Chapter 2: Alternatives

CHAPTER 2: ALTERNATIVES

INTRODUCTION

This chapter presents the four alternatives (including a preferred alternative) proposed in the *Restoration of the Mariposa Grove of Giant Sequoias/Final Environmental Impact Statement* (*Mariposa Grove FEIS*). These alternatives represent a range of management approaches, each of which would achieve the goals of the project, as required by the National Environmental Policy Act (NEPA). Each of the action alternatives is a comprehensive proposal to meet the goals of restoring degraded giant sequoia habitat and the natural processes critical to the long-term health of the Grove, and to improve the overall experience for visitors (see Chapter 1: Purpose and Need). The No Action Alternative represents a continuation of current management practices and provides a basis to compare differences among the alternatives.

This chapter includes the following:

- A description of the Choosing by Advantages process which guided alternative development (pages 2-2 to 2-4)
- A description of each alternative (pages 2-5 to 2-30)
- Alternatives considered but dismissed from further analysis (pages 2-31 to 2-33)
- The environmentally preferred alternative (pages 2-33 to 2-35)
- Cost estimates associated with implementing the alternatives (page 2-36)
- A summary comparison of the alternatives (Table 2-2)
- A summary of potential impact and restoration footprint areas (Table 2-3)

CHANGES BETWEEN THE DRAFT AND FINAL ENVIRONMENTAL IMPACT STATEMENT (EIS)

The National Park Service (NPS) issued the *Restoration of the Mariposa Grove of Giant Sequoias/Draft Environmental Impact Statement* (*Draft EIS*) to the public in February 2013. In response to the comments received on the *Draft EIS* and new technical information, the NPS revised Alternative 2 (the agency-preferred alternative) and Alternative 4 of the *Mariposa Grove Final EIS*. Alternatives 1 and 3 remain the same as in the *Draft EIS*. The process of comment analysis is described in Chapter 4 (Consultation, Coordination, and Preparers). Written responses to public concerns are located in Appendix C, Public Comments and Responses. The following revisions to the Draft EIS are integrated into the *Mariposa Grove Final EIS*:

1. Reconfigure facilities at the South Entrance hub to accommodate 26 additional parking spaces (from 269 in the *Draft EIS* to 295 in the final plan), including flex-spaces to accommodate oversize vehicles. **Rationale for change:** The increased capacity of the parking lot would ensure that the proposed facility accommodates existing levels of visitation.
2. Provide an off-season overflow parking lot along the Mariposa Grove Road near the picnic area. New analysis showed that the 50-car lot proposed in the *Draft EIS* would not be sufficient to accommodate use when the shuttle is not in operation. **Rationale for change:**

Parking near the picnic area would provide additional parking in close proximity to the Mariposa Grove when the shuttle would not be operating.

3. Increase the size of the buried water tank at the South Entrance. **Rationale for change:** The increased size of the water tank would better accommodate anticipated water needs for consolidation of visitor services at the South Entrance.
4. Explore additional options for the location of the septic system and leach field at the South Entrance. **Rationale for change:** New geotechnical data indicated that soil conditions might not be conducive for the layout and size of the leach fields identified in the *Draft EIS*. Final locations for the septic system and leach fields will be based on continuing geotechnical investigations and soil surveys. The range of options in the Final EIS includes flush toilets, vault toilets, options for leach field sites, and an option to install a sewer line from the lower Grove area to the South Entrance, all within the project area identified in the plan.

In addition to these changes, the Final EIS was edited to improve clarity and add detail in response to public comments, primarily in Chapters 2 and 3.

ALTERNATIVES

The *Mariposa Grove FEIS* describes and analyzes four alternatives: a No Action alternative that represents the continuation of existing conditions and management, and three action alternatives. All the action alternatives propose ecological restoration activities, selected utility repairs or upgrades, and rehabilitation of historic features at Wawona Point, although the alternatives differ in the buildings and infrastructure proposed for removal and relocation. Initial design concepts for the restoration of the Grove were formulated during three design charettes that were held in January, March, and May of 2012. NPS and regional staff representing various technical disciplines, as well as the contracted designer and compliance staff, participated in the charettes. Resource issues and concerns were identified based on research and baseline data documenting the existing conditions within the Grove. Park staff, assisted by the designers, identified numerous potential solutions. These concepts were iteratively assessed and improved, resulting in five preliminary alternatives. A Choosing by Advantages (CBA) workshop, including a value analysis component, was held in June 2012 and resulted in the selection of the alternatives for detailed analysis in this EIS. These sessions were augmented by a separate value analysis for design alternatives to reconfigure the intersection of Wawona Road (State Route 41) and the Mariposa Grove Road that was held in July 2012.

CHOOSING BY ADVANTAGES/VALUE ANALYSIS WORKSHOPS

Three design charettes were conducted in January, March, and May of 2012 with the project team, which included Yosemite National Park staff and management, NPS Pacific West Region staff, and contractors. A wide variety of concepts for restoring the ecology of the Mariposa Grove of Giant Sequoias and improving the visitor experience were considered. A CBA workshop was held in El Portal on June 5-6, 2012. The CBA process is a ranking process that is based on the relative advantages and costs of each alternative in accomplishing servicewide goals and objectives. Through the CBA process, alternatives for the Mariposa Grove restoration effort were evaluated to determine which should be carried through the EIS-level of analysis. The alternatives considered during the CBA process included Alternative A (No Action) and five action alternatives that emerged from the design charettes, as follows:

- Alternative B: South Entrance Hub
- Alternative C: Grizzly Giant Hub

- Alternative D: Lower Grove Hub
- Alternative E: South Entrance Hub II (included removal of commercial tram, communications tower, and road within the Grove)
- Alternative F: South Entrance Hub III (included limited commercial tram access)

Following the CBA workshop, the NPS recommended refinement of Alternatives B, E, and F, in addition to the no-action Alternative A, for analysis in the EIS. During the park's reconsideration phase, these three action alternatives were further developed and refined. With the public comment received during an open house in June 2012 and further staff analysis and discussion, the NPS concluded that Alternative E, without removal of the commercial tram road too closely resembled Alternative B, and that Alternative C provided different approaches to meeting the purpose and need and should be fully assessed in the Draft EIS. Alternative D did not adequately meet the project purpose and need. Alternatives B, C, and F are evaluated in this EIS as Alternatives 2 (South Entrance Hub), 3 (Grizzly Giant Hub), and 4 (South Entrance Hub with Modified Commercial Tram Service), respectively.

Figure 2-1 – Choosing by Advantages Workshop

A separate value analysis workshop was held on July 19, 2012, to identify and rank possible designs for an improved Wawona Road/Mariposa Grove Road intersection at South Entrance. The workshop objective was to ensure consideration of a range of proposals, and to ensure that the project satisfied the park's needs with the lowest impact on resources in the context of criteria that relate directly to NPS service-wide goals and objectives.

The highest ranked option to address issues at the Wawona and Grove roads intersection was the planned kiosk expansion, as represented in the No Action alternative. If vehicular back-ups continue at the intersection after the kiosk improvements, and extend to the kiosks over a sustained period, the park could implement the roundabout option, which was the second highest ranked intersection option. An optimized roundabout is proposed as an option in Alternative 2: South Entrance Hub. This option has several advantages over the current T-intersection design in terms of traffic capacity and safety but is associated with additional costs. A modified T-intersection is incorporated into Alternative 4: South Entrance Hub with Modified Commercial Tram Service. This option had the lowest score and lowest benefit-to-cost ratio.

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ALTERNATIVE 1: NO ACTION

Under Alternative 1, No Action, the lower Mariposa Grove area would continue to serve as the primary arrival and departure point and contact area for visitors to the Grove. Existing buildings and infrastructure in the Grove and at South Entrance would remain. These include the Grove parking lot, the paved commercial tram loop road, tram staging, the concessioner-operated gift shop, Wawona Point overlook features and communications equipment, comfort stations, the Mariposa Grove Museum, and utilities infrastructure (figures 2-2 through 2-4). Under this alternative, compliance with regulatory requirements (e.g., health and safety or historic preservation) or strategies in current and future adopted plans would be implemented over time.

Individual giant sequoia trees as well as sequoia habitat would continue to be impacted by buildings, roads, utilities, and other infrastructure that are adversely impacting tree roots and regeneration, soils, and hydrologic flow. Paved roads, in-sloped trails, and damaged and insufficient culverts would continue to impede sheet flow and divert water from the Grove, and denuded and compacted soils would continue to limit water infiltration and giant sequoia seedling germination. Plugged culverts would be cleaned as part of routine maintenance; however, additional and/or larger culverts would not be installed. The deteriorating water supply system would continue to leak, and the water storage tank and chlorination unit would remain along the upper Grove loop road (figure 2-2), and continue to require maintenance vehicle access. The gift shop, its diesel-powered generator, and the visitor parking lot would remain in place, and the poorly functioning vault toilets would remain at the entrance to the Grove. Park and concessioner operations and overall management of Mariposa Grove would continue as is, including commercial tram staging and operation in and around sensitive natural resources. Facilities and trails would have limited accessibility.

Currently, there is limited parking at South Entrance (~20 spaces) and the Grove (115 spaces, of which 2 are designated for accessible use, as shown in figures 2-2 and 2-4). When the Grove parking lot capacity is reached and the Mariposa Grove Road closes (most commonly during peak season from Memorial Day to Labor Day), visitors attempting to access the Grove are directed to Wawona (over 100 spaces during peak use) by staff at South Entrance. At Wawona, visitors can park and take a free shuttle bus to the Grove. The headways for the park's shuttle service from Wawona average about 15 minutes with stops at South Entrance and Mariposa Grove. This process results in backtracking and considerable visitor frustration; some visitors may decide against visiting the Grove given the time and effort required to reach that destination.

Under Alternative 1, staff would continue to redirect potential Grove visitors to Wawona to take the shuttle when parking areas are full. At present, Wawona is a staging area for the Grove when the Grove and South Entrance parking areas are full. At Wawona, personal vehicles and commercial buses park along the road and in the parking lot for the market and the Pioneer Yosemite History Center to catch shuttles for visitors wanting to go to the Grove. Concessioner staff would continue to provide traffic control at the Mariposa Grove Road gate and the Grove parking lot. While the separate project to relocate the South Entrance kiosks is in-progress, and is expected to alleviate some traffic congestion and confusion in the area, Mariposa Grove visitors may continue to experience occasional backups from the kiosk to the park boundary (figure 2-3).

Accessibility

Under the no-action alternative, visitors with limited mobility can experience the giant sequoias and other remarkable natural and cultural resources in the Mariposa Grove by taking a commercial tram tour, or by following the tram tours in a placarded vehicle (i.e., a vehicle displaying a state-issued license plate, a state-issued accessible parking permit, or a temporary Yosemite-issued parking permit). The other universally accessible facilities in the lower Grove area include two parking spaces and eight vault toilets. In the upper Grove area, the museum is accessible for vehicles parked in the immediate vicinity. Within the Grove, the existing bus drop-off area, parking, and trails do not meet current accessibility standards.

Actions Common to All Action Alternatives

A set of the proposed actions to address the purpose and need for this effort are common to all action alternatives (Alternatives 2, 3, and 4). This section describes these common actions to avoid redundancy in the sections that follow.

Remove Existing Parking from the Lower Grove Area and Restore Habitat – All action alternatives call for the removal of the existing Grove parking lot and the restoration of giant sequoia habitat in the lower Grove area. This would entail removing asphalt, decompacting soils, and revegetating with understory plants through propagules and seeding. The restoration plan for Mariposa Grove is included as Appendix D.

Improve Orientation and Way Finding – Comments received during public scoping and from park staff indicated that orientation and way-finding signage at the entrance and within the Grove could be improved. All action alternatives would include additional signage where needed to provide clearer orientation, interpretation, and direction to visitors upon arrival at the South Entrance to the park and at Mariposa Grove.

Rehabilitation of Wawona Point – All action alternatives call for rehabilitation of historic features at Wawona Point. Wawona Point provides a scenic vista of the western edge of the park and the South Fork Merced River valley, stretching toward the Sierra Nevada foothills and the Central Valley beyond. Historic rehabilitation would include repair of rock work, steps, paths and railings, and removal of remnant asphalt pavement in what was historically a parking area at the summit. Ecological restoration activities would include revegetation of denuded areas and where pavement is removed.

Engineered Hydrology and Road Improvements – All action alternatives include the repair or replacement of drainage culverts and the grading/outsloping of roads and trails within the Grove to promote unimpeded sheet flow and infiltration of snowmelt and rainwater. The improvements would reduce channelization and erosion, and would correct flow barriers that currently divert water both within the Grove and from the Grove watershed entirely. Routine inspection and maintenance would be required to keep culverts clear of debris and sediment.

Removal of Gift Shop from Lower Grove Area – Under all action alternates, the existing concessioner-operated gift shop and the associated diesel-powered generator would be removed from the lower part of the Grove. The gift shop building is an intrusion on the natural setting and the generator is a source of noise and air emissions.

Repair of Water Supply Pipeline – All action alternatives would include relocation of the water treatment and storage units in the upper Grove area, and repair or replacement of the associated

leaking water distribution piping. The distribution system conveys spring water from Biledo Meadow, located east of Mariposa Grove on U.S. Forest Service land, through the upper Grove area, and to Mariposa Grove and South Entrance facilities. The pipeline is leaking chlorinated water, and may be affecting local hydrology and vegetation. The NPS would conduct a Wilderness Minimum Analysis Requirement for all actions within Wilderness.

Structural and Utility Sustainability Improvements – All action alternatives would relocate facilities and functions that do not contribute to the historic significance of the Grove to areas outside of sensitive giant sequoia habitat and wetlands.

For relocated facilities, actions would be undertaken in accordance with the National Park Service *Guiding Principles of Sustainable Design* (1993) and *A Sense of Place – Design Guidelines for Yosemite National Park* (2012). These principles include the orientation of buildings to optimize seasonal solar exposures and to minimize the effects of prevailing winds, design that incorporates the use of natural ventilation, energy-efficient lighting, and the installation of energy- and water-efficient fixtures and utilities.

Commercial Bus Tours – In the future, the NPS may need to institute a permit reservation system for commercial tour buses, if demand exceeds the capacity of the septic system or commercial bus parking spaces.

Grove Vicinity Fire Management – All action alternatives would include continued mechanical thinning and prescribed fire as prescribed in the *Fire Management Plan* (NPS 2004a). Though fire management activities such as these have been occurring within the Grove since the early 1970s, heavy buildup of surface fuels and dense understories are widespread in forested areas around the Mariposa Grove. Planned fire management activities under the current *Fire Management Plan* (NPS 2004a) include mechanical thinning of trees smaller than 20 inches in diameter at breast height (excluding sequoias and black oaks) and prescribed fire in units to the south, east, and west of the Grove. Implementation of planned fire management activities south and west of the Grove to the park's boundary with the Sierra National Forest would help mitigate the risk of a catastrophic crown fire reaching the Grove, as these areas are upwind of the Grove (i.e. the prevailing winds are southwesterly).

Universal Accessibility – Each of the action alternatives would extend opportunities for universal access and enjoyment of resources within the Mariposa Grove. The action alternatives would include construction of universally accessible transportation hubs and comfort stations in accordance with applicable policies and guidance. Each would also include a universally accessible trail through the lower portion of the Grove, which would greatly enhance natural quiet and opportunities for solitude and quiet contemplation away from roads. Facilities and trails would be designed to assure that paths of travel, viewpoints, benches and interpretive signage offer all visitors a quality and meaningful experience while in the Grove.

Universally accessible facilities would comply with Architectural Barriers Act Accessibility Standards (ABAAS) and NPS *Director's Order 42: Accessibility for Visitors with Disabilities in National Park Service Programs and Services.* The design of universally accessible trails is guided by the Accessibility Guidelines for Outdoor Developed Areas.

