CHAPTER IV: ENVIRONMENTAL CONSEQUENCES

Introduction and Methodology

This section describes the potential environmental consequences associated with the No Action and Preferred Alternative. The methodologies and assumptions for assessing environmental consequences are discussed, including consideration of context, intensity, and duration of impacts; cumulative impacts; and measures to mitigate impacts. As mandated by NPS policy, impairment of potential effects is analyzed to determine if actions would impair park resources. Subsequent subsections in this section are organized by impact topic, first for the no-action alternative and then for the NPS preferred alternative.

On pages IV-47 through IV-54 is Table IV-1: Summary of Impact Topics for Detailed Analysis & Mitigations, by Alternative. This table summarized the impact topics and related mitigation discussed in the text of this chapter and Chapter II. Beginning on page IV-55 is Table IV-2: Summary of Impact Topics Considered but Dismissed, by Alternative. This summarizes the impact topics considered but dismissed in Chapter I, along with the reasoning or the mitigations that made the impacts to this resource negligible. The tables are just a summary, for a complete discussion refer to the Chapter I and Chapter IV of this EA.

Impact Definitions

Overall, the NPS based these impact analyses and conclusions on the review of existing literature and Hawaii Volcanoes National Park studies, background information and best professional judgment provided by experts at the park and other agencies as well as input from the public.

Potential impacts (direct and indirect impacts and cumulative effects) are described in terms of context (site specific, local, park wide, state, or national), duration (short-term or long-term), type (beneficial or adverse), and intensity (negligible, minor, moderate, or major).

Context

Context is the setting within which an impact may occur, such as site-specific, local, park wide, statewide, or national. The Council on Environmental Quality (CEQ) requires that impact analyses include discussions of context. For this EA, site specific impacts would at a specific location within the project area. Local impacts would occur within the general vicinity of the 2.8 mile segment of the project area. Park wide impacts would affect a greater portion of the park. Statewide impacts would extend outside the park boundaries. National impacts would extend outside the state.

Duration

The duration of an impact is the time period for which the impacts are evident and are expressed as short-term or long-term. A short-term impact would be temporary in duration and would be associated with road construction and site restoration activities. A long-term impact would continue more than one year beyond the construction and site restoration.

Intensity

Impact intensity is the degree to which a resource would be beneficially or adversely affected. The criteria (negligible, minor, moderate, and major) that were used to rate the intensity of the impacts for each resource topic is presented later in this section under each topic heading.

Туре

Impacts can be beneficial or adverse. A beneficial impact is a positive change in the condition of the resource, or a change that moves a resource toward its desired conditions. An adverse impact is a negative change in the condition of the resource, or a change that moves a resource away from its desired condition.

Direct and Indirect Impacts

Both direct and indirect impacts are analyzed, consistent with CEQ regulations (40 CFR 1502.16 and NPS D.O. 12). The following definitions of direct and indirect impacts are: direct - an effect that is caused by an action and occurs at the same time and place; indirect - an effect that is caused by an action that is later in time or farther removed in distance, but is still reasonably foreseeable.

Cumulative Effects

The Council on Environmental Quality (CEQ) regulations, which implement the National Environmental Policy Act of 1969 (42 USC 4321 et seq.), require assessment of cumulative impacts in the decision-making process for federal projects. Cumulative effects are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR 1508.7). Cumulative impacts are considered for all alternatives (No Action and the Preferred). The purpose of the analysis is to determine if there would be any additive effects upon a particular impact topic. The cumulative impact scope may differ per impact topic, for some the scope may not reach far and for others the scope may reach beyond the park boundary.

Cumulative impacts were evaluated by combining the impacts of the alternatives with other past, present, and reasonably foreseeable future actions at Hawaii Volcanoes, and if applicable, the surrounding region.

Past Actions

The following past actions could contribute to cumulative effects:

Utilities. Utilities (water and fiber optic cable) have been placed within the existing disturbed road corridor. These projects avoided the historic road features.

Rehabilitate Sulphur Bank Road and Trail. The Finding of No Significant Impact for the Rehabilitate Sulphur Bank Road and Trail EA was signed 8/7/03. The project removed the Sulphur Bank Road (off the Crater Rim Drive between Volcano House and Steam Vents). Approximately 10,000 square feet of asphalt roadway was removed and original grades and native vegetation restored. Existing trail was rehabilitated, an accessible trail constructed, interpretive signage added, and accessible parking added at Steam Vents. All new trail segments and most rehabilitated segments were at least 4-feet wide with grades of 5% or less and met accessibility standards.

Impairment of Hawaii Volcanoes National Park's Resources or Values

In addition to determining the environmental consequences of the Preferred and other alternatives, the NPS Management Policies and Director's Order – 12, require analysis of potential effects to determine if actions would impair Hawaii Volcanoes National Park's resources.

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. National Park Service managers must always seek ways to avoid or minimize, to the greatest degree practicable, adverse impacts on park and monument resources and values. However, the laws do give National Park Service management discretion to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of a park, as long as the impact does not constitute impairment of the affected resources and values. Although Congress has given National Park Service management discretion to allow certain impacts within parks, that discretion is limited by statutory requirements that the National Park Service must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise. The prohibited impairment is an impact that, in the professional judgment of the responsible National Park Service manager, would harm the integrity of park resources or values, including opportunities that otherwise would be present for the enjoyment of those resources or values. An adverse impact would constitute impairment if it affects a resource or value whose conservation is:

- Necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park.
- Key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park.
- Identified as a goal in the park's General Management Plan or other relevant NPS planning document.

Any impairment resulting from NPS activities in managing the park, visitor activities, or activities undertaken by concessioners, contractors, and others operating in the park is prohibited. In this "Environmental Consequences" section, a determination on impairment is made in the conclusion statement for each of the natural and cultural resource topics for each alternative. The NPS does not analyze recreational values / visitor experience (unless impacts are resource based), socioeconomic values, health and safety, park operations, or commercial

operations for impairment, although it is possible that one or more of these topics could cause impairment.

Natural Resources

Geologic Resources

Duration:

Short-term – Effects occurring during the proposed project. Long-term – Effects lasting beyond the project completion.

Negligible: Impacts to geologic features and processes are not detectable.

Minor: Impacts to geologic features and processes would be low because either (1) the activity would occur in an area not known to contain geologic features and the volume of disturbance would be negligible, or (2) the activity would occur in an area containing geologic features but the volume of disturbance would be nearly indiscernible.

Moderate: Impacts to geologic features and processes would be moderate because either (1) the activity would occur in an area not known to contain geologic features and the volume of disturbance would be large, or (2) the activity would occur in an area containing geologic features but the volume of disturbance would be small. Monitoring would identify most affected geologic features, but some features and/or associated contextual information would be lost.

Major: Impacts to geologic features and processes would be high because the activity would occur in an area containing geologic features and the volume of disturbance would be large. Even with monitoring, many features and/or associated contextual information would likely be lost.

Geologic Resources: Alternative 1 – No Action Alternative

Kilauea Volcano

Alternative 1, the No Action Alternative, would have no effect upon Kilauea Volcano. Under the No Action Alternative, there would be direct, local, short-term, and negligible impacts.

Volcanic Emissions (Vog)

Alternative 1, the No Action Alternative, would have no effect upon volcanic emissions. Under the No Action alternative, there would be direct, local, short-term, and negligible impacts.

Faults, Cracks, Lava Tubes, and Collapse Features

Under Alternative 1, the No Action Alternative would avoid faults, cracks, lava tubes, and collapse features. If these were discovered, then work would halt and the features would be

evaluated for potential impacts. Alternative 1, the No Action Alternative, would be direct, local, short-term, and negligible.

Geothermal Resources

Under Alternative 1, No Action, geothermal features would be avoided. Under the No Action Alternative, there would be direct, local, short-term, and negligible impacts.

Cumulative Impacts

The Steam Vents parking area has paving up to the edge of two steam vents. Rainwater drains into these features. Both vents are rimmed with pipe railings and one vent is faced with unmortared stone along the top 3-feet; while vehicles can't drive on the features, they do drive beside them. Cumulative impacts to geological resources would be direct, local, short-term, and negligible (Kilauea Volcano, Volcanic Emissions, and Faults, and Cracks, Lava Tubes, and Collapse Features) to direct, local, long-term, adverse, and minor for Geothermal Resources.

Geologic Resources Impacts Conclusion

The No Action Alternative's impact on geologic resources would be direct, local, short-term, and negligible (Kilauea Volcano, Volcanic Emissions, Cracks, Lava Tubes, and Collapse Features) to direct, local, long-term, adverse, and minor impacts for Geothermal Resources.

Impairment of Park Resources and Values

No impairment of geological resources would occur under this alternative because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the park's establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park's draft General Management Plan or other relevant National Park Service planning documents.

Geologic Resources: Alternative 2 – Preferred Alternative

Kilauea Caldera

Alternative 2 would have no impacts to Kilauea Volcano. Under Alternative 2, the Preferred Alternative, there would be direct, local, short-term, and negligible impacts.

Volcanic Emissions (Vog)

Alternative 2 would have no impacts upon Volcanic Emissions. Under Alternative 2, the Preferred Alternative, there would be direct, local, short-term, and negligible impacts.

Faults, Cracks, Lava Tubes, and Collapse Features

The information from the 2005 and 2010 geotechnical studies, as well as past studies, would be considered in project design. Before construction, plans for dealing with anomalies discovered during the surveys would be developed in consultation with the park archeologist. This would

include the consideration of avoidance and modification of construction methods to reduce the chance of opening up faults, cracks, lava tubes, and collapse features. If any of the identified anomalies are too close to the surface and their collapse may not be prevented or they may require support to assure safety, an appropriate plan would be developed and submitted to the park for approval before construction begins.

If surface or subsurface features were discovered during construction activities, work would halt, the site would be secured, a park archeologist would be contacted, and the features would be evaluated for potential impacts from construction activities (Federal Highway Administration-Central Federal Lands Highway Division, Khamis Harmay, Senior Geotechnical Engineer, Lakewood, CO, e-mail correspondence to Lisa Duwall, National Park Service Hawaii Volcanoes National Park, Hawaii National Park, HI, March 01, 2010). If possible a park archeologist would be provided the opportunity to investigate the tube or cave for the presence of natural and/or cultural resources. Options (preserving/building over versus collapsing) would be discussed with the project engineers, contractors, archeologist, and other staff. As appropriate and necessary, regulatory agencies would be consulted regarding the options.

Under Alternative 2, the Preferred Alternative, there would be more construction activities than would occur than under Alternative 1. This may increase the potential for effects upon faults, cracks, lava tubes, and collapse features. The Preferred Alternative's impacts would depend on whether these features were encountered. If they were not encountered then impacts would be direct, local, short-term, and negligible. If features were encountered, impacts could be direct, local, long-term, adverse, and minor to moderate.

Geothermal Resources

Alternative 2 would avoid geothermal resources. In the Steam Vents parking area the pavement would be moved away from the steam vents that are immediately adjacent to the pavement. Around the Steam Vents construction erosion control (following NPDES standards) would be set up to prevent soil and debris from construction activity from flowing into the vents. Rainwater currently naturally drains into the vents, and would continue to do so during and following construction. Impacts to geothermal resources would be direct, local, long-term, beneficial, and minor.

Cumulative Impacts

The Steam Vents parking area has paving up to the edge of two steam vents. Rainwater drains into these features. Both vents are rimmed with pipe railings and one vent is faced with unmortared stone along the top 3-feet. Cumulative impacts to geological resources would be direct, local, short-term, and negligible (Kilauea Volcano and Volcanic Emissions). Impacts on faults, cracks, lava tubes, and collapse features would depend on whether these features were encountered. If they were not encountered then impacts would be direct, local, short-term, adverse, and negligible. If features were encountered, impacts could be direct, local, long-term, adverse, and minor to moderate. Impacts would be direct, local, long-term, beneficial, and minor for geothermal resources.

Geologic Resources Impacts Conclusion

The Alternative 2, Preferred Alternative's impact on geologic resources would be direct, local, short-term, and negligible (Kilauea Volcano and Volcanic Emissions). Impacts on faults, cracks, lava tubes, and collapse features would depend on whether these features were encountered. If they were not encountered then impacts would be direct, local, short-term, and negligible. If features were encountered, impacts could be direct, local, long-term, adverse, and minor to moderate. Impacts would be direct, local, long-term, beneficial, and minor for geothermal resources.

Impairment of Park Resources and Values

No impairment of geological resources would occur under this alternative because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the park's establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park's draft General Management Plan or other relevant National Park Service planning documents.

Geologic Hazards

Duration:

Short-term – Effects occurring during the proposed project. Long-term – Effects lasting beyond the project completion.

Negligible: There would be little or no change in visitor and employee activities from geologic hazards.

Minor: There would be a change in visitor safety and employee activities from geologic hazards, but it would affect relatively few visitors and employees.

Moderate: There would be substantial changes in visitor and employee activities from geologic hazards; however these changes would not affect the majority of visitors and employees.

Major: There would be substantial changes in visitor and employee activities from geologic hazards and the majority of visitors and employees would be affected.

NPS Management Policies state that geologic processes would be addressed during planning and other management activities in an effort to reduce hazards that can threaten the safety of park visitors and staff and the long-term viability of the park infrastructure.

Geologic Hazards: Alternative 1 – No Action Alternative

Hazards - Kilauea Volcano

The park has a Volcanic Event Contingency Planning Strategy (NPS 2008b). The volcano is monitored by USGS Hawaiian Volcano Observatory staff and they would report changes in volcanic activity that might necessitate modification of staff and visitor activity in the area. The

2.8 mile Crater Rim Drive segment would remain open. In the event that evacuation was needed because of a potential eruption, there are multiple routes, on administrative roads from the 2.8 mile Crater Rim Drive segment to Highway 11 that would allow the area to be evacuated. Under Alternative 1 the current park procedures for volcanic eruptions would be followed. Impacts from Kilauea Volcano under current conditions upon Alternative 1, the No Action Alternative, would be direct, local, long-term, adverse, and negligible to minor.

Hazards - Volcanic Emissions (Vog)

The park has an Air Quality Management Policy (2009). The park's air quality level is regularly monitored at the Kilauea Visitor Center and Jaggar Museum. The NPS operates an advisory program that informs the public of current sulfur dioxide levels in the park. The advisory is given every 15 minutes for each monitoring site on the park's website at: <<u>http://www.nature.nps.gov/air/webcams/parks/havoso2alert/havoalert.cfm</u>>.

Vog levels can vary rapidly in a given area as well as between areas. The park would continue to inform visitors and staff about poor air quality and mitigation measures (such as not working outdoors during high levels of poor air quality). The park brochure/map states that volcanic "fumes are hazardous to your health. Persons with heart or respiratory problems and infants, young children, and pregnant women are especially at risk and should avoid Halemaumau Crater and Sulphur Bank, and other areas where volcanic fumes are present." Vog impacts under current conditions upon Alternative 1, the No Action Alternative would be direct, local to park wide, long-term, adverse, and moderate.

