 2,000 years (Hoerling et al. 2013).

Down-scaled climate projections for the Colorado Plateau predict a 10 °F increase in mean annual temperature by 2100 (Munson et al. 2011). A consensus of 22 models predicts annual temperatures to exceed the 1950 to 1999 range of variability by the 2030s, with spring precipitation declining by 11 to 45 percent by the end of the century (Krause 2015). These changes are likely to increase drought frequency, and severe droughts in the Colorado Plateau in the future could exceed any recently experienced (Seager et al. 2007).

These climatic changes are expected to adversely affect ESA-listed species and their habitats, including Mexican spotted owl (Gonzalez et al. 2018; 78 FR 61622, October 3, 2013). Climate change is likely to reduce owl distribution rangewide by increasing the prevalence of high-intensity wildland fire and through changes like increased temperature, changes in timing and amounts of precipitation, and related changes in vegetation community over time that reduce the ability of owls to persists in some areas (Wan et al. 2019; Salazar-Borunda et al. 2022). Studies have shown that high emission scenarios will result in the gradual and continuous loss of suitable bioclimatic space for owls in the Colorado Plateau EMU starting in 2030 (Salazar-Borunda et al. 2022).

3. Effects of the Action on Mexican Spotted Owl and Designated Critical Habitat

Based on geospatial models (Willey and Spotskey 1997; Lewis 2014), there are approximately 1,160 acres of potential habitat within the action area, which contains the project footprint plus a 0.5 mi buffer. The entirety of the action area (1,990.6 acres) is designated critical habitat for the species, although not all acres may contain the physical or biological features. The NPS has not delineated any PACs within the action area; however, there are 3 PACs within 2 mi of the action area (see Section 2.2.1., *Status of the Species in the Action Area*). The riparian vegetation along Oak Creek and the Virgin River in the action area contain the physical and biological features to support roosting and foraging for spotted owls, but likely not nesting.

The Project may adversely affect Mexican spotted owls and critical habitat through a range of mechanisms related to human presence, noise, surface disturbances, and vegetation removal or alteration. We anticipate that the primary effects of the Project to Mexican spotted owls would occur to foraging or roosting Mexican spotted owls. An increase in noise disturbance may affect owls from the three PACs in the vicinity of the Project and owls may experience localized disturbance of foraging and roosting habitat within the action area during construction. Additionally, there may be a reduction in prey availability during and in the period following construction until the action area revegetates.

Noise, like that produced by construction equipment, can mask biologically important sounds, such as mating call behavior and predator and prey sounds. Disturbance duration can vary from abrupt and brief (e.g., a single vehicle passing by) to extended disturbance (e.g., high traffic volumes on a busy holiday, or dispersed camping taking place within foraging habitat, etc.). Accordingly, species' response durations may also range from brief, immediate behavioral responses, such as alerting, to long-term responses, such as abandoning preferred habitat. When these stressors result in territory displacement, failure to initiate nesting, or increased

physiological stress, they negatively affect reproductive success of individuals and populations (Steven et al. 2011).

Disturbances associated with human presence and noise could also result in sub-lethal effects including elevated stress levels and reduced foraging time (Larson et al. 2016). If persistent, noise harassment and human presence could result in territory abandonment, thereby reducing reproductive success. Many animal species respond to human presence in the same ways they respond to predators (Suraci et al. 2019). These responses include increased stress and expenditures of time and energy towards vigilance and avoidance behaviors, and consequently decreased expenditures of time and energy towards beneficial activities like foraging, roosting, or caring for young (Steven et al. 2011; Ortega 2012; Shannon et al. 2016).

Infrequent, noise-producing activities are generally assumed to have relatively little long-term effect on Mexican spotted owls (USFWS 2012). However, owls will react to noise disturbances by changing behavior, such as flushing from their perches (Delaney et al. 1999a; Swarthout and Steidl 2001, 2003). The following studies show that noise has the potential to negatively affect Mexican spotted owls depending on noise levels and seasonal use:

- Delaney et al. (1999a) determined that the proportion of owls flushing was negatively related to distance and positively related to noise level.
- Pater et al. (2009) quantified the abovementioned and determined noises greater than 69 dBA had a higher probability of causing an owl to flush.
- Studies of Mexican spotted owl tolerance (resilience) to mechanical human disturbance and noise found that owls were fairly resilient to short-duration disturbance caused by overflight of helicopters and fixed-wing aircraft (Delaney et al. 1999b; Johnson and Reynolds 2002) and chainsaw operation more than 197 ft. from roosts (Delaney et al. 1999b). Closer chainsaw operations caused most owls to flush from their perches. This indicates some level of resilience of the species to human disturbance until close distance.
- The largest known populations of Mexican spotted owls in the Colorado Plateau EMU occur within National Parks (132 owl sites), where some PACs, including in Zion, support regular breeding pairs despite being in close proximity to heavily used hiking trails.

Due to the distance from core PAC areas to the action area, we anticipate direct noise disturbance is unlikely to affect breeding or nesting individuals. If owls were to utilize the action area for roosting, foraging, or dispersal it is possible individuals could be displaced from the Project area by the anticipated increased noise and human activity resulting from construction as well as reduced prey availability. For a more detailed review of noise effects to owls, see the Mexican Spotted Owl Recovery Plan (USFWS 2012).

Disturbance from the proposed action will occur on 23.13 acres of land, however not all of these acres contain the physical and biological features of Mexican spotted owl critical habitat. Of these acres, 10.42 acres will be temporarily disturbed and 12.7 acres will be permanently lost. The South Campground within the action area contains the most riparian vegetation and has the largest portion of tree removal. In total, about 147 trees (about 16 percent of trees in the campground area) will be removed. An additional 120 trees will be removed for road improvements (not in the riparian area). About 300 trees will be replanted in the South

Campground. As a result, this project will create a temporary loss of 267 trees until they reach maturity. No habitat within PACs will be altered. The net loss of foraging and roosting habitat will be about 12.7 acres. This is less than 1 percent of the available habitat at Zion for the species.

Components of the proposed action such as tree removal, soil compaction, paving, and heavy equipment operation will likely kill prey species of Mexican spotted owl (including woodrats, insects, etc.) and temporarily degrade prey habitat. This would reduce pretty availability, thus reducing owl feeding success. Prey populations are likely to return to preconstruction levels over several years after construction completion.

4. Cumulative Effects

Cumulative effects include the effects of future State, Tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

Cumulative effects to the ESA listed species under the Project would include, but are not limited to, the following broad types of effects:

- Increased recreational and economic use of non-federal lands within Zion as a result of travel access;
- Changes in land use patterns or practices that adversely affect a species' potential, occupied, or critical habitat, including encroachment of human use and/or development into those habitats; and
- Management actions by some, or all, of the following groups, on lands adjoining or upstream of NPS administered lands:
    - Tribal Nations
    - State of Utah
    - County governments in Utah
    - Local governments in Utah
    - Private landholders in Utah

Zion National Park contains private inholdings and is surrounded by a checkerboard pattern of land ownership including Federal, Tribal, State, and private landowners, where activities such as livestock grazing, human population expansion and associated infrastructure (increased trails, roads, and utilities) development, research, and recreation activities are expected to continue within the ranges of ESA-listed species (for more information, see the Zion National Park General Management Plan (NPS, 2001)). We expect many of these activities will continue on private lands and could contribute to cumulative effects to the species within the action area.

Across the entire Park, there is approximately 69,554 acres of potential habitat and 147,698 acres of critical habitat for Mexican spotted owl. Potential habitat in the Park occurs on Federal and private lands whereas critical habitat is only found on Federal lands. Activities associated with these cumulative effects have the potential to affect productivity with disturbances to breeding, nesting, and foraging behaviors and further fragmenting habitat of prey populations.

Other reasonably foreseeable activities occurring on State and private lands include land development, fire management, irrigation, and recreational activities. Implementation of these

activities will likely affect the environment through several mechanisms including water quality, water rights, and wildlife resources.

5. Conclusions

After reviewing the proposed action, the current status of species and its critical habitat, the environmental baseline within the action area, the effects of the proposed action, and the cumulative effects, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Mexican spotted owl or likely to result in the adverse modification of critical habitat for Mexican spotted owl. We base these conclusions on the following:

a. PACs include foraging and roosting habitat as well as core nesting habitat. Owls in Utah are believed to have large home ranges and may utilize the action area outside of nearby PACs for foraging, roosting, or juvenile dispersal. If owls were to utilize the action area for these purposes, it is possible individuals could be displaced from the action area by the anticipated increased noise and human activity resulting from construction as well as reduced prey availability.
b. Because baseline conditions within the action area are already heavily disturbed by human activity and existing facilities, particularly during the breeding season, it is unlikely that Mexican spotted owl utilize the area frequently.
c. The action area does not overlap with PACs, the edges of the three closest PACs are located 0.25 mi, 0.8 mi, and 0.9 mi, respectively, from the action area. Core nesting areas within PACs are over 2 mi from the action area. Due to the distance from core PAC areas to the action area, we anticipate direct noise disturbance is unlikely to affect breeding or nesting individuals.
d. Models indicate approximately 69,554 acres of potential habitat for the species in Zion, the action area contains approximately 1.6 percent of this potential habitat.
e. The applicant committed conservation measures stated in the BA, including timing restrictions on tree removal, would reduce the potential effects on Mexican spotted owl. If monitoring of Mexican spotted owl occupied habitat indicates that disturbance is occurring due to the proposed action, the NPS will implement appropriate corrective actions as identified in the BA.

We conclude, based on the reasons listed above, the sub-lethal effects of the action are not likely to significantly impair essential behavioral patterns to the point where it kills or injures owls, and that the Project may adversely affect the species, but does not rise to the level of take and that the action will not result in jeopardy to the species.

