



National Park Service
U.S. Department of the Interior

Lassen Volcanic National Park
Regions 8, 9, 10 and 12

FINDING OF NO SIGNIFICANT IMPACT
Lost Creek Campground and Volcano Adventure Camp Water Well

Recommended:

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Date

Approved:

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Date

1. Introduction

In compliance with the National Environmental Policy Act (NEPA), the National Park Service (NPS) prepared an Environmental Assessment (EA) to examine alternative actions and environmental impacts associated with the proposed project to drill a well to supply water to the Lost Creek Campground and Volcano Adventure Camp. The project is needed to develop a groundwater source to replace the surface water system that now supplies the campgrounds to provide a consistent supply of high-quality drinking water to these campgrounds during their operating season.

The statements and conclusions reached in this finding of no significant impact (FONSI) are based on documentation and analysis provided in the EA and associated decision file. To the extent necessary, relevant sections of the EA are incorporated by reference below.

2. Selected Alternative and Rationale for the Decision

Based on the analysis presented in the EA, NPS selected Alternative 2: Change the Lost Creek Campground and Volcano Adventure Camp Water Supply from a Surface to a Groundwater Source (the NPS proposed action/preferred alternative).

The selected alternative will enable one or more test wells to be drilled and if one is found to yield an adequate water supply, then a groundwater well and distribution system will be constructed to convert the existing surface water system to groundwater. With development of a production well, an access road/gate, well house, storage tank, and distribution system will also be constructed.

If adequate groundwater is not found, the park will continue to use the existing surface water system, including trucking water to the tank during high turbidity events to supply potable water to the campgrounds.

As described in the EA, the project implements a number of resource protection measures to minimize the degree and/or severity of adverse effects on soils and geology, other water resources, vegetation; cultural resources (including archeological resources and cultural landscapes); and visitor experience.

Rationale

Alternative 2 was selected because it best meets the project purpose to:

- Change the source of water for Lost Creek Campground and Volcano Adventure Camp from surface water in Lost Creek to nearby groundwater.
- Reduce impacts on other park resources.

3. Mitigation Measures

The selected alternative incorporates by reference the mitigation measures listed after the analysis of each impact topic in the Affected Environment/Environmental Consequences chapter in the EA. These sections are titled, "Impact Avoidance, Minimization and Mitigation Strategies." The

selected alternative also includes “Mitigation Measures Incorporated into the Action Alternative” in the Alternatives chapter in the EA.

4. Other Alternatives Considered

In addition to the selected alternative, the EA analyzed one other alternative and its impacts on the environment.

Alternative 1: No Action – Continue Current Management by Maintaining the Existing Lost Creek Campground and Volcano Adventure Camp Surface Water Source and Trucking Water When Necessary.

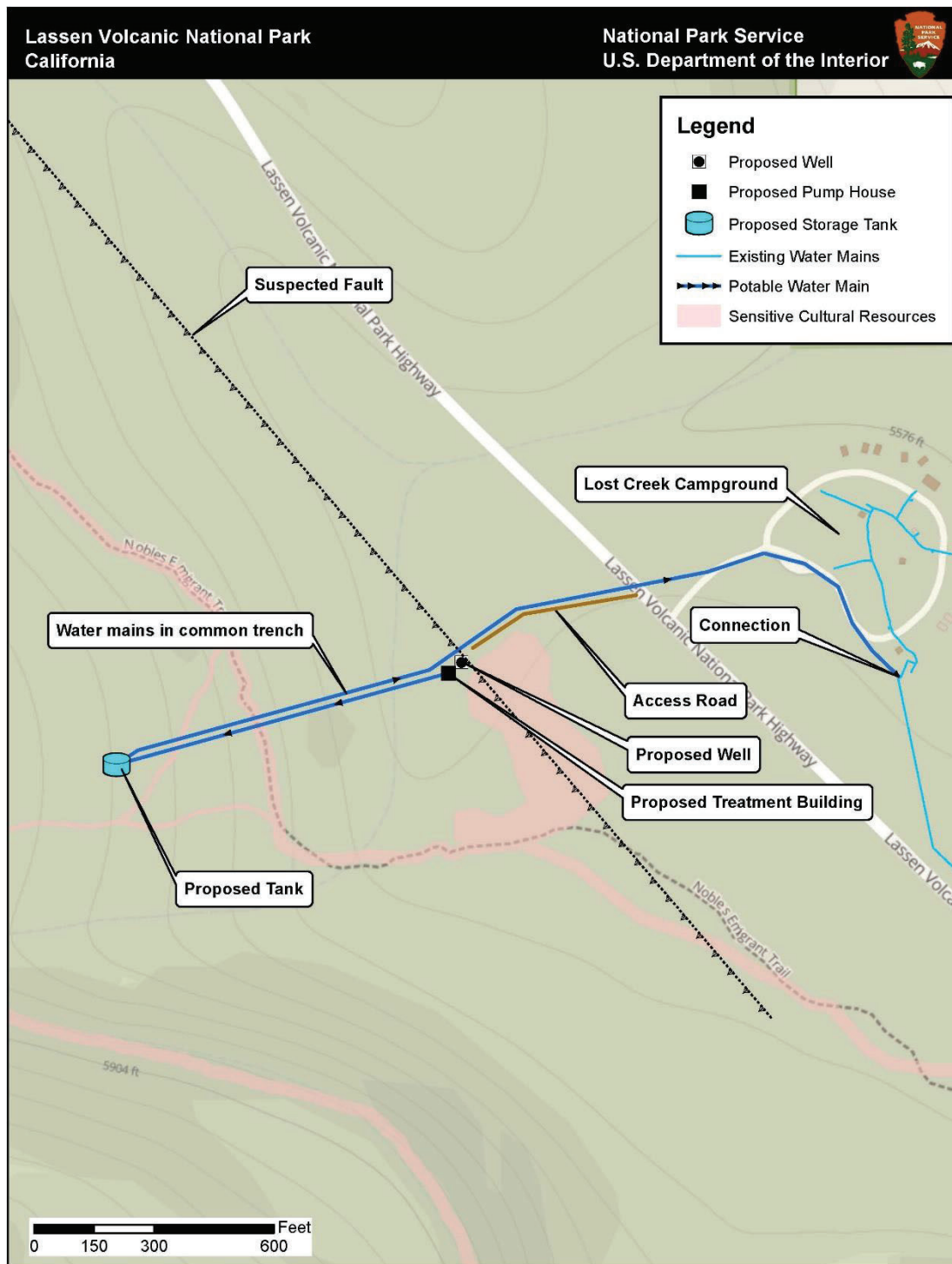
Under this alternative, the park would have continued to maintain the existing surface water source at Lost Creek to supply potable water to Lost Creek Campground and Volcano Adventure Camp. During intermittent loss of service from this system due to poor water quality, in conformance with the California Water Resource Control Board (WRCB) standards, the park would have had to obtain water from a different source. This is usually accomplished by trucking in potable water from the Manzanita Lake system and transferring that water to the Lost Creek storage tank for use in the campgrounds.