Convert Southern Portion of the Upper Grove Loop Road to a Pedestrian Trail – All action alternatives would allow for the conversion of the southern portion of the currently paved historic loop road to a pedestrian trail. This portion of the loop has a remarkable density of giant sequoias and would be an exceptional pedestrian pathway.

Convert the Mariposa Grove Road from the Intersection with the Loop Road (near the Museum) to Wawona Point into a Hardened Pedestrian Trail – The segment of the Mariposa Grove Road extending from the intersection with the loop road in the vicinity of the Museum to Wawona Point would be converted into a hardened trail but would allow for occasional use by service vehicles, including those needing access to the telecommunications equipment located at Wawona Point.

Extend Footbridge – An existing non-historic pedestrian bridge in the vicinity of the Fallen Monarch would be removed and replaced with an extended footbridge to reduce impacts on stream flow.

Museum Building – The museum building would remain, however, its use as a primary interpretive facility would be moved to the new hub location under each action alternative. The museum building may be repurposed as a group hiker's shelter, meeting room, or other compatible use.

Improve Visitor Education and Interpretation – Interpretive signage in the Grove was updated in 2009. All action alternatives would implement further measures to better educate Mariposa Grove visitors with additional interpretive waysides, orientation, and informational exhibits and a visitor contact station. All action alternatives would include interpretation of historic and cultural uses in the Grove including American Indian traditional cultural resources and practices.

Monitor Project Success – Develop a monitoring plan prior to project implementation to define the target forest condition and metrics for evaluating the success of restoration efforts as well as defining targeted conditions for the visitor experience.

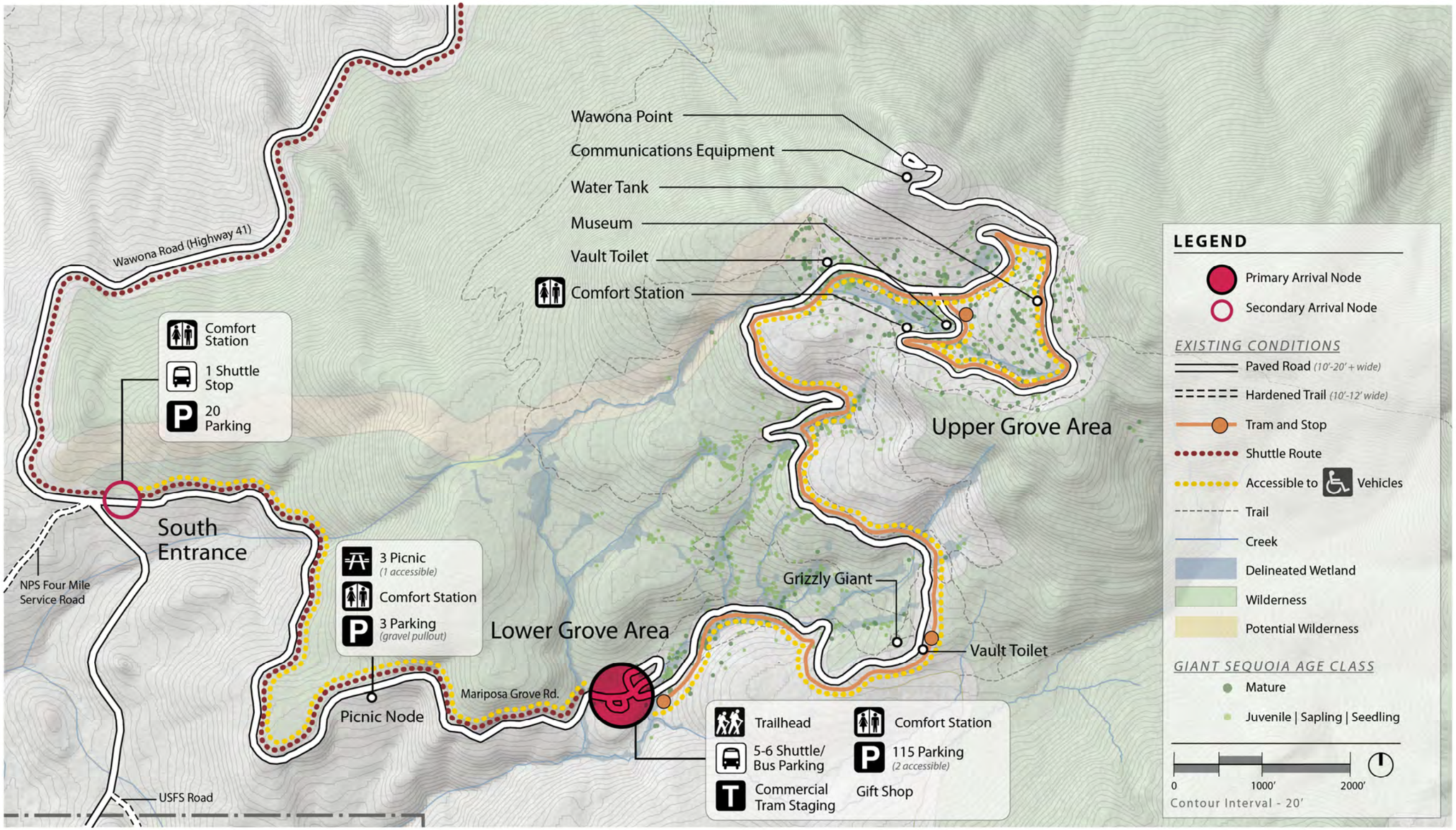

Figure 2-2 – Alternative 1: No Action

Source: Mithun 2013

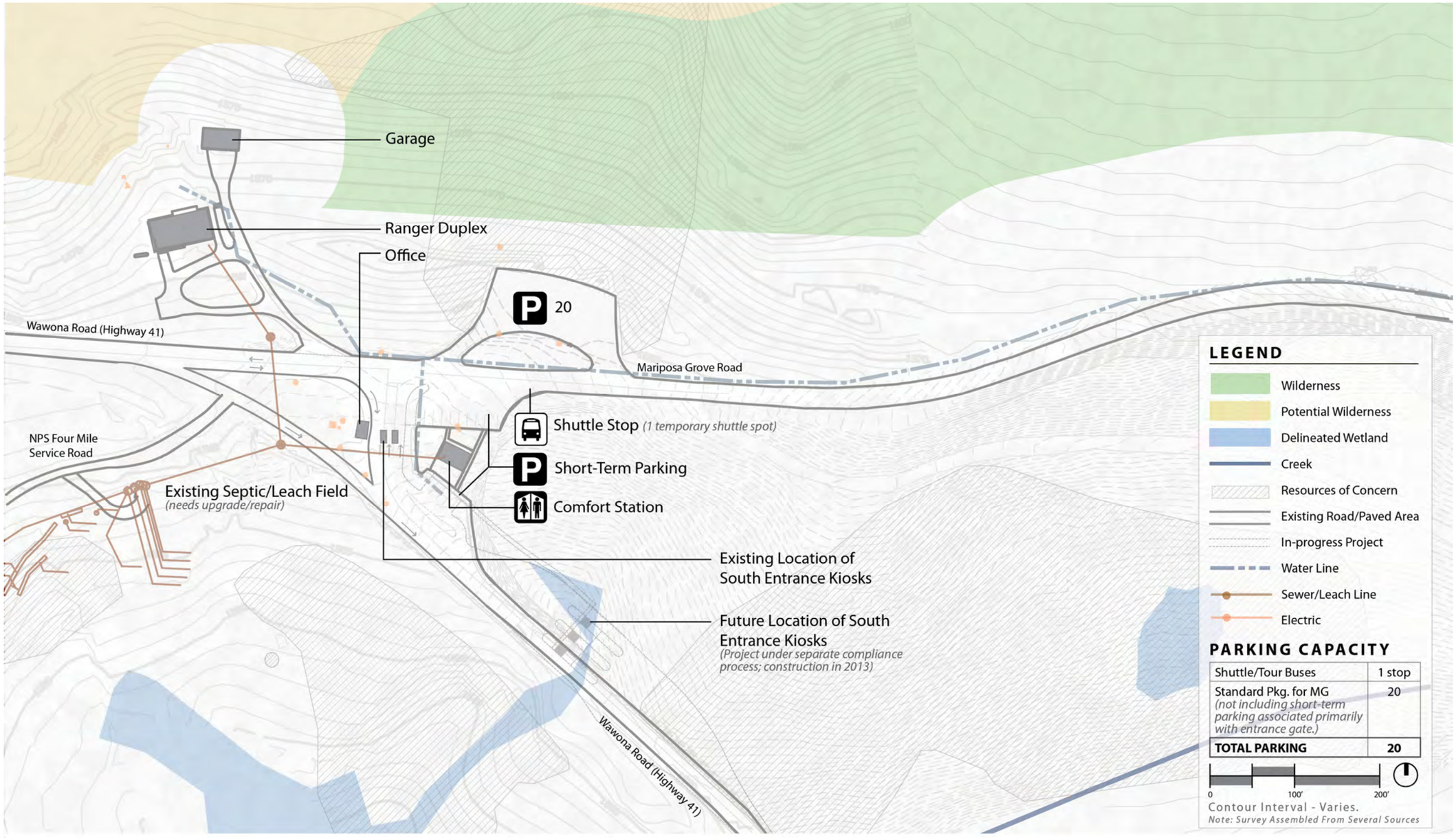

Figure 2-3 – Alternative 1: No Action – South Entrance Detail

Source: Mithun 2013

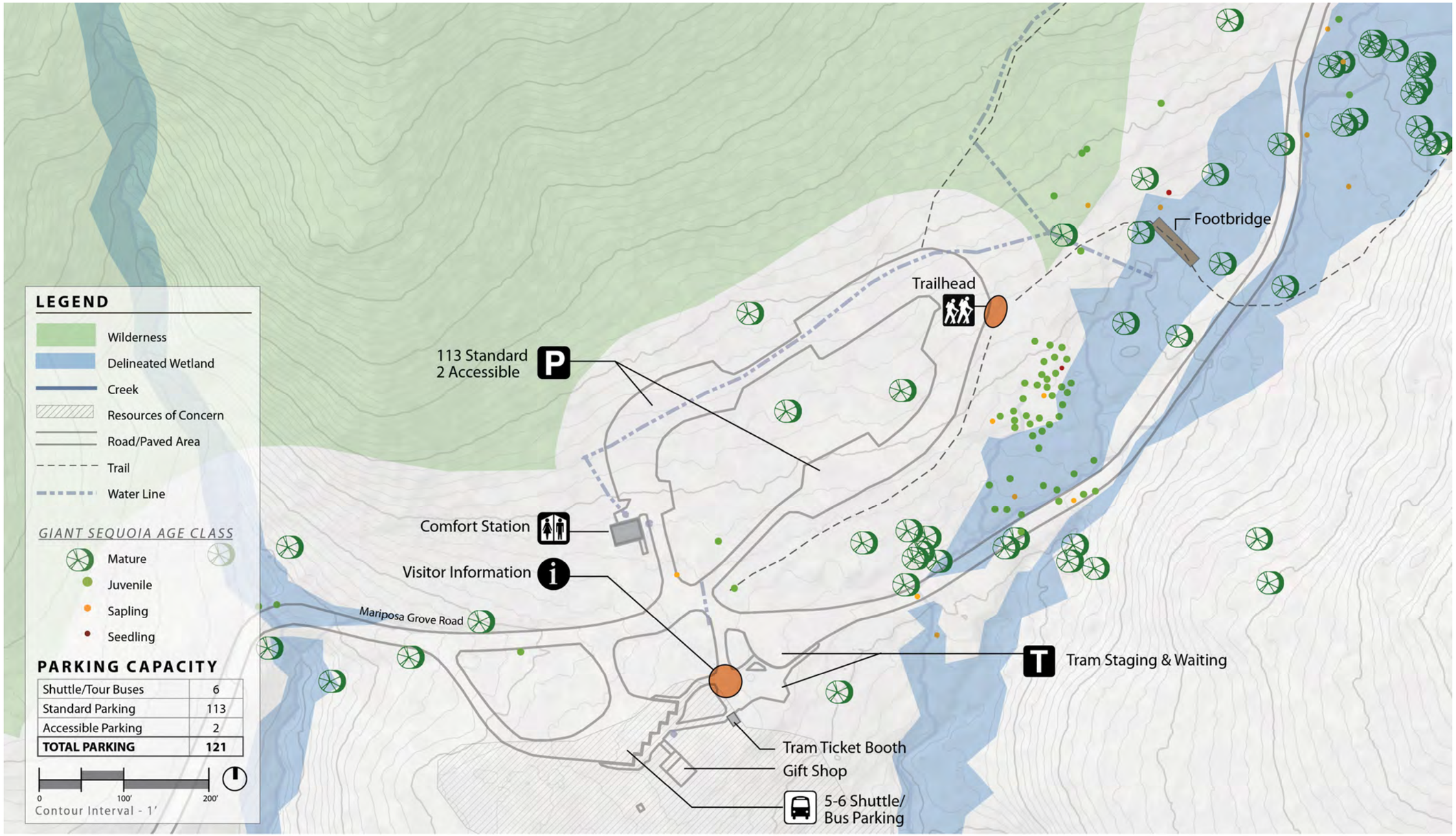

Figure 2-4 – Alternative 1: No Action – Lower Grove Area Detail

Source: Mithun 2013

ALTERNATIVE 2: SOUTH ENTRANCE HUB (PREFERRED ALTERNATIVE)

Alternative 2, South Entrance Hub, is the park's preferred alternative. Under this alternative, most public parking, the gift shop, and the concessioner-operated commercial tram staging area and tram operations would be removed from Mariposa Grove. Impervious surfaces within the Grove would be minimized, and all areas from which buildings or pavement would be removed and that are not slated for reuse would be ecologically restored natural habitat. Following removal activities, ecological restoration measures would include soil preparation (e.g., decompaction), surface contouring to match local topography, and planting the site with appropriate native vegetation. Visitor parking would be relocated to the park's South Entrance, which would serve as the primary transit hub and contact area for Grove visitors. New visitor services would be provided including visitor information and educational and other sales items. Removal of infrastructure from the lower Grove area, selective tree clearing, and development of accessible trails would allow for restoration of wetlands, soundscapes, and giant sequoia habitat, and would greatly enhance the importance of the lower Grove area and Grizzly Giant as a primary destination point for experiencing the sequoias within the Grove. An overview of the principal components of Alternative 2 is shown in figure 2-5, and details are depicted in figures 2-6 through 2-8.

The South Entrance area would be reconfigured as a hub with the main parking area for Mariposa Grove and a visitor contact area, as shown in figure 2-6. Parking at the South Entrance would be expanded from 20 spaces to a total of 295 standard, oversize, accessible, and shuttle/bus parking spaces. The size of the parking lot at South Entrance considers the proposed removal of 115 parking spaces from the lower Grove area as well as the relocation of shuttle parking in the vicinity of the Wawona store (over 100 vehicles during peak use periods). Parking capacity estimates for all of the action alternatives would accommodate the existing level of visitation at the Grove on high-use days.

A retaining wall may be constructed on the uphill side of the current South Entrance parking area to accommodate additional parking and allow for revegetation of the cut slope. A shuttle bus boarding and tour bus transfer area would facilitate visitor use of the park shuttle service to travel to the lower Grove area.

Commercial buses would stop at the South Entrance for visitor orientation, use of restrooms, and transfer to shuttles. Depending on facility capacity and shuttle operations, buses less than 40 feet long may drop off passengers in lower Grove area and park at South Entrance. To provide pedestrian access from the South Entrance to the lower Grove area, the segment of the abandoned Washburn Road alignment from the South Entrance to the Mariposa Grove Road picnic area would be cleared of vegetation and rehabilitated as a pedestrian trail. At least two trail bridges would be needed to cross streams, one in the vicinity of the parking area at South Entrance and one near the entrance to the Grove. Where the Washburn Road ends near the existing picnic area, a new trail would be constructed south of the Mariposa Grove Road from the picnic area to the lower Grove area (shown on figure 2-5). The total trail length between the South Entrance and the lower Grove area would be about 2 miles.