Hazards - Faults, Cracks, Lava Tubes, and Collapse Features

Faults, cracks, lava tubes, and collapse features may underlie or be adjacent to the Crater Rim Drive. The features may be visible on the ground, located at a shallow depth, or located deeper. Ground surface cracks or collapses could open up unexpectedly, but generally this is more likely to happen during earthquakes.

Under Alternative 1, the No Action Alternative, routine cyclic maintenance occurs on the existing road and road features, which lessens the likelihood of potential effects from faults, cracks, lava tubes, and collapse features. Generally, these features are avoided. If these features were encountered, work would halt and the features would be evaluated for safety. Impacts from faults, cracks, collapse features, and lava tubes upon Alternative 1 would be direct, local, long-term, adverse, and negligible to minor.

Hazards - Geothermal Resources

Geothermal resources are in and adjacent to the project area, with the greatest concentration in the Steam Flats area (which includes Steam Vents). Under Alternative 1, the No Action Alternative, work occurs on the existing road and road features; geothermal features are avoided. If these features were encountered, work would halt and the features would be evaluated for safety. Impacts from geothermal resources upon Alternative 1 would be direct, local, long-term, and negligible.

Cumulative Impacts

The eruption of Kilauea at the Halemaumau Crater in March 2008 resulted in the closure of a portion of Crater Rim Drive past the Jaggar Museum. The road remains closed and the closure is adjacent to but outside the 2.8 mile Crater Rim Drive segment. Cumulative impacts would be direct, local, long-term, and negligible in that there would no cumulative effect upon the implementation of Alternative 2.

Geologic Hazards Impacts Conclusion

The proposed project area is an existing visitor use area. No new areas would be opened to the public or staff. Crater Rim Drive would remain open. There are multiple administrative roads between the 2.8 mile Crater Rim Drive segment and Highway 11 that could be used if vehicles needed to evacuate that portion of the park. Potential impacts from geologic hazards upon Alternative 1 would be mitigated with procedures already in place: 1) Volcanic monitoring and reporting; 2) air quality monitoring and reporting; and 3) avoidance of faults, cracks, lava tubes, collapse features, and geothermal features, and if these are encountered work stops and the situation is evaluated for safety. Potential impacts from geologic hazards upon Alternative 1 would be direct, local to park wide, long-term, adverse, and negligible to moderate.

Impairment of Park Resources and Values

No impairment would occur under this alternative because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the park's establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park's draft General Management Plan or other relevant National Park Service planning documents.

Geologic Hazards: Alternative 2 – Preferred Alternative

Alternative 2, the Preferred Alternative would be in an existing visitor use area; no new areas would be opened to visitors or used by staff.

Hazards - Kilauea Volcano

The park has a Volcanic Event Contingency Planning Strategy (NPS 2008b). The volcano is monitored by USGS Hawaiian Volcano Observatory staff and they would report changes in volcanic activity that might necessitate modification of staff and visitor activity in the area. The 2.8 mile Crater Rim Drive segment would remain open. In the event that evacuation was needed because of a potential eruption, there are multiple routes, on administrative roads from the 2.8 mile Crater Rim Drive segment to State Highway 11 that would allow for the area to be evacuated. Under Alternative 2 the current park procedures for volcanic eruptions would be followed. Impacts from Kilauea Volcano under current conditions upon Alternative 2, the Preferred Alternative, would be direct, local, long-term, adverse, and negligible to minor.

Hazards - Volcanic Emissions (Vog)

The park has an Air Quality Management Policy (2009). The park's air quality level is regularly monitored at the Kilauea Visitor Center and Jaggar Museum. The NPS operates an advisory

program that informs the public of current sulfur dioxide levels in the park. The advisory is given every 15 minutes for each monitoring site on the park's website at: <<u>http://www.nature.nps.gov/air/webcams/parks/havoso2alert/havoalert.cfm</u>>.

Vog levels can vary rapidly in a given area as well as between areas. The park would continue to inform visitors and staff about poor air quality and mitigation measures (such as not working outdoors during high levels of poor air quality). The park brochure/map states that volcanic "fumes are hazardous to your health. Persons with heart or respiratory problems and infants, young children, and pregnant women are especially at risk and should avoid Halemaumau Crater and Sulphur Bank, and other areas where volcanic fumes are present." Vog impacts under current conditions upon Alternative 2, the Preferred Alternative would be direct, local to park wide, long-term, adverse, and moderate.

Hazards - Faults, Cracks, Lava Tubes, and Collapse Features

Faults, cracks, lava tubes, and collapse features may underlie or be adjacent to the Crater Rim Drive. The features may be visible on the ground, located at a shallow depth, or located deeper. Ground surface cracks or collapses could open up unexpectedly, but generally this is more likely to happen during earthquakes.

The information from the 2005 and 2010 geotechnical studies, as well as past studies, would be considered in project design. Before construction, plans for dealing with anomalies discovered during the surveys would be developed in consultation with the park archeologist. This would include the consideration of avoidance and modification of construction methods to reduce the chance of opening up faults, cracks, lava tubes, and collapse features. If any of the identified anomalies are too close to the surface and their collapse may not be prevented or they may require support to assure safety, an appropriate plan would be developed and submitted to the park for approval before construction begins.

If surface or subsurface features were discovered during construction activities, work would halt, the site would be secured, a park archeologist would be contacted, and the features would be evaluated for potential impacts from construction activities (Federal Highway Administration-Central Federal Lands Highway Division, Khamis Harmay, Senior Geotechnical Engineer, Lakewood, CO, e-mail correspondence to Lisa Duwall, National Park Service Hawaii Volcanoes National Park, Hawaii National Park, HI, March 01, 2010). If possible a park archeologist would be provided the opportunity to investigate the tube or cave for the presence of natural and/or cultural resources. Options (preserving/building over versus collapsing) would be discussed with the project engineers, contractors, archeologist, and other staff. As appropriate and necessary, regulatory agencies would be consulted regarding the options.

Under Alternative 2, the Preferred Alternative, there would be more construction activities than would occur than under Alternative 1. This may increase the potential for effects from faults, cracks, lava tubes, and collapse features. These features would be avoided if possible. If these features were encountered, work would halt and the features would be evaluated for safety. Impacts from faults, cracks, collapse features, and lava tubes upon Alternative 2 would be direct, local, long-term, adverse, and negligible to minor.

Hazards - Geothermal Resources

Geothermal resources are in and adjacent to the project area, with the greatest concentration in the Steam Flats area (which includes Steam Vents). Under Alternative 2, the paving would be pulled back from two steam vents in the Steam Vent parking area. These steam vents have a metal pipe rail fence around them. The fence would remain in place during the proposed work. Other geothermal resources would be avoided. If these features were encountered, work would halt and the features would be evaluated for safety. Impacts from geothermal resources upon Alternative 2 would be direct, local, long-term, adverse, and negligible.

Cumulative Impacts

The eruption of Kilauea at the Halemaumau Crater in March 2008 resulted in the closure of a portion of Crater Rim Drive past the Jaggar Museum. The road remains closed and the closure is adjacent to but outside the 2.8 mile Crater Rim Drive segment. Cumulative impacts from geological hazards upon Alternative 2 would be direct, local, long-term, and negligible in that there would no cumulative effect upon the implementation of Alternative 2.

Geologic Hazards Impacts Conclusion

The proposed project area is an existing visitor use area. No new areas would be opened to the public or staff. Crater Rim Drive would remain open. In addition, there are multiple administrative roads between the 2.8 mile Crater Rim Drive segment and State Highway 11 that could be used if vehicles needed to evacuate that portion of the park. Potential impacts from geologic hazards upon Alternative 2 would be mitigated with procedures already in place: 1) Volcanic monitoring and reporting; 2) air quality monitoring and reporting; and 3) avoidance of faults, cracks, lava tubes, collapse features, and geothermal features, and if these are encountered work stops and the situation is evaluated for safety. Potential impacts from geologic hazards upon Alternative 2 would be direct, local to park wide, long-term, adverse, and negligible to moderate.

Impairment of Park Resources and Values

No impairment would occur under this alternative because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the park's establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park's draft General Management Plan or other relevant National Park Service planning documents.

Vegetation

The following impact thresholds were established to describe the relative changes in vegetation under various alternatives being considered:

Duration:

Short-term – Effects occurring during the proposed project. Long-term – Effects lasting beyond the project completion. *Negligible:* Impacts would cause no measurable or perceptible changes in plant community size, integrity, or continuity.

Minor: Impacts would be measurable or perceptible but would be localized within a relatively small area. The overall viability of the plant community would not be affected and, if left alone, would recover

Moderate: Impacts would cause a change in the plant community (e.g., abundance, distribution, quantity, or quality); however, the impact would remain localized.

Major: Impacts to the plant community would be substantial, highly noticeable, and permanent.

Baseline information from surveys and reports indicate that vegetation along the 2.8 mile Crater Rim Drive segment varies greatly from the eastern end of the project area at the entrance station to the western end of the project at the Jaggar Museum, in response to topography, rainfall, and soil changes. Botanical habitats along the roadway range from rain forest at the entrance station and visitor center area to mesic forest and grasslands at the Kilauea Military Camp to open ohia woodlands and shrublands at the Jaggar Museum/Hawaiian Volcano Observatory. There is a mix of native and non-native species within the 2.8 mile segment.

Vegetation: Alternative 1 – No Action Alternative

Under the No Action Alternative current road and parking area maintenance activities would continue. These practices would affect little if any of the vegetation along Crater Rim Drive. Consistent with current management actions, park botanists would be consulted should routine road maintenance require removal of any vegetation. As appropriate, a vegetation management plan would be developed in conjunction with proposed removal.

Consistent with current management actions, approximately six informal pullouts would be removed and rehabilitated. Pullout rehabilitation would provide for increased native vegetation along the road and further protect existing vegetation from human disturbance. Natural regeneration of the informal pullouts would be encouraged; however, some plantings may occur.

The park procedures for vegetation management would be followed, which include:

- Before road or road feature work begins, vegetation would be salvaged, as appropriate, for replanting after construction is completed. Revegetation would rely heavily on natural regeneration.
- Disturbed and revegetated areas along the roadside would not have vegetation that is attractive to nene.
- Rehabilitated/restored areas would be monitored to determine if efforts are successful or if additional remedial actions are necessary, as outlined in the revegetation plan.

- Minimize impacts to vegetation by limiting vehicle parking to existing roadways, parking areas, and access routes.
- Implement non-native species control measures, including:
- Ensure that all construction equipment, vehicles, and machinery are weed and seed free before entering the park.
- Weed-free sources for gravel and soil are required. If the gravel and soil is infested it would be turned back.
- Cover all haul trucks bringing fill materials (excluding asphalt) from outside the park to prevent seed transport and dust deposition along the road corridor.
- Non-native species control protocols would be implemented. The park would monitor disturbed areas for up to three years following construction to identify and treat growth of noxious weeds or non-native species. Treatment of non-native species would be completed in accordance with NPS Director's Order 13, Integrated Pest Management Guidelines.

Alternative 1, No Action, impacts on vegetation with the closing of the informal pullouts and mitigation would be local, long-term, beneficial, and minor.

Cumulative Impacts

Along some of the road edges and in the Steam Vents parking area, off pavement parking occurs and this has a potential to affect native and non-native species. Cumulative impacts upon vegetation would be local, long-term, adverse (off pavement parking) and beneficial (closing pullouts), and minor.

Vegetation Impacts Conclusion

Alternative 1, No Action, impacts on vegetation would be local, long-term, adverse (off pavement parking) and beneficial (closing informal pullouts and mitigation), and minor.

Impairment of Park Resources and Values

No impairment of vegetation would occur under this alternative because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the park's establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park's draft General Management Plan or other relevant National Park Service planning documents.

Vegetation: Alternative 2 – Preferred Alternative

Under this alternative it would be necessary to remove some trees and vegetation along Crater Rim Drive to rehabilitate the road. Measures would be taken to limit off pavement parking at Steam Vents, reducing potential impacts to native vegetation. Approximately six informal pullouts would be removed and rehabilitated. Pullout rehabilitation would provide for increased native vegetation along the road and further protect existing vegetation from human disturbance. Natural regeneration of the informal pullouts would be encouraged; however, some plantings may occur.

The construction process and equipment present the potential for further introduction or spread of non-native species. Mitigation measures would be developed and implemented in conjunction with this alternative to minimize or replace lost native vegetation and prevent the introduction or further spreading of non-native species along Crater Rim Drive.

Measures to minimize and replace lost native vegetation include:

- Before road or road feature work begins, vegetation would be salvaged, as appropriate, for replanting after construction is completed. Revegetation would rely heavily on natural regeneration.
- The project would avoid removing trees as much as possible. Trimming, limbing, and salvaging trees would be used as much as possible.
- A vegetation rehabilitation/restoration plan would be developed by the park, including native species revegetation, along the roadside avoiding revegetation with species that are attractive to nene, placing barriers such as rocks or temporary fencing to protect areas that are being revegetated from off-pavement parking, monitoring revegetated areas to determine if it was successful, and a no net green loss policy (if vegetation is removed for the purpose of expanding development, an equivalent size area would be restored by the park).
- Minimize impacts to vegetation by limiting construction vehicle parking to existing roadways, parking areas, and access routes; limiting equipment to the roadbed area; and machinery and equipment remain within the construction limits.

Measures to control non-native species along Crater Rim Drive include:

- The road contractor would ensure that all construction equipment, vehicles, and machinery are weed and seed free before entering the park.
- Weed-free sources for gravel and soil are required. If the gravel and soil is infested it would be turned back.
- Cover all haul trucks bringing fill materials (excluding asphalt) from outside the park to prevent seed transport and dust deposition along the road corridor.
- Non-native species control protocols would be implemented. The park would monitor disturbed areas for up to three years following construction to identify and treat growth of noxious weeds or non-native species. Treatment of non-native species would be

completed in accordance with NPS Director's Order 13, Integrated Pest Management Guidelines and the park SOP.

Effects on multiple plants could be measurable or perceptible. However, the natural function and character of plant communities in terms of growth, abundance, reproduction, distribution, structure, or diversity of native species would only be perceptible in small localized areas. Potential effects to non-special status species would be localized, short- to long-term, and minor.

Cumulative Impacts

Along some of the road edges and in the Steam Vents visitor parking occurs off the pavement and this has a potential to affect native and non-native species. Cumulative impacts upon vegetation would be local, long-term, beneficial (with pullout removal and measures to limit off pavement parking), and minor.