Mexican Spotted Owl Critical Habitat

a. The entirety of the action area (1,990.6 acres) is designated critical habitat. This represents 1.3 percent of critical habitat within Zion National Park (147,698 acres), and less than one percent of designated critical habitat within the CP-11 (260,105 acres), Colorado Plateau EMU (3.3 million acres) and of the total designated critical habitat for the species (8.6 million acres).
b. The Project will disturb approximately 23.13 acres of designated critical habitat, and 12.7 acres will be permanently converted to pavement and sidewalks; however, not all acres contain the physical and biological features of designated critical habitat. This loss accounts for less than 1 percent of critical habitat available for the species within Zion National Park and less than 0.01 percent of critical habitat within CP-11.

c. The Project will result in a temporary loss of 267 trees until replanted trees reach maturity. Approximately 147 trees within the South Campground area (which contains physical and biological feature of riparian habitat) will be removed during Project actions.
d. NPS will implement applicant-committed conservation measures as identified in the BA to reduce the effects on Mexican spotted owl designated critical habitat, including leaving larger woody debris on the ground and replanting about 300 trees to replace riparian vegetation lost during construction.
e. Over the long term, the proposed action will have beneficial effects on critical habitat by reducing the number of dead or dying trees, reducing nonnative plants that are prone to fire, and increasing woody debris and ground litter.
f. Best available information indicates that Mexican spotted owl critical habitat continues to support the needs of the species in Zion and across the range. The Project would temporarily affect prey base and riparian habitat through noise disturbance and the removal of trees and woody debris.

We conclude, based on the reasons listed above, specifically the relatively small proportion of critical habitat within the action area and the temporary effects to the physical and biological features within the action area that the proposed action would not appreciably diminish the value of the critical habitat for the conservation of Mexican spotted owl.

6. Reporting Requirements

Upon locating a dead or injured Mexican spotted owl or other ESA-listed species, initial notification must be made within one business day to our Office of Law Enforcement in West Valley City, Utah at telephone (435) 303-0490, our Ecological Services Office at telephone (801) 975-3330, and the Southeastern Regional office of the Utah Division of Wildlife Resources at telephone (435) 613-3700. This reporting requirement will allow our field office or the UDWR to collect and process dead individual if necessary to determine cause of death. Instructions for proper handling and disposition of such specimens will be issued by our Division of Law Enforcement consistent with the provisions of the Incidental Take Statement.

7. Terms and Conditions

In order to be exempt from the prohibitions of Section 9 of the Act, NPS must ensure that any activities associated with the proposed action comply with the NPS-committed conservation measures and species-specific NPS committed conservation measures described in the BA (NPS, 2023). No additional terms and conditions are necessary for this consultation.

8. Recommended Conservation Measures

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

We recommend incorporating the following recommendations into actions occurring at Zion National Park to assist with management, protection, and recovery of listed species and their habitats at the landscape and site-specific levels. Available recovery plans, conservation agreements and strategies, scientific literature, and other available information should

consistently be applied to occupied, suitable, and potentially suitable habitats of listed species. The following recommendations should be used in conjunction with available species-specific plans and literature and appropriately applied at the landscape and site-specific planning levels in a manner that ensures conservation and recovery of listed and sensitive species. In general, these guidelines should apply to listed and sensitive species habitats in areas of known and likely occurrence, particularly where recovery and conservation objectives have been identified by available species-specific plans.

The following recommended conservation measures have been provided to minimize the effects of recreation and noise disturbances to Mexican spotted owls. These conservation measures were identified in our 2012 Recovery Plan (USFWS 2012) and we recommend that the NPS implement them to the extent feasible:

1. Recreation Disturbance:
    a. The following guidelines apply to PACs during the breeding season, (1 Mar - 31 Aug). If non-breeding is inferred or confirmed that year per the accepted survey protocol, restrictions on noise disturbances can be relaxed depending on the nature and extent of the proposed disturbance (Swarthout and Steidl 2001, 2003).
    b. No construction of new facilities (e.g., trailheads, OHV trails) or expansion of existing facilities should take place in PACs during the breeding season. Any construction within PACs should be considered on a case-specific basis.
    c. Managers should, on a case-specific basis, assess the presence and intensity of currently allowed (permitted and non-permitted) recreational activities. The assessment should include distance, frequency, duration, and source of the disturbance. If recreation is determined to be a problem (e.g., increased OHV or hiking use), limit human activities during the breeding season in areas occupied by owls (timing may vary depending on local nest chronology). Disturbance here is defined as the presence of 1 to 12 people; group sizes exceeding 12 people should not be allowed. In areas where nest and roost sites are not identified, human disturbance should be limited to ≤ 2 disturbances per hour (averaged over a 24-hour period) throughout the PAC. Where nest and roost sites are known, disturbance should be limited to ≤ 2 disturbances per hour (averaged over a 24-hour period) within line of sight of the nest/roost sites. In some cases, disturbances may be avoided by routing trails and recreational uses (e.g., OHV use) outside of PACs through signing in order to designate zones free from human disturbances during critical periods.
    d. Seasonal closures of specifically designated recreational activities (e.g., OHV use, rock climbing, or biking) should be considered where disturbance to breeding owls seems likely.
    e. Conduct education through signing, interpretation events, access permitting, or other information sources to inform the public of proper and legal behaviors when encountering owls.

2. Noise Disturbance:
    a. The following guideline applies to areas within PACs during the breeding season (1 March to 31 August).

i. Managers should, on a case-specific basis, assess the potential for noise disturbance to nesting owls.
ii. Breeding-season restrictions should be considered if noise levels are estimated to exceed 69 dBA consistently (i.e., >twice/hour) or for an extended period of time (>1 hr) within 165 ft of nesting sites (if known) or within entire PAC if nesting sites are not known.

9. Re-initiation Statement

This concludes formal consultation on your Project. As provided in 50 CFR §402.16, re-initiation of consultation is required and shall be requested by the Federal agency or by the Service, where discretionary Federal involvement or control over the action has been retained or is authorized by law and:

1. If the amount or extent of taking specified in the incidental take statement is exceeded;
2. If new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered;
3. If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion or written concurrence; or
4. If a new species is listed or critical habitat designated that may be affected by the identified action.

If any of the four re-initiation clauses occur, any activities causing such take must cease immediately pending re-initiation. To re-initiate section 7 consultation, NPS should immediately notify our office by phone or email.

We appreciate your commitment in the conservation of endangered and threatened species. If you require further assistance or have any questions, please contact Danielle Costantini at Danielle_costantini@fws.gov.

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APPENDIX F. STATEMENT OF FINDINGS FOR FLOODPLAINS

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Zion Canyon South Entrance Redesign, Zion National Park

Statement of Findings for NPS Director's Order 77-2, "Floodplain Management," PMIS 240182

National Park Service
U.S. Department of the Interior

Recommended:

_____

Jeff Bradybaugh, Superintendent, Zion National Park Date

Certification of Technical Adequacy and Servicewide Consistency:

_____

Ed Harvey, Chief, Water Resources Division Date

Approved:

_____

Kate Hammond, Regional Director, Regions 6, 7, and 8 Date

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ZION CANYON SOUTH ENTRANCE REDESIGN (PEPC 104914)
ZION NATIONAL PARK

FLOODPLAIN STATEMENT OF FINDINGS

INTRODUCTION

Executive Order (EO) 11988, "Floodplain Management," and EO 13690, "Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input," require the National Park Service (NPS) and other federal agencies to evaluate the likely impacts of actions in floodplains. The objective of EO 11988 is to avoid, to the extent possible, the long-term and short-term adverse impacts associated with occupancy, modification, or destruction of floodplains and to avoid indirect support of development and new construction in such areas wherever there is a practicable alternative. EO 13690 was issued to establish a Flood Risk Management Standard for federally funded projects to improve the nation's resilience to floods and to ensure new federal infrastructure will last as long as intended. The NPS administers floodplain policy through Director's Order 77-2: *Floodplain Management* (DO 77-2) and Procedural Manual 77-2 *Floodplain Management* (PM 77-2).

It is NPS policy to preserve floodplain functions and values and minimize potentially hazardous conditions associated with flooding, including threats to human health/life, risk to capital (NPS) investment, and impacts on natural and beneficial floodplain values. If a proposed action is found to be in an applicable regulatory floodplain with associated impacts and relocating the action to a non-floodplain site is considered not to be a practicable alternative, then a formal floodplain "Statement of Findings" must be prepared. The "Statement of Findings" must (a) quantify flood conditions and associated hazards as a basis for management decision making, (b) describe the rationale for selection of a floodplain site, (c) disclose the resources and amount of risk associated with the chosen site, and (d) explain flood mitigation plans. The "Statement of Findings" will be available for public review and comment through the National Environmental Policy Act Environmental Assessment.

This Floodplain Statement of Findings:

- Quantifies the flood hazard associated with the proposed action.
- Presents the rationale for the development of proposed facilities within the regulatory floodplain of the North Fork of the Virgin River in ZION.
- Documents the anticipated negative impacts of these improvements on human health/life, capital investment, and floodplain functions and values.
- Presents mitigations to these impacts.

The NPS is proposing to redesign the South Entrance of Zion Canyon at Zion National Park (ZION). Visitor use in and surrounding ZION has grown steadily for many years. Recently, the demand for public access in the ZION region has increased exponentially, stressing existing infrastructure on public lands, trail systems, and the environmental resources

therein. The project would include realigning the road accessed from the South Entrance Fee Station to the Zion Canyon Visitor Center by adding two roundabouts, replacing the Watchman Campground Bridge, reconfiguring and enlarging the large vehicle parking lot, and expanding the ZION Shuttle Maintenance Facility and employee parking lot. Additionally, the project would address compliance with the Architectural Barriers Act (ABA) and Americans with Disabilities Act (ADA). The project components within the regulatory floodplain are described in more detail in the *Proposed Action* section.

LOCATION

The South Entrance to ZION (project area) is shown on Figure 1. The project area is about 3,930 to 3,980 feet above sea level. The natural sources for surface water hydrology are the North Fork of the Virgin River and Sammy's Canyon Wash, an ephemeral drainage that flows into the North Fork of the Virgin River.

