

**KILAUEA POINT NATIONAL WILDLIFE REFUGE**

**ALTERNATIVE TRANSPORTATION  
SYSTEMS STUDY**

***FINAL REPORT***



**Conducted on behalf of the U.S. Fish and Wildlife Service**

**By the U.S. Department of Transportation  
Federal Highway Administration  
Central Federal Lands Highway Division**

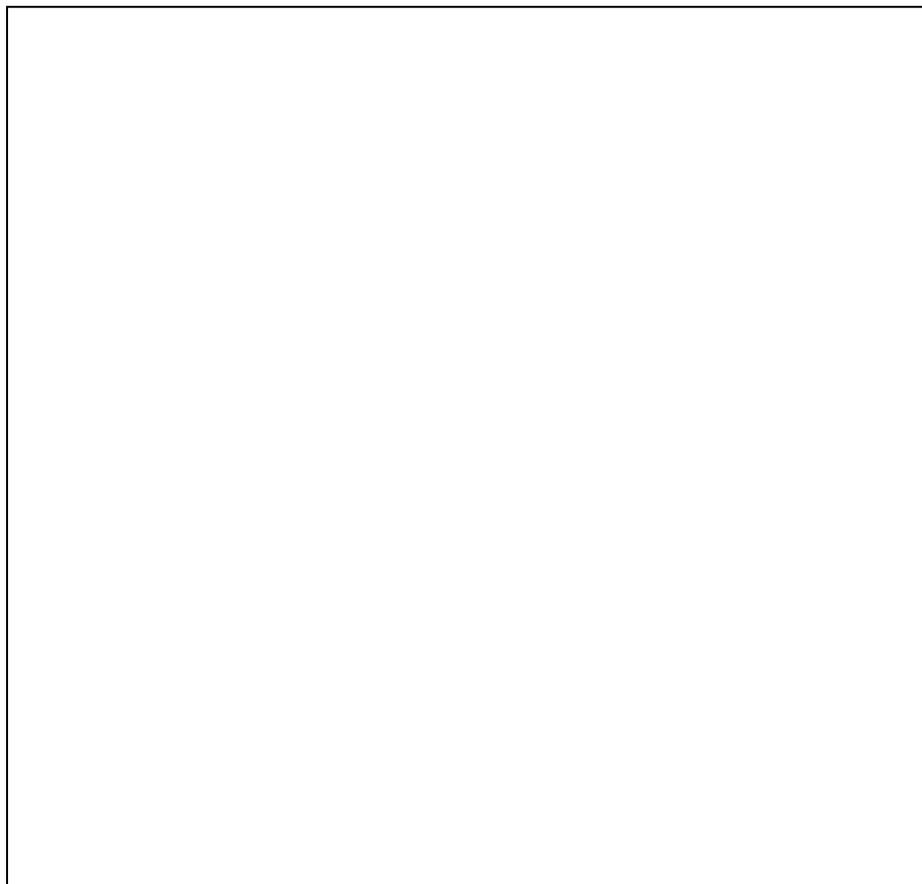
**Prepared By:  
Parsons Brinckerhoff Quade and Douglas, Inc.**

**September 2006**

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**Contract No. DTFH68-02-D-00001  
Task Order No. DTFH68-05-T-00044**



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## Acronyms used in this Final Report

ATPPL	Alternative Transportation for Parks and Public Lands
ATS	Alternative Transportation Systems
CCP	Comprehensive Conservation Plan
CE	Categorical Exclusion
CFLHD	Central Federal Lands Highways Division (FHWA)
DBEDT	State of Hawaii, Department of Business, Economic Development and Tourism
EA	Environmental Assessment
EIS	Environmental Impact Statement
FHWA	Federal Highway Administration (USDOT)
FWS	U.S. Fish and Wildlife Service
HDOT	Hawaii Department of Transportation
HRS	Hawaii Revised Statute
ITS	Intelligent Transportation Systems
KPNWR	Kilauea Point National Wildlife Refuge (FWS)
NEPA	National Environmental Policy Act
NPS	National Park Service
PASA	Policy Analysis & Science Assistance Program (USGS)
PB	Parsons Brinckerhoff
RVP	Refuge Visitor Projections Report
TDM	Transportation Demand Management
TSM	Transportation Systems Management
TVP	Traffic, Visitor, and Parking Counts Study
USDOT	U.S. Department of Transportation
USGS	U.S. Geological Survey

## Purpose of This Final Report

This Kilauea Point National Wildlife Refuge (KPNWR) Alternative Transportation Systems (ATS) Study Final Report summarizes and builds upon the findings and key elements of work conducted to date in support of the ATS Study, including coordination with the Kilauea Town Plan and Kauai General Plan Amendment planning process. This Final Report evaluates the feasibility of five conceptual transportation alternatives, four of which represent “improvements” to the existing transportation system serving the Refuge as defined through this ATS Study, including possible creation of a dedicated transit shuttle system. The fifth alternative is the “No-Build” scenario; and, all five alternatives discussed are essentially the same as those presented to the public in February 2005, with refinement of some details.

As part of the feasibility analysis, this Final Report also estimates future parking demand and/or the use of transit by anticipated visitors to KPNWR, under each transportation alternative. In doing so, this effort forecasts changes in Refuge visitation for each alternative under consideration. Implications of seasonal variability of parking and transit demand, visitor and community perceptions, and overall operational feasibility issues are addressed.

The information herein supports the first level screening effort to determine the feasibility of each transportation alternative identified to date. Information and analysis from this Final Report will assist in narrowing or refining alternatives to those that will be analyzed in greater detail during the National Environmental Policy Act (NEPA) phase of this project. Although all five alternatives currently under consideration will be carried forward into the NEPA phase of the ATS Study, it is anticipated that one or more will be screened out during the alternatives analysis process.

The selection of a “preferred alternative” may be anticipated as part of the NEPA process, based on context and intensity of the social, economic, and environmental resource effects; subsequent to exploration of all identified and potentially viable alternatives, combination and/or phasing of alternatives. The preferred alternative may then be subject to further analyses, evaluations, and public scrutiny prior to potential confirmation under NEPA. The emerging preferred alternative shall be evaluated in context, relative to all identified alternatives, always including the No-Build scenario. It is anticipated that the proposed NEPA action for KPNWR would require the preparation of an Environmental Assessment (EA). The type of NEPA document to be prepared, however, will depend on the nature and complexity of the impacts to the social, economic, and environmental issues, once determined.

## Acknowledgements

This Alternative Transportation Systems Study conducted for the Kilauea Point National Wildlife Refuge, has been a successful interagency collaboration, primarily made possible through the dedicated efforts of the ATS Study Team. Comprised of staff members from the U.S. Fish and Wildlife Service and the Federal Highway Administration, the Team also included research staff from the U.S. Geological Survey, and staff provided by the prime contractor.

The expertise, sustained effort, and “esprit de corps” demonstrated by the members of the ATS Study team were greatly appreciated during this complex engagement; as was the assistance, coordination, and direction provided by the staff from Parsons Brinckerhoff.

### **ATS Study Team:**

**U.S. Fish and Wildlife Service:** Mr. Mike Hawkes, Mr. Michael Mitchell, Ms. Kathy Batha, Mr. Bob Dieli, and Mr. David Aplin (*Former FWS*).

**Federal Highway Administration, Central Federal Lands Highway Division:** Mr. Michael Dotson, Ms. Susan Law, and Ms. Renee Sigel.

**U.S. Geological Survey, Policy Analysis and Science Assistance Researchers:** Ms. Natalie Sexton, Dr. Lynne Koontz, and Dr. Shana Gillette.

**Parsons Brinckerhoff:** Mr. Clyde Shimizu, Mr. Chuck Green, Mr. Mark Garrity, and Ms. Nami Ohtomo (*Former PB*).

**ATS Study - Peer Reviewers:** Mr. Kevin Percival (*NPS*), Mr. Rick Cushing (*CFLHD*), and Mr. Dave Zanetell (*CFLHD*).

Thanks to all individuals, other public and private stakeholders and the public at large, who contributed to this vital transportation planning endeavor.

## Executive Summary

Kilauea Point National Wildlife Refuge (KPNWR, Refuge), established in 1985, is a 203-acre facility located on the north shore of the Island of Kauai (See [Figure 1](#)), and is part of the Kauai National Wildlife Refuge Complex managed by the United States Fish and Wildlife Service (FWS). KPNWR is a popular destination for tourists with an estimated annual visitation of 215,000 in 2005. KPNWR is among the top five in public visitation for all national wildlife refuges, and is at the top in terms of revenue generated. The increasing popularity of KPNWR has led to transportation problems, including access and parking problems, congestion, and associated safety issues at the two main parking areas, the Point and the Overlook. Increasing traffic through Kilauea Town, generated in large part by visitation to the Refuge is also a concern (See [Figure 2](#)). Exacerbating the existing problems both on- and offsite, is the projection that KPNWR visitation will continue to grow, and by 2025 will be 22 to 55 percent higher than it is today.

To address such transportation-based issues for the Refuge, FWS, with support from the Federal Highway Administration (FHWA), Central Federal Lands Highway Division (CFLHD) initiated an Alternative Transportation Systems (ATS) Study to explore alternatives to the existing transportation system that currently provides access to and circulation within KPNWR. The ATS Study effort has incorporated a series of investigations, including the Traffic, Visitor, and Parking Counts Study (TVP) and the Refuge Visitor Projection Report (RVP). This ATS Study Final Report summarizes issues raised during the planning process, provides an overview of the findings to date, and makes recommendations for future phases.