The current surface water system supplying the campgrounds collects from a horizontal infiltration gallery in Lost Creek approximately 1.5 miles upstream from the campgrounds. Water travels from the collection point to a treatment plant with a 10,000-gallon storage tank approximately 0.5 miles northwest of the intake. Operational access to this site is via an unimproved unpaved road off Highway 89 south of the Lost Creek Campground that follows the route of the Nobles Emigrant Trail.

The increased frequency of fine particulate material in the Lost Creek water source has caused this surface water source to be shut down more often lately (in four of the last ten years) due to failure to meet water quality standards. During any future periods of high turbidity, the system would have continued to be shut down by the park operator because of the system's inability to deliver water meeting water quality standards.

The cost of providing drinking water to the campgrounds during these intermittent shutdowns would have continued to increase. When needed, park staff would continue to truck drinking water from the Manzanita Creek system and transfer it into the Lost Creek storage tank to keep up with demand in the Lost Creek Group Campground and the Volcano Adventure Camp. For example, during an 8-day high turbidity event in July 2021 an employee made 6-8 trips per day to move water from the Manzanita Lake area to the Lost Creek water system storage tank, consuming nearly all of their workday.

Figure 1. Potential Test Well and Water Use Development



Alternatives Considered but Dismissed

There were also four alternatives dismissed from further consideration. Detailed descriptions can be found in the section entitled “List of Alternatives and Actions Considered but Eliminated from Detailed Study in the EA.”

- Construct a 3.5-mile Water Transmission Line from the Manzanita Lake Municipal Water System.
- Contract a Water Hauling Company to Provide Potable Water to the Lost Creek Campground and Volcano Adventure Camp Storage Facility When Needed.
- Construct a Larger Water Storage Tank at Lost Creek to Supply the Camps when the Water Turbidity is too High to Meet State and Federal Drinking Water Requirements.
- Modify Slope Leading into Lost Creek Drainage Headwaters to Reduce or Eliminate Potential for Sediment Discharge into Lost Creek.

5. Public Involvement/Agency Consultation

No public comments were received during either civic engagement prior to the EA or during the public review period for the EA.

As evaluated in the EA, proposed actions associated with the selected alternative will have no adverse effect on resources listed or eligible for listing in the National Register of Historic Places or on other historic or cultural resources in the park. SHPO concurrence with this determination of no adverse effect for the drilling portion of the project was received on April 16, 2021, (NPS_2021_0304_001).

As noted in that SHPO concurrence, if “Phase I” test drilling is successful, Phase II consultation will include another request for concurrence for the access road, water tank, and well house construction, and installation of distribution lines.

6. Finding of No Significant Impact

As described in the EA, the selected alternative has the potential for adverse impacts on soils and geology, other water resources, vegetation; cultural resources (including archeological resources and cultural landscapes); and visitor experience; however, no potential for significant adverse impacts was identified.

Construction activities may adversely affect soils and geology, with direct effects on soils from removal, profile mixing, and compaction from excavation and grading. Subsurface geological materials will also be disrupted. At the drilling site, immediate and persistent soil disturbance may occur from localized compaction due to overland travel of the drill rig and support equipment, and removal of bore hole soil. Native soils and geology will also be affected from the construction of foundations for the 20,000-gallon water tank (120 square feet) and wellhouse (100 square feet), as well as from creating an access route (450 feet x 10 feet) and trenching for water distribution lines (900 linear feet x 30 inches x 26 inches) and electrical lines from the pump to the well house (1,200 feet x 12 inches x 26 inches). These actions will occur if test drilling finds a reliable water source. Beneficial effects on soils will also occur from removal of infrastructure associated with the existing

surface water source if the new source is viable. In total, drilling operation will affect approximately 0.10 acre and if viable, operations and construction impacts will affect 0.25 acre.

Existing impacts on water quantity and water quality will continue from the continued use of water. If adequate water yield is present from well drilling, then long-term seasonal impacts will result from the use of approximately 970 gallons per day (30,000 gallons per month) of groundwater instead of surface water during the peak season. The NPS will draw this groundwater from the new well site as a replacement for water withdrawal from Lost Creek. The NPS anticipates that that groundwater use will be equal to the current surface water use at each campground. Therefore, except for the additional use that will occur if the new camping cabins were constructed, the withdrawal of groundwater will be approximately equal to the current withdrawal of surface water. It is unknown whether this groundwater withdrawal will affect surface water in Lost Creek, however since the quantity will be similar, it is unlikely to have more adverse effects. There may also be fewer effects since groundwater will not be subject to the same evaporation that occurs from the use of surface water.

Continued withdrawal of water from the Lost Creek surface water source will have ongoing effects on riparian/riverine wetlands from maintaining this structure in the creek bed and from reducing the flow of water that will otherwise occur. The intake affects approximately 6,000 square feet of creek bed and has replaced natural creek bed with a concrete weir structure and piping to allow water to be drawn from the Lost Creek water system. If the test well is successful, the NPS will remove the infiltration gallery and dam on Lost Creek. Removing the infiltration gallery, polyvinyl chloride (PVC) piping, and stockpiles of materials will restore an area of approximately 60 by 100 feet (6,000 square feet or 0.14 acres) of upper perennial riverine wetlands and creek bank storage area (Photos 1-2), including former creek bed and former hydrological functions.