Vegetation Impacts Conclusion

Alternative 2, the Preferred Alternative, impacts on vegetation would be local, long-term, beneficial (measures taken to limit off pavement parking at Steam Vents and removing pullouts), and minor.

Impairment of Park Resources and Values

No impairment of vegetation would occur under this alternative because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the park's establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park's draft General Management Plan or other relevant National Park Service planning documents.

Wildlife

The following thresholds were used to determine the magnitude of effects on wildlife:

Duration:

Short-term – Effects occurring during the proposed project. Long-term – Effects lasting beyond the project completion.

Negligible: There would be no observable or measurable impacts to native species, their habitats, or the natural processes sustaining them. Impacts would be of short duration and well within natural fluctuations.

Minor: Impacts would be detectable, but they would not be expected to be outside the natural range of variability and would not be expected to have any long-term effects on native species, their habitats or the natural processes sustaining them.

Moderate: Breeding animals of concern are affected; animals are present during particularly vulnerable life-stages, such as migration or juvenile stages; mortality or interference with

activities necessary for survival can be expected on an occasional basis, but is not expected to threaten the continued existence of the species in the park unit.

Major: Impacts on native species, their habitats, or the natural processes sustaining them would be detectable, and they would be expected to be outside the natural range of variability for long periods of time or be permanent.

Wildlife: Alternative 1 – No Action Alternative

Mammals

All mammals occurring within the project area are non-native, except the Hawaiian hoary bat, which is discussed under Special Status Species. Alternative 1 would have no effects upon the non-native mammals; there would be no increase or decrease in the presence of these species within the park. The impact would be direct, local, long-term and negligible.

Amphibians

The park's standard operating procedure to limit the non-native coqui tree frogs in the park would be followed in the implementation of Alternative 1. With this mitigation, Alternative 1 impacts upon native species and the park's efforts to control the non-native coqui tree frogs would be direct, local, long-term, beneficial, and minor.

Birds

Native (non-special status species) and non-native birds are found within the 2.8 mile Crater Rim Drive segment. The 2.8 mile Crater Rim Drive segment is a heavily used road. Mitigation is needed to reduce effects upon native birds: During nesting season (January through July) if tree removal is needed in forest bird habitat (summit area 4000 feet and above) the park's bird biologist would be contacted to identify if nests are in the area. The bird biologist would assess the potential for the project to affect the nest and would provide a recommendation for the project, which may include modifying or temporarily halting the project. Impacts to non-special status birds would be direct, local, short-term, and negligible.

Cumulative Impacts

The park has implemented a standard operating procedure to limit coqui tree frogs within the park. The cumulative impacts upon the park's native species in relation to controlling the coqui tree frogs is direct, local, long-term, and minor.

Wildlife Impacts Conclusion

Alternative 1 impacts upon wildlife would be direct, local, long-term, and minor with the following mitigation: 1) Implementing the park's standard operating procedure to limit coqui tree frogs and 2) contact the park's bird biologist if tree removal is needed in forest bird habitat (summit area 4000 feet and above during nesting season (January through July).

Impairment of Park Resources and Values

There would be no impairment to wildlife because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the park's establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park's draft General Management Plan or other relevant National Park Service planning documents.

Wildlife: Alternative 2 – Preferred Alternative

Mammals

All mammals occurring within the project area are non-native, except the Hawaiian hoary bat, which is discussed under Special Status Species. Alternative 2 would have no effects upon the non-native mammals; there would be no increase or decrease in the presence of these species within the park. The impact would be direct, local, long-term and negligible.

Amphibians

Measures to limit the introduction of coqui tree frogs into the park would include:

The road contractor would ensure that all construction equipment, vehicles, and machinery are coqui free before entering the park.

Non-native species control protocols would be implemented. The park would monitor disturbed areas to identify and remove coqui tree frogs.

With this mitigation, Alternative 1 impacts upon native species and the park's efforts to control the non-native coqui tree frogs would be direct, local, long-term, beneficial, and minor.

Birds

Native (non-special status species) and non-native birds are found within the 2.8 mile Crater Rim Drive segment. The 2.8 mile Crater Rim Drive segment is a heavily used road. Mitigation is needed to reduce effects upon native birds: During nesting season (January through July) if tree removal is needed in forest bird habitat (summit area 4000 feet and above) the park's bird biologist would be contacted to identify if nests are in the area. No other mitigation for birds is needed. Alternative 2 impacts to non-special status birds would be direct, local, short-term, and negligible.

Cumulative Impacts

The park has implemented a standard operating procedure to limit coqui tree frogs within the park. The cumulative impacts upon the park's native species in relation to controlling the coqui tree frogs is direct, local, long-term, beneficial, and minor.

Wildlife Impacts Conclusion

Alternative 2 impacts upon wildlife would be direct, local, long-term, and minor with the following mitigation: 1) Implementing the park's standard operating procedure to limit coqui tree frogs and 2) contact the park's bird biologist if tree removal is needed in forest bird habitat (summit area 4000 feet and above during nesting season (January through July).

Impairment of Park Resources and Values

There would be no impairment to wildlife because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the park's establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park's draft General Management Plan or other relevant National Park Service planning documents.

Special Status Species: Threatened and Endangered Species and Species of Concern

The U.S. Fish and Wildlife Service guidance for implementing section 7 consultation under the Endangered Species Act defines the terminology used to assess impacts to listed species as follows:

No effect: The appropriate conclusion when the action agency determines its proposed action will not affect a listed species or designated critical habitat.

May affect, is not likely to adversely affect: The appropriate conclusion when effects on listed species are expected to be discountable, insignificant, or completely beneficial. Beneficial effects are contemporaneous positive effects without any adverse effects to the species. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs. Discountable effects are those extremely unlikely to occur. Based on best judgment, a person would not: (1) be able to meaningfully measure, detect or evaluate insignificant effects; or (2) expect discountable effects to occur.

May affect, likely to adversely affect: The appropriate finding in a biological assessment (or conclusion during informal consultation) if any adverse effect to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not: discountable, insignificant, or beneficial (see definition of "is not likely to adversely affect"). In the event the overall effect of the proposed action is beneficial to the listed species, but is also likely to cause some adverse effects, then the proposed action "is likely to adversely affect" the listed species. If incidental take is anticipated to occur as a result of the proposed action, an "is likely to adversely affect" determination should be made. An "is likely to adversely affect" determination requires the initiation of formal section 7 consultation. The following thresholds were used to determine the magnitude of effects on federally listed special status species and their associated habitat, including designated critical habitat that would result from implementation of any of the alternatives. The Endangered Species Act determinations pursuant to section 7 of the Act are included.

The Endangered Species Act of 1973 [16 United States Code (USC) 1531 et seq.], as amended, mandates that all federal agencies consider the potential effects of their actions on species listed

as threatened or endangered. The NPS is required to perpetuate the natural distribution and abundance of these species and the ecosystems upon which they depend. If the NPS determines that an action may adversely affect a federally listed species, consultation with the USFWS is required to ensure that the action would not jeopardize the species' continued existence or result in the destruction or adverse modification of critical habitat. NPS Management Policies states that potential effects of agency actions would also be considered for state or park species of concern.

In addition to the U.S. Fish and Wildlife Service guidance, the following thresholds were used to help determine the magnitude of effects on wildlife:

Duration:

Short-term - Special status species would recover in less than one year.

Long-term – Special status species would take more than one year to recover.

The thresholds of change for the intensity of an impact are defined as follows:

Negligible: Special status species, their habitats, or the natural processes sustaining them at a park site, would not be affected, or the effects would be so small, whether adverse or beneficial, that it would not be of any measurable or perceptible consequence. Negligible effect would equate with a "no effect" determination under section 7 of the Endangered Species Act.

Minor: Impacts to special status species or their habitats would be perceptible or measurable, but effects would be small and localized. Minor effect would equate to a determination of "may affect, not likely to adversely affect" under section 7 of the Endangered Species Act.

Minor Adverse: Individuals may temporarily avoid areas. Impacts would not affect critical periods (e.g., breeding, nesting, feeding, or resting) or habitat. This impact intensity would equate to a determination of "may affect, not likely to adversely affect" under section 7 of the Endangered Species Act.

Minor Beneficial: Impacts would result in slight increases to viability of the species in the park as species limiting factors (e.g., habitat loss, competition, and mortality) are kept in check. Nonessential features of critical habitat in a park site would be slightly improved. This impact intensity would equate to a determination of "may affect not likely to adversely affect" under section 7 of the Endangered Species Act.

Moderate: Impacts to an individual or populations of special status species or their habitats would be perceptible and measurable. Populations of special status species might have small to moderate declines, but could be expected to rebound to pre-impact numbers. No species would be at risk of being extirpated from the park. Some impacts might occur during key time periods and the change would be measurable and of consequence. The effect could have some long-term consequence to the individual, population, or habitat. Moderate effect would equate with a "may

effect" determination under section 7 of the Endangered Species Act and would be accompanied by a statement of "likely" or "not likely to adversely affect" the species.

Moderate Adverse: Individuals may be impacted by disturbances that interfere with critical periods (e.g., breeding, nesting, feeding, or resting) or habitat; however, the level of impact would not result in a physical injury, mortality, or extirpation from the park. This impact intensity would equate to a determination of "may affect, likely to adversely affect" under section 7 of the Endangered Species Act.

Moderate Beneficial: Impacts would result in improved viability of the species, population structure, and species population levels in the park, as species-limiting factors (e.g., habitat loss, competition, and mortality) are reduced. Some essential features of critical habitat would be improved. This impact intensity would equate to a determination of "may affect, not likely to adversely affect" under section 7 of the Endangered Species Act.

Major: Impacts to special status species would be noticeable and measurable. The action would result in a noticeable change to a population or individuals of a species, resource, or designated critical habitat. Major effect would equate with a "may effect" determination in U.S. Fish and Wildlife Service terms and would be accompanied by a statement of "likely" or "not likely to adversely affect" the species or critical habitat under section 7 of the Endangered Species Act.

Major Adverse: Populations of special status species might have large declines, with population numbers depressed. Substantive impacts would occur during key time periods. Populations of special status species might have large declines, with population numbers depressed. Substantive impacts would occur during key time periods. Individuals may suffer physical injury or mortality or populations may be extirpated from the park. This impact intensity would equate to a determination of "may affect, likely to adversely affect" under section 7 of the Endangered Species Act.

Major Beneficial: Impacts would result in highly noticeable improvements to species viability, population structure, and species population levels in the park, as species-limiting factors (e.g., habitat loss, competition, and mortality) are nearly eliminated. All essential features of the critical habitat would be improved. This impact intensity would equate to a determination of "may affect not likely to adversely affect" under section 7 of the Endangered Species Act.

Vegetation Special Status Species

The threatened *Silene hawaiiensis* (Hawaiian catchfly) occurs extensively through the area from Kilauea Overlook and Picnic Area to the Jaggar Museum. Populations within the project area were recorded at the Kilauea Overlook and Picnic Area and the Jaggar Museum parking area.

Vegetation Special Species Status: Alternative 1 – No Action Alternative

Road and parking area maintenance activities are not affecting the species. Consistent with current management actions, approximately six informal pullouts would be removed and rehabilitated, with the removal occurring in consultation with a botanist to ensure the plants

weren't disturbed. Also consistent with current management actions, park botanists would be consulted before any off pavement activity, including pullout removal and rehabilitation, from Kilauea Overlook and Picnic Area to ensure that *S. hawaiiensis* populations are avoided. As needed, the plants would be flagged or fenced to ensure avoidance.

Alternative 1, No Action, impacts on the *S. Hawaiiensis* would be direct, local, long-term, beneficial, minor impacts.

Cumulative Impacts

Foot traffic has a potential to impact the plants. Visitors park in formal parking areas, informal pullouts, and along the road edge. They wander beyond the paved area and unknowingly trample the species as they explore the area. In the future, at parking areas where the species is in the vicinity, visitors would be informed of the presence of the S. hawaiiensis, to lessen the potential trampling. Overall, cumulative impacts to special status species would be direct, local, long-term, beneficial, and minor to moderate impacts.

Vegetation Special Status Species Impacts Conclusion

Under Alternative 1, No Action, impacts upon vegetation special status species would be direct, local, long-term, beneficial, and minor to moderate. The following mitigation would be implemented to lessen the potential for impacts upon special status species: 1) Removing and rehabilitating/renaturalizing pullouts located near S. hawaiiensis populations in consultation with a botanist and 2) consult with a park botanists before any off pavement activity between Kilauea Overlook and Picnic Area and the Jaggar Museum to ensure avoidance of S. hawaiiensis.

Impairment of Park Resources and Values

No impairment of special status species would occur under this alternative because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the park's establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park's draft General Management Plan or other relevant National Park Service planning documents.

Vegetation Special Species Status: Alternative 2 – Preferred Alternative

This alternative would have a temporary disturbance/construction zone up to 10 feet on either side of the road for the entire length of the 2.8 mile project, except (as noted in Chapter II & IV) where there are landscape and resource constraints (as identified by park staff) that limit off-pavement activity.

The U.S. Fish and Wildlife Service was consulted regarding the proposed project's effects upon *S. hawaiiensis*. In a letter dated 3/29/06, the U.S. Fish and Wildlife Service concurred with the park's proposed actions to minimize disturbance of the species and the park's determination that the proposed action is not likely to adversely affect *S. hawaiiensis*. The recommendations to avoid/minimize impacts to *S. hawaiiensis* include:

- The park would block off informal pullouts with *S. hawaiiensis* in the pullout or adjacent areas (the informal pullouts would be removed);
- New pullouts would only be constructed in locations without potential impacts to *S*. *hawaiiensis* (there would be no new pullouts under Alternative 2);
- Any *S. hawaiiensis* within 10 feet of the roadway would be flagged; 4) on field review and prior to final drawings, the roadway would be walked by engineers and resource specialists and avoidance of potentially impacted *S. hawaiiensis* would be incorporated into final drawings.

The following would also occur in addition to the previous measures:

- A park botanist would be consulted before any off pavement activity (including pullout removal and rehabilitation/naturalization and off pavement driving or parking) between Kilauea Overlook and Picnic Area (approximately Station 625) and the Jaggar Museum (approximately Station 601). The botanist would identify where off pavement activity should be minimized or avoided altogether to protect *S. hawaiiensis*.
- If *S. hawaiiensis* was found in an area where work was to occur, then additional section 7 consultation would be needed with the USFWS.

With mitigation, Alternative 2 is expected to have direct, local, long-term, and minor beneficial effects to special status species.

Cumulative Impacts

Foot traffic has a potential to impact the plants. Visitors park in formal parking areas, informal pullouts, and along the road edge. They wander beyond the paved area and unknowingly trample the species as they explore the area. In the future, at the parking areas where the species is near by, visitors would be informed of the presence of the endangered species, *S. hawaiiensis*, to lessen the potential trampling. Overall, cumulative impacts to vegetation special status species would be direct, local, long-term, beneficial, and minor.