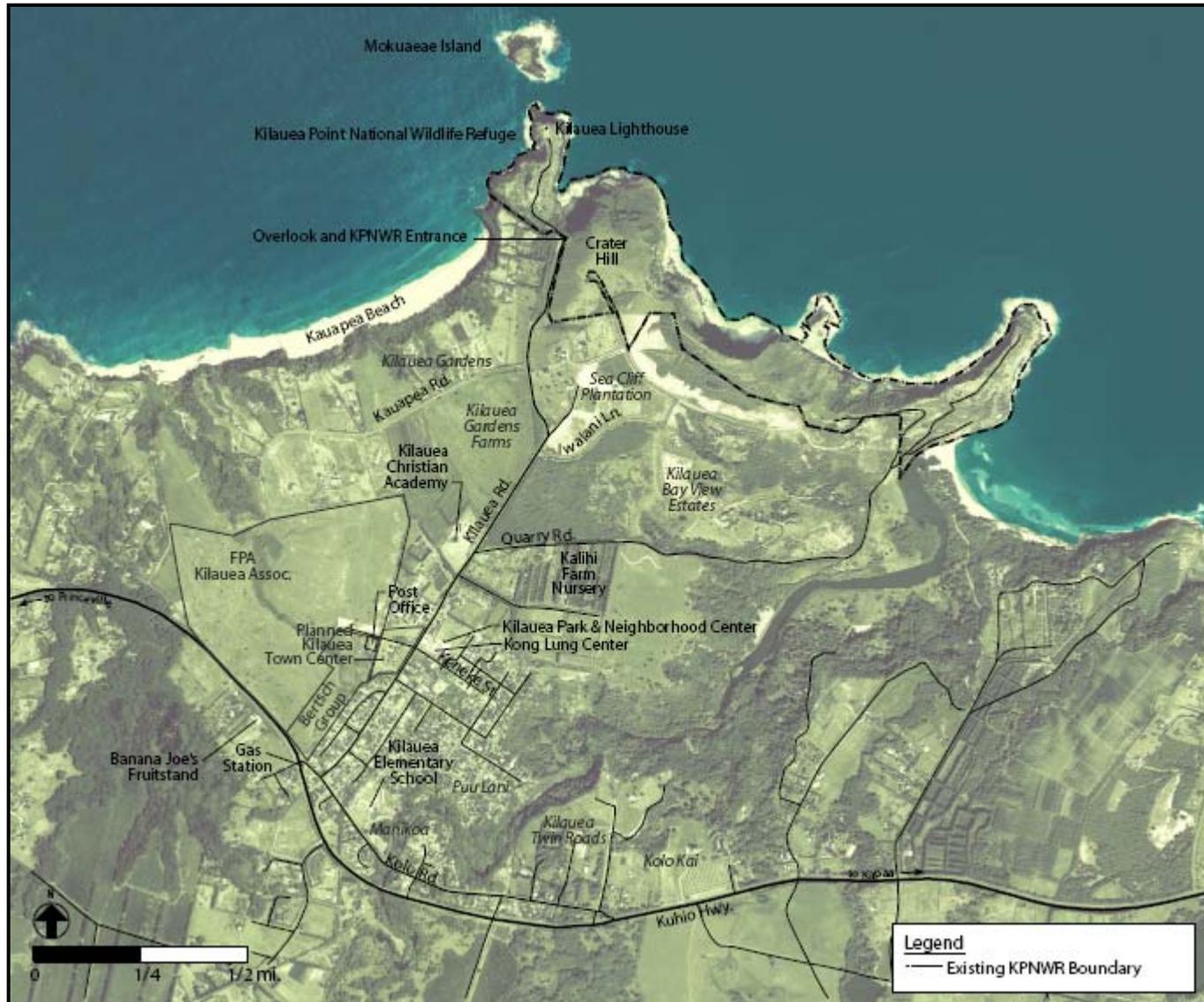
This Final Report also summarizes related transportation studies conducted during this engagement, including public opinion surveys<sup>1</sup>. It establishes the initial “purpose and need” for transportation improvements, and evaluates the feasibility of five conceptual transportation alternatives, including two that incorporate transit “shuttle” elements. This Final Report concludes that multiple alternatives (including transit alternatives) are feasible, discusses pros and cons of each alternative, the possible integration and/or phasing of alternatives, and recommends proceeding to the NEPA environmental evaluation phase of the ATS Study. Recommendations for short-, medium-, and long-term transportation improvements are included. This Final Report also identifies issues that have not been addressed to date and that should receive further analysis during the anticipated next phase of the Study.

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<sup>1</sup> For example, the [Visitor and Community Survey Results for Kilauea Point National Wildlife Refuge and Lighthouse: Completion Report](#), by the Policy Analysis & Science Assistance Program, US Geological Survey (USGS).



Figure 2. Kilauea Point National Wildlife Refuge and the Town of Kilauea



**Five conceptual transportation alternatives for KPNWR have been developed to date:**

1. **No-Build**, which would involve no physical or operational change from today;
2. **Minor Improvements, Transportation System Management (TSM) and Transportation Demand Management (TDM)**, which would include some physical or operational changes to increase effective capacity through improved management of parking resources, or would redistribute demand to less busy times;
3. **Moderate Improvements to Increase Capacity**, which could include physical improvements to increase capacity, additional parking and/or widening of the entrance road;
4. **Voluntary Shuttle Service with Private Vehicle Access**, which would institute a shuttle system from a new offsite Hub facility while continuing to allow private vehicles onto the Refuge; and
5. **Mandatory Shuttle Service**, which would prohibit public parking beyond the entry gate at KPNWR (at an area known as the Point) and requires all visitors to use a shuttle system from an offsite Hub facility.

Although some aspects of the five alternatives listed above may not be desirable by the community or FWS, each has been preliminarily identified as feasible and will be subject to further analysis and potential screening during the anticipated NEPA phase.

### **Summary of Key Findings**

The following is a summary of the key transportation system findings for Kilauea Point National Wildlife Refuge.

1. Annual visitation to KPNWR is estimated at 215,000 in 2005, and is expected to increase to between 262,000 and 332,000 by 2025.
2. The growing popularity of KPNWR is generating operational, access, and safety issues, both at the Refuge and in the nearby Kilauea Town.
3. Roughly 20 to 25 percent of all traffic on Kilauea Road is headed to the Refuge, including the Overlook and/or the Point<sup>2</sup>.
4. By 2010, existing Refuge parking capacity will be approached routinely or exceeded (by an average of 10 spaces during the daily peak hour), under

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<sup>2</sup> Parsons Brinckerhoff Quade & Douglas, KPNWR Traffic Visitor and Parking Counts Study, p.8.

a mid-range growth scenario during peak season (winter, spring, and summer).

5. By 2015, daily parking demand will approach or exceed existing capacity at the Refuge (by an average of 14 spaces during the peak hour/peak season). This deficit condition will occur all day during the Refuge's public hours of operation during the peak season, and for approximately one to two hours of the day during the off-peak season (fall).
6. Five conceptual transportation alternatives were developed, analyzed, and given cursory evaluation: No-Build; Minor Improvements, Transportation System Management (TSM) and Transportation Demand Management (TDM); Moderate Improvements to Increase Capacity; Voluntary Shuttle Service with Private Vehicle Access; and, Mandatory Shuttle Service with no public parking at the Point.
7. All five transportation alternatives were found to be economically feasible, based on preliminary analysis and certain specified parameters.
8. Based on preliminary estimates, it would cost about \$160,000 (low-cost estimate<sup>3</sup>) to \$360,000 (high-cost estimate<sup>4</sup>) per year to operate one 25-passenger shuttle bus for KPNWR.
9. Assuming development of a new offsite transit center "Hub" facility, providing visitors with convenient, ample parking; restrooms; ticket sales, and attractive, informative visitor services, it can be expected that a "free" (cost included in Refuge entry fee) voluntary shuttle system with guided narration (Alternative 4) would be used by about 10% - 20% of KPNWR visitors.
10. With a voluntary shuttle system in place, it is estimated that 80% - 90% of visitors would still choose to drive to KPNWR rather than use the shuttle.
11. Raising the current entry fee from \$3 to \$5, while adding a voluntary shuttle service with on-board guided narration, would discourage some visitors from entering due to increased cost, but would be attractive to others, resulting in no net change in visitor projections.
12. If the Refuge entry fee is raised above \$5, visitation will begin to drop, either with or without a shuttle system in operation.

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<sup>3</sup> The low-cost estimate assumes government operation, combined with grants by others to provide capital improvements such as vehicles, onsite improvements, and a Hub visitor and maintenance facility.

<sup>4</sup> The high-cost estimate assumes contracting with a private company to provide turnkey operation. Capital improvements needed under this scenario, such as the offsite Hub visitor facility, are assumed to be provided with grants by others and are not included in the high-cost estimate.

13. To provide enough additional revenue to operate a voluntary shuttle system (Alternative 4) using 14-passenger (or similar) vehicles in 2010, the Refuge entry fee would need to be raised from the current fee of \$3 to \$5, assuming the low-cost estimate for the provision of transit is valid, or raised to \$7 under a high-cost estimate.
14. A mandatory shuttle system with on-board narration (Alternative 5) to be used by all visitors, with no private vehicle access permitted into the Refuge, would reduce visitation by about 15% below projected demand.
15. A mandatory shuttle bus system (Alternative 5), using 40-passenger vehicles, would be feasible in 2010 with an entry fee of \$6 under the low-cost estimate, and \$11 assuming the high-cost estimate.

## **Recommendations Based on Findings to Date**

### **Short-Term Recommendations (1- 5 years)**

Based on findings to date, FWS management should implement the following transportation strategies in the short-term (1 to 5 years) to help relieve transportation problems at KPNWR.

1. Seek/secure funding to initiate the next transportation planning, conceptual design, and environmental (NEPA) processing phase of the ATS Study efforts for KPNWR. Establish, evaluate, and confirm the preferred transportation alternative(s), combinations, and/or phasing of alternatives, which most comprehensively address/integrate the short-, medium-, and long-range transportation system needs for the Refuge.
2. Immediately begin to implement low-cost transportation system management (TSM) and transportation demand management (TDM) strategies. These include updating visitor information available on the FWS/KPNWR web page, in published literature, and via phone message; to educate potential visitors about “the best times to visit” based on anticipated availability of parking and/or other considerations such as the scheduling of interpretive programs. If possible, monitor and record the level of success of each strategy as it is implemented.
3. Ensure that the current onsite parking and internal circulation system configuration is most efficient. Properly identify non-paved, dedicated parking spaces (e.g., gravel area at the Point) to promote efficient and safer public parking.
4. Develop and implement a formal monitoring program to track incidents when public demand for onsite parking exceeds supply. Document temporary road closures, required to prohibit additional public access

into the Refuge for limited periods of time on any given day, due to parking capacity issues.<sup>5</sup>

5. Seek funding for “Intelligent Transportation System” (ITS) applications, specifically the design/installation of an aesthetically pleasing and context-sensitive electronic sign, to be placed on Kuhio Highway. Information to be provided to the public via such technology can be changed remotely, in real time, to direct potential Refuge visitors and/or to inform them of current conditions at the Refuge which may restrict access. Such “variable message” applications will prevent visitors from wasting time and resources driving to the Refuge if no parking is currently available. Conversely, it may encourage additional visitation when access to the Refuge is unrestricted. It will also diminish safety, access, and circulation problems at the Refuge; and will reduce round-trip traffic (and associated noise and air quality impacts) in Kilauea Town.
6. Pursue from the County of Kauai, fee-simple purchase (or other long-term conveyance) of all or a portion of the County’s parcel of land adjacent to the Overlook (west of Kilauea Road). This parcel is currently used informally for overflow visitor parking; and, control of this parcel by FWS will foster comprehensive management of the Overlook parking area, and may lead to a more successful ATS program, while enhancing the visitor experience.
7. Develop a phased transportation plan for KPNWR that starts with implementing the low-cost techniques listed above, and creates “trigger points” (based on congestion levels at the Refuge) for moving toward more capital intensive access and transportation solutions.
8. Based on the outcome of the anticipated NEPA phase of the Study, begin to pursue funding for potential medium- and long-term capital improvements that could include both onsite and/or offsite infrastructure improvements.
9. Promote the “3C” planning process; i.e., to facilitate “continuous, collaborative, and cooperative” endeavors to inform and work with the Kilauea community, Kauai County, and other stakeholders including the public at large, to minimize adverse transportation impacts generated by the increasing popularity of KPNWR.
10. Based on the outcome of the anticipated NEPA phase of the Study, pursue funding of a “demonstration project” to test the viability of transit applications for KPNWR; utilizing leased vehicles, over a limited period of time.

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<sup>5</sup> Refuge staff have recently begun this type of monitoring program.

11. Fully document and analyze the utilization of transit, as currently provided by FWS during “special event days” held at KPNWR each year.

### **Medium-Term Recommendations (6-10 years)**

The following transportation strategies are medium-term (6 to 10 years) recommendations for KPNWR, based on findings to date.

1. Consider implementing more aggressive TSM and/or TDM strategies not already in place, such as installation of onsite parking meters or a pay station, and a visitor reservation system.
2. Consider increasing KPNWR entry fees, and subsequently dedicating all or a portion of the additional revenue generated toward the implementation of transportation facilities determined to be preferred during the anticipated NEPA phase of the Study.
3. Consider formalizing and expanding parking capacity on the parcel of land adjacent to the Overlook, to accommodate overflow parking when demand exceeds capacity at the Point and/or at the Overlook.
4. If the preferred alternative includes a transit system, operating from an offsite location, pursue funding for construction of Hub facility and purchasing transit vehicles.
5. Continue to work with the Kilauea community to minimize adverse transportation impacts related to increasing visitation demand at KPNWR.
6. Continue to monitor and evaluate transportation programs for success.