The well drilling project will also adversely affect vegetation, including short- and long-term effects. 5-10 small lodgepole pines and other shrubs may be removed to construct the access road. If the test well is viable, the access road will have permanent adverse effects from the removal of vegetation in an area 450 feet long and 10 feet wide (0.10 acre). For the permanent access road, gate, well housing and tank, approximately 0.25 acres of sparsely vegetated area will no longer support vegetation. Although disturbance will increase the potential for nonnative invasive plants, mitigation measures will diminish this potential.

Implementing the selected alternative has the potential to adversely affect archeological resources and cultural landscapes (Nobles Emigrant Trail and Lassen Volcanic National Park Highway). The access route to the proposed test well will begin from the historic Lassen Volcanic National Park Highway. This temporary impact will not affect the integrity of the Lassen Volcanic National Park Highway.

Similarly, the access route to the test well site must cross or run along the wide Nobles Emigrant Trail. Because that access will initially be a route, it will not diminish characteristics qualifying the Nobles Emigrant Trail for inclusion in the National Register. There will be no changes to the surfacing or alignment of the Nobles Emigrant Trail from access to the test well site. Therefore, there will be no adverse effect on the highway or the trail from actions to implement the proposed action. Proposed actions will not impact the characteristics that make these resources eligible for the National Register of Historic Places. If the test well yields adequate water, the wellhouse and

tank associated with the Lost Creek surface water intake will be removed, yielding beneficial effects on the adjacent portion of the Nobles Emigrant Trail.

The selected alternative may result in adverse impacts on visitor experience if the test well does not yield an adequate water supply. In addition, if trucking water cannot meet the need, reducing operations at Lost Creek Campground and/or Volcano Adventure Camp is another option. This could have a range of direct and indirect adverse effects on visitors, including potential reduction of camping opportunities in these areas and/or interruptions in service if the water source is not replaced.

If a viable well is drilled, during construction of the water service facilities (well house, pump, and treatment building), there could be delays in traffic and increased noise and activity related to construction, and possible interruption in use or early closure of facilities served by the water treatment system. To minimize visitor disruption, opportunities for work outside of normal work times, such as on weekends or at night will be by special permission of the superintendent and will be advertised to the public in advance.

There will be no significant impacts on public health, public safety, or unique characteristics of the region. No highly uncertain or controversial impacts, unique or unknown risks, significant cumulative effects, or elements of precedence were identified. Implementation of the NPS selected alternative will not violate any federal, state, or local environmental protection law.

7. Conclusion

As described above, the selected alternative does not constitute an action meeting the criteria that normally requires preparation of an environmental impact statement (EIS). The selected alternative will not have a significant effect on the human environment in accordance with Section 102(2)(c) of NEPA.

Based on the foregoing, it has been determined that an EIS is not required for this project and, thus, will not be prepared.

Appendix A: Errata Indicating Text Changes to EA

Note: All page number references draw from the pdf version of the document as it was published on the Planning, Environment and Public Comment website.

Insert the following sentence on page 29 at the end of the first paragraph: “If the test well yields adequate water, the wellhouse and tank associated with the Lost Creek surface water intake would be removed, yielding beneficial effects on the adjacent portion of the Nobles Emigrant Trail.”

Insert the following bullet inadvertently left out of the Cultural Resources “Impact Avoidance, Minimization and Mitigation Strategies” on page 29, between the second and third bullets: “If the test well is successful, the proposed water treatment building and tank would be concealed to the degree possible (using coloration and screening) from the viewshed of the Nobles Emigrant Trail.”

Appendix B: Determination of Non-Impairment

Lassen Volcanic National Park

Lost Creek Campground and Volcano Adventure Camp Water Well

DETERMINATION OF NON-IMPAIRMENT

Introduction

National Park Service (NPS) *Management Policies 2006* (section 1.4) requires analysis of potential effects to determine whether the selected alternative would impair a park's resources and values. The fundamental purpose of the national park system, established by the *Organic Act* and reaffirmed by the *General Authorities Act*, as amended, begins with a mandate to conserve park resources and values. NPS managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adverse impacts on park resources and values. However, the laws do give the NPS the management discretion to allow impacts on park resources and values when necessary and appropriate to fulfill the purposes of the park. That discretion is limited by the statutory requirement that the NPS must leave resources and values unimpaired unless a law directly and specifically provides otherwise.

The prohibited impairment is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values (NPS *Management Policies 2006*). Whether an impact meets this definition depends on the resources that would be affected; the severity, duration, and timing of the impact; the direct and indirect effects of the impact; and the cumulative effects of the impact in question and other impacts.

An impact on any park resource or value may, but does not necessarily, constitute impairment. An impact would be more likely to constitute impairment to the extent that it affects a resource or value whose conservation is:

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park, or
- key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or
- identified in the park's general management plan or other relevant NPS planning documents as being of significance.

An impact would be less likely to constitute an impairment if it is an unavoidable result of an action necessary to preserve or restore the integrity of park resources or values and it cannot be further mitigated. Impairment may result from visitor activities; NPS administrative activities; or activities

undertaken by concessioners, contractors, and others operating in the park. Impairment may also result from sources or activities outside the park. The description of the parks' purpose and significance is found below and is subject to the no-impairment standard.

Description of Park Purpose and Significance

Purpose of Lassen Volcanic National Park

"Lassen Volcanic National Park preserves dynamic volcanic phenomena, scenic values, outstanding wilderness character, and diverse natural and cultural resources; and provides educational, recreational, and exceptional scientific opportunities for the benefit of the public."

Significance of Lassen Volcanic National Park

The following significance statements have been identified for Lassen Volcanic National Park. (The sequence of the statements does not reflect the level of significance.)

- Few places on Earth parallel Lassen Volcanic National Park's concentrated diversity of volcanic features. The park showcases a dynamic geologic landscape containing an intact network of hydrothermal features and 60 extinct and active volcanoes in relative proximity to one another that represent all four primary types: (1) shield, (2) composite, (3) cinder cone, and (4) plug dome. This extent and diversity is complemented by more than a century of scientific study, which enhances global knowledge of volcanic systems and contributes to future research, management, and stewardship.
- Located at the crossroads of three distinct biological provinces—Cascades, Sierra Nevada, and Great Basin—Lassen Volcanic National Park preserves an exceptional biodiversity of more than 1,050 plant and animal species. This biologically rich transition zone offers many opportunities for scientists to research anthropogenic effects on biological processes and populations.
- Lassen Volcanic National Park protects valuable archeological sites, historic structures, objects, stories, and traditional places that remain significant to people of various backgrounds. These resources enrich our understanding of people that have lived in, adapted to, and traveled through the southern Cascade region for thousands of years.
- Lassen Volcanic National Park includes 79,062 acres of designated wilderness, which comprises more than 74% of park lands and are buffered by large expanses of other public lands and a contiguous wilderness area. The park's wilderness lands provide outstanding opportunities to experience natural quiet, solitude, clean air, clear views, and pristine night skies amidst a distinctive, vast landscape of volcanic landforms.