The shuttle service to the Grove would continue to operate between the South Entrance and the lower Grove area. A separate, limited schedule shuttle would connect visitors staying at Wawona, including the hotel and campground, with the South Entrance area where they would be able to catch a shuttle to the Grove. Outside of normal shuttle hours and during the shoulder seasons, when the shuttles are not running, visitors would be provided vehicular access to the lower Grove area where parking for 50-80 vehicles would be available in either the transit turn-around area or the picnic area along Mariposa Grove Road. The potential for early morning as well as late-day use of the spaces would be contingent upon the hours of shuttle operation. Only placarded or service

vehicles would be provided access to the Grizzly Giant. Traffic control related to the closure of the Mariposa Grove Road and lower Grove parking lot during periods of heavy visitation in the shoulder/winter season (typically weekends and on holidays) would continue. During these periods, visitors who are turned away when the lot is full in the Grove would be able to park at the South Entrance and walk into the Grove. When the lot is full, visitors would be directed to other areas of the park. Road closures because of snow conditions in the winter would continue.

The current tram ticketing and turn-around area in the lower Grove would be repurposed as part of a transit node which would also accommodate shuttle and school bus loading and unloading, and accessible parking for placarded private vehicles; these facilities would be located in the vicinity of the current development footprint (see figure 2-7). An accessible trail would be developed in the ecologically restored lower Grove area, and would require some vegetation clearing, grading, and surface hardening. Designated accessible parking spaces would be provided at both the lower Grove area and in the vicinity of the Grizzly Giant, but away from the existing giant sequoias. An accessible trail would be constructed connecting the Grizzly Giant with the proposed nearby accessible parking area (figure 2-8). Other trails would provide opportunities to experience the solitude of the giant sequoias in the upper Grove area.

The NPS is also exploring options for realigning the entrance to the Grove to enhance restoration efforts and straighten the existing tight curve near the giant sequoias in the vicinity of the Three Sentinels. This work would likely be completed in conjunction with the resurfacing of the Mariposa Grove Road between South Entrance and the Grove. **The** potential road realignment is shown on figure 2-7. The crossing over the creek (e.g., box culvert or bridge) would be relocated to improve safety, control erosion of the drainage channel, and avoid giant sequoias. Crossing design and construction would minimize impacts on nearby giant sequoias and wetlands.

Within the Mariposa Grove, the paved road between the Grizzly Giant and Wawona Point would be narrowed and maintained as a hardened trail for pedestrian use and limited service vehicle access. Service access is needed beyond the Grizzly Giant to maintain communications equipment at Wawona Point, and the comfort stations and leach field in the upper Grove area. The short section of road between the lower Grove area and the Grizzly Giant would be signed to encourage visitors to use the pedestrian trail instead of the road. This would help separate the pedestrians from the vehicles with accessible parking placards driving to the Grizzly Giant. The portion of the hardened trail to Wawona Point would undergo drainage improvements, including repair or replacement of existing culverts and minor grading to establish outsloping to improve surface sheet flow and reduce channelization and diversion of water outside the Grove watershed. To the maximum extent practicable, historic road prisms and materials would be retained.

The water supply treatment unit and storage tank currently located along the loop road would be relocated to in the vicinity of the intersection of the loop road and the road to Wawona Point to eliminate the need for maintenance vehicle access along that segment of the loop road. The loop road surfacing would be removed and a hiking trail constructed that would be between 4 and 8 feet wide (figure 2-5).

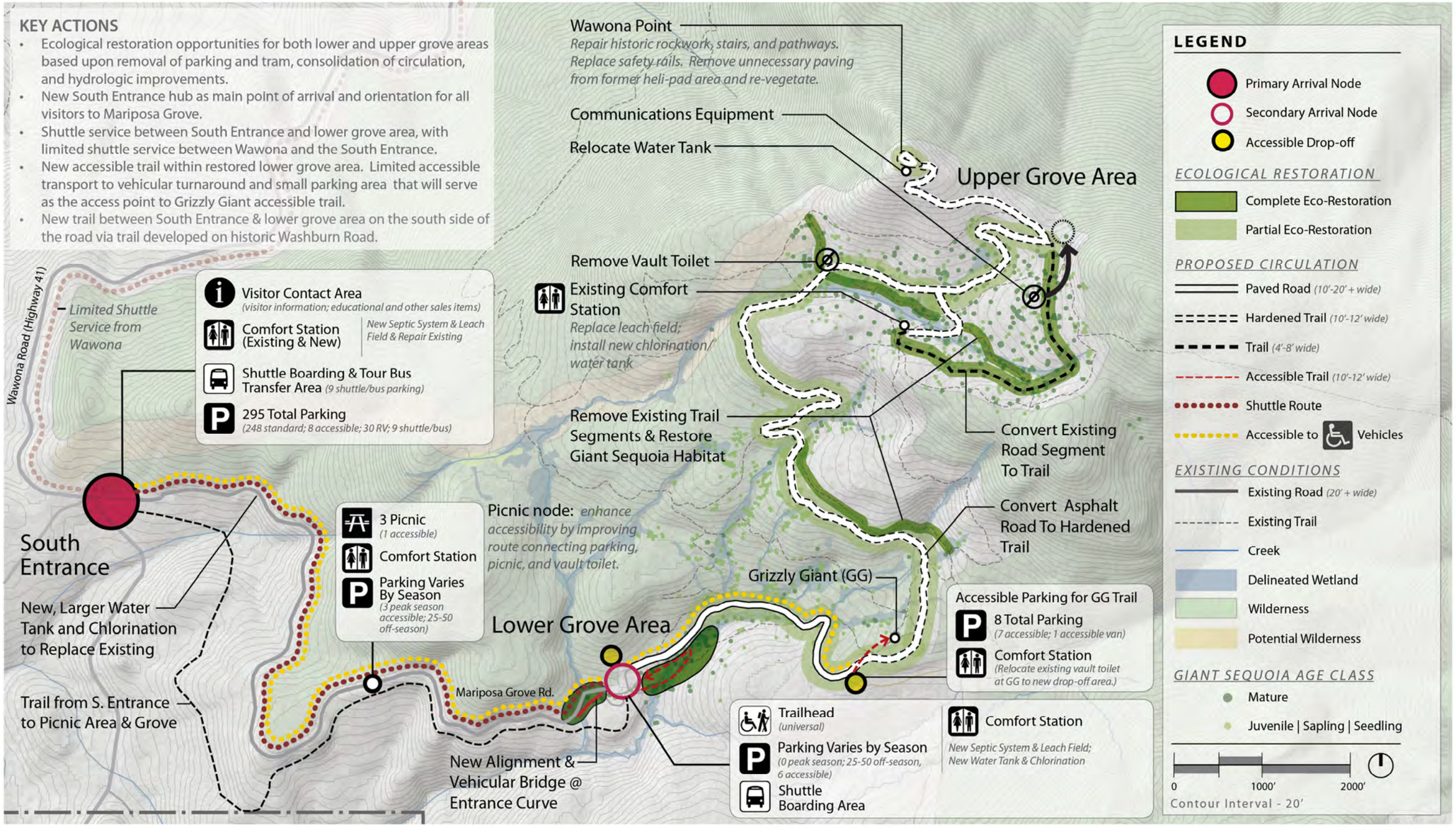

Figure 2-5 – Alternative 2: South Entrance Hub (Preferred Alternative)

Source: Mithun 2013

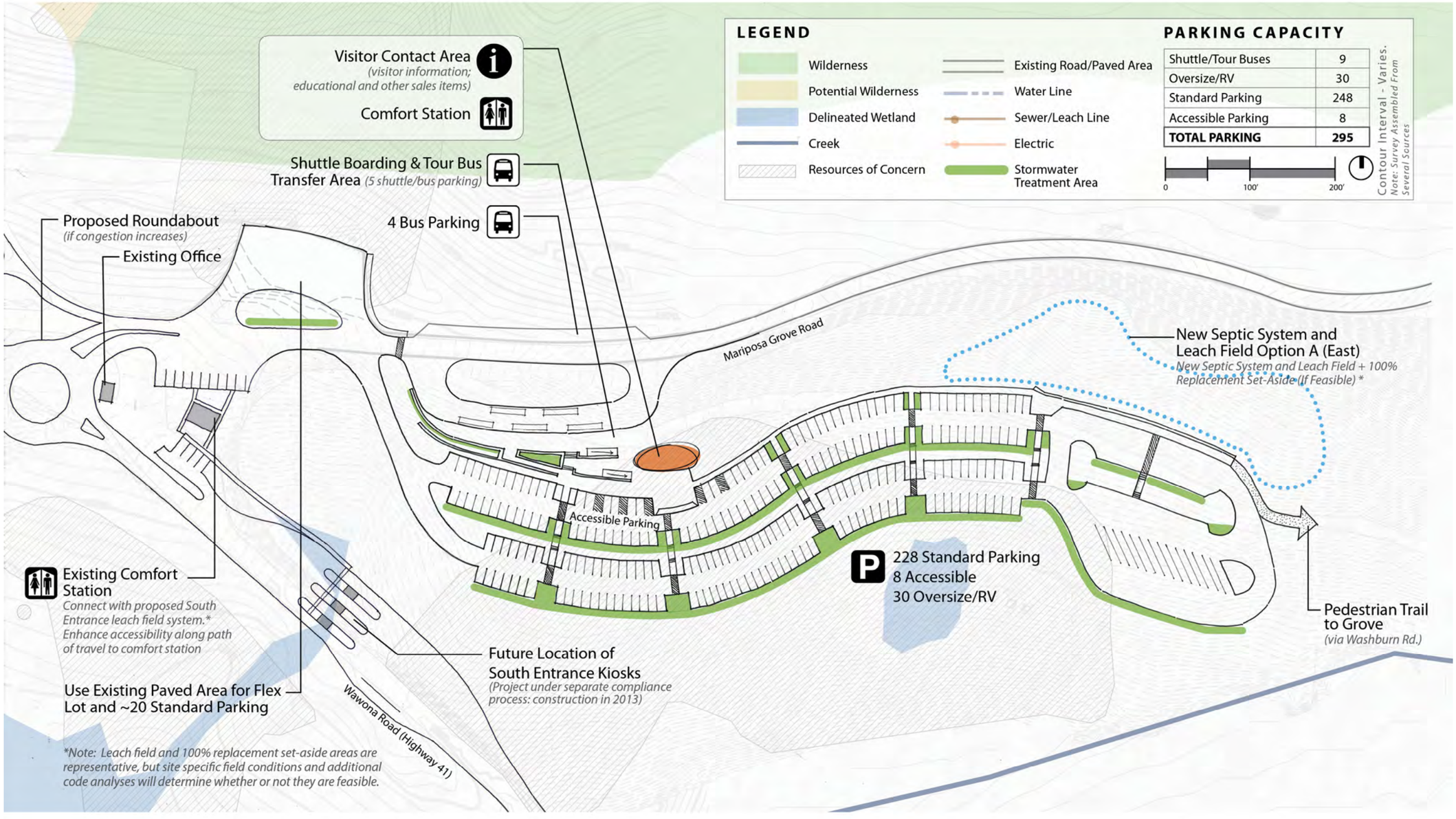

Figure 2-6 – Alternative 2: South Entrance Hub (Preferred Alternative) – South Entrance Detail

Source: Mithun 2013

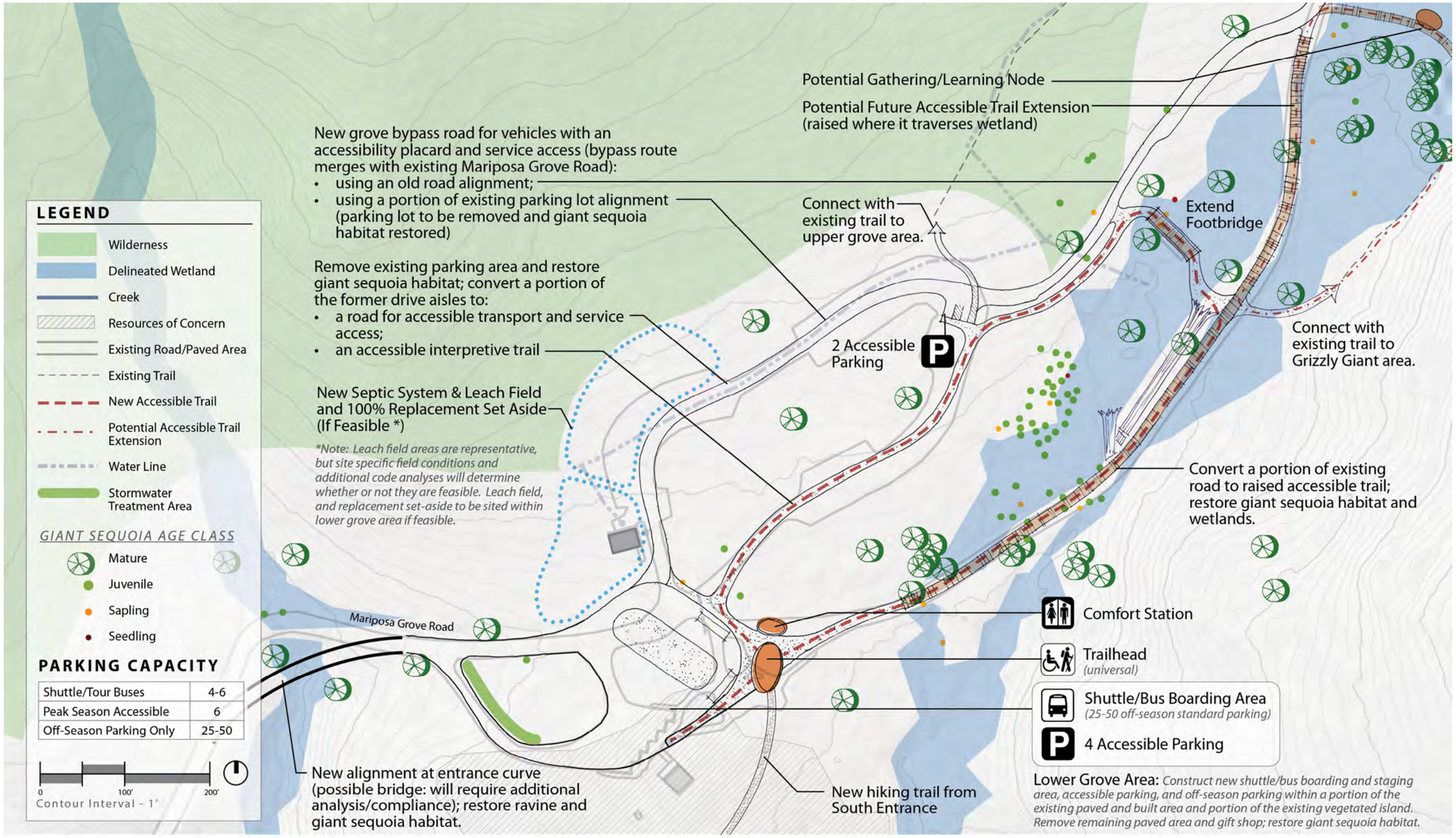

Figure 2-7 – Alternative 2: South Entrance Hub (Preferred Alternative) – Lower Grove Area Detail