### **Long-Term Recommendations (11-20 years)**

The following transportation strategies are long-term (11 to 20 years) recommendations for KPNWR, based on findings to date:

1. If the preferred alternative includes a transit option from an offsite location, and if this was not already done during the medium-term, construct Hub facility and move all visitor ticket sales (entry fees), transit and some general maintenance activities/storage, and the KPNWR book store to new location.
2. If the preferred alternative includes a transit option from an offsite location, and if this was not already done during the medium-term, implement voluntary or mandatory shuttle system operations, based on current conditions.

3. Continue to work with the Kilauea community to minimize adverse transportation impacts.
4. Continue to monitor and evaluate transportation programs and address emerging issues to ensure ongoing success.

### **KPNWR Transportation-Related Issues to be Resolved and Next Steps**

The following issues have been identified as needing further study and/or resolution, and should be addressed or completed during the next phase of study.

1. Secure Funding for the next phase of ATS Project Planning/NEPA Processing and Preliminary Design.
2. Determine Lead Agency/Cooperating Agency Status and Secure Contractual and Funding Agreements.
3. Initiate NEPA Analyses and Processing, including Public Involvement.
4. Reconfirm the Feasibility of all previously identified Transportation Alternatives. Identify any new alternatives that should be considered and confirm their feasibility.
5. Coordinate Comprehensive Transportation Planning/Integration with the scheduled FWS Comprehensive Conservation Plan (CCP) process.
6. Coordinate with Community Plans and Local Partners: ATS plans and transportation strategies, including but not limited to the five Transportation Alternatives identified to date for KPNWR, should be consistent with the goals of the Kilauea Town Plan and other long-term planning efforts by Kauai County, Kauai Bus, Hawaii Department of Transportation (HDOT), FHWA, and other stakeholders. Interagency coordination and public involvement will be important to ensure success.
7. Determine Potential Need for Participation in the Development of a Proposed Bypass Road: FWS and CFLHD are unable to make any commitments at this time about federal participation/funding in the potential development of a bypass road for Kilauea Town. Before NEPA environmental review documents can be completed, relative to KPNWR transportation issues (as is anticipated during the next transportation planning/NEPA processing phase); FWS should determine if a successful ATS strategy for KPNWR, specifically transit, is dependent upon the use of a bypass road. If so, it should subsequently be determined if the development of such transportation infrastructure improvements can/should be funded; and, how potential development

joint ventures (public-public and/or public-private), ongoing facility ownership, liability, and maintenance issues may be addressed.

8. Determine Preferred Location and Impacts of Potential Transit Hub Site: If transit is determined to be a preferred alternative for KPNWR, explore the benefits, costs, and impacts of each potential hub site, and work with the community to determine the ideal location, considering the needs of the Refuge and the intent of the Kilauea Town Plan.
9. Evaluate FWS Operational Preferences for a Potential Transit Shuttle System: FWS will need to examine various operational issues for a shuttle system, including parking and management policies, direct access to the Point by private commercial transit operators (under Alternative 5), and ticket vending options and locations, among others.
10. Conduct a Traffic Study: A traffic study will be needed to evaluate the differing impacts on the local system, of all conceptual transportation alternatives under consideration. This study should include potential transit routes and stops, alternate Hub locations, and needed improvements to local roadways.
11. Acquire Topographic Survey Data: A topographic survey will be needed to verify the engineering feasibility of potential improvements at KPNWR, such as vehicle access, entrance road widening, and expanding public facilities at the Overlook.
12. Acquire Flora and Fauna Habitat Mapping: Mapping, available from FWS, would help determine where onsite construction/expansion at KPNWR is environmentally feasible. A formal Endangered Species Act "Section 7" consultation should be conducted by FWS specialists; to reconfirm the accuracy of mapped habitats, to assess potential impacts and/or to identify mitigation measures relative to endangered species from the potential development/intensification of transportation facilities at KPNWR.
13. Update Refuge Visitor and Parking Counts: The last onsite counts were taken at the Refuge in 2003. Changes to the fee collection system, visitor use patterns, growth in the inter-island cruise ship industry, and general growth in visitations to Kauai, have all likely impacted KPNWR visitor patterns since 2003.
14. Specify all Key FWS Management Objectives and Actions to be Proposed: For example, Refuge staff would like to move administrative and maintenance functions off of the Point, perhaps to the potential Hub site. This issue was not clearly addressed in the initial Purpose and Need Statement, as developed for the current transportation Study project.

15. Refine the Purpose and Need Project Statement: The Purpose and Need statement should be refined at the start of the next planning/ environmental processing phase.
16. Refine Transportation Alternatives Cost Estimates: Conduct detailed cost estimates for all viable alternatives, including combinations and/or phasing of compatible alternatives; to be developed to a level that is appropriate for the screening process, as conducted during the alternatives analysis task of the anticipated environmental phase of the ATS Study.
17. Evaluate Transit Vehicle Types: If it is determined that transit is to be included in the preferred alternative “solution set,” conduct research on vehicles currently available; addressing attributes such as unit cost, capacity and size, reliability, aesthetics, visitor experience, legality, and applicability for the location and climate. Types of vehicles examined could include rubber-tired historic-replica trolleys, trams, electrically powered and/or alternative fuel vehicles. Specification of additional details/needs of the transit system will be required, which could affect cost and feasibility of transit options.
18. Determine/Prepare the Appropriate Type of NEPA Environmental Review Document: Although preparation of a Categorical Exclusion (CE) may be sufficient for some of the potential minor transportation improvements at KPNWR, it seems more likely that preparation of an Environmental Assessment (EA) or Environmental Impact Statement (EIS) will be required, considering the full extent of the various alternatives. All germane social, economic, and environmental (“SEE”) considerations must be addressed. Because it is likely that both federal and state/county resources would be utilized, environmental documentation would need to be prepared in accordance with both the National Environmental Policy Act (NEPA) of 1969, as amended, and the Hawaii Revised Statutes (HRS) Chapter 343, the State’s environmental review law. Additional federal requirements, such as Section 7 of the Endangered Species Act, Section 106 of the National Historic Preservation Act, and other federal and/or state regulations, would apply.
19. Conduct Public Outreach Activities: Public involvement meetings and/or hearings will be required if the Draft EA or EIS scoping and review processes are pursued. Other public forums may be advisable and/or required to obtain public input and to further develop each conceptual transportation alternative to be considered and processed under NEPA.
20. Develop Conceptual Site Plans: Develop conceptual site plans and related architectural, engineering, and/or landscaping plans at an appropriate level of detail; in an effort to document and accommodate

the proposed transportation functions, sizes, aesthetics, and costs of each potential significant transportation facility improvement.

21. Analyze Biological, Cultural, Historic, and Archaeological Impacts and Constraints at the Potential Transit Hub Sites, the Point, and Overlook: Resources at the Refuge will need to be addressed in the context of the EA or EIS. In addition, the following actions will also be needed: consultation with the State Historic Preservation Officer and concurrence with Coastal Zone Management regulations. Other issues such as Hazardous Materials clearance and aesthetics and visual impact may need to be addressed.
22. Consider how the individual Transportation Alternatives, their integration and/or phasing opportunities would affect the Visitor Experience at KPNWR.
23. Establish Selection Criteria for Transportation Alternatives.
24. Develop Phasing Plan for Improvements: The preferred alternative for KPNWR could be a phased approach that incorporates elements of several of the conceptual alternatives to be integrated and implemented in cohesive stages over time. In determining appropriate phases, "trigger points" should be developed to determine when to move into subsequent phases. Examples of trigger points include metrics of visitation, congestion, visitor comments/complaints, resource impacts, etc.

## Introduction and Background

Kilauea Point National Wildlife Refuge (KPNWR, the Refuge) is a 203-acre facility located on the north shore of the Island of Kauai (See [Figure 1](#)). KPNWR is part of the Kauai National Wildlife Refuge Complex, managed by the United States Fish and Wildlife Service (FWS). KPNWR was established in 1985 for the following purposes:

- To protect and enhance migratory seabird and endangered nene (Hawaiian goose) populations and their habitats;
- To preserve and maintain the historical integrity of the area, including the Kilauea Lighthouse and support facilities;
- To conduct interpretation and environmental education activities on Hawaiian wildlife, site history, and the refuge system; and
- To protect and enhance native coastal plant communities.

The rocky cliffs of the Refuge provide an excellent nesting and roosting habitat for native Hawaiian seabirds, making it one of the most important seabird nesting sites in the main Hawaiian Islands. Migratory birds such as the Pacific golden plover, seabirds such as the Laysan albatross, and the endangered nene (Hawaiian goose) are some of the wildlife that uses this Refuge. The nene, Hawaii's State Bird, was reintroduced on the Refuge in 1991, as part of a statewide recovery program. Wildlife habitat management at the Refuge includes opening and maintaining nesting areas for Laysan albatross and improving feeding habitat for nene.

Kilauea Lighthouse is a designated historic property, built in 1913 as a navigational aid for commercial shipping between Hawaii and Asia. In 1976, the Coast Guard deactivated the lighthouse and replaced it with an automatic beacon. In 1979, the lighthouse, three lighthouse keepers' houses, several outbuildings, and the surrounding 31 acres of land were placed on the National Register of Historic Places as an historic site. Today, this general area of the Refuge is referred to as the "Point."

Staff and community volunteers conduct onsite interpretation and environmental education activities at KPNWR. In accordance with the Refuge's mission, emphasis is placed on public education, balanced with the need to protect wildlife, habitat, and historic properties. KPNWR is distinct within the National Wildlife Refuge System; as most Refuges do not attract such a high volume of visitors. In fact, KPNWR is among the top five Refuges throughout the nation in annual visitation.

Annual visitation in 2005 at KPNWR was estimated at 215,000,<sup>6</sup> based on extrapolation of actual count data from July to December 2005. Visitation to the Refuge is linked to general visitation patterns on Kauai; it is estimated that approximately one-third of Kauai visitors also visit KPNWR (PB, January 2004).

Native and endangered plant reintroduction and alien species removal are ongoing and expanding. Native Hawaiian coastal plants such as naupaka, ilima, hala, aheahea, akoko, and others have been restored on the Refuge. In addition, an endangered plant restoration program is giving species such as the rare alula a chance to survive in KPNWR's protected and managed environment.

In addition to the stated purposes of KPNWR, the Refuge offers spectacular views of the north shore of Kauai, and it is a prime whale-watching location during the winter months. The waters immediately off its coast are the only portion of Kauai's waters designated as part of the statewide Hawaii Islands Humpback Whale National Marine Sanctuary. Humpback whales, Hawaiian monk seals, and spinner dolphins can be observed here.

Because KPNWR has so much to offer the public, parking is often insufficient at the Refuge, especially during peak visitation periods. At such times, FWS staff must be stationed to direct traffic and promote safety when the parking lot is congested. When visitation exceeds parking capacity, including reasonable overflow limits, FWS staff places a sign at the entrance gate to indicate that public entry into the Refuge is temporarily closed<sup>7</sup>. Such overflow conditions not only prevent Refuge staff from conducting other key duties; but, also degrades the quality of wildlife habitat, negatively impacts the visitor experience, and undermines FWS's ability to fulfill its mission of environmental education.

In addition, all traffic accessing KPNWR must pass through Kilauea Town on the only road leading to the Refuge. This large amount of traffic (estimated to be 20-25% of total traffic along Kilauea Road<sup>8</sup>) contributes to traffic congestion, noise, and safety issues on this small two-lane collector road through the Kilauea neighborhood.