Impairment Determinations for the Selected Alternative

Impairment determinations are not necessary for visitor experience, socioeconomics, public health and safety, environmental justice, land use, and park operations, etc., because impairment findings relate back to park resources and values. These impact topics are not generally considered to be park resources or values according to the *Organic Act* and cannot be impaired the same way that an action can impair park resources and values. After dismissing the above topics, topics remaining to be evaluated for impairment include soils and geology, water resources, vegetation, and cultural resources, including archeological resources and cultural landscapes.

Soils and Geology Description

A hydrogeologist from the NPS Water Resources Division found that "the complex volcanic geology and discontinuous stratigraphy of the area make subsurface estimations difficult" regarding the presence and thickness of units underlying surficial deposits (NPS WRD 2019).

Notably, the report states, that despite the wet climate and abundance of surface water resources at the park, the area has inherently poor aquifers due to its volcanic geology (NPS 2019). Developing successful groundwater sources is dependent on the presence and productivity of small changes in the geology, including "fracturing along fault planes and rubble zones between successive volcanic flows" (NPS WRD 2019). Based on this, the proposed target area for well drilling is approximately 200-250 feet below ground level, where faulting may have disrupted and fractured volcanic layers, which otherwise would not be conducive as aquifers.

According to the report, the stratigraphy under any given location can vary greatly because "numerous distinct geologic units can be present in a relatively small area, vary greatly in thickness, and overlie one another in an unknown fashion" [Clynne, personal communication, Christiansen and others, 2010, Clynne and Muffler, 2002 in (NPS WRD 2019)]. To better understand the geologic mapping, WRD scientists consulted with geologists from the U. S. Geological Survey who developed the most recent geologic maps of the area.

Geologic mapping shows the extent of recent pyroclastic material that fills the Lost Creek drainage and provides the fine-grained material that periodically degrades surface water quality. Moving away from Lost Creek, other unconsolidated deposits of glacial till or pyroclastic material overlie volcanic bedrock (NPS, 2019). According to the report, the glacial till near Lost Creek extends to approximately 5,500 feet elevation. With the entrance to Lost Creek Campground about 100 feet higher, the mapped till should be relatively thin, however there may also be other older, unmapped glacial tills present below those exposed at the surface (NPS WRD2019).

Soils and Geology Impacts

There will be unnoticeable adverse effects on geology and a range of adverse effects on soils from new well drilling and construction of facilities to support providing potable groundwater to the Lost Creek and Volcano Adventure campgrounds. The well will affect area stratigraphy in one to two small diameter holes (6-12-inches) and will have longer-term disruption if usable water is found. This will comprise a discountable footprint by disrupting subsurface geologic materials through well drilling activities compared to the volume of geologic materials underlying the project area vicinity.

Direct effects on soils will also result from modifications to area facilities, as well as from construction of new facilities. Actions will include soil removal, profile mixing, and compaction from excavation and grading. At the drilling site, immediate and persistent soil disturbance may occur from localized compaction due to overland travel of the drill rig and support equipment, and removal of bore hole soil. During excavation, soils will be mixed, moved and backfilled with native material, and/or imported fill, and compacted.

Excavation of trenches to link the water source to the campgrounds will occur only if adequate water yield was discovered and well construction occurred. If so, trenching from the well site to the roadway to accommodate water lines will affect generally undisturbed soils, while trenching along the roadway will affect a previously disturbed area. Trenching for water transmission lines will encompass approximately 900 linear feet. These transmission line trenches will be approximately

30 inches wide and 26-inches deep. Other utilities could also be installed in the same trench. The trenches will be backfilled with excavated soil. To reduce associated impacts from the new drilling site, there will be temporary soil disturbance from introducing fill material to cover the existing ground level for temporary road construction. If new road access is not needed, this temporary fill will be removed from the site after test drilling and the area rehabilitated by replacing logs and other vegetative barriers over the access route. There will also be longer term impacts on soils (including loss of native soil and replacement with fill and compaction of native materials in the proposed road area). Loss of some trees and vegetation (see vegetation section), prior to physically reinforcing the permanent access road, will also adversely affect soils.

If test drilling is successful, the planned well house will be a small building approximately 10 x 10-feet (100 square feet). Excavation for the concrete pad/foundation will be approximately 120 square feet. There will be permanent effects on area soils and geology (loss and replacement of native materials in the area) from placement of this small structure.

Disturbance of soils will also cause long-term localized changes in soil profiles, decreased soil productivity, especially where surfaces were hardened or compacted, and vegetation loss, temporary (for utility lines) and long-term where permanent aboveground facilities were constructed. Actions to remove previous surface water collection infrastructure will be beneficial and could improve the area with the removal of the existing Lost Creek water infrastructure (infiltration gallery, well house and water tank).

Soils and Geology Conclusion

The selected alternative will result in localized adverse impacts to approximately 0.10 acre from drilling operations and slightly more extensive impacts in an area comprising about 0.25 acre from proposed construction and operations. This range of localized adverse effects on soils will not result in impairment of soils or geologic resources.

Water Resources Description

The surface water currently supplying the Lost Creek Campground and Volcano Adventure Camp is collected approximately 1.5 miles away (straight-line distance) from the campgrounds. The intake collection point (infiltration gallery) within the creek bed supplies facilities at the campgrounds, including water service for spigots, showers, and a kitchen. In a typical high-use month (for example, July 2018) the two campgrounds used approximately 30,000 gallons of water for an average of approximately 970 gallons per day (gpd). According to the draft hydrogeologic report, average demand in 2014 was approximately 800 gpd (sustained by a flow of 3.5 gallons per minute) (Martin 2014). Flow continues year-round downstream from the intake infiltration gallery in Lost Creek. There are currently plans to add four more tent cabins at the Volcano Adventure Camp, which could increase seasonal water demand by up to 30 percent (Mateljak pers. comm). Current water withdrawal comprises less than one tenth of percent of the creek flow. At the weir, Lost Creek has an average daily flow rate of approximately 20 cubic feet per second (cfs) or approximately 9,000 gallons per minute, much greater than the 3.5 gallons per minute needed to supply the campgrounds (see small waterfall in Photo 1).