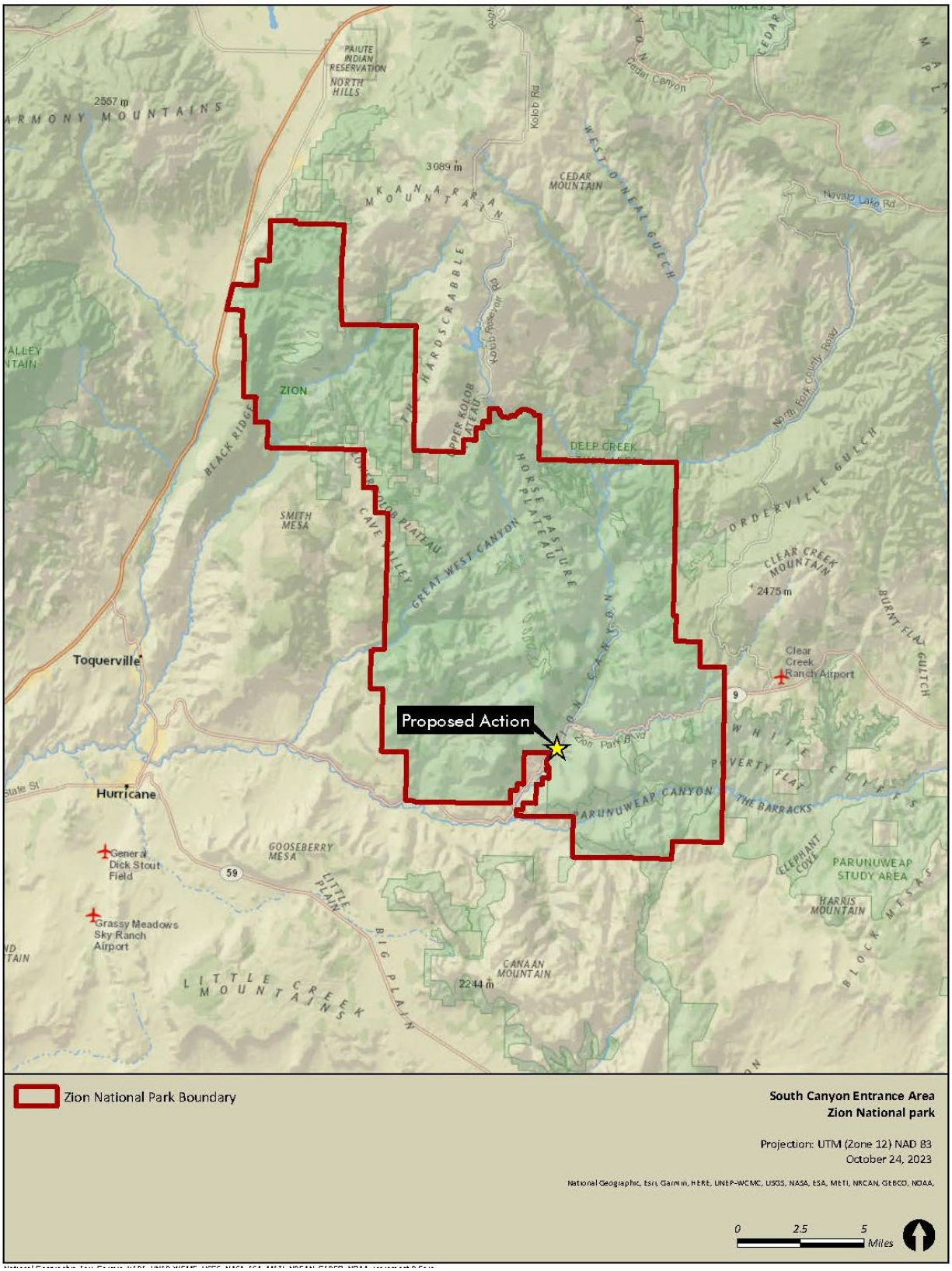

Figure 1. South Entrance and Visitor Center Road Rehabilitation

PROPOSED ACTION

Road improvements would be implemented at the South Entrance area to improve safety, reduce multimodal conflicts, and reduce traffic congestion. Road improvements would include the following proposed elements within the regulatory floodplain (Figure 2):

- Remove the existing Mission 66 vehicular Watchman Campground Bridge across the North Fork of the Virgin River.
- Construct a new vehicular bridge 60 feet upstream of the existing Watchman Campground Bridge location.
- Construct a concrete tread pedestrian underpass trail under the new bridge that connects to the Pa'rus trail running north-south along the east side of the Virgin River.
- Install rock rip rap embankment protection around the new underpass trail and the bridge abutments.
- Reconfigure and enlarge the employee parking lot.
- Pave the currently partially-paved shuttle bus parking lot.
- Reconfigure and enlarge the large vehicle parking lot.
- Grade all areas adjacent to the project area to connect to existing grades.
- Install culverts as needed.
- Plant and revegetate disturbed areas.
- Install bioswales for natural filtration of contaminants from all new and expanded parking areas.
- Reconstruct the old Watchman Trail alignment proximal to the large vehicle parking lot.

Access for construction would be from Zion-Mt. Carmel Highway. Access to the large parking lot and bus charging/employee lots would be disrupted during construction activities. Construction staging areas would include existing parking lots and previously disturbed areas (Figure 2).

The existing vehicle and pedestrian bridge across the river would be removed and the section of the river at the bridge would be restored. Portions of the existing road, large vehicle parking lot, employee parking, shuttle bus parking lot, and trails, would be removed and replaced by new infrastructure or removed as necessary.

Figure 2. Proposed Action

Grading would occur throughout the project area. Specifically, the new bridge would require extensive grading for installation and to connect adjacent roads and parking areas. The shuttle bus charging lot would require fill to meet grades and to tie into adjacent roads.

The total anticipated disturbance for the project would be about 11.8 acres, of which about 8 acres would be permanent and about 3.8 acres would be temporary. After accounting for currently paved areas that would be demolished and restored, there would be a net increase in paved area of about 2.5 acres. Of the 11.8 acres of disturbance, about 8.2 acres would be in the pre-project regulatory floodplain; however, the amount of impervious surface in the floodplain would decrease from about 3.1 acres to about 0.9 acre following construction, after accounting for the hydraulic changes that would happen because of removing the bridge. Revegetation would include placing topsoil and reseeding with native seed.

Equipment used would include skidsteers, graders, medium and large loaders, backhoes, trackhoes, trenchers, belly dumps, water trucks, compacters, concrete trucks, cranes, large dump trucks (material hauling), asphalt milling machines, paving machines, medium and large asphalt rollers, curbing machines, and various handheld medium and large power equipment (saws, drills, etc.). Pile drivers would be used for new bridge abutments. Standard work days and times are anticipated during construction.

Overall construction is anticipated to begin in fall 2024 and continue for approximately 24 months.

Bioswales would be installed for natural filtration of contaminants from all new and expanded parking areas. The bioswales would be designed as vegetated, shallow, landscaped depressions that would capture, treat, and infiltrate stormwater runoff as it moves downstream from the parking areas.

The shuttle facility improvements would include the following proposed elements (Figure 2):

- Pave shuttle bus parking lot.
- Construct a new administrative access road to access the shuttle bus charging and parking area, Shuttle Maintenance Facility, and employee housing area.
- Expand existing employee parking to include concessioner, partner, and NPS employee parking in a single location separate from visitor parking.
- Remove and revegetate existing Visitor Center employee parking.
- Add an accessible route from employee parking to the Visitor Center.

The existing Watchman Campground Bridge and abutments would be removed, and the river channel would be restored. The new four-lane bridge across the North Fork of the Virgin River would be designed to pass the 100-year flood, plus 2 feet of freeboard. The abutments of the new bridge would be outside the 100-year floodplain, as modeled, based on removal of the existing Watchman Campground Bridge (HDR 2023). The modeled 100-year floodplain elevation at the new bridge would be 3,924.30 feet (HDR 2023), and the 100-year floodplain elevation with 2 feet of freeboard would be 3,926.30 feet. The trail under the new bridge, parallel to the river, would be above the 10-year water surface (3,920.61 feet).

REGULATORY FLOODPLAIN

Following PM 77-2, three action classes were considered when determining the regulatory floodplain:

1. Class I Actions include location or construction of administrative, residential, warehouse, and maintenance buildings; non-excepted parking lots; or other man-made features which by their nature entice or require individuals to occupy the site, are prone to flood damage, or result in impacts to natural floodplain values.

2. Class II Actions, also referred to as Critical Actions, include any activity for which even a slight chance of flooding is too great such as construction of schools, medical facilities, emergency services, hazardous material storage, and records/collections storage.

3. Class III Actions include any action that involves human occupation or substantial human exposure in high hazard areas such as drainages subject to flash flooding.

This project proposes to place roads, parking lots, bridges and trails in the floodplain which are considered Class I Actions. While the North Fork of the Virgin River and Sammy's Canyon Wash is a high hazard area subject to flash flooding, this project does not propose human occupation or substantial human exposure, therefore, this project constitutes a Class I Action. The regulatory floodplain for Class I actions is the 1-percent annual exceedance probability flood, also referred to as the 100-year flood or the base flood (DO #77-2).

Additionally, following EO 13690, any proposed action that involves federal capital investment must include a Federal Flood Risk Management Standard (FFRMS). Per the Federal Emergency Management Agency's implementing guidelines for EOs 11988 and 13690, agencies may use a Freeboard Value Approach in establishing FFRMS flood elevations in areas where the 100-year base flood elevation (BFE) levels are known. This method adds 2 feet to the BFE for non-critical actions. Therefore, the regulatory floodplain for the proposed action is the 100-year flood elevation plus 2 feet. Post-construction flood conditions, including the regulatory floodplain, are described below under *Description of Site-Specific Flood Risk* and are shown on Figure 3.

Work on the bridge abutments would occur within the regulatory floodplain. In addition, the trail underpass below the new bridge, the large vehicle parking area, the shuttle parking lot, and employee parking lot are within or partially within the post-project regulatory floodplain. Portions of Highway 9, which provides access into and out of the South Entrance, are in the regulatory floodplain. Visitors to the project area frequently travel in and through flood hazard areas. The project area is on leveled land adjacent to the North Fork of the Virgin River and Sammy's Canyon Wash. A portion of the large vehicle parking area and most of the shuttle parking and employee parking areas are within the regulatory floodplain, both under current conditions and post-project. No existing or newly constructed buildings would be within the regulatory floodplain in the project area after the project is complete (Figure 3).