## **KPNWR Property and Geography**

There are two primary destinations for visitors to KPNWR. The fee portion of the Refuge, beyond the entry gate, is referred to in this Final Report as "the Point." This access-controlled area is open to the public most days 10 a.m. to 4 p.m. and

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<sup>6</sup> Parsons Brinckerhoff, "Kilauea Point National Wildlife Refuge, Alternative Transportation Systems Study, Refuge Visitor Projections Report," March 13, 2006, using fee payment data compiled by KPNWR staff. This estimate included visitation to the Refuge beyond a pay booth and does not include visitation to other publicly accessible portions of KPNWR, such as the scenic overlook at the entrance to the Refuge. Neither does the estimate include visitation on free days, when the Refuge often receives more than 1,000 visitors.

<sup>7</sup> The Refuge's sign states "Refuge is closed. Visitor capacity has been reached. Please return after \_\_\_\_ [time]."

<sup>8</sup> Parsons Brinckerhoff Quade & Douglas, KPNWR Traffic Visitor and Parking Counts Study, p.8.

requires an entry fee of \$3 per adult<sup>9</sup>. The much smaller Refuge overlook viewing area (referred to as “the Overlook”) is adjacent to the entry gate into the Point, at the terminus of Kilauea (Lighthouse) Road. Access to the Overlook is uncontrolled and open to the public at all times. The map in Figure 3 provides an overview of the Refuge areas.

**Figure 3. Kilauea Point Traffic Circulation and Parking**



<sup>9</sup> Those refuge visitors with passes, such as Golden Age, Golden Eagle, etc. are exempt from the fee, as are visitors under the age of 16. There are also four “free days” each year when the Refuge is open without charge.

The Point and the Overlook are the main destinations for the vast majority of visitors to KPNWR, and are the primary areas of concern for Refuge visitor management and transportation planning. The Point and Overlook together comprise about 31 acres, or just 15 percent of the roughly 203 acres of Refuge property. The remainder of Refuge property, including Crater Hill, “Rock Quarry” beach, and other areas east of the Point are much less frequently visited. Access to these portions of the Refuge is difficult and/or prohibited at times, and therefore not encouraged. Visitors to these “off the beaten path” areas tend to be local residents, like those who fish the Rock Quarry shoreline. Environmental education programs for school children are occasionally conducted on Crater Hill, but other than the reinstatement of the guided Crater Hill hikes, the Refuge has no plans to change access to and management of those areas in the foreseeable future. Therefore, the scope of this Final Report is limited to issues pertaining to the two main visitation areas, the Point and the Overlook.<sup>10</sup>



**Photo 1. View approaching the Refuge Overlook at the end of Kilauea (Lighthouse) Road**

<sup>10</sup> The U.S. Fish and Wildlife Service is separately conducting an Environmental Assessment to determine the feasibility and effects of acquiring and managing important wildlife habitats as additions to KPNWR. However, those additional acquisition areas are beyond the scope of this Final Report.



**Photo 2. View of Entrance Gate/Road at KPNWR from the Overlook**

## **Transportation Issues**

The only access to KPNWR is via Kilauea Road, also known as Kilauea Lighthouse Road (See [Figures 2 and 3](#)). The Refuge is located at the northern terminus of this road. Kilauea Road is a 2-mile-long County-owned facility connecting the Refuge via Kolo Road, to Kuhio Highway, the major roadway encircling most of Kauai Island. Both Kilauea Road and Kuhio Highway are part of the Federal Aid Highway System.

Visitors on their way to and from the Refuge must pass through the middle of Kilauea Town. Residences, as well as commercial sites, line the sides of Kilauea Road. Roughly 20 to 25 percent of all traffic on Kilauea Road is headed to the Refuge – either the Point and/or the Overlook<sup>11</sup>. Community members have in the past commented on how this “Refuge traffic” may be negatively affecting Kilauea, in terms of traffic volume and/or speed, and changing the character of the town.

Refer to the map in [Figure 3](#) for areas described below. The scenic Overlook, which offers views down to the Point and out to the Pacific Ocean, is at the

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<sup>11</sup> Parsons Brinckerhoff Quade & Douglas, KPNWR Traffic Visitor and Parking Counts Study, p.8.

northern terminus of Kilauea Road. This road ends in a cul-de-sac (turnaround) where it provides access to the Refuge Entrance Road, as well as to a private driveway. The Overlook area encompasses roughly 1/8-acre of land, owned primarily by the Refuge and in part by the County of Kauai. Parking is limited at this location; six marked parking spaces are provided, so people may step out of their cars to enjoy a panoramic view of Kilauea Point and its environs, and to read interpretive signs. Some visitors (55-65%) stop at the Overlook before and/or after enjoying additional amenities at the Point. Others (35-45%) visit only the Overlook, without entering the Point area, either by choice or because the Refuge is closed/full at the time<sup>12</sup>.

Steep topography, road alignment geometry and safety considerations both constrict and restrict vehicular access into the Point, beyond the entry gate at the Overlook. The only public access onto Kilauea Point is via a gated, narrow, winding, and steep entrance road, with access off of Kilauea Road at the Overlook. This two-way entrance road is 0.21 miles long and only 16 feet wide. Most Refuge visitors are tourists traveling in rented passenger vehicles, although some do arrive by taxi or tour company shuttle buses. Due to space constraints and limited sight-distances on the entry road, uncontrolled access of larger vehicles such as 25-passenger tour buses or larger school buses is currently prohibited. When school bus tours arrive and depart, it requires a significant commitment of FWS staff resources for access control, flagging and parking.



**Photo 3. Private vehicle accessing KPNWR via narrow entrance road**

<sup>12</sup> Parsons Brinckerhoff Quade & Douglas, KPNWR Traffic Visitor and Parking Counts Study, p.16-17.

Pedestrian access to the Refuge is not permitted beyond the entry gate, while bicyclists are allowed to enter, although not encouraged. According to Refuge staff, widening the entrance road is not a desirable option, because protected bird and plant habitats lie directly adjacent to the entrance road and because of a potential impact to the National Historical Site.

Once on the facility (inside the entry gate), parking at Kilauea Point is limited. There are two paved parking areas, the “upper” and “lower” lots that include two spaces designated for use by the disabled. Including the unpaved/unmarked gravel areas adjacent to the lower lot, these facilities can accommodate about 49 vehicles total. A separate “grassy” area is used for parking only in extreme overflow conditions and can accommodate about 20 vehicles. Refuge staff prefers not to use this area, particularly during the winter rainy season when it becomes very soft and muddy, and because staff must be diverted from their regular duties to direct traffic. This grassy area also serves as endangered species habitat, as it is a nene feeding site. (See [Figure 3 above](#), “Kilauea Point Traffic Circulation and Parking” and [Photo 4](#) immediately below).



**Photo 4. Cars accommodated in grassy Overflow Parking Area, as directed by Refuge staff**

When insufficient parking conditions develop during peak visitation periods at KPNWR, Refuge staff are forced to manually control traffic, including directing

visitors to park on grassy overflow areas. Such demands are frequent, and often divert FWS staff attention from other key Refuge duties. When the parking lots have reached capacity, even with the use of the overflow areas, the Refuge is temporarily closed at the entry gate, and potential visitors are advised via temporary signage to return at a later time<sup>13</sup>.



***Photo 5. Refuge temporarily closed at entry gate when parking lots are full (view from Overlook Area)***

The increasing trend of more visitations to KPNWR is aggravating the existing traffic and parking conditions. As discussed later in this Final Report, Refuge visitation in the year 2025 is projected to range from 22 to 55 percent greater than in 2005, which was estimated at 215,000.

In light of the problems elaborated above, Refuge staff identified a need to pursue potential improvements and to identify alternatives to the Refuge's existing transportation facilities and procedures.

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<sup>13</sup> Refuge staff have recently begun to track the times and days the Refuge gate is temporarily closed, which will soon provide a better understanding of the magnitude of the problem.

## Purpose and Need for Action

As described earlier, KPNWR has been experiencing increasing visitation, which has resulted in access and safety issues, parking shortages, visitor dissatisfaction, wasted staff time, and increased traffic through Kilauea Town. As part of the current planning process, and based on the work conducted to date under this ATS Study (See discussion below.), the ATS Team developed the following “Purpose and Need” statement for this phase of the study.<sup>14</sup>

***The purpose of this project is to provide an improved transportation system that supports the U.S. Fish and Wildlife Service objective to provide visitor access to Kilauea Point National Wildlife Refuge in a manner compatible with the purposes of the Refuge, consistent with the mission of the U.S. Fish and Wildlife Service, and sensitive to the needs of the local community.***

Annual visitation to Kilauea Point was estimated to be 215,000 in 2005. Parking, traffic circulation, access, and safety problems are evident, especially during peak seasons and at certain times of day. The desired transportation system improvements for KPNWR would accomplish, through 2025 (a 20-year planning horizon), the following:

- Be safer, more convenient, and more efficient than existing access and parking conditions;
- Complement the Refuge’s environmental conservation, educational, and interpretive programs;
- Maintain a high-quality visitor experience;
- Accommodate projected increases in Refuge visitation;
- Minimize traffic impacts on Kilauea Town; and
- Improve general information available to the public, including “wayfinding” assistance (directional signage) and real-time information regarding access to the Refuge, etc.

Some Kilauea community members are concerned that FWS is trying to find ways to increase visitation, and turn KPNWR into a visitor attraction. However, KPNWR is already one of the top visitor attractions on Kauai; and, it is in the top five facilities for total annual visitation within the entire National Wildlife Refuge system. As seen in the Purpose and Need Statement above, KPNWR does not

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<sup>14</sup> The Purpose and Need statement would be further refined during the proposed environmental documentation phase in order to comply with requirements of the National Environmental Policy Act (NEPA).

seek to promote increased visitation, but is instead trying to be proactive in addressing expected visitation growth over time. While it is possible that transportation improvements at KPNWR may facilitate visitation, many of the strategies analyzed here would better distribute increased visitation, reducing peak demands over time. Transportation-related information technologies may also help to educate potential visitors about appropriate/convenient times and days to visit the Refuge; and/or may entice visitors into using more efficient travel modes that could reduce the number of vehicles traveling through Kilauea Town to the Refuge.

While not as imperative as the qualities listed above, Refuge staff also plan to consider additional factors in defining and selecting any transportation system alternatives. FWS may need to consider other measures to control visitation and visitor activities at KPNWR, based on wildlife and habitat conservation needs. A desirable transportation solution would allow Refuge staff to control more easily the flow and volume of visitors on the Point. Refuge staff would also like to explore transportation options that would allow expanding wildlife and plant habitat on the Point. Reducing or eliminating visitor parking and/or other transportation-related activities on the Point is attractive for this reason, as is moving non-essential administrative and/or maintenance and storage facilities to an offsite location.

### **Completed Reports and Work Conducted To Date**

FWS and Central Federal Lands Highway Division (CFLHD) commissioned the preparation of several reports for KPNWR, which are fully integrated and incorporated, directly or by reference into this ATS Study Final Report, including the following:

- Traffic, Visitor, and Parking Study (TVP Study), by Parsons Brinckerhoff Quade and Douglas, Inc. (PB), January 2004
- Visitor and Community Survey Results for Kilauea Point National Wildlife Refuge and Lighthouse: Completion Report, by the U.S. Geological Survey (USGS), Policy Analysis & Science Assistance Program (PASA), November 2005
- Refuge Visitor Projections Report (RVP Report), by PB, March 2006

These reports were finalized with input and reviews provided primarily by the “ATS Study Project Team”: FWS, CFLHD, USGS-PASA, and PB. All three reports are summarized below, and the most recent of these, the RVP Report, is included as [Appendix A](#) of this Final Report.