Source: Mithun 2013

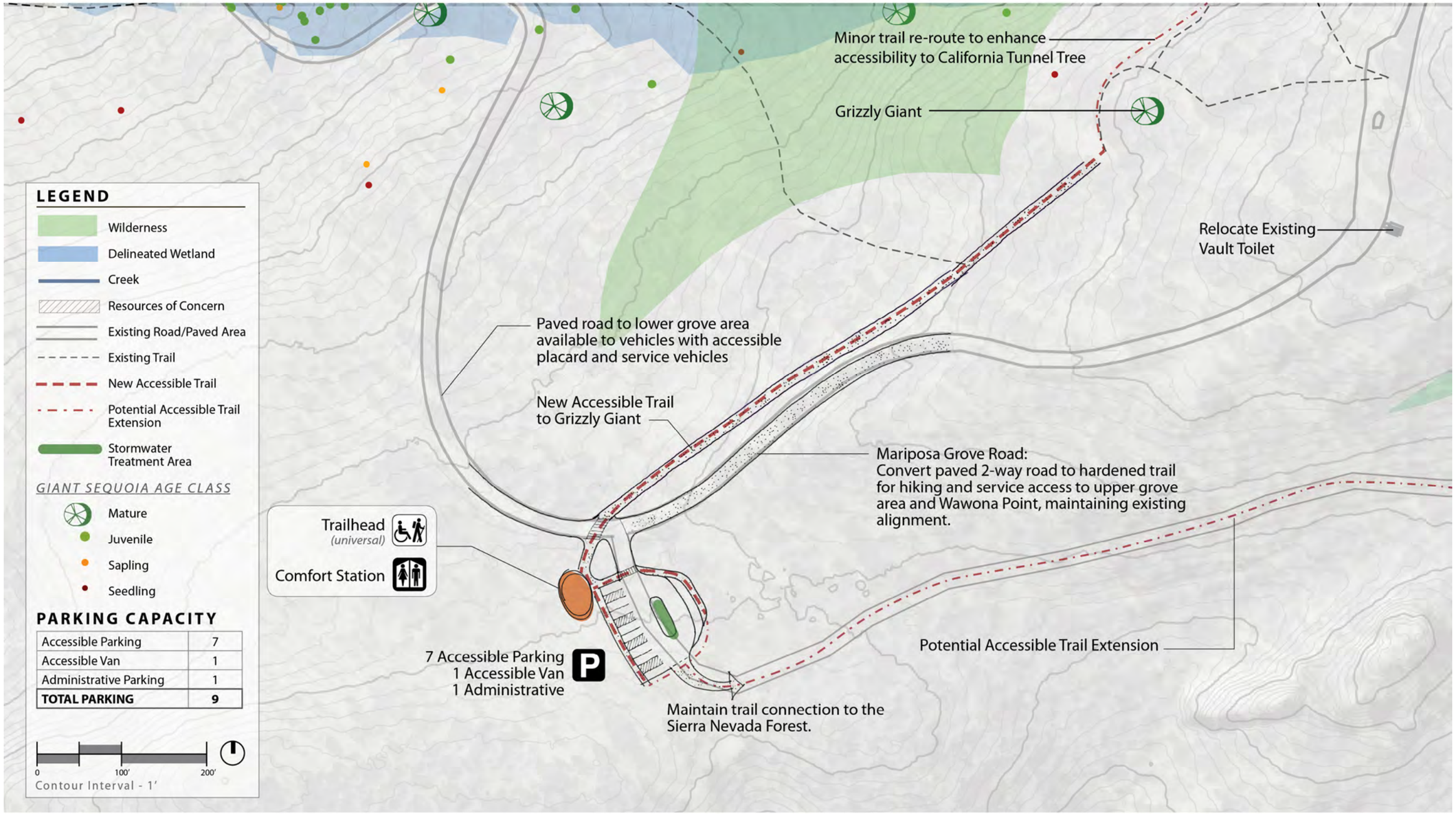

Figure 2-8 – Alternative 2: South Entrance Hub Grizzly Giant Accessible Parking Area Detail

Source: Mithun 2013

Pending geotechnical assessments, new septic systems and leach fields would be installed at both the South Entrance and the lower Grove area to accommodate flush toilets to the extent practicable. The final locations of the new leach fields would be determined based on further analysis of resource and topographic constraints. The installation of a septic system in the lower Grove area would be contingent upon additional soil surveys; an additional option is installation of a sewer line between the Grove and the South Entrance that would be located within the Mariposa Grove road right-of-way. Each leach field option would require the allocation of a 100% replacement area to be set aside for future use at the time the constructed leach field reaches the end of its life cycle. The leach field would require between 2.16 and 3.54 acres, including the 100% replacement area set-aside. Replacement areas would not need to be constructed at the same time as the designated leach fields, but must be set aside for future use. Options for the leach field locations are identified on the figures, however final locations are contingent upon additional geotechnical investigation and would be identified based on feasibility related to soil conditions and to avoid or minimize impacts on sensitive resources including archeological sites. The final determination of flush or vault fixtures would be contingent on the feasibility of the septic system and leach field based on the continuing investigation of site-specific conditions.

At the upper Grove area comfort station, the leach field would be replaced in an area outside of sequoia habitat. The water supply pipeline would be repaired or replaced.

Two non-historic trail segments would be removed under Alternative 2: a section just above the Grizzly Giant that parallels the Mariposa Grove Road and a segment that extends from the southern end of the upper Grove loop road northwestward to a point below and west of Wawona Point. As noted above, a 2/3 mile long segment of the historic loop road in the upper Grove would be converted to a pedestrian trail 4 to 8 feet wide. Existing equestrian trails would not be impacted by the project.

Wawona Road/Mariposa Grove Road Intersection

Under Alternative 2, the park would reconstruct and possibly realign the intersection of Wawona Road and Mariposa Grove Road (figure 2-6) if traffic conditions warrant. This would affect up to 1,100 feet of road beginning on Wawona Road approximately 200 feet south of its intersection with Mariposa Grove Road, and ending approximately 400 feet west on Wawona Road and 200 feet east on Mariposa Grove Road beyond the existing comfort station parking. A roundabout would be explored if the proposed kiosk improvements at the South Entrance (to be implemented in 2013) do not adequately address congestion for visitors coming into the South Entrance from Fish Camp. A proposed roundabout would be optimally located for the site conditions and roadway requirements and would have a 120-foot outside diameter to accommodate the existing type and volume of traffic using the intersection. There would be one lane of traffic in a counter-clockwise direction with an inner concrete paved circle with a mountable curb. The center of the roundabout could be revegetated. Realignment of the intersection is intended to reduce risk of collisions, better accommodate larger vehicles, increase the intersection's vehicle traffic capacity, improve clarity of way finding and travel directions for visitors, reduce traffic congestion at the intersection, and improve working conditions for NPS staff.

Accessibility

Under Alternative 2, integrated, universally accessible (ABAAS compliant) transportation hubs/nodes, parking spaces, comfort stations, interpretive signs and displays, and trails at the South Entrance Station and lower portion of the Grove would allow park visitors with a greater range of physical abilities to experience and enjoy the Mariposa Grove. Visitors with vehicles displaying accessible parking placards or NPS service vehicles would drive through the lower Grove area to the

Grizzly Giant. Several pullouts would be installed to allow these visitors to stop and view individual sequoias or groups of sequoias such as the Bachelor and Three Graces. Accessible parking spaces would be available at the lower Grove area and Grizzly Giant for visitors with accessible parking placards, and the existing vault toilet would be relocated to the Grizzly Giant parking area. The shuttle originating at the South Entrance would continue to be available to visitors with limited mobility.

Accessibility improvements (consistent with ABAAS) would be made to the approach to the existing South Entrance comfort station, which is a contributing feature to the South Entrance historic district. Any alterations would be designed to meet the Secretary of the Interior's rehabilitation treatment standard for historic properties. Historic materials would be salvaged and reintegrated, and character-defining stonework would be retained. Thresholds would be affected only to the extent necessary to allow for universal access, and modifications would be implemented per Secretary of the Interior's *Standards for the Treatment of Historic Properties*.

Additional accessible trails are proposed in the lower Grove area that would allow visitors of all abilities the opportunity to enjoy the beauty and tranquility of Yosemite's giant sequoia forest in a less crowded, more peaceful setting than is available under current conditions. Under Alternative 2, an accessible trail would be created in the ecologically restored lower portion of the Grove that would include boardwalks, benches and viewing areas outside of paths of travel (see figure 2-7). The loop trails would enable all visitors, including those in wheelchairs or with otherwise limited mobility, to move beyond the activity of the parking and shuttle boarding area and into the Grove. Visitors could experience the beauty of the giant sequoias, including the Fallen Monarch, wetlands, streams, and wildlife at their own pace and in a more natural setting. Specific accessible trail alignments will be refined based on site conditions and to maximize use of previously disturbed areas.

A similarly accessible, approximately 2,000-foot-long trail would be built and would include portions of a previously abandoned trail and existing trails to the Grizzly Giant (see figure 2-8). This trail would extend beyond the Grizzly Giant for approximately 400 feet to the California Tunnel Tree, and then beyond for just over 300 feet to an open overlook on a small ridge between two streams. The overlook would offer visitors a glimpse of the landscape context of the Grove; the hillslopes, forest, wetlands and streams that comprise the habitat of the giant sequoias. A trail leading to the adjacent Sierra National Forest is also located at the Grizzly Giant trailhead where the new accessible parking spaces would be located. A potential accessible trail extension could start here, and would wind through forest, past a massive granite outcrop, to a small wetland within the park boundary (see figure 2-8).

ALTERNATIVE 3: GRIZZLY GIANT HUB

Alternative 3, Grizzly Giant Hub, would include removal of the Mariposa Grove parking lot, gift shop, and commercial tram staging area and operations to allow for comprehensive restoration of wetlands, soundscapes, and giant sequoia habitat. Under Alternative 3, a new Grove bypass road, including two bridges, would be routed south of the current Grove access road to a new parking lot southwest of the Grizzly Giant, and outside of giant sequoia habitat (figures 2-9 through 2-11). The new parking area at Grizzly Giant would serve as the primary departure point for visitors wishing to enter the Grove and would be open to all private vehicles (including recreational vehicles and trailers) and buses. At the Grizzly Giant Hub, vault toilets would be used due to the infeasibility and high cost of delivering water to, and disposing of wastewater at, this location.

The roadway between the Grizzly Giant and Wawona Point area would be converted to a hardened trail between 10 to 12 feet wide. Service vehicles would still use the hardened trail for access to the telecommunications facilities at Wawona Point and other facilities in the upper Grove area. The existing road from the lower Grove area to the Grizzly Giant area would be converted to a trail that is between 4 and 8 feet wide. The remaining road would undergo drainage improvements, including cleaning of existing culverts and installation of new culverts to improve water infiltration and prevent diversion of water outside the Grove. Vault toilets along the road within the Grove would be removed. Similar to Alternative 2, a 2/3 mile long segment of the loop road above the Mariposa Grove Museum would be converted into a 4- to 8-foot-wide pedestrian trail.

The current parking lot in the lower Grove area would be removed. Transit service to the Grove from the South Entrance would be discontinued, and the commercial tram would no longer operate. A significantly smaller parking lot providing up to ten ABAAS-compliant accessible parking spaces, trailhead, and loop trail at the lower Grove area, and a new accessible trail at the Grizzly Giant would serve visitors with disabilities. Other visitors could choose to explore the lower Grove area using existing trails near the Grizzly Giant.

Two non-historic trail segments would be removed under Alternative 3: a section just above the Grizzly Giant that parallels the Mariposa Grove Road, and a segment that extends from the southern end of the upper Grove loop road northwestward to a point below and west of Wawona Point. Other trails within the Grove with connections to Wawona and south and east to Sierra National Forest land would remain.

The new bypass road build-out footprint would be 2.20 acres, primarily through non-giant sequoia forest. Approximately 0.33 acre would be in identified giant sequoia forest, and 0.10 acre would be raised crossings over wetlands. Under Alternative 3, the current Wawona Road/Mariposa Grove Road T-intersection would be retained, and would be the same as described for Alternative 1 (No Action).

Accessibility

Under Alternative 3, ten ABAAS-compliant parking spaces, trailhead, and loop trail would be developed at the lower Grove area. An additional seven accessible parking spaces would be provided at the main hub at Grizzly Giant, as well as a new accessible trail to the Grizzly Giant.

Alternatives 2 and 3 both provide accessible trails from the lower Grove area and Grizzly Giant, but Alternative 3 would not provide for additional potential accessible trail development at these locations. Under Alternative 3, accessible facilities would remain unchanged at the South Entrance and the shuttle that accommodated visitors with limited mobility would no longer operate.

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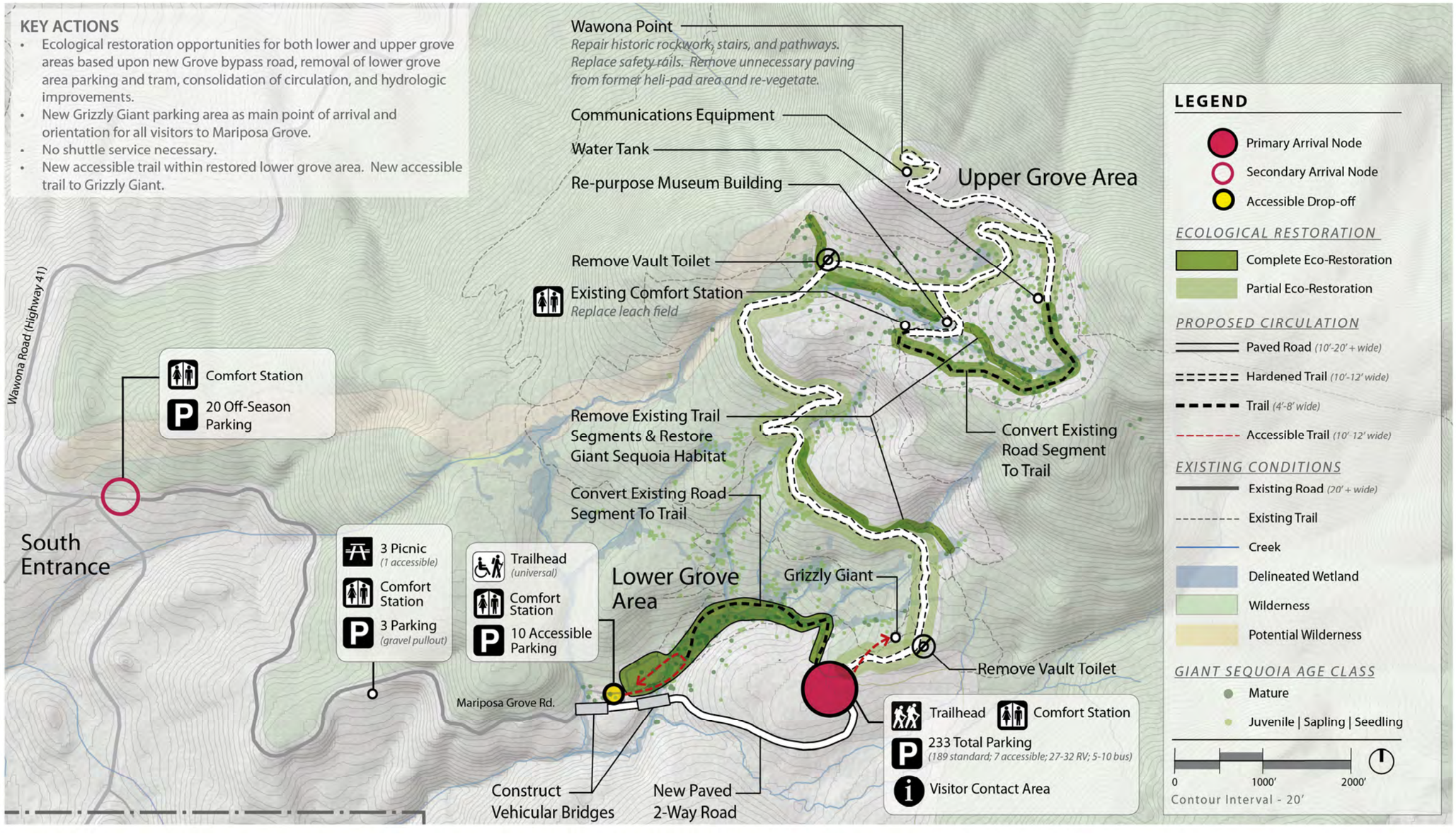