Water travels from the creek collection point to a treatment shed with a 10,000-gallon storage tank, approximately 0.5 miles from the Lost Creek intake. This system operates late spring through fall due to campground closures in winter.

Water quality in the park is generally excellent because of the high elevation headwaters in the park and the lack of upstream development that will impact park waters (NPS 1999).

Lost Creek experiences seasonal spring runoff and episodic summer storms that cause periods of high turbidity due to the fine-grained pyroclastic material in the area being washed into the creek from the May 1915 eruption of Lassen Peak. An eroding slope near the intake contributes substantial amounts of this fine-grained material to the creek just upstream of the water system intake. The particulate material clogs the filtration system requiring time-consuming and expensive maintenance and increased treatment to meet water quality standards. During periods when water from Lost Creek cannot be treated adequately to meet drinking water standards for the campgrounds, the NPS imports water from elsewhere via rental trucks.

The current water system for the Manzanita Lake area of the park is located on Manzanita Creek south of the developed area. This system provides for park housing and facilities, a visitor center, and large summertime campground. According to the WRD report, the system is substantially larger than that at Lost Creek. The system intake is an infiltration gallery on Manzanita Creek in a steep, eroding portion of the drainage where there are no problems with production rate or turbidity. In 2021, the park tried to drill a well, but could not find water, even at depths of up to 400 feet. There are two separate treatment and storage systems at Manzanita Lake: one is used in peak-season high-demand periods and one during winter low-demand periods (NPS WRD 2019:6).

The Manzanita Creek system provides an average of approximately 20,390 gpd during the peak season and an average of about 1,590 gpd in the non-peak season. Use for the Lost Creek and Volcano Adventure campgrounds comprises a very small percentage of the daily and annual water use from that site (up to 970 gallons per day) (NPS WRD 2019:7). Wetlands are a critical resource in the park supporting a high diversity of species. The park's wetlands were first mapped by the National Wetlands Inventory (NWI) in 1989 using color infrared imagery with a scale of 1:58,000. Refinements and additions were made in 2005 by Adamus & Bartlett (2008) (Adamus 2013: 23). Based on several rough estimates for vegetation types, wet meadow and riparian/alder zones total over 2,000 acres in the park. There are hundreds of smaller wetlands throughout the park; many are associated with lakes and ponds and can be found throughout the park's wilderness. The area comprising the infiltration gallery in Lost Creek is considered an upper perennial riverine wetland. Lost Creek has seasonally flooded margins including small pockets of wetlands and scrub-shrub wetlands on the boundary of its riverine and upland habitats.

Water Resources Impacts

Water Quantity and Quality: Existing impacts on water quantity and water quality will continue. This will be in the interim and if the test well is not successful, whereupon the NPS will continue to withdraw surface water from Lost Creek as needed to supply potable water to the two nearby public campgrounds. Therefore existing impacts on water quantity will continue from ongoing use of the current surface water collection system either in Lost Creek or from the Manzanita area unless one or both of the campgrounds is expanded beyond the four tent cabins currently projected.

Compared to purchasing and using expensive filtration, it is likely that the NPS will continue to rely on trucking water during these low water quality events more frequently in the future due to increased demand from the four additional units planned for the Volcano Adventure Camp, since treating with additional filtration is not a cost-efficient means to meet municipal water quality

standards (the expensive filters clog within a few minutes). The duration of high turbidity episodes is unpredictable and can last from a few days to several weeks. During this time there will be more water withdrawal from the Manzanita Lake area to obtain the same quantity of water (approximately 970 gallons per day) and water will not be withdrawn from Lost Creek until turbidity decreased.

If there is a continuing need to maintain the Lost Creek intake, the NPS will also continue to comply with the permit from the State Water Resources Control Board, including annual, long-term maintenance to prevent sedimentation at the infiltration gallery. This includes removing sediment from the gallery in the creek bed, an action which is subject to conditions from the WRCB and a water quality certification permit under the Clean Water Act from the Environmental Protection Agency. There will also continue to be runoff from the collected sediment piles in the vicinity of the intake. Sediment piles in the vicinity of the intake, from work associated with the maintenance permit will also cause small impacts to water quality from runoff during storms.

If new well drilling is successful, there will be testing for adequate groundwater resources for seasonal use at the proposed well site. If the NPS does not find adequate water yield, then impacts to groundwater resources will be those encountered during the initial yield test (1-2 days). No additional construction or sustained use will occur. If the NPS discovers adequate water yield at either proposed site, then long-term seasonal impacts will result from the use of approximately 970 gallons per day (30,000 gallons per month) of groundwater instead of surface water during the peak season. The NPS will draw this groundwater from the new well site as a replacement for water withdrawal from Lost Creek. The NPS anticipates that that groundwater use will be equal to the current surface water use at each campground. Therefore, except for the additional use that will occur if the new cabins were constructed, the withdrawal of groundwater will be approximately equal to the current withdrawal of surface water. It is unknown whether this groundwater withdrawal will affect surface water in Lost Creek, however since the quantity will be the similar, it is unlikely to have more adverse effects. There may also be fewer effects since groundwater will not be subject to the same evaporation that occurs in surface water.

Trenching to install utilities will also have very localized effects from runoff of newly disturbed soils for a few months to a few years, until herbaceous plants and grasses regrow in the disturbed soil.

Wetlands: Because existing impacts from the infiltration gallery in the creek bed of Lost Creek will continue, withdrawal of water from Lost Creek will continue to have adverse effects on riparian/riverine wetlands from maintaining this structure in the creek bed and from reducing the flow of water that will otherwise occur. The intake affects approximately 6,000 square feet of creek bed and has replaced natural creek bed with a concrete weir structure and piping to allow water to be drawn from Lost Creek.