## Traffic, Visitor, and Parking Counts Study (TVP Study)

Traffic, visitor, and parking data collected in March and August 2003, enabled the estimation of baseline conditions, which can be used to understand and project future access, congestion, and safety issues at KPNWR, and to help determine potential applications of a shuttle or transit system for the Refuge. The TVP Study also helped to identify existing and potential transportation constraints at KPNWR<sup>15</sup>. Specifically, the TVP Study made the following findings:

- Peak times for the utilization of the KPNWR parking lots and for public visitations to KPNWR are between 10:00 a.m. (daily opening time) and 2:00 p.m. every day.
- The busiest times for the Overlook are 9:30 a.m. to 10:00 a.m. (immediately prior to the KPNWR opening time) and 4:00 p.m. to 4:30 p.m. (immediately after the KPNWR closing time).
- Visitations to KPNWR and to the Overlook appear to increase on the days that cruise ships dock at Nawiliwili Harbor in Lihue. The numbers and impact of cruise ship visitors at the Refuge appear to be increasing, fueled by the expanding number of dockings of “long voyage” cruise ships, as well as the recent increase in inter-island “short” cruises.
- On peak visitation days, the KPNWR parking lot overflows between 11:00 a.m. and 1:00 p.m. by as many as seven vehicles. There are other times when one or two vehicles are in the overflow area, but the busiest time is consistently between 11:00 a.m. and 1:00 p.m.
- Although most visitors to the Overlook continue into the Refuge (between 55 and 67 percent)<sup>16</sup>, it is estimated that more than 100,000 stop at the Overlook each year and leave without “entering” KPNWR<sup>17</sup>. This fact may affect future transportation options such as shuttle or public transportation operations, including the frequency of service, bus capacity, location of stops, or hours of operation.

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<sup>15</sup> It should be noted that the timing of the TVP Study data collection in 2003 coincided with an unexpected downturn in visitation to Kauai Island and correspondingly to KPNWR. Two major events were occurring at the time which may have contributed to this decrease. The first was the general state of the economy. The recession of 2002-2003 reduced the number of Kauai tourists from the same time in previous years, which in turn affected the number of KPNWR visitors. The second event was the U.S. invasion of Iraq, which also had the immediate and continuing effect of reducing the number of tourists, especially international tourists, to both Kauai and KPNWR. Based on observations and anecdotal evidence through discussions with KPNWR staff, it is clear that that visitor count in 2003 was an anomaly. In order to estimate the potential “baseline” range of traffic and parking overflow problems, the TVP Study discussed an adjustment to the observed data to account for such external factors. (See TVP Study for details.)

<sup>16</sup> Parsons Brinckerhoff Quade & Douglas, KPNWR Traffic Visitor and Parking Counts Study, p.17.

<sup>17</sup> Based on analysis of data from the TVP Study.

- The average duration of stay by visitors at the Overlook is approximately 7 minutes, while the average duration of stay at the Point is approximately 40 minutes.
- There is latent demand by visitors to walk into the Point from the Overlook. They are currently prohibited from doing so due to the narrow, steep, and circuitous nature of the KPNWR entrance road and the lack of pedestrian facilities (sidewalks or walking trails) on or adjacent to the entrance road.
- Average vehicle occupancy at the Refuge tends to be higher in the summer (3.1 persons/vehicle) than in the spring (2.7 persons/vehicle), possibly because more families visit Kauai in the summer than in the spring.

### Visitor and Community Surveys

In a related research effort in support of the ATS Study, the U.S. Geological Survey Policy Analysis and Science Assistance (PASA) research team was retained by CFLHD, to conduct surveys of visitor and community attitudes about KPNWR, and to analyze implications of potential changes to KPNWR's transportation system. The Visitor Perceptions and Economic Valuation Research for the KPNWR (PASA Completion Report) explored several aspects of KPNWR visitation as well as community attitudes, including the following:

- Demographic profile of KPNWR visitors;
- Importance of a visit to KPNWR in the context of other visitor activities, and visitor trip patterns and behavior on Kauai;
- Economic value of a trip to KPNWR;
- Community/resident perceptions of the Refuge and its visitor services; and
- Attitudes about transportation modes including transit.

Specific findings from the PASA Completion Report were used in the preparation of this Final Report, including the following:

- Visitor demographic profiles, used to verify information in the TVP and RVP Final Reports, such as percentage of cruise ship passengers that visit KPNWR, and the average time spent at the Refuge;

- Likely impacts on Refuge visitation of potential increases in the entry fee; and
- Visitor willingness to ride transit to access the Refuge, and potential impact on visitation if a transit-only transportation system alternative were to be implemented.

Among KPNWR visitors, key factors affecting the feasibility of any transit alternative appeared to be:

- Reliability and service;
- Cost;
- Availability of parking at the Refuge or near visitor amenities; and
- The provision of guided narration (onboard interpretation) associated with the transit “experience,” beyond simply providing transportation to the Refuge.

The PASA Completion Report found community opinion mixed regarding a potential shuttle system for KPNWR. It appears the community would support a system that:

- Promoted homeowner privacy;
- Reduced local traffic;
- Included a park-and-ride facility located near the Kuhio Highway;
- Was financially self-sustaining; and
- Contributed to the economy of the Kilauea community.

The community survey also indicated that better access to the Refuge via walking and bicycling paths is desired, as long as wildlife and habitat are not adversely affected.

#### Refuge Visitor Projections Report (RVP)

The purpose of the RVP Report (found in [Appendix A](#)) was to characterize future visitation at KPNWR by relying on an understanding of the “baseline” conditions and likely growth rates. Developing this projection of future visitation involved a variety of relevant factors, including projected growth rates for overall visitation to

Kauai Island, seasonal variations in visitation, and possible changes to visitor services at the Refuge.

After completion of both the TVP Study and the public surveys conducted for the PASA Final Report, a fee collection booth was established at the Refuge in the summer of 2005, allowing more accurate visitor counts to the fee portion of the Refuge.<sup>18</sup> Using the recently available visitor counts from actual fee booth data, combined with known seasonal and daily visitation patterns discerned through the TVP Study, three KPNWR visitation growth scenarios (referred to as Low-, Mid-, and High-Range) were developed in the RVP Report.

The RVP Report has the following conclusions:

- Visitation to the fee portion of the Refuge (the Point) is estimated to be about 215,000 in 2005, not including four “fee free” days with a total of about 4,000 visitors on those four days.
- Growth in visitation over the next 20 years may range from 1.0 to 2.2 percent per year. Under the Mid-Range Growth Rate Scenario (which assumes 1.4 percent growth per year), there would be about 32 percent more visitors to KPNWR in 2025 than in 2005. A Low Growth Rate Scenario would result in 22 percent more visitors, while a High Growth Rate Scenario would result in an increase of 55 percent.
- Seasonal variability in visitation is not large at KPNWR, compared to similar destinations on the U.S. mainland. Visitation to KPNWR tends to peak in the winter, spring, and summer, declining about 17% in fall.

The original intent of developing visitor projections was to account for possible changes to “visitor services” at the Refuge, based on an understanding of potential impacts from visitation and their compatibility with the biological conservation priorities of the Refuge. Visitor services, such as interpretative programs with staff or volunteer docents, enhancement of the onsite visitor center and bookstore, and increased opportunities for the public to interact and observe wildlife, could affect the number of visitors and the duration of a typical Refuge visit.

However, an analysis of visitor carrying capacity has not yet been completed by FWS; and, through discussions with Refuge staff, it was determined that future changes to visitor services cannot be defined clearly at this time. For example, there are plans to reinstate a wildlife hike to Crater Hill from the Overlook, which had been cancelled due to lack of staff and concerns about interactions (negative

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<sup>18</sup> Visitation numbers prior to 2005 were difficult to estimate, because until that time the Refuge staff did not clearly track the numbers of visitors; and, entry fees were collected only through an “honor box” payment station on Kilauea Point.

impacts) on resident wildlife. However, this change is not expected to impact visitation or alter conclusions about long-range visitor forecasts.

All refuges need to be flexible to respond to conditions affecting the welfare of their natural and cultural resources; including implementing programs that discourage, control, or encourage visitation, as needed or as permissible, in a manner that is compatible with the purposes of each refuge and the FWS. The low, mid-range, and high growth scenarios developed for the KPNWR long-range visitation forecast, reflect the uncertain future in regard to the provision of visitor services and represent a wide range of possible changes.



***Photo 6. Refuge visitors approaching new fee collection booth established on the Point in 2005***

## Kilauea Town Planning Context: Community Issues

### *Kilauea Town Plan*

During the course of this ATS Study, the ATS Team learned that the County of Kauai Planning Department intended to prepare a “Kilauea Town Plan” as a sub-area plan in support of an amendment to the County of Kauai General Plan. Because great potential existed under the ATS Study for cooperative elements with the Kilauea community and the County, and because the ATS Study had also anticipated conducting public outreach activities, the ATS Team opted to participate actively in the Kilauea Town Plan meetings.

In conjunction with the Kilauea Town Plan “charrette” process in February 2005, the ATS Study Team conducted extensive team meetings, met with local stakeholders and property owners, staffed an ATS Study display at a Kilauea Town Plan “open house” event, as well as organized two separate “public” events for the ATS Study: a multi-agency briefing meeting and a public meeting to present the ATS Study to the community. The agency meeting was advertised through direct notification to agencies, and attempts were made to advertise the community meeting through Kilauea Town Plan meeting organizers. The Team distributed a questionnaire about the preliminary KPNWR ATS transportation options at the February 2005 Kilauea Town charrette to solicit the community’s input on the options under consideration.<sup>19</sup>

The Draft Kilauea Town Plan document was publicly released in September 2005. Public hearings before the Kauai County Planning Commission began in November 2005. FWS submitted testimony in support of this draft plan on March 24, 2006. A copy of FWS’ testimony is included as [Appendix B](#) of this Final Report. In May 2006, the Kauai Planning Commission voted to approve the Draft Kilauea Town Plan, and forward it to the Kauai County Council. To date, the County Council has taken no formal action on the plan.

#### Comprehensive Conservation Plan

Preplanning for the development of KPNWR’s Comprehensive Conservation Plan (CCP) effort is currently scheduled to begin in October 2007, although it could start in the fall 2006, if funding is available. The timing of the CCP process, especially if advanced, is such that it would likely overlap with the next phase (NEPA process) of this ATS Study effort; and as much as possible, the two efforts will be coordinated and integrated.

#### Bypass Road Concept

The Draft Kilauea Town Plan recommends that Kilauea Town be expanded westward in phases, with the key focus on creating affordable housing opportunities for the Kilauea community. To that end, the draft plan discusses the need for a bypass road, not only to open up additional lands for development, but also to improve circulation and help address traffic concerns on Kilauea Road.

As shown in [Figure 4](#), there are two potential alignments for the bypass road. One would connect Kuhio Highway with Kilauea Road near the Post Office. The

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<sup>19</sup> A “Trip Report” summarizing the activities conducted and materials prepared for the Kilauea Town charrette was separately prepared by PB and submitted to CFLHD and FWS. It includes documentation of the agency meeting, public meeting, and the results of the public questionnaire on preliminary transportation options. Note that the questionnaire response rate was low, with only 13 respondents, such that the results are deemed to be of limited use. However, of those respondents, one person preferred Moderate Improvements; three people preferred Minor Improvements, and six people (about half of the total) indicated a transit system as their first choice. Not all respondents indicated a clear preference. These responses are consistent with the findings of the PASA Final Report, which found community members mixed in their support of a transit system.

other alignment would intersect Kilauea Road near the Kilauea Christian Academy and close to where Quarry Road meets Kilauea Road. Both alignments would intersect Kuhio Highway near Banana Joe's fruit stand, and would likely divert at least some KPNWR traffic away from the center of Kilauea Town, especially mauka (toward the mountains) of the Post Office area. Both potential bypass alignments are discussed and illustrated within the Draft Kilauea Town Plan<sup>20</sup>.