Figure 2-9 – Alternative 3: Grizzly Giant Hub

Source: Mithun 2013

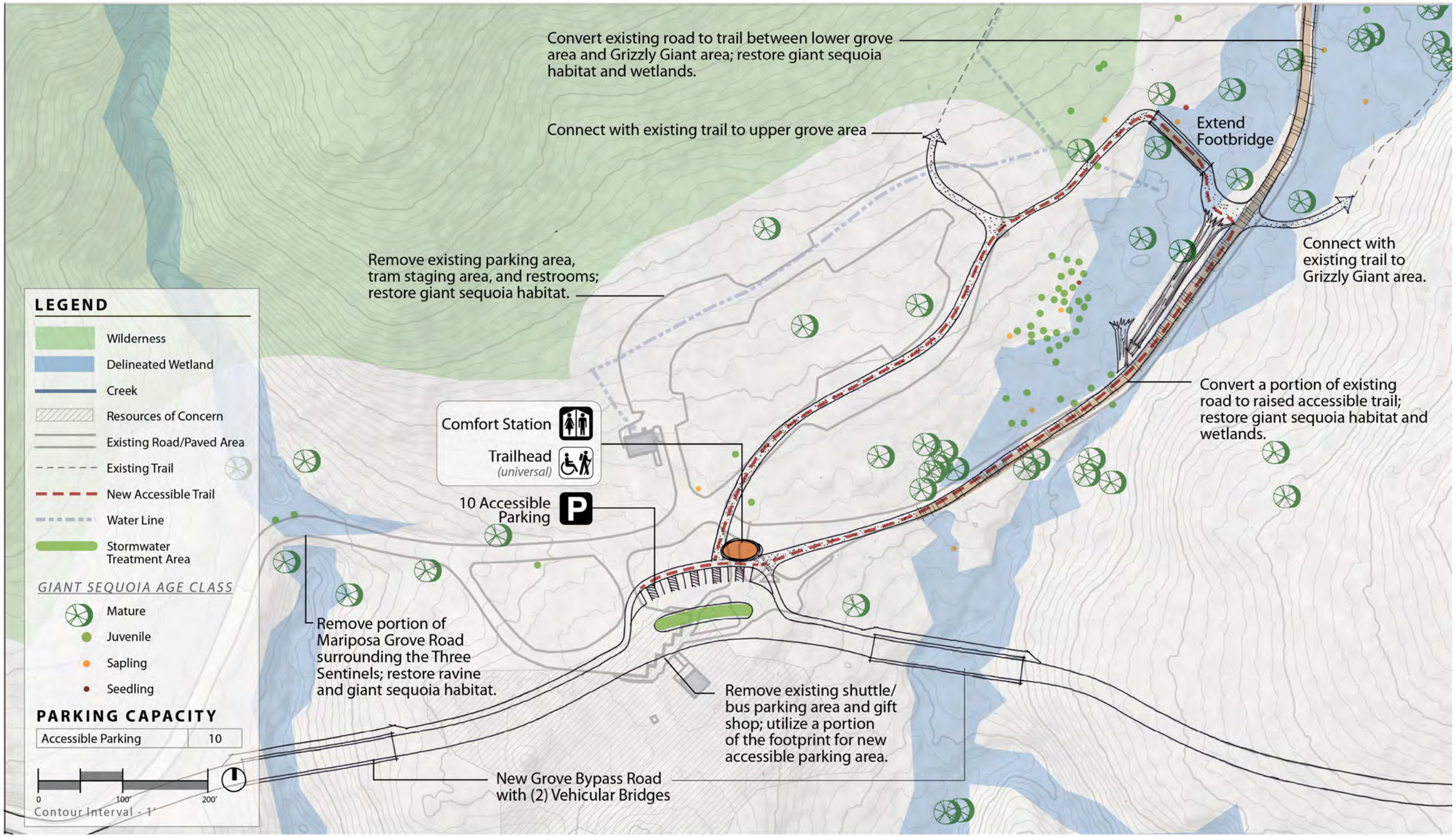

Figure 2-10 – Alternative 3: Grizzly Giant Hub – Lower Grove Area Detail

Source: Mithun 2013

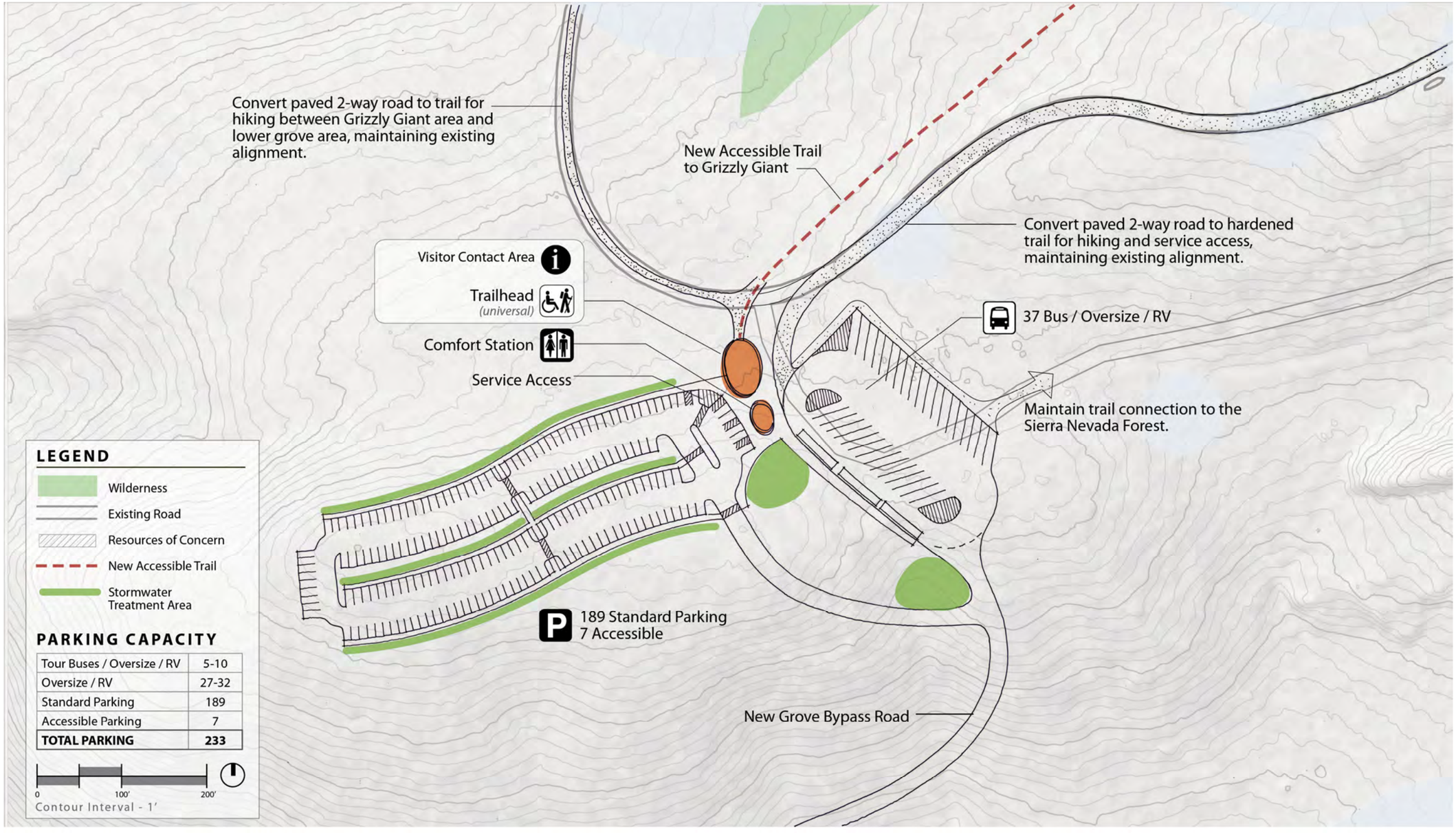

Figure 2-11 – Alternative 3: Grizzly Giant Hub – Grizzly Giant Area Detail

Source: Mithun 2013

ALTERNATIVE 4: SOUTH ENTRANCE HUB WITH MODIFIED COMMERCIAL TRAM SERVICE

Alternative 4, South Entrance Hub with Modified Commercial Tram Service, would remove most public parking, the gift shop, and commercial tram staging from Mariposa Grove, and relocate the parking and tram staging to the park's South Entrance. New visitor services would be provided at the South Entrance including visitor information and educational and other sales items. Previously developed areas not slated for reuse would undergo ecological restoration of wetlands and giant sequoia habitat, similar to that described for Alternative 2. An overview of the principal components of Alternative 4 is shown in figure 2-12, and details are depicted in figures 2-13 through 2-15.

Under Alternative 4, visitor parking would be relocated to South Entrance east of Wawona Road and south of the Mariposa Grove Road (figures 2-12 and 2-13). The proposed configuration at the South Entrance as the primary arrival node would be very similar to Alternative 2. However, the commercial tram tour would operate from the South Entrance, with stops at the lower and mid Grove areas, and end in the vicinity of the Mariposa Grove Museum. To obtain a balance between visitor access and opportunities for quiet and solitude in the upper portion of the Grove, the hours of operation for the tram would be reduced.

Shuttle service would also continue to operate as a free service between the South Entrance and the lower area of the Grove. Under Alternative 4, the shuttle and the commercial tram would share the same road from South Entrance to the lower Grove area. In addition, a shuttle with a more limited schedule than existing conditions would connect visitors staying at Wawona, including the Hotel and campground, with the South Entrance. Commercial bus activity would occur in the same manner as proposed under Alternative 2, with buses greater than 40 feet long stopping at South Entrance for transfer to shuttle. Depending on facility capacity and shuttle operations, buses less than 40 feet long may drop off passengers in lower Grove area and park at South Entrance.

The paved road through Mariposa Grove would undergo drainage improvements, including installation of new culverts to improve sheet flows and reduce channelization and diversion of water out of the Grove watershed. The short section of road below the Grizzly Giant would be signed to encourage visitors to use the pedestrian trail instead of the road. This would help separate pedestrians from vehicles. The paved road would be maintained to the historic museum building and restroom in the upper portion of the Grove, and tram service would transport visitors to the upper Grove along this road. Similar to the other action alternatives, a 2/3 mile long segment of the loop road in the upper Grove area would be converted into a 4- to 8-foot wide trail.

Pending geotechnical assessments, new septic systems and leach fields would be installed at both the South Entrance and the lower Grove area to accommodate flush toilets to the extent practicable. The final locations of the new leach fields would be determined based on further analysis of resource and topographic constraints. The installation of septic in the lower Grove area would be contingent upon additional soil surveys; an additional option is installation of a sewer line between the Grove and the South Entrance that would be located within the Mariposa Grove road right-of-way. Each leach field option would require the allocation of a 100% replacement area to be set aside for future use at the time the constructed leach field reaches the end of its life cycle. The leach field would require between 2.16 and 3.54 acres, including the 100% replacement area set-aside. Replacement areas would not need to be constructed at the same time as the designated leach fields, but must be set aside for future use. Options for the leach field locations are identified on the figures, however final locations are contingent upon additional geotechnical investigation and would be identified based on feasibility related to soil conditions and to avoid or minimize impacts on sensitive resources

including archeological sites. The final determination of flush or vault fixtures would be contingent on the feasibility of the septic system and leach field based on the continuing investigation of site-specific conditions.

Path-of-travel accessibility improvements would be made to the historic comfort stations at the South Entrance and in the upper Grove area. Modifications would be designed to meet the Secretary of the Interior's rehabilitation treatment standard for historic properties. Historic materials, such as any character-defining stonework along the existing paths to the comfort stations, would be incorporated into the upgraded accessible paths-of-travel. The upper Grove leach field would be renovated, and the leaking water line would be repaired or replaced.

One non-historic trail segment would be removed under Alternative 4: a section that extends from the southern end of the upper Grove loop road northwestward to a point below and west of Wawona Point. Because of occasional commercial tram use of the Mariposa Grove Road, the non-historic trail segment proposed for removal under Alternative 2 would remain under Alternative 4 to give pedestrians a vehicle-free option above the Grizzly Giant.

Wawona Road/Mariposa Grove Road Intersection

Under Alternative 4, the park would reconstruct and possibly realign the intersection of Wawona Road and Mariposa Grove Road (figure 2-13). This would include up to 1,100 feet of road beginning on Wawona Road approximately 200 feet south of the intersection with Mariposa Grove Road, and ending approximately 400 feet west on Wawona Road and 200 feet east on Mariposa Grove Road beyond the existing comfort station parking. Under Alternative 4, the T-intersection would be shifted to the northwest, making the entrance into the park a through movement directly toward Wawona and Yosemite Valley destinations, and allowing a right turn onto the Mariposa Grove Road as the minor intersecting roadway. A protected left turn lane for traffic coming from Yosemite Valley and headed toward Mariposa Grove would be provided. This would widen the existing exit lane to three lanes: one in each direction and a turning lane. Realignment of the intersection is intended to reduce accident risks, better accommodate larger vehicles, increase the intersection's through-traffic capacity, improve clarity of way finding and travel directions for visitors, reduce traffic congestion at the intersection, and improve working conditions for Yosemite National Park staff.

Accessibility

Under Alternative 4, placarded vehicles would be able to drive beyond the Grizzly Giant into the vicinity of the Museum in the upper Grove area. Accessible parking spaces would be provided at the upper Grove (4 spaces) as well as Grizzly Giant (4), lower Grove area (6), and South Entrance (8). The tram would also be available for visitors with limited mobility from the South Entrance to the upper Grove, with several stops in between. Visitors would be able to experience the mid-Grove area from an accessible overlook; unlike Alternatives 2 and 3, an accessible trail would not be constructed under Alternative 4. The shuttle originating at the South Entrance would also be available to visitors with limited mobility to take to the lower Grove.

Accessibility improvements would be made at the South Entrance, lower Grove area, and upper Grove. An accessible trail would be constructed in the ecologically restored lower Grove area, and an accessible overlook would be provided near the Grizzly Giant.