The existing floodplain in the project area was mapped in 2022 by Wood Environment and Infrastructure Solutions, Inc. (Wood 2022). North Fork Virgin River's peak flow values were determined by performing a statistical stream gage analysis using Bulletin 17C (Advisory Committee on Water Information, 2017) in the Hydrologic Engineering Center's Statistical Software Package (HEC-SSP) (Hydrologic Engineering Center (HEC), 2017) published by the United States Army Corps of Engineers (USACE). Annual peak flow data was downloaded from the United States Geological Survey (USGS) National Water Information System (USGS 2019) from the stream gage station on the North Fork Virgin River near Springdale, Utah (09405500). Hydrologic analyses of Sammy's Canyon Wash were performed using the 2D rain-on-mesh model developed in the Hydrologic Engineering Center River Analysis Systems Version 6.2 (Hydrologic Engineering Center 2022). This methodology applies a unit precipitation hyetograph to each mesh element within the study area. The model then estimates the amount of runoff lost due to infiltration and evaporation characteristics, creating an excess rainfall hyetograph for each mesh element. Using the unique hydraulic properties of each mesh element (i.e., roughness coefficient, volume vs. elevation curve, terrain profile of each mesh edge, slope, etc.) hydraulic routing is calculated through each mesh element to the next. This model was then used to calculate future flood elevations under the proposed design (Figure 4).

The modeled floodplain area would change dramatically when the proposed project is implemented (Figure 4). Existing infrastructure (Watchman Campground Bridge and the Sammy's Canyon Wash culverts) were dramatically undersized causing a damming effect which resulted in floodwaters backing up upstream. Under the proposed actions in this project, the Watchman Campground Bridge would be removed and replaced with a new vehicular bridge designed to convey the 100-year + 2 feet added to the BFE event resulting in a restoration of the river's natural floodplain. The Sammy's Canyon Wash culverts are proposed to be replaced in another project (PEPC 117719 Expand Bus Parking Area to Facilitate Electric Charging Stations, Zion National Park) designed to convey the 100-year flood event.

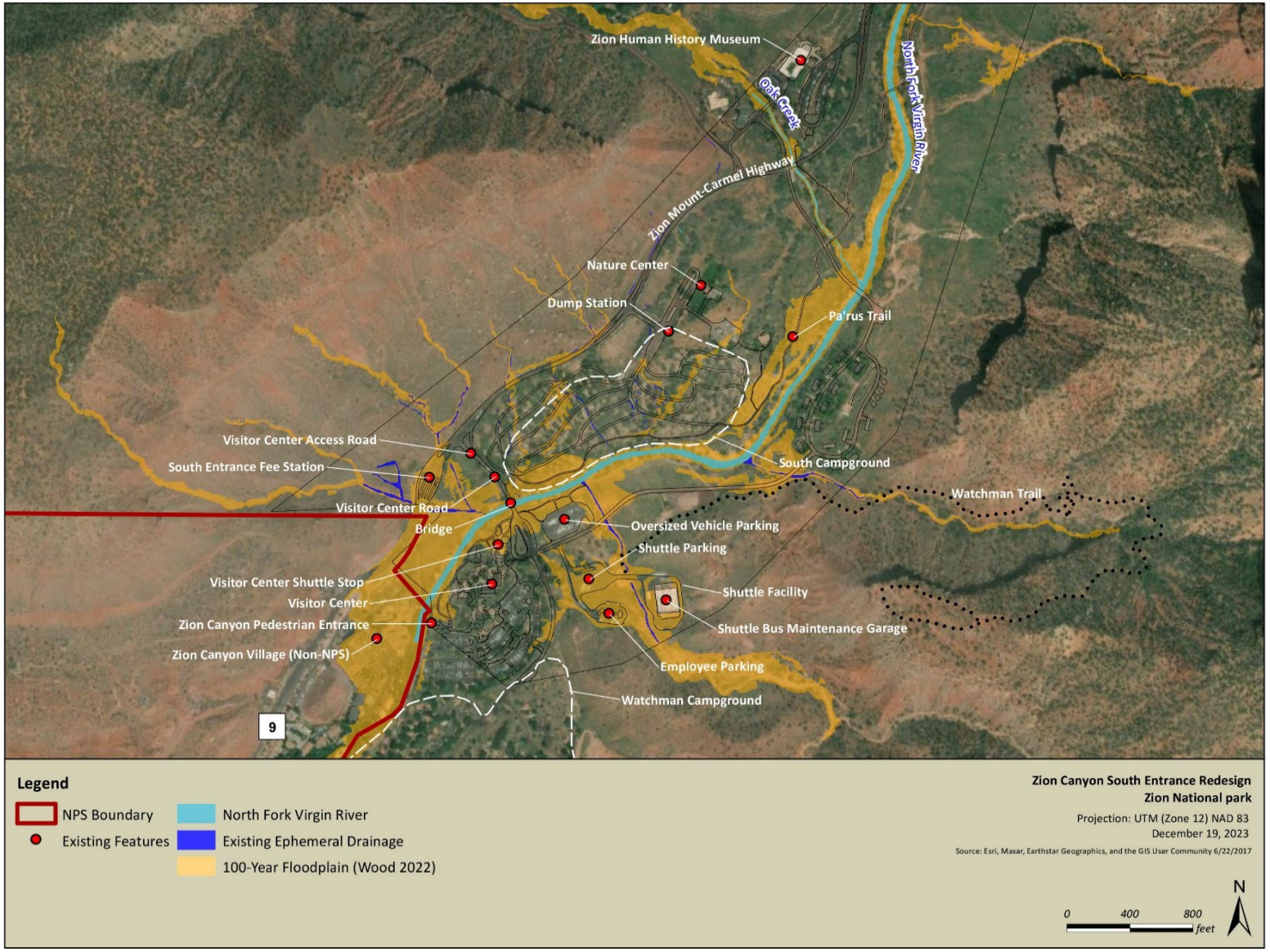

Figure 3. Project Area within Existing 100-Year Floodplain.

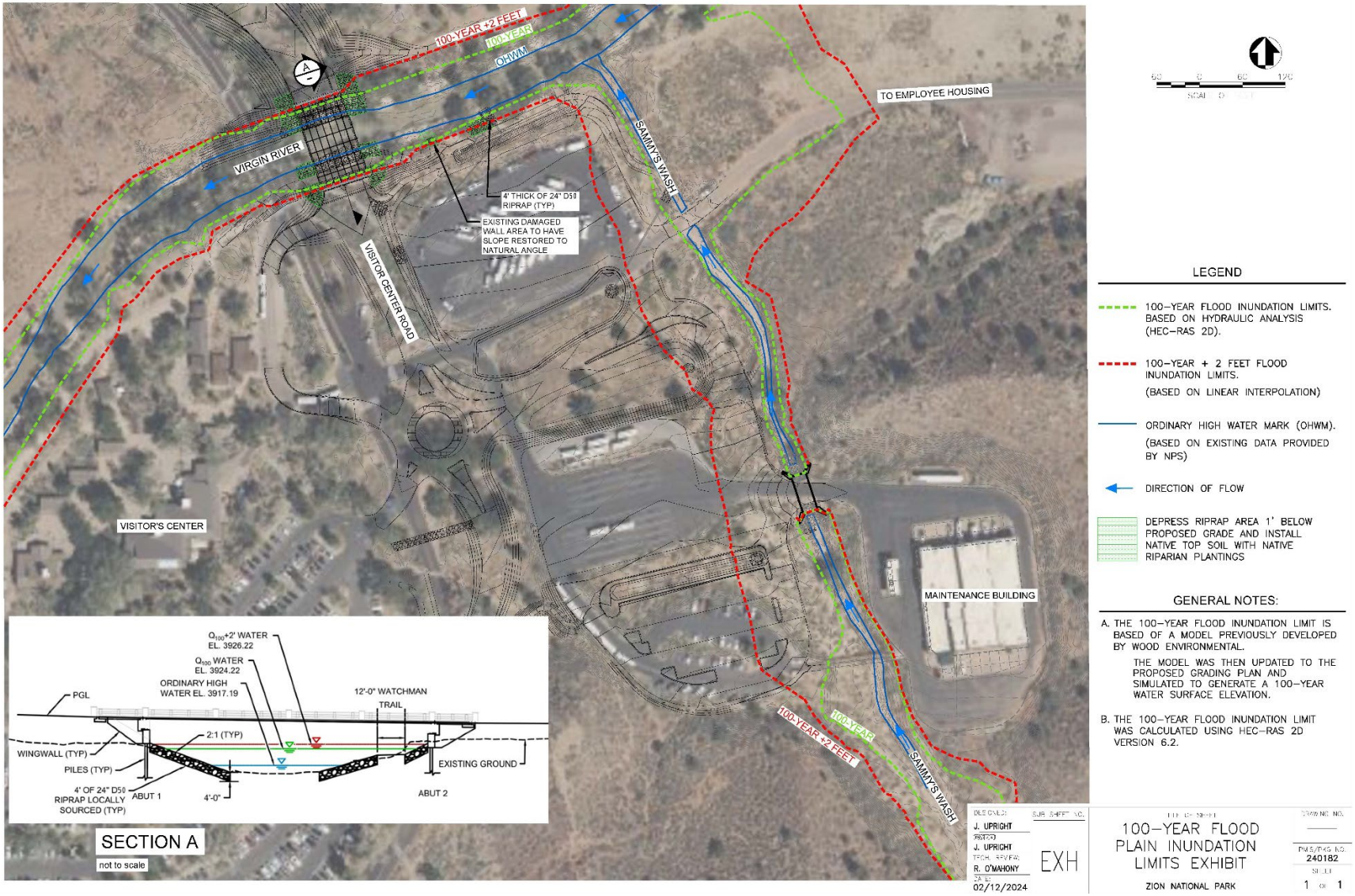

Figure 4. Project Area within Post-Project Regulatory Floodplain (100-Year plus Two Feet of Freeboard)

JUSTIFICATION FOR USE OF THE FLOODPLAIN

No practicable alternatives exist for locating the project outside of the regulatory floodplain because:

- The project area and associated floodplain have already been heavily disturbed by the existing infrastructure in the floodplain including the existing Watchman Campground Bridge, roads, parking areas, and trails. Alternative sites nearby are less disturbed, and moving these facilities out of the floodplain would result in impacts on nearby natural and cultural resources.
- Potential alternative sites outside the floodplain are constrained by steep terrain that is not suitable for construction without substantial grading and recontouring that would damage ZION resources.