If the new test well is successful, the NPS will remove the infiltration gallery and dam on Lost Creek. Removing the infiltration gallery, polyvinyl chloride (PVC) piping, and stockpiles of materials will restore an area of approximately 60 by 100 feet (6,000 square feet or 0.14 acres) of upper perennial riverine wetlands and creek bank storage area (Photos 1-2), including former creek bed and former hydrological functions. Doing so will also have short-term adverse effects from removal of the infrastructure but will likely result in long-term beneficial effects on water flow, depending on the influence of groundwater withdrawal in the same watershed (see above), and avoidance of interference with the creek bed.

Water Resources Conclusion

Existing long-term adverse impacts from surface water use will continue until the system was either abandoned or replaced with groundwater. If replacement occurred, there will also be long-term beneficial effects on the riverine wetland in Lost Creek from restoration of the current water intake facility. There will be short-term adverse impacts on water quality during construction and long-term impacts on water quantity from water use that will continue to be similar to the current water system. This range of small localized adverse effects on water resources will not result in impairment of water resources, including wetlands.

Vegetation Description

Lassen Volcanic National Park covers approximately 166.2 square miles (106,372 acres). Elevations in the park range from 5,300 feet at Warner Valley to 10,457 feet atop Lassen Peak. The park contains a far greater diversity of plant species than its size will suggest. This is partially because the park occupies a geographic zone where three major ecological systems meet: the southern Cascades, the Sierra Nevada, and the Great Basin. Each system contributes a unique floristic element to the park's vegetation. In addition, the park's dynamic history of glaciation and recent volcanic activity creates a suite of diverse substrates ranging from excessively dry volcanic cinders to hydrothermally altered clays. The range of geologic formations and chemically and texturally varied soil types contribute to species diversity as well as many anomalies within each community type.

Four major plant communities occur within the park, including red fir forest, yellow pine forest, subalpine forest and alpine fellfields. Minor plant communities include montane chaparral, herbaceous wet meadows and riparian areas. Community types applicable to the project area and surroundings are described below, in order of abundance within the park.

Red Fir Forest: Red fir forest is the most widespread forest type in the park and is a common upper montane forest type throughout the Sierra Nevada and in the southern Cascades. Red fir forest grows between 6,500 and 8,000 feet and covers approximately one third of the park. In these forests, red fir (*Abies magnifica*) is the dominant canopy tree; however, lodgepole pine (*Pinus contorta* ssp. *murrayana*), mountain hemlock (*Tsuga mertensiana*), western white pine (*Pinus monticola*) and white fir (*Abies concolor*) may also be present. Mature red fir trees are commonly 60 to 120 feet tall and live to be more than 300 years old. Red fir seedling distribution is closely related to exposure to sun; seedlings usually establish in sites with part to full shade. Common shrubs and flowers in red fir forests include woolly mules' ear (*Wyethia mollis*), lupine (*Lupinus* spp.), beardtongue (*Penstemon* spp.), and pinemat manzanita (*Arctostaphylos nevadensis*). This is the predominant vegetation community on the north facing slopes adjacent to and slightly above the project area.

Yellow Pine Forest: This open forest occupies flats and slopes below 6,000 feet and is best developed around Manzanita Lake, Butte Lake, and Lost Creek. The canopy of mature stands consists of scattered large Jeffrey pine (*Pinus jeffreyi*) with or without ponderosa pine (*Pinus ponderosa*). Depending on site conditions and the time since the last fire, the canopy may include sugar pine (*Pinus lambertiana*), white fir, ponderosa pine, lodgepole pine, western white pine, incense cedar (*Calocedrus decurrens*) and red fir. In the absence of fire, these minor species will gradually fill in and dominate the forest canopy which is the most common condition of the forest immediately around the proposed well site. The soils associated with this forest type have

significantly higher potassium, calcium, and magnesium than most other park forest types (Parker 1991). Common understory species include western needlegrass (*Achnatherum occidentale*), bottlebrush squirreltail (*Elymus elymoides*), and greenleaf manzanita (*Arctostaphylos patula*).

Riparian Areas: These woody wetland communities are supported by surface water, and are associated with springs, stream banks, and lake margins throughout the park. The current Lost Creek water intake is within a degraded riparian area. The most common community in these sites is a shrubland dominated by willows and alders. Riparian woodlands of aspen (*Populus tremuloides*) or black cottonwood (*Populus balsamifera* ssp. *trichocarpa*) are rare and scattered in low-elevation wet areas. In addition to the deciduous trees and shrubs, these communities support many showy herbaceous species such as cow parsnip (*Heracleum maximum*), monkeyflower, and arrowleaf ragwort (*Senecio triangularis*).

Although most of the park is vegetated, areas of recent volcanic activity tend to be rocky, exposed and relatively devoid of vegetation. The volcanic eruptions of Lassen Peak destroyed more than three square miles of forests, and the areas affected by the eruption of Cinder Cone 340 years ago are still largely barren.

Two other plant communities not found in the project area are montane chaparral and herbaceous wet meadows.

Vegetation Impacts

There will be short- and long-term adverse effects on vegetation from constructing a temporary and/or permanent roadway to the proposed well site. As noted above, the area is primarily within Yellow Pine Forest and includes a variety of tree species, as well as forest openings with shrubs. There are numerous downed trees along the potential approach route to the well drilling site. As the project area approaches the hillslope where the proposed fault line occurs, the area becomes more densely forested but is bisected by an opening for the Nobles Emigrant Trail route.

Among the trees noted in the area are lodgepole pine, red fir, and sugar pine. Understory plants include seedling trees, pyrola and pipsissewa. Though designed to minimize disturbance, approximately 5-10 small lodgepole pine trees from 2-6 inches dbh and shrubs may be removed to construct the access road. If the road is needed for continued access, it will be improved and gated. This will cause additional impacts from permanent loss of vegetation along a swath approximately 450 feet long and 10 feet wide (0.10 acre). Although the area is sparsely vegetated, construction activities under the selected alternative will affect seedling and sapling trees, some mature trees, as well as shrubs and seasonal herbs.

Approximately 11,000 square feet (0.25 acre) of sparsely vegetated area and soils will be affected to construct the access road, well and well housing and to install the water line to the campgrounds. After the water line is installed, understory vegetation will likely regrow along the roadway, while shrubs and small trees removed at the well site (for tank and treatment building construction) will not return. The vegetation to be removed consists of common species that are widespread adjacent to the area and in other similar habitats in the park.