Vegetation Special Status Species Impacts Conclusion

Under Alternative 2, Preferred Alternative, the U.S. Fish and Wildlife Service concurred with the park's proposed actions to minimize disturbance of *S. hawaiiensis* and the park's determination that the proposed action is not likely to adversely affect the species. Impacts upon vegetation special status species would be direct, local, long-term, beneficial, and minor.

Impairment of Park Resources and Values

No impairment of special status species would occur under this alternative because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the park's establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park's draft General Management Plan or other relevant National Park Service planning documents.

Wildlife Special Status Species

Wildlife Special Status Species: Alternative 1 – No Action Alternative

Hawaiian Goose/Nene. The Hawaiian goose or nene (Branta sandvicensis) is a federally listed endangered species. Implementation of Alternative 1 would include following the park procedures for nene, which includes consultation with the park's bird biologist to identify and avoid impacts to nene.

- Notify the park's bird biologist if nene are observed in or adjacent to the project area.
- The bird biologist would assess the potential for the project to affect the nene, including the assessment for sound related impacts, and would provide a recommendation for the project, which may include modifying or stopping the project.

Under Alternative 1, impacts to nene would be direct, local, short-term, and negligible to minor. Under the U.S. Fish and Wildlife Service guidance for implementing section 7 consultation under the Endangered Species Act, the effect would be may affect, is not likely to adversely affect.

Hawaiian Hawk/Io. The Hawaiian hawk or io (*Buteo solitaries*) is a federally listed endangered species. Potential habitat for nesting io is occurs between the park entrance station and the Kilauea Visitor Center area. No nests have been reported in this heavily trafficked area in the past. Implementation of Alternative 1 would include following the park procedures for io, which includes consultation with the park's bird biologist to identify and avoid potential effects.

- If an io nest was observed within a project area, the park's bird biologist would be contacted.
- The bird biologist would assess the potential for the project to affect the io, including the assessment for sound related impacts, and would provide a recommendation for the project, which may include modifying or stopping the project.

Under Alternative 1, impacts to io would be direct, local, short-term, and negligible. Under the U.S. Fish and Wildlife Service guidance for implementing section 7 consultation under the Endangered Species Act, the effect would be no effect.

Hawaiian Petrel and Band-rumped Storm Petrel. The Hawaiian petrel or uau (*Pterodroma sandwichensis*), federally listed as endangered, is a pelagic seabird that nests in upland areas of the park. The band-rumped storm petrel or akeake (*Oceanodroma castro*), which is currently listed under State of Hawaii endangered species statutes, is not on any federal list. Both species are known to over-fly the area. These seabirds are sensitive to glaring night-lights and could be impacted by their use. Under Alternative 1 there is no night work so there would be no glaring night-lights. There would be no effects to petrels. Alternative 1 impacts upon these two species would be direct, local, short-term, and negligible. Under the U.S. Fish and Wildlife Service

guidance for implementing section 7 consultation under the Endangered Species Act, the effect would be no effect.

Hawaiian Hoary Bat. Hawaii's sole endemic terrestrial mammalian species, the Hawaiian hoary bat or opeapea (*Lasiurus cinereus semotus*), is a resident species within the park and has been identified near the area affected by the proposed action. It is listed as endangered under both federal and State of Hawaii endangered species statutes. Implementation of Alternative 1 would include following the park procedures for the Hawaiian hoary bat, which includes consultation with the park's bird biologist to identify avoid potential effects to bats and designing projects so that impacts are avoided.

- If bats were observed within a project area, the bird biologist would be notified.
- The biologist would assess the potential for impacts to the bat and would make a recommendation made for the project, which may include project modification.
- No trees greater than 15 feet in height should be removed during May-August without prior monitoring and approval by the park's bird biologist.

Impacts under Alternative 1 would be direct, local, short-term, and negligible. Under the U.S. Fish and Wildlife Service guidance for implementing section 7 consultation under the Endangered Species Act, the effect would be no effect.

Cumulative Impacts

The park's management programs for nene, io, petrels, and the Hawaiian hoary bat include evaluating proposed projects for the potential to affect these species and avoiding impacts. Cumulative impacts in combination with Alternative 1 would be direct, local, short-term, and negligible (io, petrels, and the Hawaiian hoary bat) and for nene it would be direct, local, short-term, and negligible to minor. Under the U.S. Fish and Wildlife Service guidance for implementing section 7 consultation under the Endangered Species Act, the effect would be no effect (io, petrels, and the Hawaiian hoary bat) and for nene it would be may affect, is not likely to adversely affect.

Wildlife Special Status Species Impacts Conclusion

Under Alternative 1, No Action, impacts upon the special status species io, petrels, and the Hawaiian hoary bat would be direct, local, short-term, and negligible (io, petrels, and the Hawaiian hoary bat). Under the U.S. Fish and Wildlife Service guidance for implementing section 7 consultation under the Endangered Species Act, the effect would be no effect. For the special status species nene impacts would be direct, local, short-term, and minor. Under the U.S. Fish and Wildlife Service guidance for implementing section 7 consultation under the Endangered Species Act, the effect would be may affect, is not likely to adversely affect.

Impairment of Park Resources and Values

There would be no impairment to park resources and values because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the park's establishing legislation, (2) key to the natural or cultural

integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park's draft General Management Plan or other relevant National Park Service planning documents.

Wildlife Special Species Status: Alternative 2 – Preferred Alternative

Hawaiian Goose/Nene. Implementation of Alternative 2 would include following the park procedures for nene:

The U.S. Fish and Wildlife Service was consulted regarding the proposed project's effects upon nene. In a letter dated 3/29/06, the U.S. Fish and Wildlife Service concurred with the park's recommendations to avoid/minimize impacts to nene and the park's determination that the proposed action is not likely to adversely affect nene. The recommendations to avoid/minimize impacts to nene include:

- All construction activities that take place on the portions of the road that pass through nene nesting habitat (the stretch of the road between Kilauea Military Camp and the Jaggar Museum) would occur outside the nene breeding season. Therefore, construction would be confined to May 1 through August 31.
- Park staff would give the contractor a briefing on nene and potential project impacts and would include instructions to immediately report any nene sightings in the area.
- Park staff would consult on actions to be taken in the event of a nene sighting depending on time of year, area, and nature of sighting.
- No feeding or approaching nene would be allowed.
- Any nene collisions would be reported to park personnel.
- A litter control program would be implemented during construction to eliminate the accumulation of trash and wind blown trash.

In addition to the measures concurred with by the U.S. Fish and Wildlife Service, the following measures would be implemented:

- May through August is when construction can occur in areas where nene nest, brood, and molt (all are part of breeding season); however, because of nene variability, the construction time frame may be shortened (NPS, Misajon 2005c).
- When nene are sighted in the construction area (including staging areas and lower Mauna Loa Strip Road), the park's bird biologist would be notified and construction activities may need to be modified.
- The park's bird biologist would work with the project manager to identify project areas and specific construction-related activities (including those at staging areas and on access

roads) for which advance notice is needed. This would enable the biologist to assess construction activities and associated sounds for potential impact upon nene and develop mitigation measures as needed, which may require activities to be modified.

- From May through August, nene activity in the area from Kilauea Military Camp to the Jaggar Museum is more likely not associated with nesting, brooding, and molting, which is why this construction window was selected for this road segment. If nene are in this area during these months, there may need to be little if any change in construction related activities (including staging and using the lower Mauna Loa Strip Road). However, nene nesting, brooding, and molting is not synchronous; there is variation in the start. If it starts early or late for some birds, the construction activities may need to be modified or halted in the area with the birds and there may be little to no advance notice of this.
- If the Kilauea Overlook and Picnic Area is used for project staging and/or the lower Mauna Loa Strip Road is used for construction access from September 1 through April 30, the adjacent area would be routinely surveyed for nene nests and broods. If a nest is located in close proximity, then measures would be taken to protect the nest and nene and this may include a temporary closure or the need to relocate the construction-related activity. In addition, from September 1 to April 30 the staging-related noises would be at a lesser level than the noise associated with the road construction.

Cars are a leading cause of adult nene deaths in the park. The following measures would be taken to ensure there is no increase in nene road kill during and following construction:

- No increased speed limits. If vehicles are routinely speeding measures would be taken to ensure speed is reduced.
- Measures would be taken to ensure that disturbed and revegetated areas along the roadside do not have vegetation that is attractive to nene.

With mitigation, Alternative 2 impacts to nene would be direct, local, short-term, adverse, and minor. Under the U.S. Fish and Wildlife Service guidance for implementing section 7 consultation under the Endangered Species Act, the effect would be may affect, is not likely to adversely affect.

Hawaiian Hawk/Io. The Hawaiian hawk or io is a federally listed endangered species. Potential habitat for nesting io is occurs between the park entrance station and the Kilauea Visitor Center area. No nests have been reported in this heavily trafficked area in the past.

- To the degree possible, construction in this segment would be conducted outside of nesting season. Nesting is typically March through September.
- If construction activities must occur during the breeding season, a nest search of the area adjacent to the road corridor would be conducted by the park bird biologist or qualified ornithologist immediately prior.

• If an active nest is detected, construction activity would be halted and would not resume until the nest has been vacated or further coordination with the U.S. Fish and Wildlife Service has occurred.

Under Alternative 2, impacts to io would be direct, local, short-term, and negligible. Under the U.S. Fish and Wildlife Service guidance for implementing section 7 consultation under the Endangered Species Act, the effect would be no effect.

Hawaiian Petrel and Band-rumped Storm Petrel. The Hawaiian petrel or uau (*Pterodroma sandwichensis*), federally listed as endangered, is a pelagic seabird that nests in upland areas of the park. The band-rumped storm petrel or akeake (*Oceanodroma castro*), which is currently listed under State of Hawaii endangered species statutes, but is not on any federal list. Both species are known to over-fly the area. These seabirds are sensitive to glaring night-lights and could be impacted by their use. Under Alternative 2 there is no night work so there would be no glaring night-lights. There would be no effects to petrels. Alternative 2 impacts upon these two species would be direct, local, short-term, and negligible. Under the U.S. Fish and Wildlife Service guidance for implementing section 7 consultation under the Endangered Species Act, the effect would be no effect.

Hawaiian Hoary Bat. Hawaii's sole endemic terrestrial mammalian species, the Hawaiian hoary bat or opeapea (*Lasiurus cinereus semotus*), is a resident species within the park and has been identified near the area affected by the proposed action. It is listed as endangered under both federal and State of Hawaii endangered species statutes. Implementation of Alternative 2 would include following the park procedures for the Hawaiian hoary bat, which includes consultation with the park's bird biologist to identify avoid potential effects to bats and designing projects so that impacts are avoided.

• No trees greater than 15 feet in height in potential endangered bat habitat should be removed during May-August without prior monitoring and approval by the park biologist.

Impacts under Alternative 2 would be direct, local, short-term, and negligible. Under the U.S. Fish and Wildlife Service guidance for implementing section 7 consultation under the Endangered Species Act, the effect would be no effect.

Cumulative Impacts

The park's management programs for nene, io, petrels, and the Hawaiian hoary bat include evaluating proposed projects for the potential to affect these species and avoiding impacts. Cumulative impacts in combination with Alternative 2 would be direct, local, short-term, and negligible (io, petrels, and the Hawaiian hoary bat) and for nene it would be direct, local, short-term, and minor. Under the U.S. Fish and Wildlife Service guidance for implementing section 7 consultation under the Endangered Species Act, the effect would be no effect (io, petrels, and the Hawaiian hoary bat) and for nene it would be no effect (io, petrels, and the Hawaiian hoary bat) and for nene it would be no effect (io, petrels, and the Hawaiian hoary bat) and for nene it would be may affect, is not likely to adversely affect.

Wildlife Special Status Species Impacts Conclusion

Under Alternative 1, No Action, impacts upon the special status species io, petrels, and the Hawaiian hoary bat would be direct, local, short-term, and negligible (io, petrels, and the Hawaiian hoary bat). Under the U.S. Fish and Wildlife Service guidance for implementing section 7 consultation under the Endangered Species Act, the effect would be no effect. For the special status species nene, impacts would be direct, local, short-term, and minor. Under the U.S. Fish and Wildlife Service guidance for implementing section 7 consultation under the Endangered Species Act, the effect would be direct, local, short-term, and minor. Under the U.S. Fish and Wildlife Service guidance for implementing section 7 consultation under the Endangered Species Act, the effect would be may affect, is not likely to adversely affect.

Impairment of Park Resources and Values

There would be no impairment to park resources and values because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the park's establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park's draft General Management Plan or other relevant National Park Service planning documents.

Cultural Resources

In this environmental assessment, cultural resources impact analysis complies with the requirements of NEPA and Section 106 of the National Historic Preservation Act (NHPA). Potential impacts are described in terms of direct, indirect or cumulative; type (beneficial or adverse), context (site specific, local, regional, or national), duration (short or long-term or permanent), and intensity (negligible, minor, moderate, or major). Because definitions vary by impact topic, intensity and duration definitions are provided for each impact topic analyzed. Impacts to cultural resources were identified and evaluated by 1) determining the area of potential effect; 2) identifying cultural resources present in the area of potential effect that are either listed in or eligible to be listed in the National; 3) applying the criteria of adverse effect to affected, National Register eligible or listed cultural resources; and 4) considering ways to avoid, minimize or mitigate adverse effects.

Under 36 CFR Part 800, the implementing regulations for Section 106, a determination of either adverse effect or no adverse effect must be made for affected National Register listed or eligible cultural resources. An adverse effect occurs whenever an impact alters, directly or indirectly, any characteristic of a cultural resource that qualifies it for inclusion in the National Register, e.g., diminishing the integrity of its location, design, setting, materials, workmanship, feeling, or association. Adverse effects also include reasonably foreseeable effects caused by the alternatives that would occur later in time, be farther removed in distance or be cumulative (36 CFR 800.5, Assessment of Adverse Effects). Although actions determined to have an adverse effect under Section 106 may be mitigated, the effect remains adverse. A determination of no adverse effect means there is an effect, but the effect would not diminish the characteristics of the cultural resource that qualify it for inclusion in the National Register.

Cumulative impacts (past, present, and reasonably foreseeable future projects) are evaluated for each impact topic.

Archeological Resources

Duration:

Short-term – effects lasting for the duration of the proposed action.

Long-term - effects lasting beyond the project completion

The thresholds of change for the intensity of an impact are defined as follows:

Negligible: The impact on archeological sites, whether beneficial or adverse, is at the lowest level of detection, barely perceptible and not measurable. Under Section 106 there would be no adverse effect.