INVESTIGATION OF ALTERNATIVE SITES

No alternative sites were identified that would entirely avoid locating project facilities in the floodplain. As described above under *Justification for Use of the Floodplain*, the existing bridge, roads, and parking areas are in or partially within the floodplain, and no practicable alternative sites exist for locating the project outside of the floodplain.

DESCRIPTION OF SITE-SPECIFIC FLOOD RISK

The watershed area that could contribute flows from the North Fork of the Virgin River at the project area is 354 square miles. Precipitation anywhere within this watershed has the potential to cause flooding along the North Fork of the Virgin River. The watershed area for Sammy's Canyon Wash is about 1 square mile. Flood risks associated with the proposed action include risk to human health and life and risk to capital investment resulting from damage to existing and expanded infrastructure. The post-project regulatory floodplain within the project area is shown on Figure 4.

Three types of floods typically occur in ZION: riverine floods, flash floods/debris flows, and sheet floods (Lund et al. 2010, 16-27). The project area contains areas subject to all three types of floods (Lund et al. 2010, 20). Riverine floods result from rapid melting of the winter snowpack or from prolonged heavy rainfall associated with major frontal storms, or from both conditions simultaneously. Flash floods can occur with little to no warning when sudden, intense, localized events occur in response to cloudburst rainfall that often accompanies convective monsoonal thunderstorms. Because cloudburst storms result from strong convective cells produced by differential atmospheric heating, flash floods are largely a summertime phenomenon in desert regions. Flash floods in ZION can affect both large perennial drainages and small ephemeral drainages. The North Fork of the Virgin River and its tributaries in the project area are subject to periodic flash floods (Lund et al. 2010, 17). Debris flows occur when flash floods contain large amounts of sediment, ranging in size from clay to boulders. Like flash floods, debris flows are fast moving. Because of their high density and high speed, debris flows are particularly dangerous to life and destructive to property.

Sheetfloods occur when a broad expanse of unconfined moving storm water spreads as a thin, continuous, and relatively uniform sheet over a large area and is not concentrated into well-defined channels (Lund et al. 2010, 18). Additional types of floods could occur from unintentional water release from water retention structures or from breaching of rockfall or landslide dams. These two types of floods would not necessarily be associated with precipitation events.

Destructive floods have occurred periodically in ZION, including in the project area. The history of flooding and flood risk in ZION is described in Lund et al. (2010, 16-27) and summarized below. The project area is, and has been, susceptible to flooding during 100-year flood events. Major floods in the project area included a flood in December 1966 that produced a maximum flow of 9,150 cubic feet per second (cfs) on the North Fork of the Virgin River just outside ZION near Springdale and a flood in January 2005 that produced a maximum flow of 5,450 cfs on the North Fork of the Virgin River near Springdale. In 1998, a flash flood and debris flow inundated the current location of the Zion Canyon Visitor Center and the shuttle bus maintenance facility. Lund et al. (2010, 21) estimated the 100-year flood discharge on the North Fork of the Virgin River at the Springdale gage at 9,020 cfs and the 500-year flood at 13,500 cfs. The flood study by Wood calculated the 100-year flood event flow in the North Fork of the Virgin River as 10,660 cfs at the South Entrance Visitor Center and the Sammy's Canyon Wash 100-year flow as 1,020 cfs at the confluence with the North Fork of the Virgin River (Wood 2022).

In recent years, floods in Zion Canyon included a flash flood in June 2021 when ZION received more than an inch of rain in one hour. This flood required temporary closure of the South Entrance and evacuation of visitors.

With removal of the Watchman Campground Bridge, restoration of the river channel, and construction of a new bridge with a longer span, the post-project floodplain along the North Fork of the Virgin River would be less constricted since the new bridge would have a longer span and elevated low chord height than the existing bridge. As previously described, the new four-lane bridge across the North Fork of the Virgin River would be designed to pass the 100-year flood, plus 2 feet of freeboard. The abutments of the new bridge would be outside the 100-year floodplain, as modeled, based on removal of the existing bridge (HDR 2023). Stream velocities and flow data for the proposed bridge are summarized in Table 1.

Table 1. Design Discharge Summary Calculated at Proposed Bridge.

Existing Bridge VIR070 Low Chord (feet) [According to Model] 3925.84 feet	U/S Face of PR Visitor Center Road Bridge				
	WSE (ft)		Flow (cfs)	Velocity (ft/s)	
Plan Name	Average	Max	Max	Average	Max
100-YR	3924.30	3924.30	10,748	11.1	18.0
50-YR	3923.19	3923.30	8,698	10.3	16.9
25-YR	3922.01	3922.17	6,754	9.5	15.7
10-YR	3920.61	3920.66	4,761	9.6	13.9

Source: HDR 2023.

Potential Risk to Human Health and Safety

Over the long term, the proposal would reduce risks to human health and safety from flooding by improving traffic circulation and improving egress from the east side of the Virgin River. As previously described, several roads and facilities in the project area are within the regulatory floodplain, including the roads providing access to the project area (Figure 4). Inundation of the roads leading to the new bridge is not expected during the regulatory flood event. The proposed action would generally reduce flooding in the project area and upstream in the South Campground by removing the existing Watchman Campground Bridge and replacing it with a new bridge with a longer span. In addition, by improving vehicle and pedestrian access and circulation at the South Entrance, the proposed project would allow more rapid evacuation of the area in an emergency, such as a flash flood. The new bridge across the North Fork of the Virgin River would have four lanes and would allow more rapid evacuation than the existing two-lane bridge. There exists adequate escape terrain east and west of Sammy's Canyon Wash and the north and south of the North Fork of the Virgin River to quickly move people out of the course of floodwaters during an event.

Guided by Homeland Security Presidential Directive 20 and National Security Presidential Directive 51, ZION has established a Continuity of Operations Plan (COOP) which identifies steps to be taken in an emergency situation to minimize disruption to essential functions and return the park to normal operations as soon as possible. The COOP would be activated in case of flooding in ZION. Continuity of operations planning aims to identify risks, institute preventative mechanisms, and develop measures to deal with consequences when prevention fails. The COOP is a flexible, structured common sense approach to outline the prudent actions relevant to any adverse situation that could arise, but specific to each individual park's needs and the severity of the crisis. The COOP covers evacuation planning for Zion Canyon, including the site of proposed development in Sammy's Canyon Wash and the North Fork of the Virgin River.

Because flood events in Zion Canyon could affect a wide range of visitor and administrative facilitates (lodge, visitor center, multiple campgrounds, trails, roads and bridges), and involve rapid changes and developments in what areas are impacted, an Incident Command structure will be utilized in order to be responsive to evolving conditions. As directed by the Incident Commander, Zion National Park rangers on scene will notify individuals utilizing daytime parking facilities and trails located in the floodplain of impending conditions if information and time allows and will direct evacuation timing and path as dictated by best paths open at the time of the event. In some cases, users may be directed to shelter in place until conditions permit evacuation. This project area is located in the frontcountry of the park with good access to communications and timely weather and reporting data.

The COOP also includes information on communication and agreements with local government entities outside of the park to ensure that evacuation and flood response is coordinated and shelter or evacuation instructions to park users are consistent with conditions including road closures in the surrounding area.

The proposed action includes an underpass with a pedestrian and bicycle trail beneath the bridge, parallel to the river. The trail would be at an elevation above the 10-year water surface

elevation but would be subject to periodic flooding and would be within the regulatory floodplain. People using the underpass during a flood event could be exposed to flood hazards. This risk would be mitigated by installing signs warning visitors of the flood dangers and to not enter during active flooding. Despite the reduction in the floodplain from existing conditions due to the removal of undersized bridges and culverts, portions of the shuttle bus charging area, employee parking lot, large vehicle lot, and Watchman Trail would be located in the post-project floodplain and humans located in these areas would be exposed to flood hazards during a flood event. The park would place warning signs at the entrance to the shuttle bus charging/parking area and the large vehicle lot to inform visitors and staff of the flood hazard. However, even with these mitigation measures, the risk to human life and safety cannot be eliminated.

Potential Risk to Property

The proposed project would construct infrastructure within the regulatory floodplain. Most of the facilities would be constructed at or near existing grade and would not increase the flood elevation.

As previously described, the new bridge across the North Fork of the Virgin River and the abutments of the new bridge would be outside the regulatory floodplain, as modeled, after accounting for removal of the existing bridge. The newly constructed trail under the new bridge would be within the regulatory floodplain. Although the trail under the bridge would be within the floodplain, the trail would be designed to have limited hydraulic effects on the river during flood events. Additional infrastructure located in the post-project regulatory floodplain would include portions of the large vehicle parking lot, shuttle charging area, employee parking lot, and a section of the Watchman Trail. All structures and facilities would be designed to be consistent with the intent of the standards and criteria of the National Flood Insurance Program (44 CFR Part 60). With these design features, the new infrastructure would be resilient to flood damage, and no increased risk to property is expected compared to existing conditions; however, risk to property cannot be eliminated.

Potential Risk to Floodplain Values

The North Fork of the Virgin River floodplain is adjacent to the river and serves important functions such as reducing flood risks downstream by absorbing and storing excess water during flood events, improving water quality by filtering contaminants during flood events, providing habitat for plants and animals, and recharging groundwater aquifers. The floodplain natural values in the project area have been altered by human activities such as construction of the bridge and parking areas. Modifications of the floodplain have resulted from construction of drainage swales and irrigation ditches, and construction of infrastructure, such as roads. Past construction and proposed improvements in the South Campground resulted in increased impervious surface adjacent to the project area.

The floodplain would be negatively impacted during construction due to the presence of staging areas, construction equipment, and materials in the floodplain and possible erosion from bare soils prior to revegetation. However, construction activities would be monitored, and erosion and sediment control best management practices would be implemented to

minimize erosion and sediment movement. Disturbed areas would be revegetated following construction with native species.