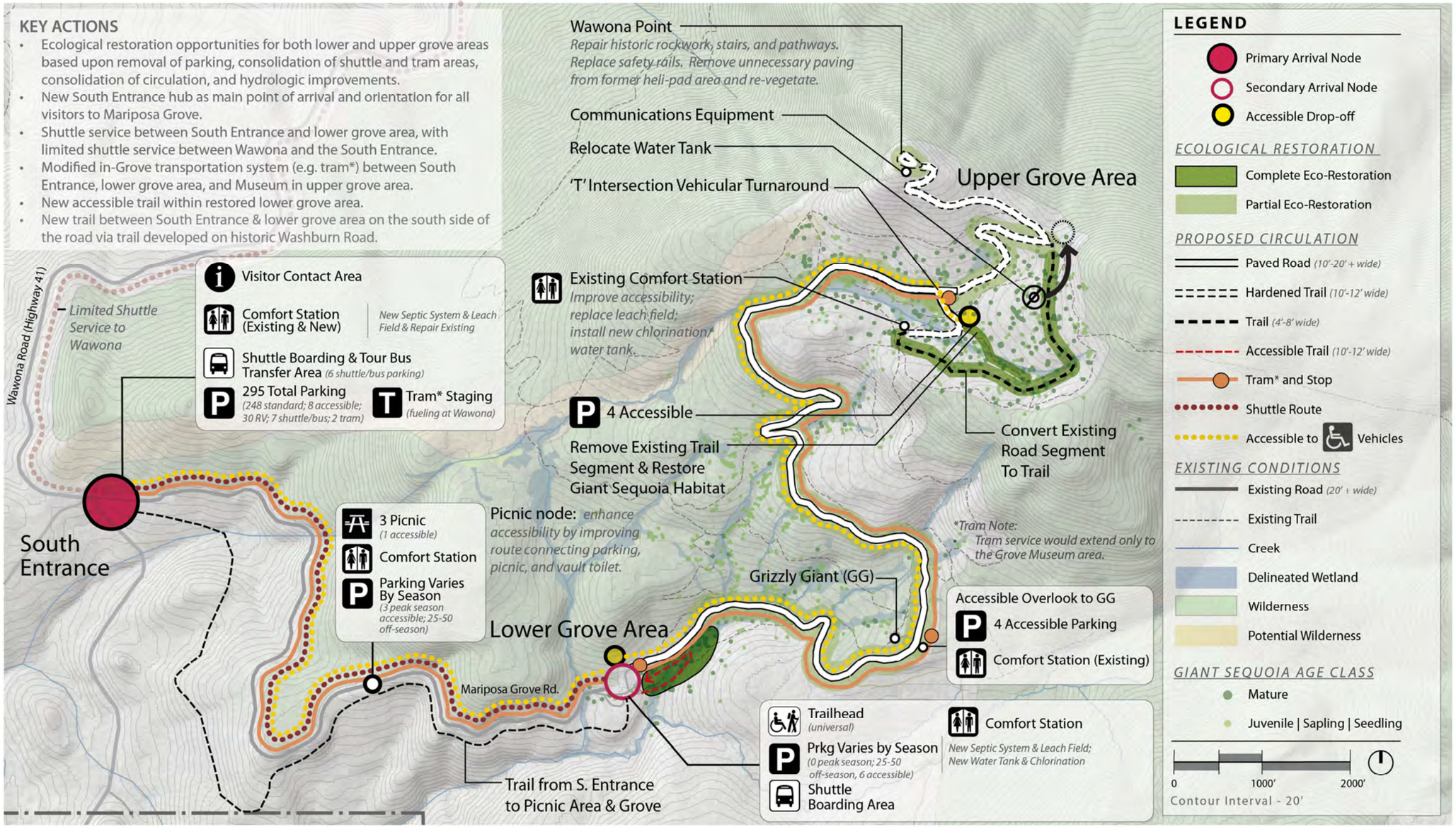

Figure 2-12 – Alternative 4: South Entrance Hub with Commercial Tram Service

Source: Mithun 2013

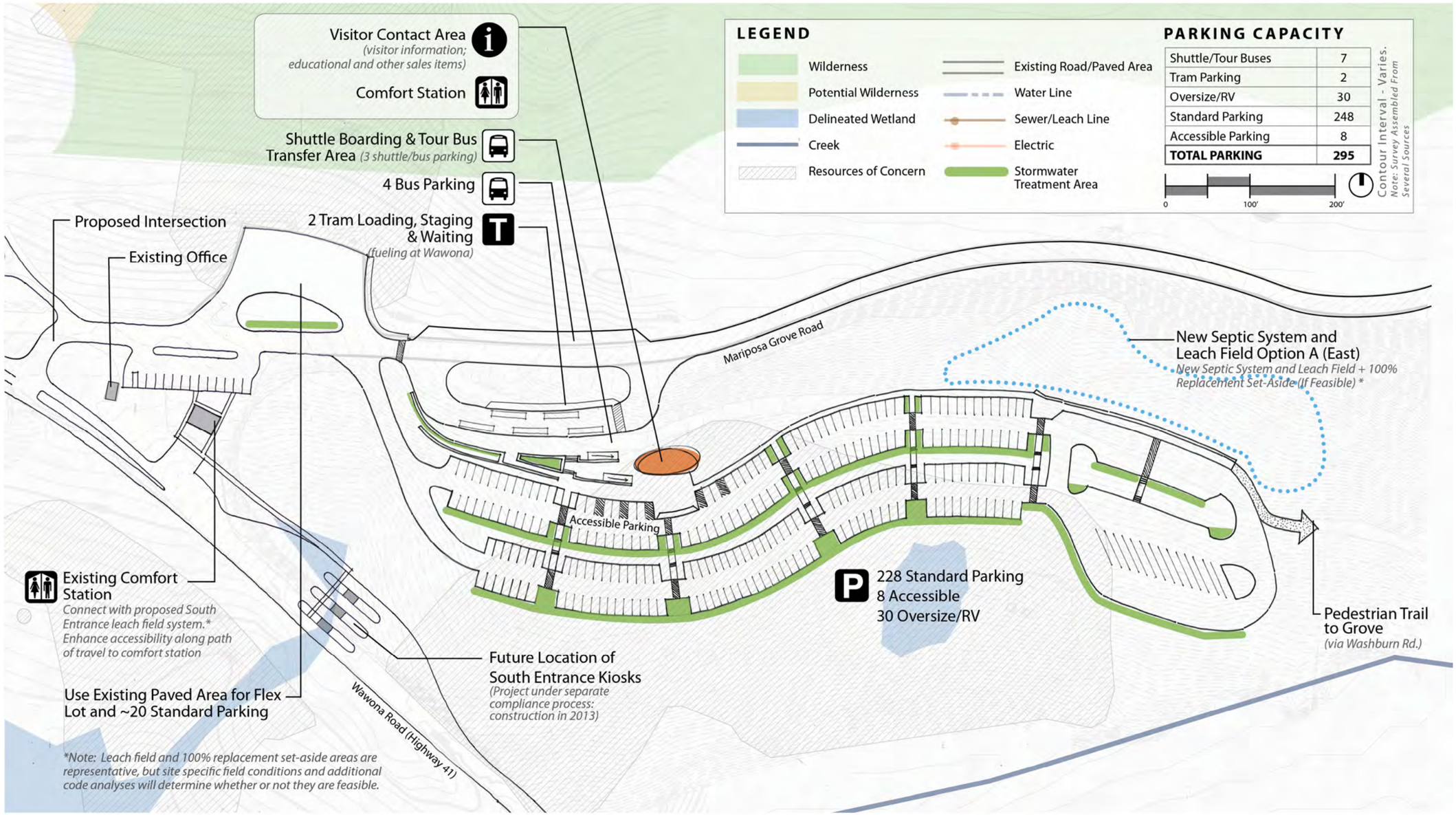

Figure 2-13 – Alternative 4: South Entrance Hub with Commercial Tram Service – South Entrance Detail

Source: Mithun 2013

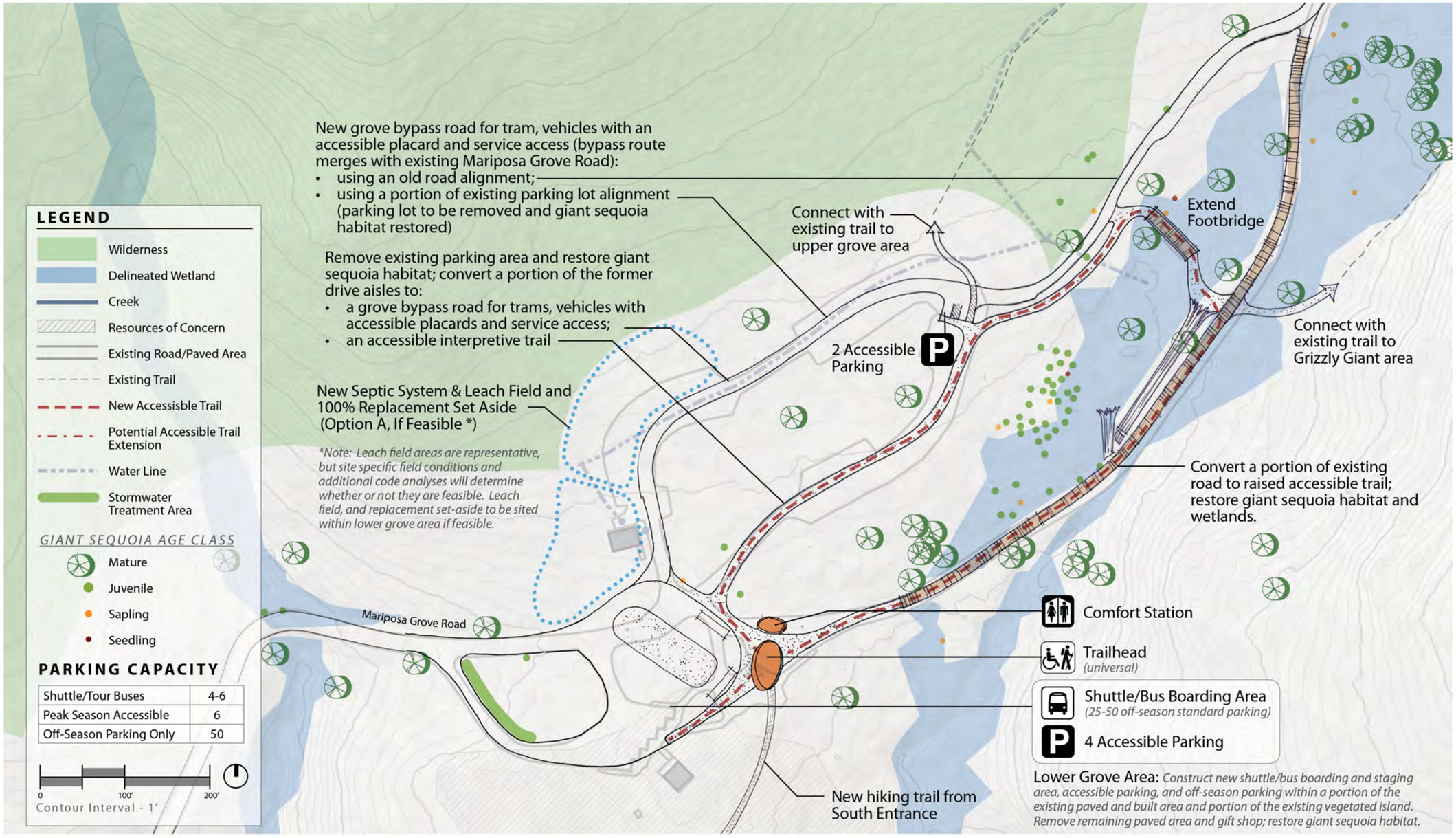

Figure 2-14 – Alternative 4: South Entrance Hub with Commercial Tram Service – Lower Grove Area Detail

Source: Mithun 2013

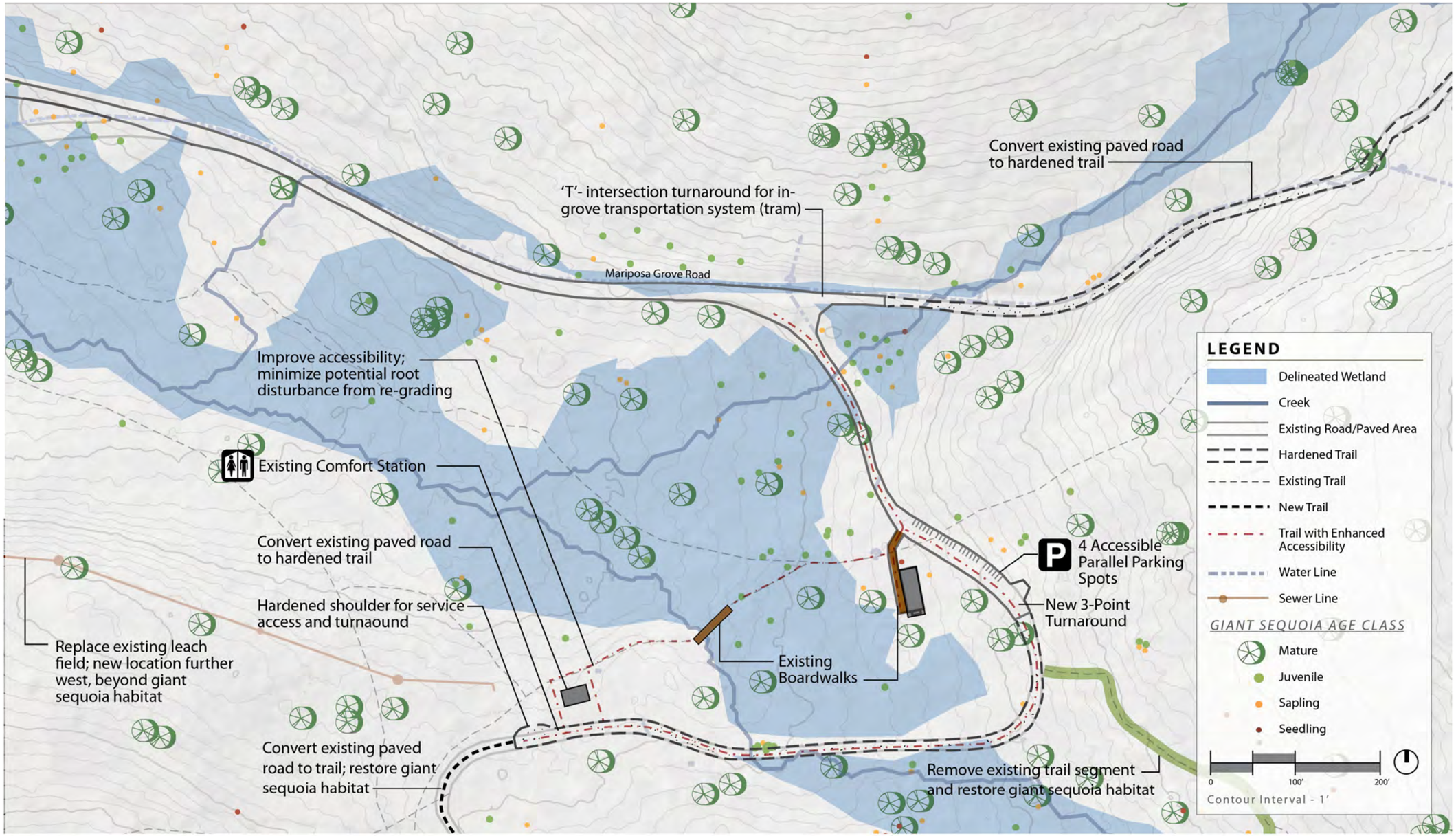

Figure 2-15 – Alternative 4: South Entrance Hub with Commercial Tram Operation – Upper Grove Area Detail

Source: Mithun 2013

ALTERNATIVES CONSIDERED BUT DISMISSED FROM FURTHER ANALYSIS

Under the National Environmental Policy Act (NEPA), an alternative may be eliminated from detailed study for the following reasons (Title 40 Code of Federal Regulations [CFR] Part 1504.14 (a)):

- Technical or economic infeasibility
- Inability to meet project objectives or resolve need for the project
- Duplication of other less environmentally damaging alternatives
- Conflicts with a current, valid plan, statement of purpose and significance, or other policy; and therefore, would require a major change in that plan or policy to implement
- Environmental impacts are too great

The following alternatives and options were considered during the preliminary design phase of the Mariposa Grove of Giant Sequoias restoration project; because they met one or more of the above criteria, they were eliminated from detailed analysis in this EIS.