Minor Adverse: The impact on archeological sites is measurable or perceptible, but it is slight and localized within a relatively small area of a site or group of sites. There would be little if any affect on the character-defining features of a listed or eligible National Register of Historic Places archeological site. The National Register eligibility of the site would not be jeopardized. Under Section 106 there would be adverse effect.

Minor Beneficial: A site would be preserved in its natural state. Under Section 106 there would be no adverse effect.

Moderate Adverse: The impact is measurable and perceptible. The impact is readily apparent and/or changes one or more character-defining feature(s) of an archeological resource but the National Register eligibility is not jeopardized. Under Section 106 there would be no adverse effect.

Moderate Beneficial: The impact is measurable and perceptible. The site would be stabilized. Under Section 106 there would be no adverse effect.

Major Adverse: The impact on archeological sites is substantial, noticeable, and permanent. For National Register eligible or listed archeological sites, the impact changes one or more character-defining feature(s) of an archeological resource, diminishing the integrity of the resource to the extent that it is no longer eligible for National Register listing. Under Section 106 there would be adverse effect.

Major Beneficial: The impact on archeological sites is substantial, noticeable, and permanent. Active intervention would be taken to preserve the site. The National Register eligibility of the site is unaffected. Under Section 106 there would be no adverse effect.

Archeological Resources: Alternative 1 – No Action Alternative

There is one archeological site within the area of potential effect for Alternative 1. Crater Rim Drive passes through the middle of Site 23647, a lithic quarry site. The informal pullouts are affecting the site. The affects are measurable, but slight and localized within a relatively small area of the site; the impact does not affect the National Register eligibility of the site. To protect the site and consistent with current management actions, the following mitigation is recommended: 1) between FHWA Station 601 and Station 650 (approximately between Jaggar Museum and Kilauea Military Camp) no ground disturbing activities would be allowed outside of the existing paved road and gravel shoulders unless prior consultation with an NPS archeologist identifies areas where it is permissible; 2) all vehicles would remain on paved areas, unless consultation with an NPS archeologist identifies areas where off-pavement activity is necessary and permissible; 3) informal pullouts would be removed because their use is adversely affecting the site; 4) pullout removal and rehabilitation plans would be developed in consultation with an archeologist; 5) an NPS archeologist would need to be on site for the entire time that any ground disturbance is occurring within and adjacent to the site boundary, including the removal of the informal pullouts; 6) ground disturbing activities outside of the site boundary would be monitored by an NPS archeologist but monitoring may be less than 100%; and 7) if archeological material is inadvertently discovered during the project, all work within the immediate area would stop until the park archeologist is notified and appropriate consultation and a mitigation plan is implemented according to the National Historic Preservation Act of 1966, as amended. The Alternative 1, No Action impacts on Site 23647 would be direct, local, long-term, minor, and beneficial. Under Section 106, there would be no adverse effect.

Cumulative Impacts

Past actions to Site 23647 include the construction of the road through the site and maintaining the ahu along the trail to the Namakani Paio Campground. Site materials were collected (such as hammer stones and flakes) to make the ahu. Consistent with current management actions, in the future no site materials would be collected and ahu maintenance would only use rock currently within an ahu. Overall, cumulative impacts to Site 23647 would be direct, local, long-term, minor, and beneficial. Under Section 106 there would be no adverse effect.

Archeological Impacts Conclusion

Under Alternative 1, No Action, with mitigation, impacts upon archeological resources would be direct, local, long-term, minor, and beneficial. Under Section 106 there would be no adverse effects.

Impairment of Park Resources and Values

There would be no impairment of park resources or values because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the park's establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park's draft General Management Plan or other relevant National Park Service planning documents.

Archeological Resources: Alternative 2 – Preferred Alternative

There is one archeological site within the area of potential effect for Alternative 2, Preferred Alternative. Crater Rim Drive crosses through the middle of Site 23647, a lithic quarry site. The recommended mitigation is: 1) between Station 601 and Station 650 ground disturbance is limited to the area necessary to improve and construct the new paved width and shoulders. (This is approximately 4 feet wide and 6 inches deep on the north side and 2 feet wide and 6 inches deep on the south side of the existing road); 2) for all other areas in the quarry site all vehicles would remain on paved areas; 3) where erosion control is necessary sediment logs or silt fencing would be used, and the NPS archeologist would be consulted and conduct necessary shovel tests prior to workers setting up erosion controls; 4) informal pullouts would be removed because their use is adversely affecting the site; 5) pullout removal and rehabilitation plans would be developed in consultation with an archeologist; 6) prior to construction, the NPS archeologist would, as he/she deem appropriate, conduct shovel testing in all areas where ground disturbing activities would be allowed to take place, 7) an NPS archeologist must be on site for the entire time that any ground disturbance is occurring within and adjacent to the site boundary of the quarry, including the removal of the informal pullouts and work by botanists; 8) ground disturbing activities outside of the quarry site boundary would be monitored by an NPS archeologist but monitoring may be less than 100%; and 9) if archeological material is inadvertently discovered during the project, all work within the immediate area would stop until the park archeologist is notified and appropriate consultation and a mitigation plan is implemented according to the National Historic Preservation Act of 1966, as amended. With implementation of the recommended mitigation Alternative 2, Preferred Alternative, impacts on Site 23647 would be direct, local, long-term, minor, and beneficial. Under Section 106 there would be no adverse effect.

Cumulative Impacts

Past actions to Site 23647 include the construction of the road through the site and removing site materials to maintain the ahu along the trail to the Namakani Paio Campground. In the future, no site materials would be disturbed for ahu maintenance and only rock currently within an ahu would be used. Overall cumulative impacts to Site 23647 would be direct, local, long-term, minor, and beneficial. Under Section 106 there would be no adverse effect.

Archeological Impacts Conclusion

Under Alternative 2, Preferred Alternative with mitigation, impacts from the road rehabilitation upon archeological resources would be direct, local, long-term, minor, and beneficial. Under Section 106 there would be no adverse effects.

Impairment of Park Resources and Values

There would be no impairment of park resources and values because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the park's establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park's draft General Management Plan or other relevant National Park Service planning documents.

Historic Structures and Cultural Landscapes

Duration:

Short-term – Occurs only during the construction period.

Long-term – Occurs during and continues after the construction period.

The thresholds of change for the intensity of an impact are defined as follows:

Negligible: Impact(s) is at the lowest levels of detection - barely perceptible and not measurable, either adverse or beneficial. Under Section 106 there would be no adverse effect.

Minor Adverse: Impact is slight but detectable. There is little loss of significance or integrity and the National Register eligibility is unaffected. Under Section 106 there would be no adverse effect.

Minor Beneficial: Impact is slight but detectable. There is no loss of significance or integrity and the National Register eligibility is unaffected. Under Section 106 there would be no adverse effect.

Moderate Adverse: The impact is readily apparent. Impact would alter a character defining feature(s) but would not diminish the integrity of the resource to the extent that its National Register eligibility is jeopardized. Under Section 106 there would be no adverse effect.

Moderate Beneficial: The impact is readily apparent. There is no loss of significance or integrity and the National Register eligibility is unaffected. Rehabilitation is in accordance with the Secretary of the Interior's Standards. Under Section 106 there would be no adverse effect.

Major Adverse: The impact is severe. Impact would alter a character defining feature(s), diminishing the integrity of the resource to the extent that it is no longer eligible to be listed in the National Register. Under Section 106 there would be adverse effect.

Major Beneficial: The impact is of exceptional benefit. Restoration is in accordance with the Secretary of the Interior's Standards. Under Section 106 there would be no adverse effect.

Historic Structures and Cultural Landscapes: Alternative 1 – No Action Alternative

The 2.8 mile project area is completely within the Crater Rim Drive Historic District. This district has the dual distinction of being eligible for the National Register as well as contributing to the National Register eligibility of the larger Crater Rim Historic District. The project area is also partially within the Kilauea Administration and Employee Housing Historic District and adjacent to the Kilauea Military Camp Historic District.

Crater Rim Historic District

Alternative 1 would maintain the road and features that contribute to the National Register eligibility of the Crater Rim Historic District. The No Action Alternative's impacts to the Crater Rim Historic District would be direct, local, long-term, minor, and beneficial. Under Section 106 there would be no adverse effect.

Crater Rim Drive Historic District

Under the No Action Alternative, the road work would continue to be done by segment, based on available funding. The historic character would be retained; the road width, historic road cuts, and numerous features would remain intact; the relationship of the road to the landscape would remain unchanged. Informal pullouts would be removed consistent with current park practice to protect resources. The park staff would work on maintaining the existing road widths without adverse affects to historic stone work. The No Action Alternative's impacts to the Crater Rim Drive Historic District would be direct, local, long-term, minor, and beneficial. Under Section 106 there would be no adverse effect.

Kilauea Administration and Employee Housing Historic District

Under the No Action Alternative, road work would continue to be done by segment, based on available funding. The intersections and parking areas for the Kilauea Visitor Center and Volcano House may be included in the cyclic work, such as repaving. Historic rock work, such as curbstones, would remain. The historic character of these intersections and parking areas would be retained. The No Action Alternative's impacts to the Kilauea Administration and Employee Housing Historic District would be direct, local, long-term, minor, and beneficial. Under Section 106 there would be no adverse effect.

Kilauea Military Camp Historic District

Under the No Action Alternative, cyclic road work would continue to be done by segment, based on available funding. The Crater Rim Drive intersections with the roads into the Kilauea Military Camp Kilauea Visitor Center may be included in the cyclic work, such as repaving. Historic rock work, such as curbstones, would remain. The historic character of these intersections would be retained. The No Action Alternative's impacts to the Kilauea Military Camp would be direct, local, long-term, negligible. Under Section 106 there would be no adverse effect.

Cumulative Impacts

In the past some road features such as the Steam Vent shoulder stones have been paved over; however, they are still in their original location. Cumulative impacts to the historic districts would be direct, local, long-term, minor, and beneficial. Under Section 106 there would be no adverse effect.

Historic Structures and Cultural Landscapes Conclusion

The No Action Alternative's impacts upon Historic Structures and Cultural Landscapes would be direct, local, long-term, minor, and beneficial (historic road character maintained, historic road and features remain in place). Under Section 106 there would be no adverse effect.

Impairment of Park Resources and Values

There would be no impairment of park resources and values because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the park's establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park's draft General Management Plan or other relevant National Park Service planning documents.

Historic Structures and Cultural Landscapes: Alternative 2 - Preferred Alternative

The 2.8 mile project area is completely within the Crater Rim Drive Historic District. This district has the dual distinction of being eligible for the National Register as well as contributing to the National Register eligibility of the larger Crater Rim Historic District. The project area is also partially within the Kilauea Administration and Employee Housing Historic District and adjacent to the Kilauea Military Camp Historic District.

Crater Rim Historic District

Alternative 2 would maintain the road and features that contribute to the National Register eligibility of the Crater Rim Historic District. The alternative's impacts to the Crater Rim Historic District would be direct, local, long-term, minor, and beneficial. Under Section 106 there would be no adverse effect.

Crater Rim Drive Historic District

Under this alternative, a larger footprint for the road would affect a greater number of the contributing or character defining features of Crater Rim Drive, a National Register eligible property. However, the Secretary of the Interior's Standards for Rehabilitation would be followed, which would minimize impacts to the road and road features. The rehabilitated roadway would be paved at a typical and continuous width of 22 feet. There would be two 10-foot travel lanes, each with a one-foot paved and chip sealed shoulder. In areas where the current pavement width is greater than 22 feet, the paved width would be reduced to the 22 foot template. The pavement width would not be reduced in areas where the paved road is currently wider than 22 feet due to intersections with parking areas or other roads, at the entrance station where the number of lanes taper, and on one tight-radius curve, so tour buses and other large vehicles would be able to drive the roadway safely. The existing roadway, averaging 21 feet, would be widened an average of 1 foot through the length of the project. The narrowest parts of road, at 18 feet, would be widened by about 4 feet.

Key elements that contribute to Alternative 2 being assessed as a "compatible alteration" consistent with the Secretary of the Interior's Standards for Rehabilitation include:

• The design includes a 1 foot-wide coarse aggregate (chip seal) shoulder on either side of the traveled way.

Reason for compatibility of textured paved shoulder:

1) At the end of the period of significance (1942) the road was generally 20 feet wide with narrow gravel shoulders. The textured paved shoulder design simulates the historic design condition, only the historic gravel shoulders would now be composed of bonded granular material, rather than loose granular material. Overall, the historic proportions of traveled way to shoulder would still be discernible.

2) To be compatible and meet the Secretary of Interior's Standards for Rehabilitation, an alteration must be distinguishable, removable, in keeping with the historic character, and not destroy a character-defining feature. The narrow width of the road is a character-defining feature. A general width of 20 feet is a historic park road geometry, and a 22 feet width is a post-World War II park road geometry. By simulating the historic width condition, the rehabilitation design would not destroy this character defining feature.

3) The design retains the historic shoulder stones near Steam Vents in their historic location, and preserves them in-situ, by removing the asphalt, covering with barrier fabric, and covering with new asphalt up to 5" in thickness. Removal of the stones would destroy a historic feature, result in loss of cultural resources information, and would be an adverse impact. Preserving the stones in-situ avoids the adverse impact.

4) The design replaces the proposed drains (beyond the edge of pavement) in the vicinity of the Volcano House rock cut slope with naturalistic area drains. These drains may include vegetated swales, native rock and blue stone swales or dry wells, but should not use a large horizontal metal grate, which detracts from the historic character of the area. The historic character is conveyed by rustic architecture and naturalistic landscape architecture. The drainage structure should be naturalistic, using natural forms and materials, in order to be assessed as a compatible alteration of the road.

Other elements of Alternative 2, the Preferred Alternative, that minimize the potential effect upon historic structures and cultural landscapes include:

- Historic road features would be preserved in place unless specified in the project design.
- The existing rock cut slope in the road segment west of Kilauea Visitor Center would be cut back in several small locations to create sufficient road width. An estimated 10 rock cuts would be needed over a road length of approximately 60 feet; each would be cut back approximately 2 to 10 inches and would be done by NPS approved stone masons. The new cut surfaces would be visually compatible with the existing cut.
- The new road surface in the segment west of the Kilauea Visitor Center would be 3 to 9 inches lower than the existing road surface, exposing more of the historic stone guardwall, the base of which has been obscured by layers of accumulated asphalt. A

narrow drainage ditch would also be constructed in this section to improve surface drainage.

- Parking areas would not be expanded. Features such as curbstones would remain.
- The paved trail from the intersection with the Sulphur Bank Trail through Steam Vents would be repaved. The profile relationship of the trail to the road would be maintained or improved to minimize the drop between the road and the trail.
- Tree removal would be minimized (estimated 15 trees would need to be removed). Where possible trees would be limbed, trimmed, or salvaged, rather than removed. Trees to be removed would be decided via consultation between the road design engineer and park resource specialists.