As noted in the Draft Town Plan, there is no firm commitment for funding and construction of a bypass road. The Plan states that without federal funding, the bypass is not feasible, and is not recommended as part of the first phase of Town expansion. Under the first phase, only a small leg of this potential future road would be built as a spur – not as a bypass – with access off of the main Kilauea Road at the center of Town.

FWS and CFLHD are unable to make any commitments at this time about federal participation in a bypass road. However, a bypass road would allow more and potentially better options for accessing KPNWR from Kuhio Highway; as well as, improving general circulation and distributing traffic impacts in Town, regardless of whether or not a transit system is implemented.

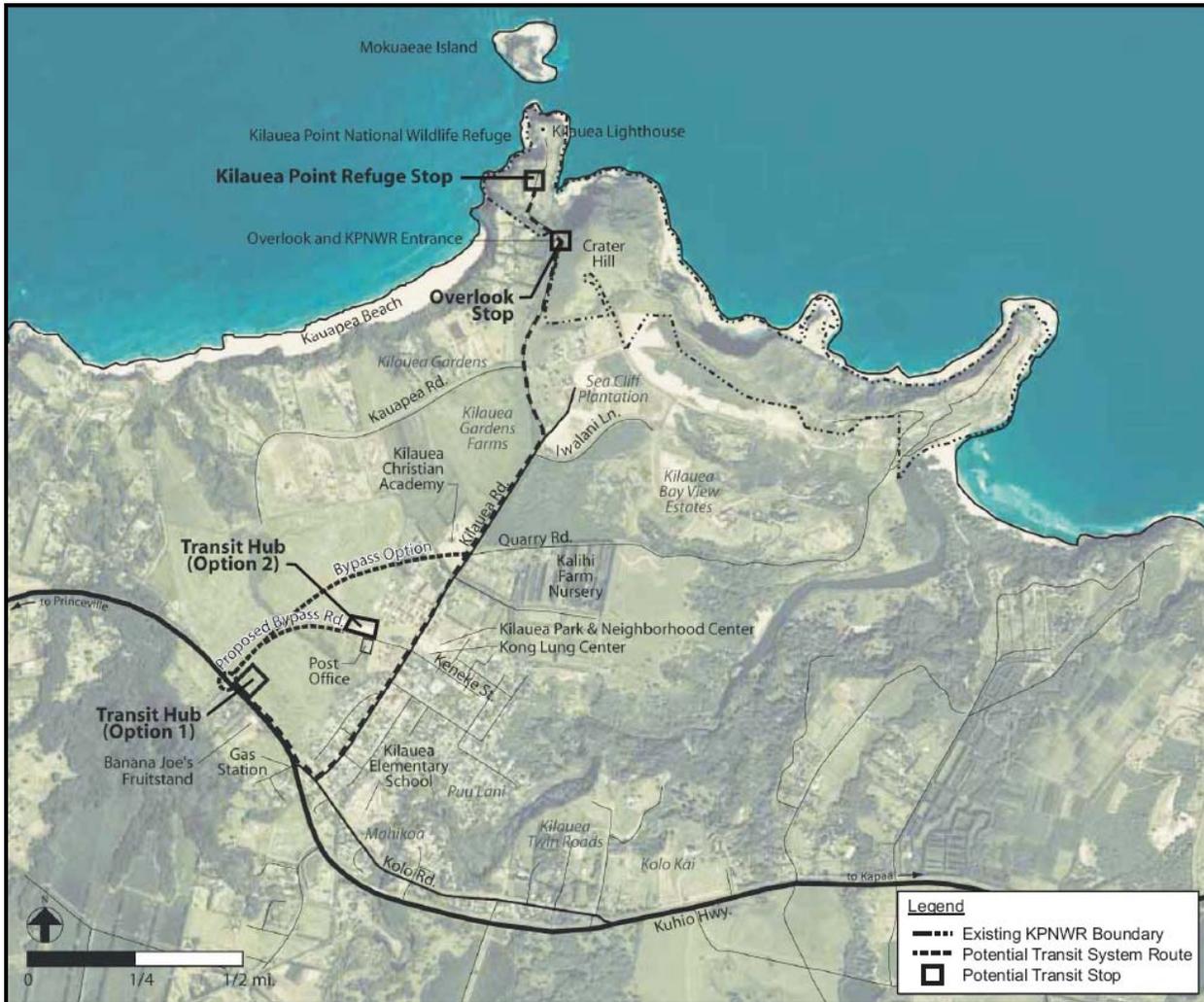
The Kilauea community in general seems to support a bypass road, because it would enhance circulation and community safety by reducing traffic volumes and congestion on Kilauea Road; and, may foster local economic development, especially new housing stock. A potential public/private joint venture in regard to potential advancement of this bypass concept may be worthy of future consideration; especially, if further development of adjacent land uses are permitted, subsequent to refinement of the Kilauea Town Plan and related Kauai General Plan amendment processes.

It should be noted that if a bypass were to be constructed, the potential economic impacts on some existing private businesses in the Kilauea community (especially those along Kilauea Road) may be negative. This issue has not been analyzed here and is beyond the scope of this Study. However, it is likely that such a change in general circulation patterns, including those of visitors to the Refuge, would result in reduced traffic volumes on Kilauea Road and perhaps lost revenues for local businesses along this route.

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<sup>20</sup> Draft Kilauea Town Plan, An Update of the Kilauea Sub-Area Plan, September 2005, p. 5-4, 5-5 and 6-5.

**Figure 4. Kilauea Town Vicinity with Potential Bypass Road Alignments and Potential Transit Hub Sites**



### Location Options for Potential Transit Center (Hub) Development

The Draft Kilauea Town Plan shows two options for a possible transit center location, each of which could be used by a Refuge transit system (and perhaps also by Kauai Bus). The first location is on Kuhio Highway, at the projected intersection of the first of two potential bypass road alignments. The second location under consideration is in Kilauea Town, near the existing Post Office, which is located on the second potential bypass alignment. (See [Figure 4](#)).

The potential hub site on Kuhio Highway may be adjacent to and could share parking with a potential civic use, such as a local park; whereas, the second site in the town center would be adjacent to light industrial zoning and close to established commercial areas. The Kuhio Highway site is shown as the preferred transit center “Hub” site in the Draft Kilauea Town Plan; but, the Plan preparers have indicated that the town center location would also be viable, especially if the bypass road were to be built.

Both sites are deemed to be viable for a potential Refuge transit system. The Kuhio Highway site was used for costing and analytic purposes in this study, as this location would generate more conservative estimates about travel times and operating costs<sup>21</sup>. However, the site near the Post Office is also under consideration, because the current light industrial zoning is compatible with such transportation facilities, and accommodates FWS’ desire to relocate its maintenance and storage facility to the transfer site. Also such uses would be more compatible with existing adjacent land uses, and would facilitate greater visitor access to existing and future retail commercial activities. A potential layout of a generic park-and-ride facility that could be used at either location can be found in [Appendix D](#). The Transit Feasibility section later in this Final Report looks at the costs of operating a shuttle to KPNWR from each potential location.

### Kauai Bus

Kauai Bus provides the only public transit service on Kauai. Kilauea Town is served by routes 400, 400E, 500 and 500E, with scheduled stops at the Kilauea Food Mart, approximately eight times per weekday in each direction, plus four times in each direction on Saturdays. There is no transit service on Sundays.

The ATS Study Team made concerted efforts to coordinate specifically with Kauai Bus, the County’s local bus service. The intent was to explore the possibility of combining operations and/or co-locating operational facilities. Although Kauai Bus indicated they are considering installing a transit center or more permanent bus stop in Kilauea Town in the future, no specific, detailed plans have been established, and no mention of this idea appears in the Kilauea Town Plan. Either of the potential transit center locations identified may be able

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<sup>21</sup> Because the Kuhio Highway site is further from the Refuge, it is estimated that associated shuttle system operating costs would be higher at this location; i.e., a more conservative cost estimate. It was assumed that if a shuttle system were feasible from this site, it would also be feasible (and less expensive to operate) from a location closer to the Refuge.

to accommodate the operational needs of Kauai Bus, in concert or not, with the potential provision of shuttle transit service to the Refuge.

For purposes of this Final Report, and because no definitive direction has been articulated to date by Kauai Bus, or is delineated in their current four-year “long-range” transit plan, the Team has chosen to explore transit alternatives for KPNWR that do not require coordination with Kauai Bus. Reassessment of this issue is recommended for the next phase of this study.

*KPNWR “Free Days” Shuttle Bus Service*

KPNWR is open to the public and free of charge on four days each year: Lighthouse Day in May, Ocean Fair Day in July, Free Public Lands Day in September, and National Wildlife Refuge Week day in October. On those days, attendance sometimes exceeds 1,000 visitors (compared with about 600 on normal days, when entry fees are charged to most visitors over the age of 16). To accommodate this level of visitation, the Refuge has begun to close the parking area on the Point on one of those free days (Ocean Fair Day), requiring visitors to use a free shuttle bus from one or more staging and parking areas.

Most recently, Kauai Christian Academy was used as a staging/parking area, which is located north of Kilauea Town on Kilauea Road, roughly 1 mile from the Refuge. Volunteers directed visitors to park in a grassy field next to the Academy and use the free shuttle system, which consisted of three 19-passenger school buses. According to Refuge staff, the transit service appeared to work well on Ocean Fair Day, and has shown to be a feasible method for serving a large number of visitors.

## Visitor Projections Summary

The following is a summary of the Refuge Visitor Projections Report (RVP) (PB, March 2006), which was an earlier element of the ATS Study effort (The full report can be found in [Appendix A.](#)). The RVP Report identified three potential growth scenarios for the Refuge:

- **Low Growth Scenario**, which accounts for economic downturns, a possible reduction in services at the Refuge, and other factors which could limit the growth in visitation to the Refuge;
- **Mid-Range Growth Scenario**, which uses a combination of past trends and market growth projections from the State of Hawaii Department of Business, Economic Development, and Tourism (DBEDT) to represent moderate projected growth; and
- **High Growth Scenario**, which assumes a combination of an improved tourism market, increased visitor services, and/or other factors which could result in a higher visitor growth rate over time at the Refuge.

These low, mid-range, and high growth rates were then combined with other variables of interest to the FWS.

**Changes Over Time** - Visitor projections (forecasts) were developed for the short-term (5-year), medium-term (10-year), and long-term (20-year) planning horizons.

- **Short-Term Forecast (Year 2010)** – Represents the situation within a 5-year period, which corresponds to the time required to phase in initial improvements or implement interim stopgap transportation measures.
- **Medium-Term Forecast (Year 2015)** – Represents the 10-year horizon, which could be a transitional period between short-term measures and long-term transportation solutions.
- **Long-Term Forecast (Year 2025)** – Represents a 20-year period, which is enough time to plan for and design transportation alternatives that will serve the anticipated growth in visitation at KPNWR.

**KPNWR Annual Visitor Projections** – Annual visitor projections for persons and vehicles entering the Refuge; i.e., onto the “Point” via the entry gate (but not including those who visit the Overlook and then leave without entering the Refuge), using the three growth scenarios described above, are presented in [Table 1](#). The annual forecast for 2005 was extrapolated from actual visitor

counts (provided by the Refuge) from a 5-month period (July 16 to December 15, 2005).