Other effects on native vegetation include the potential for introduction of invasive plants that could be carried in on construction equipment and in soils, however this risk will be low because all

construction equipment is required to be cleaned to remove invasive plants or seeds prior to being used in the park.

Vegetation Conclusion

The selected alternative will have a range of small-scale vegetation impacts, including removal of small trees and downed logs, trampling, excavation, and clearing of vegetation for construction of the concrete pads for the pump house, and storage tank, and the well housing. This range of localized adverse effects on vegetation will not result in impairment.

Cultural Resources, including Archeological Resources and Cultural Landscapes Description

The Area of Potential Effect (APE) is an area within the boundary of Lassen Volcanic National Park, Tehama County, California in which cultural resources might be affected. It is located near Lost Creek Campground and encompasses an 8.77-acre area between the park highway and the Nobles Emigrant Trail. The NPS has delineated this area to include consideration of indirect, and temporary effects (access roads), extending the vertical APE to 400 feet below grade, rather than just taking into account surface materials and shallowly located trenches. There are no historic structures within or near the APE.

Prehistoric Archeological Resources

Little is known of the early part of the prehistoric chronology of Lassen Volcanic National Park. Part of this may be, as Treganza (1963:14) suggests, because large areas suitable for use as seasonal campsites have been covered by the eruptions of Lassen Peak during and prior to the early 20th century. As noted by Journey (1970:31), there appears to be more evidence of use in the southern part of the park (most likely due to the volcanic disturbance in the north). These southern sites are generally low in elevation (often in the open valleys), near fresh water, and in areas that support game and other wild resources. The lack of early sites represented in the archeological record also appears to be partly due to the limited numbers of cultural resource inventories and test excavations conducted in the area. Many archeological sites, because of their seasonal, high elevation nature, have limited deposits. In general, the high elevations within the park precluded year-round human occupation. Park lands, however, were an important area for hunting game and gathering food and other materials for subsistence in lower river valleys.

Archeological sites are distributed throughout the park from about 5,500 feet up to about 7,000 feet. Archeological sites include a large village, lithic scatters (from stone tool manufacture) and evidence of numerous smaller seasonal camps. To date, a total of 202 archeological sites are documented in the park, including 74 prehistoric sites, 22 multicomponent sites, and 106 historic sites. These include prehistoric flaked-stone artifact scatters and habitation sites with midden deposits, historic-period structures, features, and associated artifacts. Prehistoric site density varies within the park as a result of past volcanic activities. Volcanic tephra deposits cover much of the northern half of the park burying signs of early human activities in the park under layers of volcanic ash and lapilli. Recorded prehistoric sites are sparse in the northern portion of the park with many of the documented sites located in the Warner Valley or Sulphur Creek areas in the southern portion of the park.

Historic Archeological Resources

Peter Lassen and William H. Nobles founded the "Nobles Trail" to take emigrants into northern California. This trail, which passes through the park, is listed on the National Register of Historic Places. As a result, historic-period archeological sites in the park include features related to early

emigration to California, homesteading, ranching, early use of the park area for recreation, and park administration and development. Other historic-period features include cabins, corrals, fence lines, old telephone lines, and related historical debris that have been documented in the park as archeological sites or are referenced in literature and historical records. The park Historic Resources Study (2003) provides an in-depth review of the park's history.

There is one historic archeological site within the APE. Site CA-LAS-2495H is a section of the Nobles Emigrant Trail and is listed on the National Register. This linear site crosses several state lines and multiple counties in California. Within Lassen Volcanic National Park, the site passes through both Lassen County and Shasta County. The section of the site that is within the test well APE is located on the eastern flank of Table Mountain and adjacent to a dry drainage proceeding from Sunflower Flat and Nobles Pass. This short section was recorded in 2015 and represents one of the few locations within the park that still retains integrity. It is about 1,600 feet long and has variable widths and a "Y" shape; the alignment runs straight up a steep slope, a common feature of two track wagon roads due to the increased side-to-side balance gained from climbing up a hill rather than traversing the side slope.

Lassen Volcanic National Park Highway Historic District

The Lassen Volcanic National Park Highway Historic District (Lassen Loop Highway/ Lassen Peak Highway) was nominated and accepted on to the National Register of Historic Places in 2006 (No. 06000527). The following is from the National Register nomination form summarizing the main reasons the park highway was listed on the National Register:

The road, a designed landscape, is eligible for listing in the National Register of Historic Places for its direct and significant association with National Park Service administration of the park and with development of the northern California tourism industry (criterion A) and for its association with Rustic architecture as developed by the National Park Service (criterion C). The period of significance covers two eras: 1925, when the National Park Service initiated construction, until 1941, when the CCC terminated construction efforts; and 1948 to 1951, a period when the road was modified to its current design standards. (NPS 2006)

The portion of the Lassen Volcanic National Park Highway in the APE is Section 4- Old Boundary Springs to the Northwest Entrance. The alignment of the highway within the APE is in its original alignment from initial construction in the 1920s and 1930s. The test well and its potential additional development into a production well will have physical and visual impacts to the highway.

Site Specific Archeological Surveys

The APE for the well drilling site has been surveyed twice, once in 1993 and again in 2015. There is one historic-era archeological site within the vicinity of the test well location - the Nobles Emigrant Trail.

A segment of the Nobles Emigrant Trail wagon road associated with European emigrants is adjacent to the proposed well site and as noted above, the Lassen Volcanic National Park highway is adjacent to the road that will provide access to the site for well drilling and well development if well drilling is successful.

Cultural Resources, including Archeological Resources and Cultural Landscapes Impacts

Under the selected alternative, the NPS or its contractors will drill a test well and potentially a permanent production well. Drilling will occur within the boundary of the 2015 survey. Because of the proximity of the 2015 survey edge, however, it was important that the consulting NPS archeologist review the maps and survey. As a result, areas adjacent to the boundary were reviewed and the archeologist has determined that the area just outside of the boundary of the 2015 survey is unlikely to hold resources due to the rocky and steep terrain (average of 13% slope). The NPS has not identified any other archeological sites within 600 meters of the proposed project area. The reviewing NPS archeologist assumes that the conditions described in the survey apply to immediately adjacent lands. Except for the Nobles Emigrant Trail that will be crossed by the proposed access road and waterline and the Lassen Volcanic National Park Highway, there are no other historic properties that will be affected within the APE for this site.