The Preferred Alternative would have a direct, local, long-term, moderate, beneficial impact upon the Crater Rim Drive Historic District. Under Section 106 there would be no adverse effect.

Kilauea Administration and Employee Housing Historic District

Alternative 2 would affect the intersections and parking areas for the Kilauea Visitor Center. The work would be consistent with the Secretary of the Interior's Standards for Rehabilitation and would include: An asphalt overlay, improved surface drainage, and adding wheel stops in the parking area; reconfiguring parking spaces within existing parking area footprint; increasing accessibility by the addition of accessible parking stalls and adding accessible routes and crosswalks; rebuilding and slightly widening the sidewalk in front of the visitor center, curbstones would be removed and reset; and adding foot lighting by sidewalks.

At the Volcano House parking area, Alternative 2 would include a pavement overlay of the parking area, improved surface drainage, reconfiguration of parking spaces within existing footprint, increased accessibility through the addition of accessible parking spaces and adding accessible routes from the parking area to the hotel, and the realignment of crosswalks.

Historic rock work, such as curbstones, would remain. The historic character of these intersections and parking areas would be retained. The Alternative 2 impacts to the Kilauea Administration and Employee Housing Historic District would be direct, local, long-term, minor, and beneficial. Under Section 106 there would be no adverse effect.

Kilauea Military Camp Historic District

Under Alternative 2 the Crater Rim Drive intersections with the roads into the Kilauea Military Camp and Kilauea Visitor Center would be affected. Historic rock work, such as curbstones, would remain. The historic character of these intersections would be retained. Alternative 2 impacts to the Kilauea Military Camp would be direct, local, long-term, and negligible. Under Section 106 the effect would be no adverse.

Cumulative Impacts

In the past some road features such as the Steam Vent shoulder stones have been paved over; however, they are still in their original location. Cumulative impacts to the historic districts would be direct, local, long-term, minor, and beneficial. Under Section 106 there would be no adverse effect.

Historic Structures and Cultural Landscapes Conclusion

Alternative 2 would have a direct, local, long-term, moderate, beneficial impact upon historic structures and cultural landscapes. Under Section 106 there would be no adverse effect.

Impairment of Park Resources and Values

There would be no impairment of park resources and values because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the park's establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park's draft General Management Plan or other relevant National Park Service planning documents, there would be no impairment of park resources and values.

Ethnographic Resources

Duration:

Short-term – Effects lasting for the duration of the proposed action.

Long-term – Effects lasting beyond the project completion

The thresholds of change for the intensity of an impact are defined as follows:

Negligible: The impact on ethnographic resources, whether beneficial or adverse, is at the lowest level of detection, barely perceptible and not measurable. Under Section 106 there would be no adverse effect.

Minor Adverse: The impact on ethnographic resources is measurable or perceptible, but it is slight and localized within a relatively small area of a site or group of sites. There would be little if any affect on the character-defining features of a listed or eligible National Register of Historic Places archeological site. The National Register eligibility of the site would not be jeopardized. Under Section 106 there would be no adverse effect.

Minor Beneficial: Ethnographic resources would be preserved in its natural state. Under Section 106 there would be no adverse effect.

Moderate Adverse: The impact is measurable and perceptible. The impact is readily apparent and/or changes one or more character-defining feature(s) of an ethnographic resource but the National Register eligibility is not jeopardized. Under Section 106 there would be no adverse effect.

Moderate Beneficial: The impact is measurable and perceptible. Under Section 106 there would be no adverse effect.

Major Adverse: The impact on ethnographic resources is substantial, noticeable, and permanent. For National Register eligible or listed ethnographic resources, the impact changes one or more character-defining feature(s) of an ethnographic resource, diminishing the integrity of the resource to the extent that it is no longer eligible for National Register listing. Under Section 106 there would be adverse effect.

Major Beneficial: The impact on ethnographic resources is substantial, noticeable, and permanent. Active intervention would be taken to preserve the resource. The National Register eligibility of the resource is unaffected. Under Section 106 there would be no adverse effect.

Ethnographic Resources: Alternative 1 – No Action Alternative

The Kilauea Caldera and its associated sites, including the Steam Vents area, have been identified as Native Hawaiian sacred sites. The area of potential effect for the No Action Alternative is within and adjacent to these sites. Traditional access occurs in the project area. The proposed project was discussed with the park's Kupuna Advisory Group. An option to close the Steam Vents parking area and relocate it was discussed. A comment was made that "culturally we have adapted, leave it the way it is" (NPS 2004).

The Alternative 1, No Action Alternative impacts on ethnographic resources could be noticeable but would not appreciably alter resource conditions, such as traditional access or site preservation, or the relationship between the resource and the Native Hawaiian beliefs and practices. The following mitigation occurs to minimize impacts upon ethnographic resources:

- Construction associated with road maintenance may be stopped for short-term periods to allow for traditional cultural practices, including providing for the absence of construction-associated sounds.
- If Native Hawaiian remains or resources were discovered, work would halt that had a potential to affect the remains or resources and consultation would occur with Native Hawaiians.

Alternative 1 impacts would be direct, local, long-term, and minor adverse. Under Section 106 there would be no adverse effect upon ethnographic resources.

Cumulative Impacts

Actions with a potential to affect ethnographic resources include the construction of the road and road features and visitor use. Cumulative impacts would be direct, local, long-term, and minor. Under Section 106 there would be no adverse effect upon ethnographic resources.

Ethnographic Resources Impacts Conclusion

Under Alternative 1, Preferred Alternative with mitigation, impacts from the road rehabilitation upon ethnographic resources would be direct, local, long-term, adverse, and adverse. Under Section 106 there would be no adverse effect upon ethnographic resources.

Impairment of Park Resources and Values

There would be no impairment of park resources and values because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the park's establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park's draft General Management Plan or other relevant National Park Service planning documents.

Ethnographic Resources: Alternative 2 – Preferred Alternative

The Alternative 2, Preferred Alternative, is generally within the footprint of the existing road and parking areas, and trail. The roadway would be widened an average of 1 foot through the length of the project. The narrowest parts of road, at 18 feet, would be widened by about 4 feet.

As stated previously, the proposed project was discussed with the park's Kupuna Advisory Group. Closing the Steam Vents parking area and relocating it was discussed. A comment was made that "culturally we have adapted, leave it the way it is" (NPS 2004) The parking areas, including Steam Vents, would not increase in size.

The Alternative 2, Preferred Alternative impacts on ethnographic resources could be noticeable, but would not appreciably alter resource conditions, such as traditional access or site preservation, or the relationship between the resource and the Native Hawaiian beliefs and practices. The following mitigation would occur to minimize impacts upon ethnographic resources:

- Construction associated with road maintenance may be stopped for short-term periods to allow for traditional cultural practices, including providing for the absence of construction-associated sounds.
- If Native Hawaiian remains or resources were discovered, work would halt that had a potential to affect the remains or resources and consultation would occur with Native Hawaiians.

Alternative 2 impacts would be direct, local, long-term, adverse, and minor. Under Section 106 there would be no adverse effect upon ethnographic resources.

Cumulative Impacts

Actions to ethnographic resources include the construction of the road and road features, including the parking areas, and visitor use. Cumulative impacts would be direct, local, long-

term, adverse, and adverse. Under Section 106 there would be no adverse effect upon ethnographic resources.

Ethnographic Resources Impacts Conclusion

Under Alternative 2 with mitigation, impacts from the road rehabilitation upon ethnographic resources would be direct, local, long-term, adverse, and minor. Under Section 106 there would be no adverse effect upon ethnographic resources.

Impairment of Park Resources and Values

There would be no impairment of park resources and values because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the park's establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park's draft General Management Plan or other relevant National Park Service planning documents.

Park Operations

Park operations, for the purpose of this analysis, refers to the quality and effectiveness of the infrastructure and the ability to maintain infrastructure used in the operation of the park in order to adequately protect and preserve resources and provide for a positive visitor experience.

Duration:

Short-term – Effects lasting for the duration of the proposed action.

Long-term – Effects lasting after the proposed action is completed

The thresholds of change for the intensity of an impact to Park Operation are defined as follows:

Negligible: Park operations would not be affected, or the effects would be at low levels of detection and would not have an appreciable effect on park operations.

Minor: Park operations would be affected, and the effect would be detectable, but current levels of funding and staff would be adequate and other park operations would not be reduced.

Moderate: Park operations would be affected, the effect would be readily apparent. For adverse impacts, increased staff and funding would be needed or other park operations would have to be reduced and/or priorities changed.

Major: Park operations would be affected, the effect would be readily apparent. For adverse impacts, increased staff and funding would be needed or other park programs would have to be eliminated.

Park Operations: Alternative 1 – No Action Alternative

Under the No Action Alternative, road work would be done by segment, based on available funding, and not as one project. Generally, the amount of funding that would be available is more limited than that provided by the Federal Highways Administration program, which would fund Alternative 2. The No Action Alternative would not reduce the need for road and road feature maintenance; the road would not undergo comprehensive improvements and structural deficiencies would not be corrected. The roadway would likely continue to deteriorate. Over time, this deterioration could result in increasingly uneven pavement (warping and cracking), narrowing lane width, and other road conditions that could adversely affect the road resource.

The current levels of funding and staff are not adequate to complete all the road rehabilitation that is needed. As funding becomes available road work would occur. Current levels of funding and staff are generally adequate for the road maintenance support activities, such as archeological or nene monitoring during construction activities. Impacts to park operations would be direct, local, long-term, minor to moderate, and adverse.

Cumulative Impacts

There are no past, present, or reasonably foreseeable future actions that could contribute to cumulative effects.

Park Operations Impacts Conclusion

The impacts of Alternative 1, the No Action Alternative, on park operations would be direct, local, long-term, minor to moderate, and adverse.

Impairment of Park Resources and Values

The NPS does not analyze recreational values/visitor experience (unless impacts are resource based), socioeconomic values, health and safety, park operations, or commercial operations for impairment, although it is possible that one or more of these topics could cause impairment.

Park Operations: Alternative 2 - Preferred Alternative

Under the Preferred alternative, the road would undergo comprehensive rehabilitation and structural deficiencies would be corrected. Some cyclic maintenance needs would be reduced. The project would be funded by the Federal Highways Administration program. This would include funding for the construction support activities, such as archeological or nene monitoring.

Traffic delays during construction would have an impact on staff working in the park, including emergency responders and HVO staff. The road would remain open. Generally, one lane would be undergoing construction and the other lane would be open for travel; for brief periods of time, both lanes may be closed. Delays would generally be kept to 15 minutes or less per passage through a construction segment, with the road opened to emergency responders within 5 minutes of notification. At the entrance station, one lane would always be open and traffic would be controlled so that it did not back up to State Highway 11.

Overall, implementation of Alternative 2 impacts upon park operations would be direct, local, long-term, moderate, and adverse (during construction) and beneficial (after construction).

Cumulative Impacts

There are no past, present, or reasonably foreseeable future actions that would contribute to cumulative effects.

Park Operations Impacts Conclusion

Impacts of the implementation of Alternative 2 on park operations would be direct, local, long-term, moderate, and adverse (during construction) and beneficial (after construction).

Impairment of Park Resources and Values

The NPS does not analyze recreational values/visitor experience (unless impacts are resource based), socioeconomic values, health and safety, park operations, or commercial operations for impairment, although it is possible that one or more of these topics could cause impairment.

Visitor Use and Experience

Public scoping, observation of visitor use patterns, and an assessment of what is available to visitors under current management were used to estimate the effects of the alternatives.

Duration:

Short-term – Effects lasting for the duration of the proposed action.

Long-term – Effects lasting beyond when the project is completed.

The thresholds of change for the intensity of an impact to visitor use and experience are defined as follows:

Negligible: Visitors would not be affected by the change, or the change is slight and visitors would not likely be aware of the effects.

Minor: Changes would be detectable by some visitors although the changes would be slight. Those aware of the changes would not likely express an opinion about the change. Visitor satisfaction would not be measurably affected.

Moderate: Changes would be readily apparent by many visitors and some visitors would be likely to express an opinion about the changes. Visitor satisfaction might be measurably affected. Some visitors would choose to pursue activities in other available local or regional areas.

Major: Changes would be readily apparent by most visitors, severely adverse, or exceptionally beneficial, and have important consequences. Many visitors would be aware of the effects associated with the alternative and would likely express a strong opinion about the changes. Visitor satisfaction could decrease substantially. Changes in visitor use and experience would be

readily apparent. Some visitors would choose to pursue activities in other available local or regional areas.

Visitor Use and Experience: Alternative 1 - No Action Alternative

Under the No Action Alternative, the roadway would likely continue to deteriorate. Over time, this deterioration could include increasingly uneven pavement (warping and cracking) and narrowing lane width.

Routine and cyclic maintenance, preservation maintenance, and rehabilitation would occur on road segments road as funding allowed. The road work would sometimes result in a lane closures, with one lane open and managed for vehicular travel. Travel delays would be 15 minutes or less per passage through a construction segment.

The impacts of the No Action Alternative on visitor use and experience would be direct, local, long-term, adverse (road deterioration) and beneficial (road maintained), minor to moderate.

Cumulative Impacts

There are no past, present, or reasonably foreseeable future actions that would contribute to cumulative effects.

Visitor Use and Experience Impacts Conclusion

The impacts of the No Action Alternative on visitor use and experience would be direct, local, long-term, adverse (road deterioration and safety) and beneficial (road would be maintained), and minor to moderate.

Impairment of Park Resources and Values

The NPS does not analyze recreational values/visitor experience (unless impacts are resource based), socioeconomic values, health and safety, park operations, or commercial operations for impairment, although it is possible that one or more of these topics could cause impairment.

Visitor Use and Experience: Alternative 2 - Preferred Alternative

Under the Preferred Alternative, the roadway would undergo comprehensive rehabilitation and structural deficiencies would be corrected. During the implementation of the Preferred Alternative, visitors would be able to access the visitor use areas and facilities along the road, such as the Kilauea Visitor Center, Volcano House, Volcano Art Center, Steam Vents, Kilauea Military Camp, and Jaggar Museum. Accessible parking, walkways, and crosswalks would be added at the Kilauea Visitor Center, Volcano House, Steam Vents, and Jaggar Museum. Bicycle parking would be added at the Jaggar Museum. Some visitor use parking areas may be closed during work at a particular site.

Under this alternative the paved pedestrian and bicycle trail from the intersection of Sulphur Bank Trail through Steam Vents would be repaved. Signage would be improved to encourage pedestrians to use the Sulphur Bank Trail to walk between Steam Vents and the Kilauea Visitor Center. These actions would improve pedestrian safety. Additionally, pedestrian safety improvements such as foot lighting, crosswalks, and walkways would be added throughout the project area. These improvements would be beneficial to the visitor use experience.