**Peak and Off-Peak Seasons Forecasts** – Based on a review of visitor fee receipts compiled by Refuge staff for FY2000 through FY2004, it was determined that peak seasons at KPNWR are winter, spring, and summer, while fall is considered off-peak. Daily, peak season visitor projections are shown in [Table 2](#), and were calculated by dividing the annual estimate of total visitation by a factor of 329<sup>22</sup>. [Table 3](#) shows daily, off-peak season projections, which were calculated by reducing the peak season forecasts by 17 percent<sup>23</sup>.

Growth rates for the off-peak period (fall) are assumed to be the same as the peak period. For more information on visitor projections, forecasting methods, and results, see the KPNWR Visitor Projections Report in [Appendix A](#).

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<sup>22</sup> This factor was determined by comparing daily fee receipts from a typical peak-season day in March and August, to annual receipts from the same time period (FY2000-FY2004). This methodology is similar to that used by Federal Highway Administration (FHWA), the Federal Transit Administration, state departments of transportation, and transit agencies. See [Table 4](#) to see how this factor was calculated.

<sup>23</sup> Comparing average fee receipts from all four seasons indicates that winter, spring, and summer have similar attendance, while fall is about 17% lower. See [Table 5](#) for calculations.

**Table 1. KPNWR Visitation Growth Forecasts (Annual)**

Year	Low Growth Rate Scenario	Mid-Range Growth Rate Scenario	High Growth Rate Scenario
<b>Average Annual Growth Rate</b>	1.0%	1.4%	2.2%
<b>Persons</b>			
<b>2005 (estimate of existing annual visitors)</b>	215,000 <sup>24</sup>		
<b>Short-term: 2010 (5-year projection)</b>	226,000	231,000	240,000
<b>Medium-term: 2015 (10-year projection)</b>	238,000	247,000	267,000
<b>Long-term: 2025 (20-year projection)</b>	262,000	284,000	332,000
<b>Growth (2005-2025)</b>	22%	32%	55%
<b>All Vehicles</b>			
<b>2005 (estimate of existing annual vehicles)</b>	74,100 <sup>25</sup>		
<b>Short-term: 2010 (5-year projection)</b>	78,000	80,000	83,000
<b>Medium-term: 2015 (10-year projection)</b>	82,000	85,000	92,000
<b>Long-term: 2025 (20-year projection)</b>	91,000	98,000	115,000
<b>Growth (2005-2025)</b>	22%	32%	55%

<sup>24</sup> Based on extrapolation of actual visitor count data from July-December 2005.

<sup>25</sup> Based on average occupancy of 2.9 persons per vehicle.

**Table 2. KPNWR Visitation Growth Forecasts (Daily, Peak Season<sup>26</sup>)**

Year	Low Growth Rate Scenario	Mid-Range Growth Rate Scenario	High Growth Rate Scenario
<b>Average Annual Growth Rate</b>	1.0%	1.4%	2.2%
<b>Persons</b>			
<b>2005 (estimate of existing daily visitors)</b>	653 <sup>27</sup>		
<b>Short-term: 2010 (5-year projection)</b>	690	700	730
<b>Medium-term: 2015 (10-year projection)</b>	720	750	810
<b>Long-term: 2025 (20-year projection)</b>	800	860	1010
<b>Growth Projection (2005-2025)</b>	22%	32%	55%
<b>All Vehicles</b>			
<b>2005 (estimate of existing daily vehicles)</b>	225 <sup>28</sup>		
<b>Short-term: 2010 (5-year projection)</b>	240	240	250
<b>Medium-term: 2015 (10-year projection)</b>	250	260	280
<b>Long-term: 2025 (20-year projection)</b>	280	300	350
<b>Growth Projection (2005-2025)</b>	22%	32%	55%

<sup>26</sup> Peak season is defined as winter, spring, and summer, combined.

<sup>27</sup> Based on annual estimate divided by annual-to-peak conversion factor of 329.

<sup>28</sup> Based on average occupancy of 2.9 persons per vehicle.

**Table 3. KPNWR Visitation Growth Forecasts (Daily, Off-Peak Season<sup>29</sup>)**

Year	Low Growth Rate Scenario	Mid-Range Growth Rate Scenario	High Growth Rate Scenario
<b>Average Annual Growth Rate</b>	1.0%	1.4%	2.2%
<b>Persons</b>			
<b>2005 (estimate of existing daily visitors)</b>	547 <sup>30</sup>		
<b>Short-term: 2010 (5-year projection)</b>	580	590	610
<b>Medium-term: 2015 (10-year projection)</b>	600	630	680
<b>Long-term: 2025 (20-year projection)</b>	670	720	850
<b>Growth Projection (2005-2025)</b>	22%	32%	55%
<b>All Vehicles</b>			
<b>2005 (estimate of existing daily vehicles)</b>	189 <sup>31</sup>		
<b>Short-term: 2010 (5-year projection)</b>	200	200	210
<b>Medium-term: 2015 (10-year projection)</b>	210	220	230
<b>Long-term: 2025 (20-year projection)</b>	230	250	290
<b>Growth Projection (2005-2025)</b>	22%	32%	55%

<sup>29</sup>Off-peak season is defined as fall (October-December).

<sup>30</sup>Based on estimate of daily peak season visitors, adjusted downward by 17 percent.

<sup>31</sup>Based on average occupancy of 2.9 persons per vehicle.

**Table 4. KPNWR Peak Day to Annual Conversion Calculations**  
**Monthly Visitation Receipts, Averaged for FY2000-FY2004**

Month	Average Receipts for Month
January	\$31,397
February	\$35,163
March	\$34,562
April	\$31,093
May	\$33,269
June	\$32,773
July	\$34,578
August	\$35,106
September	\$31,502
October	\$32,547
November	\$25,961
December	\$24,299
<b>TOTAL YEARLY</b>	<b>\$382,450</b>
March/August monthly average <sup>32</sup>	\$34,834
March/August average day	\$1,161
<b>Conversion factor<sup>33</sup></b> <i>(annual divided by average day in March/August)</i>	<b>329</b>

**Table 5. Comparing Peak Season with Off-Peak Season Visitation**

Season	Average Monthly Receipts
Winter (Jan-Mar)	\$33,707
Spring (Apr-Jun)	\$32,378
Summer (Jul-Sep)	\$33,503
Fall (Oct-Dec)	\$27,669
Peak Season (winter, spring and summer combined)	\$33,196
Off-Peak Season (fall)	\$27,669
<b>Difference, Peak to Off-Peak</b>	<b>17%</b>

<sup>32</sup> March and August were used to match the dates studied in the Traffic, Visitor and Parking Counts Study in 2003.

<sup>33</sup> Calculations do not include 4 annual free days, when visitation often reaches 1000. The days are Lighthouse Day in May, Ocean Fair Day in July, Free Public Lands Day in September, and National Wildlife Refuge Week day in October.

## Conceptual Transportation Alternatives

The visitor projections outlined above indicate a possible need for both short- and medium-term improvements, as well as long-term strategies to access and enjoy KPNWR, which could eventually include a transit shuttle operation or other improvements. In response, a series of draft conceptual transportation alternatives have been developed and critiqued by the ATS Study Team, undergoing preliminary evaluation of their practicality and potential feasibility. The five conceptual transportation alternatives identified to date are described below.

Initial alternatives were developed and evaluated by the ATS Study Team, and refined prior to and during a planning charrette held February 22-24, 2005, that involved Refuge staff, stakeholders and agency personnel. These alternatives were presented to the public during a Kilauea Town Plan (An Update of the Kilauea Sub-Area Plan) meeting, a County of Kauai General Plan process held in February 2005. Public comments were requested; however, the number of community responses received was low, and no additional transportation alternatives were suggested via public input, aside from variations or combinations of those already proposed.

During the anticipated NEPA evaluation phase, the No-Build Alternative, plus the other draft transportation alternatives will be re-examined. Some of the alternatives may be screened out during this phase. *A combination of alternatives may also be considered for implementation in a phased manner.* A summary of the Conceptual Transportation Alternatives is shown in [Table 6](#). An attribute/preliminary evaluation matrix, including preliminary cost estimates and details of the conceptual alternatives under consideration are included as [Appendix C](#).

### **Alternative 1: No-Build**

The No-Build Alternative is the same as the current situation at KPNWR, and establishes the baseline for analysis and evaluation. This “status quo” alternative consists of no physical or operational change from the existing conditions, and no additional parking would be provided. FWS staff would continue to assist with parking cars at the Point during high public use periods to facilitate safe public access to onsite overflow parking, and to escort school buses to specific parking spots (by appointment only).

Private tour operators would continue to provide service to KPNWR, as they do today. No public transit service to KPNWR would be provided by FWS or any other provider. Bicycle access would continue to be allowed, though infrequently used and not encouraged. Pedestrian access would continue to be prohibited onto the Point due to the lack of pedestrian facilities, onsite safety and environmental concerns. There would be no change in access to the Overlook;

i.e., uncontrolled public access, at all times and days, would continue to be allowed.

The 2003 TVP Study documented that private transit vehicles (including tour vans and taxis) currently carry about 5% of all visitors into the Refuge, while about 95% arrive by private vehicle (primarily rental car). A very small percentage arrives by bicycle or on school buses in scheduled groups. It is assumed that these percentages would continue in the No-Build scenario.

### **Alternative 2: Minor Improvements, Transportation System Management (TSM) and Transportation Demand Management (TDM)**

This alternative would include few or no changes to the current parking areas at the Refuge, keeping the number of available public parking spaces the same as today. This alternative would primarily focus on a series of TSM and TDM measures that seek to better manage the existing onsite parking capacities. These measures could include one or a combination of the following: broadcasting traffic and parking information via the media and/or a public website; providing potential Refuge visitors with real-time parking information via signs/radio/mobile technologies, i.e., Intelligent Transportation Systems (ITS) applications; potential use of a dedicated onsite parking attendant during times of high visitation; implementation of time limits on parking; installation of parking meters to discourage long visitations; and congestion pricing and other measures to make more efficient use of the current parking supply.

Private tour operators would continue to provide service to the Refuge, as they do today. Boarding areas or dedicated parking for private tour operators may be provided at the Refuge, to encourage greater use of this option. Bicycle and pedestrian access could possibly be accommodated, but only if found to be compatible with the protection of habitat species. In addition, components of this alternative could be phased as needed or included in other alternatives as appropriate.

### **Alternative 3: Moderate Improvements to Increase Capacity**

This alternative would provide moderate onsite physical improvements to the entrance road and parking areas at the Overlook and at the Point, to increase the visitor capacity of the Refuge.<sup>34</sup> Passenger boarding and parking areas for private shuttle bus and/or tour operators could be provided at both the Overlook and at the Point. Parking areas would be better defined and possibly enlarged to accommodate additional cars and improved access/circulation. The Refuge entrance road could be improved to accommodate larger vehicles and possibly a

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<sup>34</sup> The amount of additional parking needed is estimated in the next section.

bicycle lane and/or pedestrian path, if found to be desirable.<sup>35</sup> Other optional elements of this alternative include using environmentally friendly porous paving or other surface type in overflow parking areas, which would minimize additional stormwater runoff and facilitate vegetation growth.

To facilitate an expansion of parking at the Overlook, acquisition of all or a part of the parcel of land (immediately adjacent to Refuge property at the Overlook) from the County of Kauai, or development of a formal Use Agreement for same, may be pursued by FWS under a separate process. Previous conversations between FWS and County staff have indicated an interest in this option by both organizations.