Impervious surface in the project area would increase following construction. Impervious surfaces in the project area would increase from about 5.5 acres to about 8 acres, a net increase in impervious surface of about 2.5 acres. Although the overall impervious surface in the project area would increase, the amount of impervious surface in the modeled floodplain would decrease after construction, after accounting for removal of the existing bridge. The amount of impervious surface in the floodplain would decrease from about 3.1 acres to about 0.9 acre following construction. Land cover changes would result from increased impervious surface, soil compaction, and changes in existing drainage patterns. Changes in land cover could alter the hydrology of the project area and increase the volume of runoff. Impervious areas also collect pollutants, which are then mobilized after rainfall and potentially transported to streams or other waters. Decreasing impervious surface in the floodplain would benefit floodplain functions and values by increasing flood storage capacity and the ability of the floodplain to recharge and infiltrate stormwater. To reduce the risk of pollutants entering waterways, fuel storage and hazardous waste storage during construction would be at least 3 feet above the regulatory floodplain elevation.

FLOODPLAIN IMPACT MITIGATION MEASURES

The following floodplain impact mitigation measures would be implemented:

- The COOP would be activated in case of flooding in ZION. As previously described, the COOP covers evacuation planning for Zion Canyon, including the site of proposed development in Sammy's Canyon Wash and the North Fork of the Virgin River
- To reduce the risk of exposure to flood hazards, warning signs would be placed on the trail approaching the underpass under the new bridge, warning visitors not to use the underpass during flood conditions.
- To reduce the risk of exposure to flood hazards, warning signs would be placed at the entrance to the shuttle bus charging/parking area and the large vehicle lot to inform visitors and staff of the flood hazard.
- To reduce the risk of pollutants entering waterways, fuel storage and hazardous waste storage during construction would be at least 3 feet above the regulatory floodplain elevation.
- Structures and facilities would be designed to be consistent with the intent of the standards and criteria of the National Flood Insurance Program (44 CFR Part 60).

SUMMARY

The NPS has determined that implementing the proposed action would restore the flood capacity and conveyance of North Fork of the Virgin River that would result in a net reduction of risk to human health and safety, property and floodplain values. Risks to life,

property, and natural resources from flooding can be mitigated. Bioswales designed to collect runoff from developed surfaces would be installed to reduce impacts to water quality. Necessary adverse floodplain impacts would be reduced to the greatest extent practicable while meeting the design requirements and operational needs of the project area. With the proposed mitigations applied, the NPS finds that the proposed action would have minor adverse impacts on floodplains and their associated values due to increased impervious surface in the valley bottom.

REFERENCES

Executive Order 11988, "Floodplain Management." 1980. Executive Order of the President of the United States. May 28.

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APPENDIX G. WILD AND SCENIC RIVER MITIGATION MEASURES

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APPENDIX I: EXAMPLES OF BEST PRACTICES AND REQUIRED MEASURES FOR BRIDGE CONSTRUCTION, REMOVAL AND/OR REPLACEMENT

Best practices for bridge removal, replacement, refurbishing, or new construction depend on the project scope (area of impact, including staging areas), project timing and duration, and WSR values that may be affected. However, there are a number of commonly used best practices that can be implemented to avoid, eliminate, reduce, or minimize impacts to WSR values and render a "will not have a direct and adverse impact" finding. (See Chapter 3, Understanding and Implementing Section 7).

The Section 7 determining agency may reasonably request, and project proponents are responsible to provide, sufficient information to inform a well-reasoned and technically supported determination. At a minimum. project proposals should include the project start date, construction sequencing/phases, bridge dimensions, number of piers, location of staging areas, design features (decking; abutments/materials; rail design; lighting; signage), hydrological and hydraulic data, as well as proposed measures to avoid or minimize harm. It is strongly encouraged that resource advisors or environmental inspectors who are familiar with the WSR values and all required avoidance and minimization measures attend pre-construction meetings and are on-site during construction. Consistent practice with respect to similar projects across regions not only strengthens the effectiveness of determinations in protecting and enhancing WSR values, but also provides clear and reasonable guidance for project proponents.

Examples of best practices and required measures are provided below for each phase of the project. River managers may incorporate best practices into Section 7 determinations, as appropriate, for bridge construction, removal, and/or replacement projects. However, required measures are those measures that are necessary for proper evaluation of the proposed project.

1. Project Coordination

Best Practices

Project Coordination is a critical component of a successful Section 7 determination process. Interagency coordination should occur early, and then as necessary throughout the process, to ensure WSRA compliance and avoid last minute changes or project delays.

It may also be necessary to recruit a representative partner at meetings that the NPS is not able to attend. Often a fellow DOI Agency with mutual interest in the project (ex. USFWS) or a state river manager, (e.g., DNR) in the case of a 2(a)(ii) river.

For complex projects or those that could have significant impacts, consider establishing an interdisciplinary team or request technical assistance from the appropriate regional and/or national support office (e.g. engineering specialists; hydrologists in the NPS Water Resources Division, geologists in the NPS Geologic Resources Division).

Conducting interdisciplinary on-site planning meetings and project reviews with project planners and equipment operators is strongly recommended to ensure all parties involved have a complete understanding of the project requirements, definitions and conditions.

It is often helpful to request that the project proponent provide copies of engineering plans and specifications following the completion of each major design phase (eg., 30%, 60%, 90% of project

completion). While a preliminary Section 7 determination may be made based on conceptual plans, the final Section 7 evaluation and determination should be based on a review of engineering plans that are nearly (at least 60%, but preferably 90%) complete.

Section 7 determinations should recite required measures and additional provisions that must be met to satisfy the determination, including language that requires the completed project to be consistent with the project plans evaluated on a specific date and identified with a specific title so that there is no ambiguity or misunderstanding. It may also be helpful to seek inclusion of similar language in engineering plans (eg., in the general or construction notes sections) or supplemental specifications, as well as in any other required permits such as USACE Section 404 permits. Such inclusion ensures that the contractor submits bids and performs construction with full understanding of, and compliance with, the required measures.

Required Measures

- The project proponent must provide NPS with an approved and complete project plan set, including any appropriate special provisions or supplemental specifications, along with all design and engineering plans.
- NPS must be notified of any proposed changes to the project package originally submitted for evaluation, such as the plan set, special provisions, construction methods, or schedule for instream work. Any such changes require consultation with NPS before the work proceeds, and may require additional Section 7 review and approval. The project proponent may be required to undo or change any construction that was not part of the approved package.
- NPS must be notified and invited to all pre- and post-construction agency coordination meetings, including final site inspections.
- NPS must perform project plan reviews, comment on preliminary project construction plans, and monitor on-site construction activities. Site visits and on-site construction reviews are required to identify maintenance needs and chronic problems that may be occurring.
- Remedial actions must be implemented in a timely manner.
- A pre-construction meeting with equipment operators must be held prior to project commencement to discuss project requirements.
- NPS must be promptly notified of accidents and/or failures of project features intended to protect the free-flowing condition, water quality, or ORVs during construction activities.
- The project proponent must submit a post construction report to the NPS within 90 days of project completion. The report should include a set of before and after pictures along with a written summary of the project, any complications or challenges, and any solutions or deviations to plans.
- The NPS must complete a post-construction follow up and completion report in a timely manner. Any practice failures will be remedied at this time. There is a performance warranty period of 2-5 years after the completion of the project.
- NPS must provide the project proponent with a formal approval or denial of the project. An example of the language to include is as follows:

  "The National Park Service has determined on behalf of the Secretary of the Interior, pursuant to Section 7 of the Wild and Scenic Rivers Act, that the proposed project would not have a direct and adverse effect on the free-flowing condition, water quality or outstandingly remarkable values of the [*insert WSR name*], provided that the project is constructed consistent with the [insert project proponent name] plans entitled [*insert project title*] dated *[insert date*], and that the avoidance and minimization measures and actions cited below are fully and properly fulfilled, for the duration of the project [*insert list of avoidance and minimization measures and conditions*]."

2. Preconstruction Studies

Best Practices

It is often necessary and appropriate for NPS to request additional information in the form of pre-construction studies, (e.g., geotechnical, biological, or recreational studies, etc.). It is the responsibility of the project proponent to provide the necessary data for the evaluating agency to make an informed determination.

Baseline inventories of ORVs and aquatic and terrestrial resources will better inform the project planning and design process.

For areas supporting federally or state listed species, informal and/or formal consultation with the USFWS and/or state resource management agencies may be necessary.

Required Measures

- Appropriate biological inventories of aquatic (e.g. fish, mussels) and terrestrial resources may be required prior to project startup. Avoidance measures must be developed in consultation with the NPS. Cultural resources inventories may also be required in order to comply with Section 106 of the National Historic Preservation Act.
- Relocation of mussel species is required where in-stream work cannot be avoided within reaches of known mussel populations. USFWS and/or state resource agencies must be consulted to ensure any established mussel relocation protocols are followed.
- Appropriate geotechnical, hydraulic, visual resource, and auditory, other project-specific resource studies may be required prior to project start. Avoidance measures must be developed in consultation with the NPS.
- Appropriate hydrologic/hydraulic information (including scour depth analysis) may be required to accompany or be included in all design and engineering plans for the project.

3. Notification to River Users

Best Practices

Instream work can pose a safety hazard to river users. It is important to warn the recreating public of any temporary hazards associated with the construction activity and provide instruction on how to safely avoid an unsafe situation.

Required Measures

- Boating (canoe/kayak or other) shall be safely maintained throughout the duration of the project either through the existing river channel or through a temporary portage trail. The trail should be approved by NPS and other agencies as necessary. Construction during peak recreational season must be avoided unless otherwise authorized in writing by the NPS and/or other recreation agency. Avoidance measures must be developed in consultation with the NPS.
- Press releases shall be issued to local media prior to project implementation and signs must be provided to recreational river users and canoe livery operators, advising users of closures and/or portage routes and their effective dates.

- A portage route must be maintained around the site during construction and removed, (and the site restored to its original condition) upon project completion. Any exceptions to this condition must be approved by the NPS and/or other recreation agency prior to project implementation or as may be necessary during project construction. Signage announcing the temporary portage will be removed at project completion.