Work would be done by segment with at least one lane open in the segment. Traffic delays during construction would be kept to 15 minutes or less per passage through a construction segment. During some of the construction phases there might be limited bike access, or bicycles would be re-routed. Information about the road construction would be provided on the park's web site, at the entrance station and visitor centers, and through other appropriate means such as press releases.

The Preferred Alternative impacts upon visitor use and experience would be direct, local, long-term, minor to moderate, and adverse (during construction) and beneficial (after construction).

Cumulative Impacts

There are no past, present, or reasonably foreseeable future actions that would contribute to cumulative effects.

Visitor Use and Experience Impacts Conclusion

Impacts of the implementation of Alternative 2 on visitor use and experience would be direct, local, long-term, minor to moderate, and adverse (during construction) and beneficial (after construction).

Impairment of Park Resources and Values

The NPS does not analyze recreational values/visitor experience (unless impacts are resource based), socioeconomic values, health and safety, park operations, or commercial operations for impairment, although it is possible that one or more of these topics could cause impairment.

Commercial Operations

Duration:

Short-term – Effects lasting for the duration of the proposed action.

Long-term – Effects lasting after the proposed action is completed.

The thresholds of change for the intensity of an impact are defined as follows:

Negligible: Commercial Operations would not be affected, or effects would not be measurable.

Minor: Commercial Operations would be small but detectable.

Moderate: The effects on Commercial Operations conditions would be readily apparent but would not substantially affect business income.

Major: The effect on Commercial Operations conditions would be readily apparent and would substantially affect business income.

Commercial Operations: Alternative 1 - No Action Alternative

Routine and cyclic maintenance, preservation maintenance, and rehabilitation would occur on road segments road as funding allowed. Road work would sometimes result in a lane closure, but one lane would be left open for vehicular travel. Travel delays would generally be 15 minutes or less per passage through a construction segment.

The impacts of the No Action Alternative on visitor use and experience would be direct, local, long-term, adverse (road deterioration) and beneficial (road maintained), and minor to moderate.

Cumulative Impacts

Planned updates and modifications are occurring to Volcano House. If cyclic maintenance was occurring to the Volcano House parking area, it would be coordinated with the planned updates and modifications to the building.

Commercial Operations Impacts Conclusion

The impacts of Alternative 1 on Commercial Operations would be direct, local, long-term, adverse and beneficial, and minor to moderate.

Impairment of Park Resources and Values

The NPS does not analyze recreational values/visitor experience (unless impacts are resource based), socioeconomic values, health and safety, park operations, or commercial operations for impairment, although it is possible that one or more of these topics could cause impairment.

Commercial Operations: Alternative 2 - Preferred Alternative

The road would remain open. Generally, one lane would be undergoing construction and the other lane would be open for travel; for brief periods of time, both lanes may be closed. Delays would generally be kept to 15 minutes or less per passage through a construction segment, with the road opened to emergency responders within 5 minutes of notification. At the entrance station, one lane would always be open and traffic would be controlled so that it did not back up to State Highway 11.

During some of the construction phases there might be limited bike access. Travelers would continue to be able to access the visitor use areas and facilities along the road, such as the Kilauea Visitor Center, Volcano House, Volcano Art Center, Steam Vents, Kilauea Military Camp, and Jaggar Museum. Some visitor use parking areas may be closed during rehabilitation at a particular area. Rehabilitation of the Volcano House parking area would be coordinated with the planned updates to the building.

Information in advance and during the road construction would be provided to commercial operations through mailings, on the park's web site, available at the entrance station and visitor centers, and through other appropriate means such as press releases.

The Preferred Alternative would have direct, long-term, local, adverse (during construction) and beneficial (after construction), and minor to moderate impacts on Commercial Operations.

Cumulative Impacts

Work is occurring on the Volcano House. Rehabilitation of the Volcano House Parking Area would be coordinated with the planned updates and modifications to the building.

Commercial Operations Impacts Conclusion

The Preferred Alternative would have direct, long-term, local, minor to moderate adverse (during construction) and beneficial (after construction) impacts on Commercial Operations.

Impairment of Park Resources and Values

The NPS does not analyze recreational values/visitor experience (unless impacts are resource based), socioeconomic values, health and safety, park operations, or commercial operations for impairment, although it is possible that one or more of these topics could cause impairment.

Summary Tables

Beginning on the next page, IV-47 through IV-54 is Table IV-1: Summary of Impact Topics for Detailed Analysis & Mitigations, by Alternative. This table summarized the impact topics and related mitigation discussed in the text of this chapter and Chapter II. Beginning on page IV-55 is Table IV-2: Summary of Impact Topics Considered but Dismissed, by Alternative. This summarizes the impact topics considered but dismissed in Chapter I, along with the reasoning or the mitigations that made the impacts to this resource negligible. The tables are just a summary, for a complete discussion refer to Chapter I and Chapter IV of this EA.

Table IV-1: Summary of Impact Topics for Detailed Analysis & Mitigations, by Alternative

	I I I I I I I I I I I I I I I I I I I			
ALTERNATIVES	ALTERNATIVE	1: NO ACTION	ALTERNATIVE 2: PF	₹EFERRED ALTERNATIVE
	Alternative 1, the No Action Alternative, would continue present management activities, which provide for existing vehicular access on the road. Park staff would respond to future needs and conditions associated with the road without major actions or changes in the present cyclic maintenance course. This alternative would include some minor rehabilitation or reconstruction of existing road features if failure occurred. Deterioration of the road surface would continue because of the advanced age of the pavement and insufficient subsurface structure. Improvements to the parking areas would not occur without special funding. Informal pullouts would be removed to protect park resources. There would continue to be variable road widths for the 2.8 miles.		Alternative 2, the Preferred Alternative, would rehabilitate the 2.8 mile segment of Crater Rim Drive. Deteriorated pavement and related roadway structures would be rehabilitated to provide another 20 or more years of service and to better accommodate the size and volume of average daily traffic. The rehabilitated roadway would be paved at a typical and continuous width of 22 feet, with modification at the entrance station, intersections, and one tight-radius curve. Parking area rehabilitation would occur at Kilauea Visitor Center, Volcano House, Steam Vents, and Jaggar Museum. Informal pullouts would be removed and rehabilitated to protect park resources.	
IMPACT TOPICS for DETAILED ANALYSIS	DESCRIPTION OF POTENTIAL IMPACT	MITIGATION	DESCRIPTION OF POTENTIAL IMPACT	MITIGATION
Geologic Resources: Includes volcanoes; volcanic emissions, faults, cracks, lava tubes, and collapse features; and geothermal resources.	Continued maintenance of the road occurs in an area where numerous geologic resources exist. Maintenance activities could impact some of these resources.	 No impact to volcanoes, or volcanic emissions expected from continued maintenance. NPS park archeologist would be consulted before work expected to come in contact with cracks, lava tubes, or collapse features. If crack, lava tube, or collapse feature found during work: work halted, park archeologist is consulted, engineers consulted if necessary, & park would develop plan to protect or collapse features. Avoid geothermal resources. 	Construction activities associated with road rehabilitation would occur in an area with numerous geologic resources. Activities could impact some resources in numerous ways.	 No impact to volcanoes or volcanic emissions expected. Geotechnical surveys would be conducted before construction. For any crack, lava tube or collapse featured discovered, a plan for covering over, protecting, or collapsing the feature would be drafted in consultation with park archeologist. If features are found during construction work would halt, pending consultation and identification of a mitigation plan. Steam Vents geothermal resource would be protected from debris run-off during construction. Result at Steam Vents beneficial; pavement pulled back from resource.

ALTERNATIVES	ALTERNATIVE 1: NO ACTION		ALTERNATIVE 2: PREFERRED ALTERNATIVE	
IMPACT TOPICS for DETAILED ANALYSIS	DESCRIPTION OF POTENTIAL IMPACT	MITIGATION	DESCRIPTION OF POTENTIAL IMPACT	MITIGATION
Geologic Hazards: Includes volcanoes; volcanic emissions; faults, cracks, lava tubes, and collapse features; and geothermal resources.	Continued maintenance would be performed in an area, used by visitors & staff, where these hazards exist.	 Road would remain open. Follow existing park protocols for dealing with geologic hazards. 	Road rehabilitation would be performed in an area, used by visitors & staff, where these hazards exist.	 Road would remain open. Follow existing park protocols for dealing with geologic hazards. Make construction crews aware of protocols.
Vegetation: Including removal of vegetation & prevention of non-native species	Minor impacts to existing vegetation expected under this alternative.	 Consult park botanist should vegetation removal become necessary for road maintenance. Before construction salvage vegetation as appropriate & according to park specifications for replanting. Revegetate disturbed sites immediately following construction. Monitor rehabilitated areas to determine if efforts are successful or if additional remedial actions are necessary. Minimize soil disturbance. Limit vehicle parking to existing roadways & parking areas. 	Some removal of trees and vegetation along 2.8 miles of road in this project.	 A rehabilitation/restoration plan would be developed by the park. including: Before construction salvage vegetation, as appropriate & according to park specifications, for replanting. Revegetate disturbed sites immediately following construction. Monitor rehabilitated areas to determine if efforts are successful or if additional remedial actions are necessary. For every ohia (<i>Metrosideros</i> <i>polymorpha</i>) tree removed for the purpose of rehabilitating the road, the park would replant 5. Result is no net green loss. Minimize impacts to vegetation by: Minimizing soil disturbance. Limiting vehicle parking to existing roadways & parking areas. Limiting disturbance to roadsides and anlwart areas

ALTERNATIVES	ALTERNATIVE 1: NO ACTION		ALTERNATIVE 2: PREFERRED ALTERNATIVE	
IMPACT TOPICS for DETAILED ANALYSIS	DESCRIPTION OF POTENTIAL IMPACT	MITIGATION	DESCRIPTION OF POTENTIAL IMPACT	MITIGATION
		• Follow park SOP for non- native vegetation management:		Non-native Species Control would be implemented: • Ensure all construction
		• Ensure all construction equipment is weed & seed		equipment is weed & seed free before entering the park.
Vegetation (Cont):	Potential for introduction or further spreading of non-	free before entering the park. • Gravel & soil sources for	Potential for introduction or further spreading of non-	• Gravel & soil sources for construction must be weed-free.
Including removal of vegetation & prevention of non-native species.	native species.	construction must be weed- free. • Haul trucks bringing	native species.	• Haul trucks bringing materials from outside the park would be covered up enroute.
		materials from outside the park would be covered up enroute.		• The park would monitor areas disturbed during construction for up to 3 years & treat in accordance with NPS guidelines.
	Removal and rehabilitation of informal pullouts. Result is beneficial for vegetation.	• No additional mitigation necessary.	Removal and rehabilitation of informal pullouts. Result is beneficial for vegetation.	• No additional mitigation necessary.
Wildlife: Includes mammals, amphibians, and birds, native and non-native. Does not include wildlife that is of special species status.	Continued maintenance occurs in area where numerous species of wildlife (native & non- native exist).	 Follow park's standard operating procedure for preventing spread of nonnative species in the park (specifically coqui tree frog). If further impacts are identified they would be addressed and mitigated on a project by project basis. 	Rehabilitation occurs in area where numerous species of wildlife (native & non-native exist).	 Before removing trees January through July, conduct surveys for native bird nests. The road contractor would ensure that all construction equipment, vehicles, and machinery are coqui free before entering the park. Park's non-native species control standard operating procedures would be implemented. The park would monitor disturbed areas to identify and remove coqui tree frogs.

ALTERNATIVES	ALTERNATIVE 1: NO ACTION		ALTERNATIVE 2: PREFERRED ALTERNATIVE	
IMPACT TOPICS for DETAILED ANALYSIS	DESCRIPTION OF POTENTIAL IMPACT	MITIGATION	DESCRIPTION OF POTENTIAL IMPACT	MITIGATION
Vegetation: Special	Routine road repair & resurfacing not affecting the species.	 NPS maintenance to notify park botanist of upcoming work. NPS botanist to survey, flag, & fence off <i>S</i>. 	Addition of pavement width & rebuilding shoulders could disturb plants.	 NPS botanist would survey, flag, or fence off <i>S. hawaiiensis</i> prior to construction. Collaborate w/ contractor to avoid foot & vehicle traffic off-
Presence of <i>Silene Hawaiiensis</i> from Kilauea Overlook to the Jaggar Museum (~ Station 625 to 601).	Foot traffic from vehicles parked at informal pullouts affecting the species. Removing informal pullouts	 hawaiiensis before work. NPS botanist to survey, flag, & fence off S. hawaiiensis before work. 	Removal of informal pullouts has potential to affect	 • NPS botanist would survey, flag, or fence off <i>S. hawaiiensis</i> prior to construction.
	has potential to affect species.	• Collaborate w/ park maintenance crew to avoid these areas during removal.	species.	 Collaborate w/ contractor to avoid foot & vehicle traffic off- pavement where plants found.
Wildlife Special Status Species (Threatened and Endangered Species and Species of Concern): Presence of Nene, Petrels, Hawaiian Hoary Bat, & Hawaiian Hawk.	Routine road maintenance occurs in areas where 4 endangered birds and an endangered mammal are or may be found. Activities could affect these species.	 Nene: Notify the park's bird biologist if nene are observed in or adjacent to the project area. The bird biologist would assess the potential for work to affect the nene, including the assessment for sound related impacts, and would provide a recommendation for the work, which may include modifying or stopping the project. Petrels: No night work is allowed. 	Road rehabilitation occurs in areas where 4 endangered birds and an endangered mammal are or may be found. Construction activities could affect these species.	 Inform construction personnel of presence of special species wildlife and advise on how to avoid impacts to them. Nene: Park staff would brief contractor on potential impacts to nene & instructions for what to do when nene are encountered. No road construction would occur between KMC and the Jaggar Museum from Sept. 1st to April 30th to protect nene during breeding season. If nene are encountered between KMC & the Jaggar Museum outside of Sept. 1st to April 30th, a park biologist would be notified and construction may be halted depending on the nature of nene activity.