Lower Grove Area Hub

This alternative was developed to explore low-cost changes that might make a significant difference in resolving the major issues at the Mariposa Grove. In this alternative, the commercial tram would be removed, the Mariposa Grove parking lot would have a smaller footprint, and modest giant sequoia habitat restoration could be achieved in the lower Grove area that would improve existing conditions. An accessible trail could be constructed, and restroom accessibility at the lower Grove area could be greatly improved. This conceptual alternative had an accessible viewpoint overlooking the Grizzly Giant, but no accessible trails. The primary arrival point and contact area for visitors would have remained in the lower Grove area, and access and parking would remain fragmented at the Grove, South Entrance, and Wawona. The alternative, though offering some restoration opportunities, did not adequately address the purpose and need components associated with the sustained overflow parking problems at South Entrance and the subsequent adverse impact on visitor access times and visitor experience. In addition, lower Grove area buildings and infrastructure that are currently adversely impacting giant sequoias as well as other sensitive resources such as wetlands would have remained under this alternative. Therefore, because this alternative did not adequately meet the project purpose and need, it was dismissed from further analysis.

South Entrance Hub, Complete Commercial Tram Road Removal, Relocate Wawona Point Communications Equipment

This alternative was developed to provide extensive giant sequoia habitat restoration by completely removing and restoring the existing commercial tram/service road from the lower Grove area to Wawona Point, including the upper Grove area loop road. Other aspects of this alternative were essentially the same as the Alternative 2, South Entrance Hub. To eliminate the service road, the NPS would have had to relocate the recently installed communications tower at Wawona Point. The location of the Wawona Point communications tower is a critical component of the park-wide communications network. The tower requires periodic maintenance (e.g., refueling) throughout the year, and therefore must be accessible via a roadway for service vehicles.

The park reviewed possible sites for tower relocation, but the only suitable alternate location lies within designated wilderness, and relocation costs would be prohibitive, possibly exceeding several million dollars. The project team also considered alternate power supply for the Wawona Point equipment, but determined that new power transmission lines would cross designated wilderness, solar panels would be unreliable in the winter due to snow cover, and delivery of propane via other transportation modes (e.g., helicopter) during winter months would require extensive site preparation and would be expensive and unreliable during inclement weather. Because the communications tower and the current fueling system could not reasonably be relocated or replaced, the "full" restoration benefits envisioned in this alternative could not be realized, and the alternative ended up being nearly identical to Alternative 2: South Entrance Hub. Therefore, this alternative was dismissed from further analysis. Under the retained action alternatives, the road to Wawona Point would continue to be maintained for occasional vehicular use until the telecommunications tower becomes obsolete due to technological advances, after which more permeable trail surfaces may be explored.

Studhorse Parking

NPS considered adding supplemental parking at the Studhorse parking area located on Wawona Road between Wawona and the South Entrance, to support visitation at the Mariposa Grove. However, the area's proximity to designated wilderness and topographic constraints made a new large parking lot infeasible in the area. In addition, the South Entrance area, being in closer proximity to the Grove, provides more logical centralized placement for Grove visitor parking. Therefore, this area was dismissed as a possible parking component of the alternatives, and was not evaluated further.

Sierra National Forest Parking Siting

NPS considered collaborating with the U.S. Department of Agriculture, Forest Service to create a collection/parking hub and visitor contact area for Mariposa Grove in the Goat Meadow snow play area on Sierra National Forest land, or using Sierra National Forest land for road access. Extensive issues with road widening and fee collection were identified. Complications of planning and managing an out-of-park site with multiple jurisdictions, and a desire to have parking and other visitor facilities closer to the Grove and within the boundaries of the park, led to the dismissal of this option.

New Parking at South Entrance West of Wawona Road

The option to develop new parking on the west side of Wawona Road, near the Wawona Road/ Mariposa Grove Road intersection, was considered. Initial analysis indicated this option would be problematic in terms of topography, visitor orientation, traffic flow, and pedestrian safety. The main concerns were the safety of entrances and exits on the Wawona Road curve and the safety of pedestrians crossing the highway. A possible vehicle or pedestrian underpass beneath Wawona Road was considered to mitigate some of the safety concerns, but the cost associated with a grade separation at this location, coupled with the difficulty in maintaining efficient operations at the South Entrance due to parking congestion, led to dismissal of this alternative. Operational issues were also a concern, as the park service ranger shooting range would be close to the proposed visitor parking. Parking on the east side of the road is more intuitive for people going eastward from South Entrance to Mariposa Grove and allows for a simpler transition for people entering the park from the south. This option also would displace the existing septic system and leach field at South Entrance. The possibility of routing wastewater from South Entrance to the Wawona treatment plant via a new sewer line that would be constructed along Wawona Road also was considered for all alternatives. However, the 7-mile-long sewer line was determined to be cost-prohibitive at an estimated cost of $12 million to $14 million, and this option was dismissed.

Oakhurst or Fish Camp Parking and Visitor Contact

Developing a visitor contact area (similar to that in Mariposa) and possible parking outside park boundaries in Fish Camp or Oakhurst was considered. Complexities with land and building ownership outside the park and a desire to have visitor facilities for the Mariposa Grove closer to the Grove and within the boundaries of the park led to the dismissal of this option.

MITIGATION MEASURES

The NPS places a strong emphasis on avoidance, minimization, and mitigation of adverse impacts under NEPA, and adverse effects under the National Historic Preservation Act (NHPA). To help ensure that project activities protect natural, cultural, and social resources and the quality of the visitor experience, mitigation measures have been developed that would be implemented as part of the action alternatives (see Appendix E: Mitigation Measures). These mitigation measures would occur prior to, during, and after implementation of all proposed actions in Alternatives 2, 3, and 4. Additional mitigation measures may be identified through consultation with the California State Historic Preservation Officer (SHPO) and implemented through a project-specific Memorandum of Agreement, as required under 36 CFR Part 800. All the mitigation measures are considered to be integral to each alternative.

ENVIRONMENTALLY PREFERRED ALTERNATIVE

In accordance with NPS *Director's Order 12: Conservation Planning, Environmental Impact Analysis, and Decision-making* and Council on Environmental Quality requirements, the NPS is required to identify the "environmentally preferred alternative" in all environmental documents, including EISs. The environmentally preferred alternative is determined by applying the criteria listed in NEPA Sec. 101(b). The Council on Environmental Quality (46 Federal Register 18026-18038) states that the "environmentally preferable alternative is the alternative that would promote the national environmental policy as expressed in NEPA's Section 101." Generally, the environmentally preferred alternative is the alternative that causes the least damage to the biological and physical environment and that best protects, preserves, and enhances historic, cultural, and natural resources (46 Federal Register 18026 – 46 Federal Register 18038). Per Section 101 of NEPA, it is the responsibility of the federal government to:

(1) Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations.

All of the action alternatives would, to varying degrees, reduce development footprints within the Mariposa Grove, restore hydrologic and ecological systems to more natural conditions, and stabilize, and/or rehabilitate cultural resources at South Entrance, the Grove, and Wawona Point. Alternative 2 best meets goal 1 because it would reduce developed area within sequoia habitat; require the least new development outside sequoia habitat; implement substantial restoration of wetlands and giant sequoia habitat; and better protect Pacific fishers from road fatalities on the Mariposa Grove Road and within the Grove. The project would also improve the soundscape throughout the Grove by eliminating most private vehicle parking in the lower Grove area during peak-use periods and discontinuing operation of the commercial tram in the upper Grove area. All of these actions would address visitor and operational services that are adversely affecting giant sequoia habitat and provide the best opportunity for sustaining the long-term health of the Mariposa Grove.

(2) Assure for all visitors safe, healthful, productive, and aesthetically and culturally pleasing surroundings.

All of the action alternatives would meet goal 2. Alternative 2 best fulfills this goal for several of the reasons stated above, in conjunction with affording the best balance of more efficient visitor transport via shuttle to and from the Grove and relocation of traffic- and parking-related impacts outside of the Grove. Alternative 2 provides universal access to a quality giant sequoia grove experience in the lower Grove while preserving a less developed, more natural visitor experience in the upper Grove through elimination of the commercial tram operations and reducing the footprint of trails and roadways. The short section of road below the Grizzly Giant would be signed to encourage visitors to use the pedestrian trail instead of the road. This would help separate pedestrians from vehicles with accessible parking placards going to the Grizzly Giant. Alternative 2 assures a safe, productive, and aesthetically and culturally pleasing environment for visitors to the Mariposa Grove of Giant Sequoias.

(3) Attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences.

Alternative 2 would attain the widest range of beneficial uses of the environment while minimizing further degradation of the sensitive giant sequoia environment, and managing risks to visitor health and safety concerns by eliminating vehicle/pedestrian conflicts within the Grove. All of the action alternatives would improve sanitary facilities, and reduce current safety hazards associated with Grove traffic, shuttle stops, and parking. Alternative 2 would also improve visitor safety by separating hikers and pedestrians from roadway traffic, eliminating the commercial tram service and redesigning parking areas and shuttle stops, thereby reducing vehicle/pedestrian conflicts currently associated with shared use of the in-Grove parking lot and roadway. The road below the Grizzly Giant would be signed to encourage visitors to use the pedestrian trail to help separate pedestrians from vehicles.

(4) Preserve important historic, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment which supports diversity, and variety of individual choice.

Alternative 2 would best restore and preserve the giant sequoias of the Mariposa Grove, which are important to our national heritage and the development of both state and national park systems. Alternatives 2 and 3 would provide a better opportunity for solitude in the upper Grove area with the removal of the tram and private vehicles. All of the action alternatives would avoid and/or minimize effects to historic and traditional cultural aspects of the Grove and South Entrance areas; Alternative 3 would have the least effect on the historic setting at South Entrance, but would sustain the most extensive disturbances on archeological resources and alter historic circulation patterns within the Grove by constructing a new road to a new visitor parking and information hub near the Grizzly Giant.

(5) Achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities.

Alternative 2 would reduce in-Grove infrastructure. Alternative 2 best conserves energy by significantly restricting private vehicle access to the Grove and eliminating commercial tram operations within the Grove. All action alternatives improve accessibility to the Grove for visitors with limited mobility. Alternative 2 offers the best opportunity for expanding the range of visitor experiences by expanding accessible trail opportunities in diverse areas in the lower Grove area and at Grizzly Giant. Alternatives 2 and 3 would provide a better

opportunity for quiet, natural sounds, and solitude in the upper Grove with the removal of the tram and private vehicles, enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

All of the action alternatives would implement sustainable principles and technologies in accordance with *Guiding Principles of Sustainable Design* (NPS 1993). Sustainable principles and technologies would include recycling of demolition debris to the extent practicable, using recycled materials in construction, repair or replacement of inefficient systems, improved operational practices, and installation of energy- and water-efficient features and utilities. Alternative 2 represents the most efficient management of depletable fossil fuels both by eliminating in-Grove tram operations, and most private vehicle access during peak visitor season, and by concentrating visitor and employee parking near a park entrance and implementing efficient shuttle service using buses that operate on alternative fuels.

On balance, Alternative 2 (the preferred alternative) best achieves these national environmental policy goals, and therefore is identified as the environmentally preferred alternative.

COST ESTIMATES

The estimated costs of "hard construction" for each alternative, as understood at the 50-percent schematic design development phase, were assembled using empirical market data and input from vendors and industry professionals. These cost estimates present a relative comparison of costs among the alternatives. The estimating process attempted to anticipate design and scope in advance of the development of engineering, architectural detailing, inventory of existing conditions, and topographical surveys. The estimate employed unit assembly costs extrapolated, in part, from modeling data from similar completed projects. The unique nature and remote location of the Mariposa Grove of Giant Sequoias, however, presented a challenge for identifying comparable project data. Table 2-1 presents the preliminary cost estimates for construction costs. With regard to the accuracy of the estimated costs, Alternative 3 has the most uncertainty since additional geotechnical investigation would be needed to determine the costs of construction for a new segment of road within the Grove. Unlike the action alternatives, the No Action Alternative has no net construction costs.

Table 2-1 – Preliminary Cost Estimates

Action	Alternative 1: No Action	Alternative 2: South Entrance Hub	Alternative 3: Grizzly Giant Hub	Alternative 4: South Entrance Hub with Commercial Tram Operation
Facilities at South Entrance	$ 0	$9,986,000	$ 0	$9,986,000
Facilities in Lower Grove Area	$ 0	$1,317,000	$433,000	$1,578,000
Facilities at Grizzly Giant	$ 0	$214,000	$3,819,000	$54,000
Facilities in Upper Grove Area	$ 0	$547,000	$476,000	$498,000
Roads, Trails, and Restoration	$ 0	$8,647,000	$18,070,000	$9,339,000
Construction Costs	**Existing conditions**	**$20,711,000**	**$22,798,000**	**$21,455,000**

Notes:
1) Construction of an optional bridge in the lower Grove area under Alternative 2 would require additional cost/design analysis and compliance. A preliminary estimate for construction of the bridge is $4M.
2) If soil conditions in the lower Grove area are such that a septic system is not feasible, a sewer line would need to be installed within the road prism and would add an additional $2M to the cost for Alternatives 2 and 4. Alternative 3 relies on use of vault toilets at the Grizzly Giant.
3) 50-year project life cycle costs assume a 2.2% discount rate (which refers to the interest rate used in discounted cash flow

SUMMARY OF ALTERNATIVES AND POTENTIAL IMPACTS

Table 2-2 presents a summary comparison of alternatives, and Table 2-3 summarizes build-out and ecological restoration acreages by alternative.