The access route to the proposed test well will begin from the historic Lassen Volcanic National Park Highway. This temporary impact will not affect the integrity of the Lassen Volcanic National Park Highway.

Similarly, the access route to the test well site must cross or run along the wide Nobles Emigrant Trail. Because that access will initially be a route, it will not diminish characteristics qualifying the Nobles Emigrant Trail for inclusion in the National Register. There will be no changes to the surfacing or alignment of the Nobles Emigrant Trail from access to the test well site.

For long-term objectives, if the test well drilling finds a productive well, then the access route from the Lassen Volcanic National Park Highway will be improved and gated to prevent public access. A water line will also then extend from the well site under the trail and access road to Volcano Adventure Camp and Lost Creek Campground. Proposed road and trail improvements will retain the existing area surfacing but will likely be reinforced with road base under existing topsoil. Upon reaching the Nobles Emigrant Trail, the road will be converted to a route that follows that wide trail to the test site. Surfacing material will not change and no visible physical changes to the trail alignment will be implemented. Therefore, there will be no adverse effect on the highway or the trail from actions to implement the proposed action. There are numerous access routes off the highway and in several locations in the park, the Nobles Emigrant Trail provides administrative access to park vehicles to reach operational features. This is currently true of the existing access to the Lost Creek infiltration gallery. The road to Lost Creek also spurs from the Lassen Volcanic National Park Highway and is itself a segment of the Nobles Emigrant Trail.

Archeological Resources and Cultural Landscapes Conclusion

There will be no adverse effect on known archeological or historic resources from implementation of the alternatives. Proposed actions will avoid impacting these resources or will be modified in their proposed implementation to avoid impacting the characteristics that make these resources eligible for the national register. There will be no impairment of archeological resources or cultural landscapes, there will be no impairment.

Conclusion

In conclusion, as guided by this analysis, good science and scholarship, advice from subject matter experts and others who have relevant knowledge and experience, and the results of public

involvement activities, it is the Superintendent's professional judgment that there will be no impairment of park resources and values from implementation of the selected alternative.

Appendix B: Selected Alternative Mitigation Measures

Impact Avoidance, Minimization and Mitigation Strategies

To avoid, minimize or mitigate impacts, the following strategies will be used during or following construction. These best management practices, except where stated otherwise, are derived from Management Policies (NPS 2006) and the Lassen Volcanic National Park General Management Plan (NPS 2003).

The NPS and its contractors will:

Soils and Geology

- Delineate the project construction areas to minimize disturbance outside construction footprints.
- Use existing roads, trails and established pathways to access construction areas where available. Park staff and contractors will install permanent equipment and access roads only if the NPS locates a new adequate and potable groundwater supply. If no usable water is found, the construction areas will be rehabilitated to pre-existing conditions.
- Provide spill-response materials on site at all times during construction. The NPS and its contractors will ensure that on site workers are trained in spill prevention and response. This is an Environmental Protection Agency Clean Water Act requirement under a Non-point Discharge Elimination System (NPDES) permit required for all construction over 0.25 acres.
- Minimize soil disturbance during construction and use of temporary and permanent facilities; the NPS will commence with reseeded or revegetating disturbed areas as soon as practicable.
- Pressure wash any equipment brought to the site to ensure it is clean of mud, weed, seed, etc.
- Inspect all equipment for compliance with cleaning procedures prior to entering the park, including recommending repeat cleaning at the contractor's expense, if needed.

Water Resources

- Use temporary sediment control devices such as filter fabric fences, or sediment traps as needed during construction.
- Naturalize disturbed areas following project completion by adding rocks, soil, or duff to areas without vegetation or needing restoration.
- Locate staging areas well away from places where runoff could affect nearby water bodies.
- Use swales, trenches or drains to divert stormwater runoff away from disturbed areas.

Vegetation

- Establish narrow limits of construction to avoid impacting adjacent vegetation.
- Source all fill materials only from approved sources and inspect all materials prior to importation into the park to avoid inadvertent importation of invasive species.
- Transport and store materials used in project work will be transported and stored so as not to acquire noxious weed seeds from adjacent areas.
- Monitor the project area for undesirable plant species (exotics) and implement control strategies if such species occur.
- Use only native species, appropriate to the site, during revegetation.
- Construct a berm around the well head, to avoid impacts when treating nonnative species in the vicinity of the well. This is required when using herbicides near a well under California State law.

Cultural Resources

- Consult with tribes and groups regarding monument undertakings with the potential to affect resources of cultural and religious significance to ensure tribal perspectives are understood, and adverse effects are avoided or minimized.
- Identify tribal monitoring requirements (if any) during consultation.
- If the test well is successful, the proposed water treatment building and tank will be concealed to the degree possible (using coloration and screening) from the viewshed of the Nobles Emigrant Trail.
- Monitor archeological resources during ground disturbance. Modify actions, if needed, to avoid impacts to previously unknown resources (see next bullet).
- Under the National Historic Preservation Act (NHPA), should unknown archeological resources be uncovered during construction, work will be halted in the discovery area, including within a boundary of approximately 200 feet, a cultural resources specialist contacted, the site secured, and an Inadvertent Discovery Plan implemented, including consult with SHPO and tribal entities according to 36 CFR 800.11. As appropriate, implementing provisions of the Native American Graves Protection and Repatriation Act (NAGPRA) of 1990 would also occur.
- Relocate work if necessary or possible, to a non-sensitive area when unknown archeological resources are located. Relocation will occur to enable more site testing and documentation. Every effort will be made to avoid further disturbance to the site.
- If relocation cannot occur, then mitigation will include documentation of the site to appropriate standards based on consultation with the State Historic Preservation Officer and other experts as applicable.
- Notify and consult with concerned tribal representatives for the proper treatment of human remains, funerary, and sacred objects should these be discovered during the project (in compliance with NAGPRA).

Visitor Experience

- Inform visitors about conditions in the park through press releases to local media and signs in the park.
- During construction, inform visitors via signs about construction activities, including potential closures or delays.
- Use barriers and barricades, signs and flagging, as necessary or appropriate, to clearly delineate work areas and to provide for safe pedestrian travel through the construction area.