ALTERNATIVES	ALTERNATIVE	1: NO ACTION	ALTERNATIVE 2: PREFERRED ALTERNATIVE	
IMPACT TOPICS for	DESCRIPTION OF	MITIGATION	DESCRIPTION OF	MITIGATION
DETAILED ANALYSIS	POTENTIAL IMPACT	Hawaiian Hoary Bat:	POTENTIAL IMPACT	• Staging areas between KMC & Jaggar
		• No trees greater than 15 feet in height in potential endangered bat habitat should he removed during May		would be routinely surveyed between Sept. 1 & April 30. If nene activity is found, measures would be taken to protect them.
		August without prior monitoring and approval by the park biologist	, , , ,	• Re-vegetation along roadway would avoid vegetation attractive to nene.
		• If bats are observed in work		• Following construction road speed would not be increased. Petrels:
	1	area, halt work and contact park biologist. Biologist	1 	• No night work would be allowed.
	1	would assess and give	1	Hawaiian Hoary Bat:
	Routine road maintenance	Hawaiian Hawk/Io:	Road rehabilitation occurs in areas where 4 endangered	• If bats are observed in area, halt work, consult biologist, and wait for assessment and recommendation on how to proceed.
Wildlife Special Status Species (Cont.)	occurs in areas where 4 endangered birds and an endangered mammal are or may be found. Activities could affect these species.	 To the degree possible, construction should avoid the entrance station to the Kilauea Visitor Center area during io nesting season, which is typically between March and September. If an io nest was observed, the park's bird biologist would be contacted. The biologist would assess the potential for the project to affect the io, including the assessment for sound related impacts. Construction would 	birds and an endangered mammal are or may be found. Construction activities could affect these species.	 No trees greater than 15 feet in height in potential endangered bat habitat should be removed during May-August without prior monitoring and approval by the park biologist. Hawaiian Hawk/Io: To degree possible construction
				between the entrance station and the Kilauea Visitor Center area would be conducted outside of nesting season, which is typically between March and September.
				• If construction activities must occur during the breeding season, a survey of the area would be conducted by the bird biologist.
		only resume after coordination with the USFWS.		• If an active nest is detected, construction activity would halt and not resume until the nest has been vacated or further coordination with the USFWS occurred.

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ALTERNATIVES	ALTERNATIVE 1: NO ACTION		ALTERNATIVE 2: PREFERRED ALTERNATIVE	
IMPACT TOPICS for DETAILED ANALYSIS	DESCRIPTION OF POTENTIAL IMPACT	MITIGATION	DESCRIPTION OF POTENTIAL IMPACT	MITIGATION
Cultural Resources: Archeological Resources: Presence of archeological site throughout the area between KMC & the Jaggar Museum (~ Station 650 to 601).	Off pavement foot &/or vehicle traffic could disturb site.	 No off pavement activity (human or vehicle) without prior consultation & permission from NPS archeologist. As necessary archeologist would conduct shovel tests. 	Addition of pavement width & rebuilding shoulders could disturb site.	 Limit off pavement activity to area necessary for widening (~6' wide, .5' deep altogether). NPS archeologist to conduct ground testing before construction. NPS archeologist to monitor during construction. If discoveries made during construction, work is halted pending further consultation.
	Removal of informal pullouts could disturb site. Result is beneficial to site, prevents further disturbance.	 Develop pullout removal plan in consultation with NPS archeologist. As necessary archeologist would conduct shovel tests. 	Removal of informal pullouts could disturb site. Result is beneficial to site, prevents further disturbance.	 Limit off pavement activity to area necessary to rehab pullout. NPS archeologist conducts shovel testing prior to construction. NPS archeologist to monitor during removal. If discoveries made during removal, work is halted pending further consultation.
Cultural Resources: Ethnographic Resources: Sacred sites, areas of traditional access and practices for Native Hawaiians.	Sites identified as sacred to Native Hawaiians are within or adjacent to the 2.8 miles of Crater Rim Drive that would continue to receive road maintenance.	 Construction associated with road maintenance may be stopped for short-term periods to allow for traditional cultural practices, including the absence of construction- associated sounds. If Native Hawaiian remains or resources were discovered, work would halt that had a potential to affect them and consultation would occur with Native Hawaiians. 	Sites identified as sacred to Native Hawaiians are within or adjacent to the 2.8 miles of Crater Rim Drive that would be rehabilitated under this alternative. However, access, use, or preservation of traditional sites would not change as a result of this project.	 Construction activities in areas may be stopped for short-terms to allow for traditional cultural practices, including the absence of construction-associated sound. Access, use, and preservation to/of traditional sites would not change as a result of this alternative. If Native Hawaiian remains or resources were discovered, work would halt that had a potential to affect them and consultation would occur with Native Hawaiians.

ALTERNATIVES	ALTERNATIVE	1: NO ACTION	ALTERNATIVE 2: PREFERRED ALTERNATIVE	
IMPACT TOPICS for DETAILED ANALYSIS	DESCRIPTION OF POTENTIAL IMPACT	MITIGATION	DESCRIPTION OF POTENTIAL IMPACT	MITIGATION
	Continue paving over shoulder stones.	• No mitigation identified.	Completely cover shoulder stones. Result preserves them in place; avoids adverse impact.	 Hand remove asphalt adhering to stones now. Cover stones with barrier fabric & 5" new asphalt
Cultural Resources: Historic Structures & Cultural	Road, road features, and cultural landscape maintained.	• No mitigation necessary.	Addition of road width and paved shoulders could change historic look of road.	• Treat shoulders to present visual appearance closer to historic gravel, rather than asphalt.
Landscapes: Road width, individual features, landscape, and viewshed all contribute to character and historic eligibility of Crater Rim Drive.	No change in features.	• No mitigation necessary.	Altering of historic road features: cutting rock slope; removing & resetting curbstones.	 Use NPS approved masons for rock cutting. Clean curbstone & return them to exact location they were removed from.
	No change in vegetation or drainage.	• No mitigation necessary.	Some alteration to vegetation and drainage.	 Limit tree removal. Use naturalistic drainage, or smaller metal grates that are disguised with natural features where possible.
Park Operations: 2.8 mile segment used by over 1000 people working in park including.	Road maintained; no comprehensive improvements; structural deficiencies not corrected; road likely to continue to deteriorate. Limited traffic delays during road work.	• Work would occur as funding becomes available; current funding levels not adequate to complete all the road rehabilitation. Emergency responders would contact construction crew to avoid being held up in traffic delays.	Road would be rehabilitated to accommodate average daily traffic loads and avoid the need for large scale road repairs for another 20 years. Traffic delays during construction for staff working in park. Delays for emergency responders leaving park.	 Traffic delays would be limited to less than 15 minutes. Emergency responders would contact construction crew when they were dispatched, allowing 5 minutes to clear the road. The entire construction project is expected to take no more than 6 months.

ALTERNATIVES	ALTERNATIVE	1: NO ACTION	ALTERNATIVE 2: PREFERRED ALTERNATIVE	
IMPACT TOPICS for DETAILED ANALYSIS	DESCRIPTION OF POTENTIAL IMPACT	MITIGATION	DESCRIPTION OF POTENTIAL IMPACT	MITIGATION
Park Operations (Cont.)	Continuing existing routine maintenance & repairs would not adequately address road deficiencies. Work would be dependent on available funding.	• Park would seek find funding to keep the road in adequate operating condition.	Road would undergo comprehensive improvements & have structural deficiencies fixed with one project (~6 months). Project would be funded. Repairs needed over next 20yrs are fewer. Completed construction impact on park operations is beneficial.	• Road remains open, alternate entry into park for staff.
Visitor Use and Experience: Main route to major park destinations used by majority of visitors. Road itself is part of the visitor experience.	Continuing routine repairs & maintenance would not adequately address road conditions. Some traffic delays related to work. Road work is dependent on available funding. Road would continue to deteriorate. Visitor use & experience could be affected.	• Work would occur as funding becomes available; current funding levels not adequate to complete all the road rehabilitation. Park would seek funding to keep the road in adequate operating condition & an enjoyable experience for visitors.	Road would undergo improvements by 1 project (~6 months). Project would be funded. Road would provide better experience for users, with minimal repairs over next 20 years. Completed construction impact to visitors is beneficial.	 Reduce delays and impacts to visitors during 6 month construction. Road remains open. Access maintained to visitor facilities. Accessible parking, walkways, and crosswalks added. Signs added to better direct visitors. Information on construction to be provided on park's website and at the Kilauea Visitor Center.
Commercial Operations: Routine users of CRD. Use of the road is vital to the nature of their operations.	Road maintenance & repairs would be ongoing over years, with some traffic delays. Some work (emergency) may have to be done with short notice to concessions and commercial road users.	 NPS would attempt to give advance notice and coordination for all repairs/ projects. Minimize amount of time road use is restricted. 	Road would undergo numerous improvements via 1 project (~6 months). Road would be better experience for users with minimal repairs over next 20 years. Completed construction impact is beneficial to this group.	 Provide advance construction notification and road use coordination with these groups. Assist in finding alternate destinations or routes during construction. Minimize traffic delays in construction area to 15 minutes.

Table IV-2:	Summary	of Impact	Topics	Considered	but Dism	issed, by	Alternative
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ALTERNATIVES	ALTERNATIVE 1: NO ACTION	ALTERNATIVE 2: PREFERRED ALTERNATIVE
	Alternative 1, the No Action Alternative, would continue present management activities, which provide for existing vehicular access on the road. Park staff would respond to future needs and conditions associated with the road without major actions or changes in the present cyclic maintenance course. This alternative would include some minor rehabilitation or reconstruction of existing road features if failure occurred. Deterioration of the road surface would continue because of the advanced age of the pavement and insufficient subsurface structure. Improvements to the parking areas would not occur without special funding, as is currently the case. Informal pullouts would be removed and rehabilitated to protect resources. There would continue to be variable road widths for the 2.8 miles.	Alternative 2, the Preferred alternative, would rehabilitate the 2.8 mile segment of Crater Rim Drive. Deteriorated pavement and related roadway structures would be rehabilitated to provide another 20 or more years of service and to better accommodate the size and volume of average daily traffic. The rehabilitated roadway would be paved at a typical and continuous width of 22 feet, with modification at the entrance station, intersections, and one tight-radius curves. Parking area rehabilitation would occur at Kilauea Visitor Center, Volcano House, Steam Vents, and Jaggar Museum. Informal pullouts would be removed and rehabilitated to protect park resources.
IMPACT TOPICS CONSIDERED BUT DISMISSED	REASON/MITIGATION MAKING IMPACTS ACCEPTABLE OR NEGLIGIBLE	REASON/MITIGATION MAKING IMPACTS ACCEPTABLE OR NEGLIGIBLE MITIGATION
Topography, Soils, and Drainage	 Erosion & sediment controls would be installed if necessary to maintenance work. No removal of topsoil or need for additional topsoil is expected. No mitigation necessary for this. 	 Erosion & sediment controls would be installed during construction. NPS must approve all topsoil needed for the project & it must come from within HAVO. Topsoil removed during construction would be replaced in the same area it is removed from.
Water Resources/ Water Quality	• Impacts would be addressed and mitigated on a repair project by repair project basis.	 Sediment logs/erosion controls would be used at all culvert drains & ditches. Sediment & erosion controls would be used in all cut & fill areas. Restoration & re-vegetation would be implemented to minimize long-term erosion (and associated effects). Water needed for construction would come from existing developed systems within the park and the county.

ALTERNATIVES	ALTERNATIVE 1: NO ACTION	ALTERNATIVE 2: PREFERRED ALTERNATIVE
IMPACT TOPICS CONSIDERED BUT DISMISSED	REASON/MITIGATION MAKING IMPACTS ACCEPTABLE OR NEGLIGIBLE	REASON/MITIGATION MAKING IMPACTS ACCEPTABLE OR NEGLIGIBLE
Wetlands and Floodplains	 No jurisdictional or NPS-defined wetlands or floodplains within the project area. No mitigation necessary. 	• No jurisdictional or NPS-defined wetlands or floodplains within the project area. No mitigation necessary.
Wilderness & Wild and Scenic Rivers	 No part of the project area is defined as Wilderness or containing Wild & Scenic Rivers. No mitigation necessary. 	• No part of the project area is defined as Wilderness or containing Wild & Scenic Rivers. No mitigation necessary.
Air Quality	 During continued maintenance & repair the following mitigations would be implemented: Use water to control fugitive dust. Construction vehicles would not idle for more than 3 minutes. Drivers told to not idle vehicles more than 3 min., including while waiting in construction delay. Concrete & asphalt plants would be located outside of the park. Construction debris would be hauled from the park to an appropriate disposal location. 	 During rehab and construction the following mitigations would be implemented: Use water to control fugitive dust. Drivers told to not idle vehicles more than 3 min., including while waiting in construction delay. Concrete & asphalt plants would be located outside of the park Construction debris would be hauled from the park to an appropriate disposal location.
Greenhouse Gas Emissions, Climate Change, & Energy Conservation	• Greenhouse gas emission associated with continued repair and maintenance considered negligible No mitigation necessary.	 No idling more than 3 min. for all vehicles, including non-operation related construction vehicles and vehicles waiting in construction delays. Install temp card gate for HAVO employees; redistributes traffic flow and volume; potentially reduces construction congestion. Recycle existing asphalt into new pavement. Encourage contractor to use alternative fuel vehicles & environmentally friendly materials where possible.
Soundscapes	• Would be addressed & mitigated on a project by project basis.	• The soundscape impacts on wildlife special status species and ethnographic resources are addressed under each of those topics. No further mitigation necessary.

Table IV-2 Cont. : Summary of Impact Topics Considered but Dismissed, by Alternative

 Table IV-2 Cont.:
 Summary of Impact Topics Considered but Dismissed, by Alternative

ALTERNATIVES	ALTERNATIVE 1: NO ACTION	ALTERNATIVE 2: PREFERRED ALTERNATIVE
IMPACT TOPICS CONSIDERED BUT DISMISSED	REASON/MITIGATION MAKING IMPACTS ACCEPTABLE OR NEGLIGIBLE	REASON/MITIGATION MAKING IMPACTS ACCEPTABLE OR NEGLIGIBLE
Viewsheds	• No impact to viewsheds expected with continuing maintenance & repair work.	 Minor shifts in roadway profile would not significantly alter viewshed. Construction process would only temporarily alter viewshed. Viewsheds are also addressed as component of the cultural landscape, and this is addressed in the detailed analysis impact topics.
Night Sky/Natural Landscapes	• There would continue to be no repairs or maintenance at night and there would no construction-associated night lighting. No mitigation necessary.	 There would be no construction at night and there would be no construction-associated night lighting. Foot lighting added would be low to ground, dim, and downward pointing.
Socioeconomics	• Crater Rim Drive expected to remain open during all continued repair work. No mitigation necessary.	• Crater Rim Drive would remain open during construction. No policy changes to who can use Crater Rim Drive. No mitigation necessary.
Prime or Unique Farmlands	• There are no prime or unique farmlands in the park. No mitigation necessary.	• There are no prime or unique farmlands in the park. No mitigation necessary.
Indian Trust Resources	• There are no Indian trust resources in the park. No mitigation necessary.	• There are no Indian trust resources in the park. No mitigation necessary.
Environmental Justice	• No disproportionate impacts on the health or environment of minority or low-income populations or communities. No mitigation necessary.	• No disproportionate impacts on the health or environment of minority or low-income populations or communities. No mitigation necessary.