Table 2-2 – Summary Comparison of Alternatives

Proposed Project Action/Component	Alternative 1: No-Action	Alternative 2: South Entrance Hub (Preferred Alternative)	Alternative 3: Grizzly Giant Hub	Alternative 4: South Entrance Hub with Modified Commercial Tram Service
Ecological Restoration				
Wetland restoration at lower Grove area with boardwalk	No	Common to all action alternatives	Common to all action alternatives	Common to all action alternatives
Remove 115-car parking lot and other infrastructure in lower Grove area	No	Yes, but addition of 6 accessible and 25-50 parking spaces in new shuttle turnaround for when shuttle is not in operation	Yes, but addition of 10 accessible spaces in new design	Yes, but addition of 6 accessible and 25-50 parking spaces for when shuttle is not in operation
Remove upper Grove area loop road/convert to trail	No	Common to all action alternatives	Common to all action alternatives	Common to all action alternatives
Install/repair/replace culverts to improve hydrology	No	Common to all action alternatives	Common to all action alternatives	Common to all action alternatives
Prescribed fire and thinning within and surrounding the Grove	Yes	Common to all action alternatives	Common to all action alternatives	Common to all action alternatives
Soil decompaction	No	Yes	Yes	Yes, more limited than Alternative 2
Natural soundscapes improved/restored	No	Yes	Yes	Yes, more limited than Alternative 2
Additional fencing for root protection	No	Common to all action alternatives	Common to all action alternatives	Common to all action alternatives
Visitor Use and Access				
Improved visitor orientation and wayfinding	No	Common to all action alternatives	Common to all action alternatives	Common to all action alternatives
Improved ecological, historical and cultural interpretation	No	Common to all action alternatives	Common to all action alternatives	Common to all action alternatives
Primary visitor contact	At lower Grove staging area	At South Entrance Hub	At Grizzly Giant Hub	At South Entrance Hub
Visitor amenities	Gift Shop (snacks) at lower Grove area, Museum (interpretation, books) in upper Grove area	New/relocated visitor information and services at South Entrance Hub, including information, educational and other sales items	New /relocated visitor information and services at Grizzly Giant Hub	New /relocated visitor information and services at South Entrance Hub, including information, and educational and other sales items
Mariposa Grove Museum interpretive components	Contains primary interpretative exhibits for the Grove.	Primary interpretive information relocated to South Entrance Hub. Repurpose museum to ensure protection of historic resource.	Primary interpretive information relocated to Grizzly Giant Hub. Repurpose museum to ensure protection of historic resource.	Primary interpretive information relocated to South Entrance Hub. Repurpose museum to ensure protection of historic resource.
Wawona Point overlook	Access for utility functions only.	Common to all action alternatives: Repair historic walls and overlook.	Common to all action alternatives: Repair historic walls and overlook.	Common to all action alternatives: Repair historic walls and overlook.
Visitor winter access to Grove (all-season visitor enjoyment)	Road closed, not plowed. Can ski/snowshoe from South Entrance, limited parking (20 spaces) at South Entrance.	Could ski/snowshoe, hike from South Entrance if road/gate closed, ample parking at South Entrance. 50-80 seasonal spaces available at the picnic area and lower Grove if road open.	Could ski/snowshoe, hike from Grizzly Giant trailhead if road open (parking at Grizzly Giant lot). If road closed, still have limited parking at South Entrance (20 spaces).	Could ski/snowshoe, hike from South Entrance if road/gate closed, ample parking at South Entrance lot. 50-80 seasonal spaces available at the picnic area and lower Grove if road open.
Accessible trail	No Paths of travel in lower Grove area not up to accessibility standards.	Lower Grove area, Grizzly Giant with potential accessible trail expansions in those areas	Lower Grove area, Grizzly Giant	Lower Grove area, Grizzly Giant overlook
Trail from South Entrance to the Grove	None	Utilize abandoned Washburn Road as trail to picnic area and continue into lower Grove area.	None	Utilize abandoned Washburn Road as trail to picnic area and continue into lower Grove area.
Accessible road access(for private vehicles with placards)	Access to lower Grove area, Grizzly Giant, and upper Grove area loop road.	Access to lower Grove area and Grizzly Giant.	Access to lower Grove area and Grizzly Giant.	Access to lower Grove area, Grizzly Giant, and a portion of the upper Grove area.
Accessible parking spaces	2 at lower Grove area	8 at South Entrance; 6 at lower Grove area ; 3 at picnic area; 8 at Grizzly Giant	7 at Grizzly Giant; 10 at lower Grove area	8 at South Entrance; 6 at lower Grove area ; 3 at picnic area, 4 at Grizzly Giant; 4 at upper Grove
Accessibility of visitor amenities	Accessible vault toilet at picnic area along Mariposa Grove Road (outside Grove). Accessible vault toilet in lower Grove area.	Accessible comfort stations at South Entrance and lower Grove. Accessible vault toilets at Grizzly Giant and picnic area.	Accessible vault toilets at picnic area, lower Grove, and Grizzly Giant.	Accessible comfort stations at South Entrance and lower Grove. Accessible vault toilets at Grizzly Giant and picnic area.
Transportation				
Commercial tram staging area and operations (approximate) (Tram is accessible.)	Yes, through upper Grove loop road, staging at lower Grove area	No service	No service	Yes, to museum, staging at South Entrance
Shuttle access to lower Grove area (Shuttle is accessible.)	Yes, peak season (Memorial Day-Labor Day)	Yes, expanded to include shoulder seasons (April through October as weather permits)	N/A	Yes, during peak season
Shuttle schedule (approximate)	May – October, South Entrance and Wawona to lower Grove area	April – October, South Entrance to lower Grove area; occasional service between South Entrance and Wawona	No service	April – October, South Entrance to lower Grove area; occasional service between South Entrance and Wawona
Standard vehicle parking spaces	20 at South Entrance, 115 seasonal at lower Grove area. Over 100 spaces at Wawona are used for overflow parking.	248 at South Entrance, 25-50 seasonal at lower Grove area, 25-50 seasonal at picnic area	20 seasonal at South Entrance, 189 at Grizzly Giant	248 at South Entrance, 25-50 seasonal at lower Grove area, 25-50 seasonal at picnic area

Proposed Project Action/Component	Alternative 1: No-Action	Alternative 2: South Entrance Hub (Preferred Alternative)	Alternative 3: Grizzly Giant Hub	Alternative 4: South Entrance Hub with Modified Commercial Tram Service
Large vehicle parking spaces	<5	30 oversize, 9 commercial bus/shuttle at South Entrance	27-32 oversize, 5-10 bus at Grizzly Giant	30 oversize, 7 commercial bus/shuttle, 2 commercial tram at South Entrance
Tour bus access	Buses less than 40 feet long can park and drop passengers in lower Grove area. Buses greater than 40 feet park at Wawona and transfer passengers to park shuttles.	Buses greater than 40 feet long would stop at South Entrance for transfer to shuttle. Depending on facility capacity and shuttle operations, buses less than 40 feet long may drop off passengers in lower Grove area and park at South Entrance.	All buses would drive to Grizzly Giant Hub.	Buses greater than 40 feet long would stop at South Entrance for transfer to shuttle. Depending on facility capacity and shuttle operations, buses less than 40 feet long may drop off passengers in lower Grove area and park at South Entrance.
Infrastructure Improvements				
Retain Mariposa Grove Road surface within the Grove	Paved to Wawona Point	Paved to Grizzly Giant	Paved to Grizzly Giant	Paved to museum
Conversion of Mariposa Grove Road to hardened trail	No	Yes, from Grizzly Giant to Wawona Point (10-12'wide)	Yes, from Grizzly Giant to Wawona Point (10-12'wide),	Yes, from museum to Wawona Point (1012' wide)
Water pipe repair or replacement	No	Yes	Yes	Yes
Water tank and chlorination unit	Present location along upper Grove loop road	Relocate near museum	Relocate near museum	Relocate near museum
Comfort station fixtures (flush or vault)	10 at South Entrance, 1 at picnic area, 8 at lower Grove area, 1 at Grizzly Giant, 1 and 10 at upper Grove area	28 at South Entrance, 1 at picnic area, 10 at lower Grove area, 1 at Grizzly Giant (shuttle drop off), 10 at upper Grove	10 at South Entrance, 1 at picnic area, 2 at lower Grove area, 18 at Grizzly Giant, 10 at upper Grove	28 at South Entrance, 1 at picnic area, 10 at lower Grove, 1 at Grizzly Giant (shuttle drop off), 10 and 2 at upper Grove area
Infrastructure Relocation/Realignment				
Parking hub	Lower Grove area	South Entrance	Grizzly Giant	South Entrance
New roads	None	Lower Grove bypass road (0.10 mile)	New road from Three Sentinels to Grizzly Giant (0.76 mile)	Lower Grove bypass road (0.10 mile)
New vehicular bridges	None	Optional bridge at Three Sentinels pending further study	Two in lower Grove area	None
Septic tank/leach field installation and/or improvement	No	New system at South Entrance and lower Grove areas (if feasible), replace system in upper Grove area	Replace system, in upper Grove area	New system at South Entrance and lower Grove areas (if feasible), replace system in upper Grove area
Mariposa Grove shuttle drop-off areas	Wawona, South Entrance, and lower Grove area	South Entrance and lower Grove area	None	South Entrance and lower Grove area
Bus parking pads (for heavy vehicle parking loads)	No	Yes, South Entrance and lower Grove area	Yes, Grizzly Giant	Yes, South Entrance, and lower Grove area
South Entrance intersection	Existing T	Roundabout if T-intersection exceeds capacity	Existing T	Modified T
Sustainability				
Infrastructure consolidation	No	Yes	Yes	Yes, more limited than Alternatives 2 and 3
Improved traffic flow and orientation	No	Yes	Yes	Yes
Improvements to energy- and water-efficient design	No	Yes	Yes, more than Alternative 2	Yes, more limited than Alternatives 2 and 3

Table 2-3 – Summary of Potential Impacts and Restoration Footprint Areas

Surfaces / Ground Disturbance	Alternative 1: No Action	Alternative 2: South Entrance Hub	Alternative 3: Grizzly Giant Hub	Alternative 4: South Entrance Hub with Modified Commercial Tram Service
Existing Conditions				
Existing impervious (asphalt)surface in lower Grove area	2.9 acres	N/A	N/A	N/A
Existing impervious (asphalt) surface at South Entrance parking lot	0.31 acre	N/A	N/A	N/A
Existing impervious(asphalt) surface at Wawona Point	Yes, at overlook	N/A	N/A	N/A
Existing road through the Grove	8.4 acres	N/A	N/A	N/A
Existing trails within the Grove	3.5 acres minimum (based on estimated widths)	N/A	N/A	N/A
Ecological Restoration				
Net change in development, excluding areas needed for new leach fields	N/A	0.74 acre *addition* of developed area project-wide (comprised of 3.98 acre net reduction of developed area within the Grove, plus 4.72 acre new development at the South Entrance)	0.5 acre *addition* of developed area project-wide (comprised of 5.75 acre net reduction of developed area within the Grove, plus 6.25 acre new development at the Grizzly Giant arrival area and the new Grove bypass road)	2.88 acre *addition* of developed area project-wide (comprised of 1.84 acre net reduction of developed area within the Grove, plus 4.72 acre new development at the South Entrance)
Restoration of giant sequoia habitat through reduction of impervious surfaces in lower Grove	N/A	1.44 acres restoration of giant sequoia habitat (1.45 acre of new build out, all except 0.32 acre atop previous impervious footprint.) Removal of 1.44 acres of the existing development footprint within the lower Grove area would comprise a 50% reduction of impervious surfaces (includes footprint of accessible trails)	2.38 acres restoration of giant sequoia habitat (0.52 acre of new build out, all atop previous impervious footprint.) Removal of 2.38 acres of the existing development footprint within the lower Grove would comprise an 82% reduction of impervious surfaces	1.59 acres available for restoration of giant sequoia habitat (1.30 acres of new buildout, all except 0.17 acre atop previous impervious footprint.) Removal of 1.59 acres of the existing development footprint within the lower Grove area would comprise a 55% reduction
Net restorable area due to trail removal	N/A	0.43 acre	0.58 acre	0.02 acre
Restoration of giant sequoia habitat resulting from narrowing of Mariposa Grove Road or conversion of road segments to trails	N/A	Removal of 2.11 acres of the existing paved road throughout the Grove comprises a 25% reduction of road	Removal of 2.79 acres of the existing paved road throughout the Grove comprises a 33% reduction of road	Removal of 0.23 acres of the existing paved road throughout the Grove comprises a 3% reduction of road
Restoration of hydrologic connectivity to areas where natural flow is disrupted	N/A	Restore two areas where water is currently diverted from its natural course within the Grove (areas are 21.1 acres and 27.5 acres). Restore flow in one area where water is being diverted from the Grove altogether (88.5 acres)	Same as Alternative 2	Same as Alternative 2
Giant sequoia habitat restoration area within the Grove	N/A	3.99 acres removal of built footprint within Grove (27% reduction)	5.75 acres removal of built footprint in the Grove (39% reduction)	1.84 acres removal of built footprint in the Grove (12% reduction)
Restore of natural hydrologic process by repairing leaking water pipe in upper Grove area	N/A	Restore natural hydrologic condition within the western end of the upper Grove Palustrine Emergent wetland by analyzing 4000 lineal feet of water pipe that is understood to be leaking and contributing chlorinated water to the wetland	Same as Alternative 2	Same as Alternative 2
Wetland restoration	N/A	1.0 acre total of wetland restoration due to ecological restoration activities in the lower Grove area and removal of trails and road narrowing in the upper Grove area	Same as Alternative 2	0.77 acre total of wetland restoration due primarily to ecological restoration activities in the lower Grove area
Construction Footprint				
Trail from South Entrance to picnic area using existing Washburn Road to picnic area and construction of a new trail extending from picnic area to lower Grove	N/A	0.66 acre (includes 0.42 acre along old road alignment through non-giant sequoia forest; 0.21 acre new trail through non-giant sequoia forest; and 0.03 acre new trail through giant sequoia forest)	N/A	Same as Alternative 2
Area required for South Entrance construction	N/A	5.0 to 6.0 acres +/- of non-giant sequoia forest	N/A	Same as Alternative 2
South Entrance build out (i.e. net footprint after construction)	N/A	4.72 acres of non-giant sequoia forest (3.13 acres of impervious surfaces)	N/A	Same as Alternative 2
Clearing area required for Grizzly Giant Hub construction	N/A	N/A	5.61 acres +/- of non-giant sequoia forest/ shrubland	N/A

Surfaces / Ground Disturbance	Alternative 1: No Action	Alternative 2: South Entrance Hub	Alternative 3: Grizzly Giant Hub	Alternative 4: South Entrance Hub with Modified Commercial Tram Service
Grizzly Giant area build out (net new footprint after construction)	N/A	0.06 acre of non-giant sequoia forest (includes 0 acres impervious surfaces)	3.13 acres of non-giant sequoia forest (includes 2.92 acres impervious surfaces)	0.06 acre of non-giant sequoia forest (includes 0 acres impervious surfaces)
New bypass road build out footprint under Alternative 3	N/A	N/A	2.20 acres, primarily through non-giant sequoia forest, but with 0.33 acre through giant sequoia forest and 0.10 acre of raised crossings over wetlands	N/A
Prime Habitat Considerations				
Disturbance to prime denning pacific fisher habitat	0 acres	0 acres	3.11 acres disturbed by new road	0 acres
Traffic impacts through fisher habitat	Current activity in habitat areas	Decreases overall traffic	Increases overall traffic	Decreases overall traffic
Potential Impacts to Trees				
Giant Sequoia seedlings/saplings potentially removed or transplanted (0-15" DBH) [1]	N/A	30 (+5 at least seedlings)	0	30 (+5 at least seedlings)
Juvenile Giant Sequoia trees potentially removed(15-30" DBH) [1]	N/A	5	0	5
Giant Sequoia Trees potentially removed (30"or greater DBH) [1]	N/A	0	0	0
Non-Giant Sequoia habitat potentially removed (area in acres)	N/A	4.0 – 5.0 acres	6.9 acres (Includes bypass road and new parking lot at Grizzly Giant.)	4.0 – 5.0 acres
Non-Giant Sequoia trees potentially removed (Total comprised of cedar, pine, fir, and oak [2]	N/A	414 trees	591 trees (comprised of the sizes and species noted below)	414 trees
• By Size:Non-Giant Sequoia trees potentially removed (10-15" DBH)	N/A	17 trees	189 trees (160 estimated in Grizzly Giant west parking lot and bypass road, 29 measured in Grizzly Giant east parking lot and lower Grove accessible drop off)	17 trees
• By Size: Non-Giant Sequoia trees potentially removed (15-30" DBH)	N/A	281 trees	291 trees (242 estimated in Grizzly Giant west parking lot and bypass road, 49 measured in Grizzly Giant east parking lot and lower Grove accessible drop off)	281 trees
• By Size: Non-Giant Sequoia trees potentially removed (30+" DBH)	N/A	116 trees	111 trees (100 estimated in Grizzly Giant west parking lot and bypass road, 11 measured in Grizzly Giant east parking lot and lower Grove accessible drop off)	116 trees
• By Species: Cedar trees potentially removed	N/A	161	59	161
• By Species: Pine trees potentially removed	N/A	109	135	109
• By Species: Fir trees potentially removed	N/A	138	394	138
• By Species: Oak trees potentially removed	N/A	6	3	6
Non-Giant Sequoia tree habitat potentially impacted by construction of new trail from South Entrance to the lower Grove area using Washburn Road alignment	N/A	0.67 acres (includes 0.42 acres along old road alignment through non-giant sequoia forest; 0.21 acres new trail through non-giant sequoia forest; 0.03 acres new trail through giant sequoia forest)	N/A	Same as Alternative B

[1] Giant sequoia tree impacts would be due to the proposed re-route of Mariposa Grove Road through the lower Grove area under Alternatives 2 and 4. The potential tree impacts are based on a visual assessment of the general location of the re-route, but specific locations have not been surveyed yet. During the design of the re-route, impacts on giant sequoia trees would be avoided as much as possible.

[2] Tree Impact Measurement Constraints: (1) Trees below 10" diameter at breast height (DBH) were not surveyed at South Entrance. (2) Tree density and composition was estimated for the Grizzly Giant bypass road (Alternative 3) based on average composition in non-giant sequoia surveyed areas. (3) Tree density and composition was estimated for west Grizzly Giant parking area (Alternative 3) based on average composition in surveyed east Grizzly Giant parking area.