4. Erosion Control

Best Practices

Water quality management is delegated to state and local resource agencies. Erosion control often falls to local zoning, conservation commissions, and NPDES permits or Section 401 water quality certifications under the Clean Water Act. By coordinating with the appropriate agencies and including specific conditions about sediment erosion control, effective protections for riverine health can be implemented.

Required Measures

- An erosion and sediment control plan must be developed for the site and remain on site for the duration of the project. Particular attention shall be given to any drainage ways, ditches and streams that could convey sediment laden water directly to the [*stream name].* Appropriately designed rock-check dams and other erosion controls shall be utilized in ditches and drainage ways.
- A phased construction schedule must be utilized to minimize open areas and reduce the potential for erosion. Temporary vegetative cover must be used to stabilize areas that are not subject to active construction. Any exceptions to these conditions must be authorized by the NPS in writing or otherwise made part of this determination.
- Appropriate sediment/storm water controls must be installed prior to grading or other land disturbing activities.
- Properly installed (framed and entrenched) silt fence shall be properly installed around the work site perimeter and storm water inlets.
- All erosion control devices shall be inspected daily and properly maintained until final site stabilization is achieved. Accumulated sediment shall be cleaned out of erosion control devices, and worn-out or deteriorated materials must be replaced on a regular basis.
- All sediment and erosion controls shall be removed upon stabilization of the project area with vegetation.
- Straw bales shall not be permitted as a form of erosion control.
- All denuded areas, including ditches, culverts and river/stream banks, shall be permanently seeded [*inset recommended or approved seed type/source*] and mulched (or covered with fiber mat material) immediately upon completion of earthwork or temporarily seeded and mulched (or covered with fiber mat material) within seven days if the area is to remain idle for more than thirty days.

5. Construction Equipment/Staging Areas/Work Site

Best Practices

A majority of impacts to the river that are attributed to construction activities can be avoided by maintaining a tidy site. Proactive site management minimizes the potential for unintended consequences.

Standard best practices include scheduling to avoid sensitive periods, biological monitoring, erosion and sediment control, and revegetation.

Required Measures

- Litter and construction debris shall be contained daily. Construction and/or worker generated debris/garbage must be contained on site in properly covered containers; daily clean up must be performed to prevent materials from entering the river.
- All construction equipment must be inspected daily for hydraulic and fuel leaks, and repaired as necessary. When not in use, idle equipment, petrochemicals and toxic/hazardous materials shall be locked and may not be stored in the 100-year floodplain or near any drainage ways, ditches or streams; discharge of petroleum products, cement washings, or other construction materials into the river is not permitted.
- All fueling operations, lubricating, hydraulic topping off, fuel tank purging, and equipment maintenance/repairs shall be performed at an upland site outside of the one-hundred-year floodplain. These activities shall take place on an approved pad with spill control/collection devices in place. The use of canola oil or other biodegradable fuels and fluids is recommended when working in sensitive riverine environments.
- Appropriate oil spill kits shall be maintained on site and readily accessible at all times during construction and each operator trained in its use.
- No wastewater shall be discharged into the river.
- Prior to moving construction equipment into the project area, the contractor must take reasonable measures to ensure that each piece of equipment is free of soil, seeds, vegetative matter, or other debris that may contain seeds of non-native invasive species (consider including aquatic if equipment will be used in-stream).
- All tools, equipment, barricades, signs, surplus materials, and rubbish from the project work limits shall be removed upon project completion. All construction debris and litter must be completely removed off site and disposed of properly upon completion of the project.
- All debris, excess fill material and material excavated shall be disposed of at an approved upland location (above 100-year flood elevations). Disposal in wetlands, floodplains or within 1000 feet of the [*insert river name*] is prohibited.

6. Bridge Rehabilitation/Restoration/Removal

Best Practices

The goal should be to minimize the number of piers in the river to enhance fish, wildlife, and recreational user passage. Pier designs that incorporate or mimic the surrounding landscape will decrease the visual impact of the structure.

Location and timing of construction activities are important and streams should be crossed at the point and time least damaging to fishery and aquatic organisms and generally at right angles.

Rural broadband cables can be problematic if placed below the OHWM. Cables can be screwed (using ¾" screws) to the underside of a bridge crossing or other existing river spanning infrastructure to lessen the scenic impact and eliminate the need for trenching the cable under the river.

Required Measures

- If painting, sand or water blasting any portion of the bridge is necessary, appropriate aprons shall be utilized to provide for complete containment of all paint, and/or sealant over-spray particles and other debris during bridge removal, installation, or maintenance operations.
- Fire retardant, termiticide and insecticide/fungicide shall be applied to new and reused wooden bridge members outside of surface waters or wetlands.
- Aprons, tarps, shrouds, and/or other containment devices must be in place during bridge demolition, bridge maintenance, bridge construction and/or bridge surfacing activities to capture falling debris, paints, welding slag, sealant overspray, asphalt deck materials, or other debris. All concrete chunks, asphalt, grindings, concrete materials, wood, rebar, and other debris generated during demolition or construction that enters the river shall be immediately removed and taken to an appropriate disposal facility outside of the floodplain.
- All concrete chunks, asphalt, grindings, concrete materials, wood, rebar, and other debris generated during demolition or construction that enters the river must be immediately removed from the river and taken to an appropriate disposal facility outside of the floodplain.
- The old bridge, abutments, pier(s) and foundation must be removed entirely [*or cut to X feet below the river bed surface*] and river bed/features restored to preconstruction condition. No rebar or other structural remnants that pose a danger to paddlers and other river users shall remain.
- Replacement bridges that are designed to span the river (no piers in the water) are preferred. At minimum, replacement bridge design shall result in the elimination or reduction of instream piers with no net addition of piers.
- No net gain of transportation corridors is required unless otherwise agreed to in writing. All approaches, abutments must be returned to preconstruction condition. Bed, banks, corridor and corridor must be restored and no net loss of floodplain is required unless otherwise agreed to in writing.

7. Work Pad/Causeway/Culverts

Best Practices

It is important to maintain a river's hydraulic capacity and geomorphology throughout the project area. Work pads, causeways, and culverts should not overly constrict the flow of the river.

Required Measures

- One to two temporary causeways/work pads may be used provided they do not occupy more than one-half the river channel at any given time. The use of barges or docks is preferred if conditions allow. Temporary causeways/work pads must be completely removed in a timely manner, and natural channel conditions must be fully restored.
- Work platforms (causeways; work pad) shall be kept to the absolute minimum size needed to facilitate in-stream work. In-stream work shall be conducted through the use of water diversions made of clean/rinsed quarried stone of appropriate size and not requiring the placement of earthen fill (sheet piling, membrane dams, etc.) wherever possible. Additional requirements include:
  - Causeway(s) must be placed on top of an appropriate number of open culverts of sufficient diameter and numbers to pass a sufficient flow to handle minor storm events. A [*insert X minimum diameter opening*] is required.
  - Culverts must be designed to allow fish passage and must be orientated parallel to normal stream flow.
  - Culverts must not pose a safety hazard to river users.

  - Culverts must provide for a natural streambed under the structure, either by using a bottomless structure or by recessing the culvert bottom below the stream bottom a sufficient depth into the stream bed to avoid disrupting fish passage and to maintain natural flow and other river functions.
  - Culverts devices must be clear of debris and fully functioning throughout the duration of the project.
  - The causeway must be removed prior to [*date of average high flow period or critical fish migration period*].
  - The riverbed underneath the causeway must be returned to its pre-construction contours, elevations, and substrate sizes and types.
  - All motorized equipment operations must be conducted from the causeway; machinery is not permitted to operate from within the riverbed.
- Work area isolation (sheet piling, bladder bags, solid barriers or coffer dams) must be implemented prior to any streambed excavation unless it can be demonstrated that work area isolation will cause more resource harm then the excavation activity.
- Existing in-stream flows must be maintained through the causeway(s) using culverts sized to pass a flow equal to 150 percent of existing flow to account for minor storm events. No more than [*insert amount based on stream conditions*] cubic yards of clean, non-erosive rock material may be used to construct the causeway. This rock material must be free of any fines, clay or silts and of sufficient size to prevent movement downstream.
- All appropriate measures must be in place to minimize sedimentation and streambed impacts prior to initiating in-stream work. All in-stream work must be kept to a minimum and be conducted between the low flow/low precipitation periods for the area [*insert date range*]. In-stream construction work may not be conducted when flows are greater than a 1-year flow or if excessive turbidity is observed.
- Concrete, broken concrete (with or without rebar), asphalt, slag, or other such material for the causeways, abutments or piers is prohibited.
- Commercial rip-rap should be avoided or otherwise kept to the absolute minimum amount needed to prevent scour and shall consist of clean rock only (free of any toxic or fine material). Native field stone from the area should be used whenever possible. All fill material used as rip-rap, work platforms or cofferdams shall be a minimum of three inches in diameter and be washed to remove fine particulate matter (clay, silt, sand and soil).
- Rip rap and stone fill shall conform to specifications as set forth in [*insert reference to appropriate federal/state standard specifications; include section number*], and shall only be used as scour protection around abutments/piers, not to armor the river channel.
- The causeway culverts and temporary rock pads must be completely removed to channel bottom immediately upon completion of in-stream work and disposed of at an appropriate upland site out of the 100-year flood plain and out of view from the river. To minimize soil compaction and turbidity, culverts and causeway rock may not be removed during rain events.

8. Abutments/Piers (bridges that span the rivers are preferred)

Best Practices

Bridges that span the river channel without the use of piers better maintain a river's hydraulic capacity and geomorphology, and are the preferred approach.

If in-stream piers are proposed, a net reduction of in-channel piers is preferred and, at minimum, the project should not further disrupt the free-flowing condition of the designated river as existed prior to the project implementation.

Required Measures

- Concrete, broken concrete, slag, or other such material for protection of abutments or piers is prohibited.
- No more than [*insert maximum limit*] cubic yards of rock channel protection (RCP) may be placed within the river below the Ordinary High Water Mark (OHWM) elevation to protect the new abutments and minimize scour. If rock riprap is necessary, the rock must be of a similar size, shape, and color as that found in the immediate area of the project where feasible to minimize visual impacts.
- Piers must be orientated in a manner that will reduce restrictions on the existing river flow (discharge, direction, velocity) and not significantly alter flows or the location of the thalweg.
- Channel modifications associated with pier and/or abutment must be avoided and the stream banks/bed must be returned to pre-construction elevations and contours using the existing natural substrate such that the amount or timing of the flow in the channel are not significantly altered from pre-construction condition and the thalweg alignment upstream/downstream of the bridge is maintained.
- The width of the streambed must not be altered (*see Section 3.2.6 Stream Channel Stabilization and Restoration*).
- Rock weirs or other such diversions may not be established.
- If dewatering is necessary, downstream flows must be maintained. Pumps or flume diversions may be necessary to prevent interruption of downstream flow. Water must be filtered to remove excessive sediments (must meet state discharge guidelines) and must be discharged onto an energy-dissipating device (e.g. splash pup, concrete weight, or equivalent) to reduce discharge velocity/prevent scouring of the riverbed or adjacent banks.
- Sediment control measures (e.g. sandbags, aqua-barriers, or other coffer dam structures) must be in place to prevent a release of turbid water into downstream areas.
- Fish or mussels trapped in the dewatered area must be appropriately collected and properly relocated to a downstream section of the river that will promote their safe recovery. Fish/mussel capture/release must be conducted by a designated/qualified individual (on-site biological monitoring staff). Emergency capture/release of fish/mussels may be conducted by any on site staff if the situation warrants it.

9. Bank Protection

Best Practices

The use of native boulders and cobbles along with native planting and bioengineering will best achieve the desired natural appearing and functioning river bank after construction is complete.

Required Measures

- Minimize the use and visibility of rock channel protection (RCP), and use only the minimum amount necessary to protect structures. Integrated plantings, soil, and native seed may be used to further reduce the profile of visible rock.
- If necessary, stone fill (riprap) may only be used for abutment scour protection; the use of stone fill to stabilize the riverbanks is prohibited. To stabilize the riverbanks, use approved native boulders, cobble and gravel; loam; vegetation; and bio-engineering techniques such that the banks, when fully restored, have an appearance and function similar to the natural riverbank.
- Riparian areas must be restored to pre-disturbance conditions immediately after construction activities are completed.

- Disturbed/exposed banks, staging and project access areas must be properly stabilized (seeded, mulched, or otherwise) with native vegetation to prevent erosion and establishment of invasive plant species. A non-persistent cover crop of annual rye or equivalent temporary seeding may be used to ensure a more rapid establishment of cover while native perennial plantings grow.
- Bio-engineering methods must be used or, where deemed necessary by the [*insert river managing agency/contact*], clean broken rock rip rap of an adequate size for the specific for bank stabilization
- The use of demolition debris for slope armoring is not allowed.

10. Vegetative Plantings/Tree Removal/Tree Replacement

Best Practices

Trees that are preserved in the project work area will help to maintain bank stability and riverine aesthetics.

Required Measures

- Avoid unnecessary tree removal within the project work area.
- A vegetation plan shall be in place to protect existing vegetation/trees from damage by construction equipment (e.g. provide temporary barriers to protect existing trees, plants, root zone).
- Disturbances of the riparian zone must be limited to the indicated access points; prior to the operation of heavy equipment (dozers, cranes, trucks), orange construction fencing must be erected to delineate the dripline of remaining trees to avoid compaction of tree roots.
- The fastening of ropes, cables, or fencing to trees is prohibited.
- To ensure bank stability, trees removed within fifteen feet of the top of the river bank shall be cut flush to the ground; stumps and roots shall be left in place; indiscriminate bulldozing of riparian trees is prohibited.
- All trees removed from the riparian corridor shall be replaced with a native tree of like species. Replace each mature tree removed (12-inch or greater diameter at breast height [DBH]) with [*insert specifications, e.g. replant 3:1 ratio depending on expected survival rate and with trees that are a minimum 3-inches DBH*]. Plant only local, native trees/shrubs/grasses, naturally occurring within the [*insert river name*] riparian zone [*insert plant species list and/or to be determined in coordination with appropriate staff*].
- A qualified individual (arborists, foresters, or trained staff with similar experience) shall plant replacement trees at the appropriate time of year and in a random fashion to avoid a plantation effect. Cultivate and monitor planted tree seedlings/saplings for two years to ensure success; water plantings as necessary. Promptly replace planted stock showing signs of mortality.
- Stakes and guide wires shall be properly remove and dispose of once seedlings are established.

11. Archeological/Cultural Resources

Best Practices

Engage the Section 106 process at the earliest stages (i.e., planning), ensuring identification of historic properties (including archeological sites) has been completed within the area of potential project effects. See Appendix K: Section 7 Coordination – National Historic Preservation Act for more information about coordinating the Section 106 and Section 7 review processes.

Incorporate efforts to protect known/unknown archeological resources in the area into the planning process. Coordinate with the SHPO and THPO.

Required Measures

- Should previously unknown archeological materials be discovered during land clearing activities, consult and coordinate with the SHPO and THPO before work resumes. Properly document results of consultation and additional practices that need to be implemented.

12. Bridge Design Criteria (scenic/visual/recreation considerations)

Best Practices

Bridge designs can incorporate natural thematic approaches to the shape, color, and features to lessen the impact on wildlife, recreation, and scenery.

Request a bridge design that is visually appealing and does not break the horizon. Consider the form, line, color, textures and other features so the bridge blends in with the existing environment.

Pay attention to the scenic and cultural ORVs, including the viewshed and cultural landscape when considering bridge placement and design. Contact the NPS Visual Resources Program for technical assistance to systematically identify scenic values and assess potential project impacts. Good baseline information and a systematic robust approach is essential when evaluating the potential impacts of proposed development projects and making Section 7 determinations about effects on scenic ORVs.

Conducting a design charrette and reviewing artist renderings or computer generated schematics of the bridge design/options can be helpful, particularly for projects that may have an impact to scenic and recreational values.

Where possible, seek opportunities to provide recreational access to the river at road-stream crossings. Consider requesting construction of new river access, or improvements to existing river access for paddlers and other recreational river users, particularly as part of a Section 4(f) requirement under the Department of Transportation Act.

Required Measures

- Incorporate design elements (forms, lines, colors, textures) into bridge guardrails, piers/abutments, and girders.
  - Use tinted concrete and girder paint colors to blend in with the scenic nature of the river corridor.
  - Use low-profile design features, such as keeping the structure below tree line and earth-tone tinted cements for abutments and guardrails, to minimize visual impacts.
  - Use reactive galvanized color treatment or “weathering” steel to visually soften the railings for a park-like appearance.
- Include storm water conveyances (gutters or drains) in bridge design specifications to intercept, collect and redirect bridge deck runoff (including suspended solids, salts, fluids, oils and grease, asbestos, heavy metals, etc.) away from the river.

13. Embedded culverts (stream-simulation)

Best Practices

Culverts are sometimes used instead of bridges to span smaller streams when they cost less to engineer or construct. Culverts can be fully enclosed or have open bottoms. Open bottom structures are the preferred option when there is a need to provide for aquatic organism passage (AOP).

If it is not possible to use an open bottom structure containing native substrate, the culvert should be partially embedded and contain a well graded mix of bed materials that simulate natural stream conditions and allow for aquatic organism passage. A minimum embedment depth of two feet is generally recommended. Continuous irregular banklines of large rock may be built within the structure to provide dry passage for terrestrial animals and low velocity areas for aquatic organisms.

In newly constructed streambeds, there is an increased risk of bed failure during high flow events until hydraulic forces from moderate flows sort, structure and consolidate the new bed. This risk can be reduced by compacting the bed materials in layers, increasing the particle size distribution, incorporating steps and key features (e.g., boulders), or adding additional material (up to 20 percent) to compensate for initial bed erosion and consolidation.

There is also a risk in newly constructed streambeds of excessive streambed permeability and loss of surface flow during low flow conditions. This risk can be reduced by using a well graded mix of bed materials that incudes enough clay, silt and sand to fill voids, and by washing the fines into each layer.

Mechanical compaction is not recommended for beds containing particles larger than cobbles due to increased risk of damaging the culvert; compaction should instead be achieved by washing the fines into the bed. If necessary, the risk of culvert damage can be reduced by placing a layer of sand on the bottom of structure prior to installing the streambed mix.

Required Measures

- A minimum of two feet of bed materials shall be placed within the culvert.
  - The mix of bed materials should be based on the subsurface particle-size distribution of an undisturbed up- or downstream reference reach with similar characteristics.
  - The mix of bed materials should be well graded (consisting of a wide range of particle sizes) and include enough particles less than 2 millimeters in diameter (clay, silt and sand) to fill voids between larger particles and reduce infiltration into the channel bed.
  - The particle size distribution may be modified to address various risk factors such as a steeper slope.
- Up to [*insert percentage based on stream conditions*] percent additional bed material mix may be added to compensate for initial bed erosion and consolidation.
- Segregation of bed materials shall be avoided during handling.
- Bed materials shall be placed and compacted in layers by washing the fines into each layer to reduce initial infiltration rates.
- Bed structures such as steps and key features may be incorporated to support the bed material mix until it is consolidated.

The effects of high flows shall be monitored for [*two*] years or until bed structure develops, and any bed failures repaired in a timely manner.

14. Bridge Signage

Best Practices

Placing WSR signage at road-stream crossings provides useful geographic information (eg., the river name) and also identifies a river as part of the national system (NWSRS logo). The *NPS National Wild and Scenic Rivers System Roadway Signage Specifications (October, 2017)* are suitable for use on all NPS managed National Wild and Scenic Rivers. County or state engineer's offices often have the tools to easily fabricate a sign in their own sign shop.

Required Measures

- State approved scenic, recreational, and cultural interest area signs shall be placed at both bridge approaches identifying the [*insert river name*] as a National Wild and Scenic River (e.g. river name and the Interagency WSR graphic logo).
- Signage shall be consistent with *NPS National Wild and Scenic Rivers System Roadway Signage Specifications (October, 2017)*.