#### **Alternative 4: Voluntary Shuttle with Private Vehicle Access**

This alternative includes a dedicated, albeit voluntary shuttle service to the Refuge from an offsite “Hub” transit facility that would also offer visitor services such as parking, Refuge entry fee payment (which includes a round-trip ride on the voluntary shuttle), restrooms, a bookstore, and other resources. The Hub could also be used for Refuge operational needs such as shuttle vehicle parking, maintenance vehicle parking and equipment storage, administrative offices, and other related functions. Onsite improvements at the Point would be limited to improved shuttle bus boarding and waiting facilities, and possible layover or parking for transit vehicles and tour vans. The number of general use parking spaces at the Point may need to be reduced and access/circulation modified to accommodate transit and tour vehicles. Other optional features of this alternative include improvements to the Overlook and/or the Point proposed in Alternative 3, such as improvements to the onsite entrance road, for safety and better access by shuttle buses and other modes (e.g., bicyclists).

Using attractive road signage, online “real-time” information, and/or ITS applications, visitors would be directed to the offsite Hub facility first, to pay entry fees and would be encouraged to ride the shuttle to the Refuge (at no additional charge).<sup>36</sup> This alternative would not prohibit private vehicle parking at the Point, but no additional parking capacity would be provided onsite to accommodate the expected increase in demand over time<sup>37</sup>. Some existing onsite parking may need to be eliminated to accommodate potential transit operations at the Refuge. Thus, as an incentive to use transit, the KPNWR visitor would incur no additional cost above the established Refuge entry fee. That is, each visitor would be charged the same entry fee, whether using the shuttle or accessing the Refuge

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<sup>35</sup> Pedestrian access on the Refuge’s entrance road is considered a safety issue by FWS personnel. While this option is being retained until more detailed engineering analysis and consideration of management options can be completed, pedestrian access would require the widening and reconfiguration of the entrance road or separate path alignment, which is likely to affect endangered bird habitat.

<sup>36</sup> Offsite transit hubs were considered in other areas, such as Lihue or at resorts, but deemed less feasible than one located in Kilauea Town.

<sup>37</sup> Parking at the Point may actually need to be reduced to accommodate shuttle vehicles.

by a private vehicle<sup>38</sup>. However, the potential to provide interpretive narration on the shuttle by either an informed driver, a volunteer or staff tour guide (which, based on the PASA survey research, has been determined to be desirable by the general public), would enhance the experience of the visitor that utilizes this transit option.

Aspects of other alternatives (listed above) could be included or phased under this alternative. These could include, ITS applications to inform visitors and improve the efficiency of the existing parking areas, improved pedestrian and bicycle access (only if found to be desirable), and/or expanded parking at the Overlook area using the adjacent parcel currently owned by the County.

### **Alternative 5: Access by Mandatory Shuttle Only**

This alternative is similar to Alternative 4, involving the construction of an offsite Hub transit facility with parking for Refuge visitors, a bookstore and other visitor amenities, and administrative, operational, and maintenance facilities. However, in this alternative, public access to the Point (beyond the entrance gate) by private vehicle would be prohibited year-round. Visitors would park at the Hub and use the shuttle to reach and enter the Refuge.

While no parking for personal vehicles would be permitted on the Point, limited public parking would remain available at the Overlook, and could be expanded onto the parcel of land currently owned by the County. Management of general purpose parking would no longer be required at the Point, which would reduce administrative and staff costs, relative to the other alternatives. As with Alternative 4, aspects of other alternatives (listed above) could be included or phased under this alternative, if found to be desirable. This includes ITS applications, improved signage, and possible improvements for pedestrians and bicyclists.

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<sup>38</sup> It is assumed that visitors who currently are not charged an entry fee (Golden Eagle, etc. pass holders and visitors under 16 years of age) would continue to get in for free.

**Table 6. Summary of KPNWR Conceptual Transportation Alternatives<sup>39</sup>**

Alternative	Name	Description
1	No-Build	No physical or operational change from today.
2	Minor Improvements, Transportation System Management (TSM) and Transportation Demand Management (TDM)	Some physical or operational changes to improve effective capacity through improved management of parking resources. Could include: improved visitor information through road signage or posting on KPNWR web page, hiring parking attendant, time limits on parking, parking fees, and/or other strategies.
3	Moderate Improvements	Some physical improvements to increase capacity, possibly including boarding and parking areas for private tour operators, better definition of existing parking and some additional parking, and improved entrance road to accommodate larger vehicles and possibly bicycles and pedestrians. Possible expansion of Overlook parking onto adjacent County parcel.
4	Transit Shuttle Service with Private Vehicle Access	Voluntary shuttle access from offsite Hub facility. Visitor parking still allowed at Refuge, but may be reduced to accommodate boarding and waiting areas for shuttle vehicles. Possible access for bicyclists. Could include components of other alternatives. Possible expansion of Overlook parking onto adjacent County parcel.
5	Access by Transit Shuttle Service Only	Mandatory transit shuttle service from offsite Hub facility. Parking no longer allowed within the Refuge. Possible access for bicyclists. Possible access by private tour operators, vans, and taxis. Could include components of other alternatives. Possible expansion of Overlook parking onto adjacent County parcel.

<sup>39</sup> The full matrix of conceptual transportation alternatives can be found in Attachment C.

## Estimating Future Parking Demand

This section shows anticipated demand for parking at the Refuge, and discusses how the implementation of the five conceptual transportation alternatives, described in the previous section, would affect parking demand over time.

In the Refuge Visitor Projection Report (RVP), general visitation and parking demand trends were calculated for KPNWR based on factors such as overall visitation to Kauai, cruise ship arrivals, potential changes to services at the Refuge, and possible changes in entry fees. Three growth rates (low, mid-range, and high) were established, and visitation and parking demand were projected using these growth rates for three target years: 2010, 2015, and 2025.

### Existing Conditions and Future Demand for Parking

The Traffic, Visitor, and Parking Counts Study (TVP Study) identified current parking duration (elapsed time) and utilization rates by time of day at the Refuge. Those results were applied to the parking projections, using the mid-range growth rate, to forecast future parking demand on an hour-by-hour basis at both the Point and the Overlook.

The TVP Report found that the duration of each public visit is about 5-10 minutes (7 minutes average) at the Overlook and 40-45 minutes (41 minutes average) at the Point.<sup>40</sup> Parking duration affects the capacity of the parking lots. At the Overlook, the effective hourly capacity of existing parking is increased by the high vehicle turnover rate that results from short duration visits.

The resulting hour-by-hour projected demand for parking at the Point is shown for peak seasons (winter, spring, and summer) in [Figure 5](#), and for the off-peak season (fall) in [Figure 6](#). Projected demand for parking at the Overlook is shown in [Figure 7](#) (peak season) and [Figure 8](#) (off-peak). It should be noted that these tables show projected demand, and have not been adjusted to account for the inadequate supply of parking that will inevitably occur over time. While the demand for parking will continue to rise with the increase in visitation, the total amount of cars could never exceed capacity. Additionally, there could be a certain amount of existing pent-up demand for parking that is not being met, described as overcrowding by Refuge staff, via anecdotal observations.

[Figure 5](#) indicates that during the peak season, parking demand currently (2005) exceeds onsite capacity (49 spaces plus two disabled spaces)<sup>41</sup> in the late morning, and will tend to approach or exceed capacity through much of the day by 2010. By 2015, the demand for parking at the Point will routinely exceed

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<sup>40</sup> Parsons Brinckerhoff Quade and Douglas, Inc. "Traffic, Visitor and Parking Counts Study." January 2004, pg.15-16.

<sup>41</sup> The grassy overflow area is not counted as part of the normal capacity, and is only used when needed.

capacity throughout the day during the peak season and in the late morning during the off-peak season.

The 2004 TVP Study did not specifically count parking utilization at the Overlook (located on the Refuge, but outside the entry gate and perimeter fencing). However, observations during the TVP Study and by Refuge staff indicate that the six paved spaces currently located at the Overlook are typically full before the 10:00 a.m. daily opening of the Refuge gate to the public. Additionally, much of the dirt overflow area (Kauai County property) next to Kilauea Road (also property of the County of Kauai), is also often full at this time. It was observed during the TVP Study that many of these spaces are occupied by early-arriving Refuge visitors, waiting for the gate into the Refuge/Point area to open at 10:00 a.m. Often there is a queue of vehicles in front of the gate waiting to enter when the Refuge opens. This congestion is problematic because it results in the obstruction of the Refuge entrance gate, hindering official and emergency ingress/egress prior to the Refuge opening time. Often, this congestion also obstructs parking and mobility within the Overlook area. During the rest of the day, when the Refuge is officially opened to the public, the Overlook parking area, including the overflow area, did not appear to fill to capacity during the 2004 TVP Study<sup>42</sup>. Parking turnover at the Overlook continues to be high, but more recent observations by Refuge staff have shown most Overlook parking spaces to be filled throughout the day. [Figures 7](#) (peak season) [and 8](#) (off-peak season) show the estimated and projected hourly parking demand at the Overlook.<sup>43</sup>

Although, currently there may not be a consistent parking problem throughout the day at the Overlook, this is likely to be a future concern if alternative transportation modes are introduced at the Point and entry fees are raised. Due to the unique location of the Overlook (near the Point, yet outside the Refuge's controlled access area), there will be the potential for ongoing operational problems. The Overlook should be included in future transportation study phases.

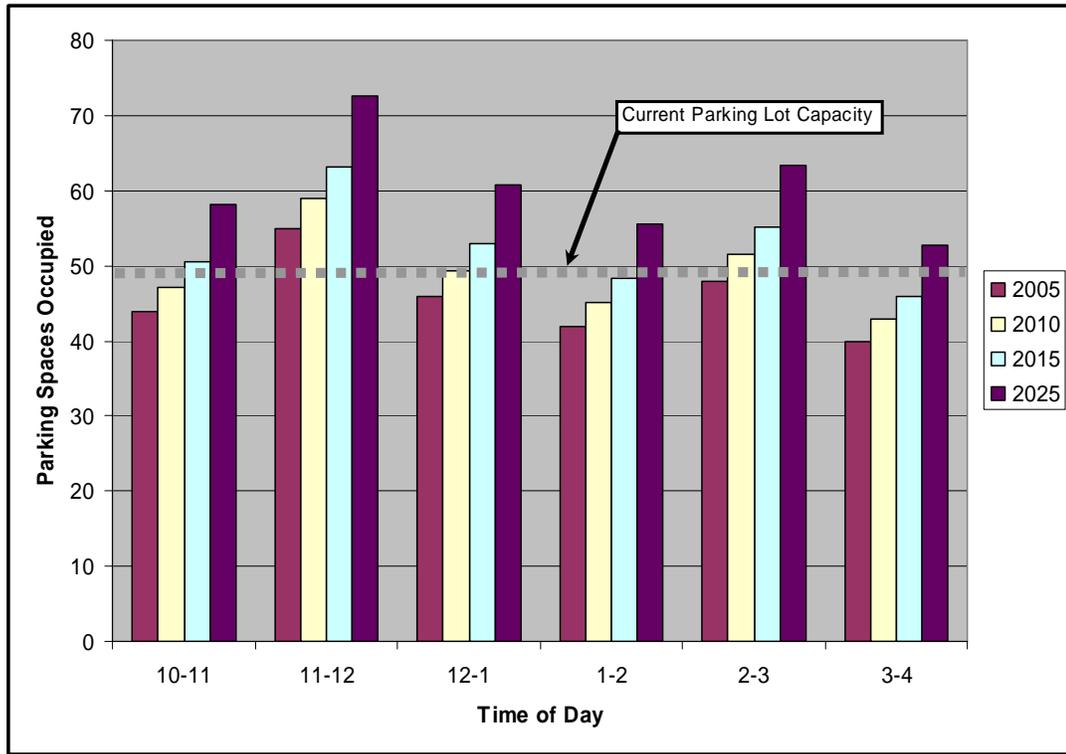
The sub-sections that follow [Figures 5 through 8](#) discuss how the various transportation alternatives under consideration would impact the projected demand for parking at KPNWR.

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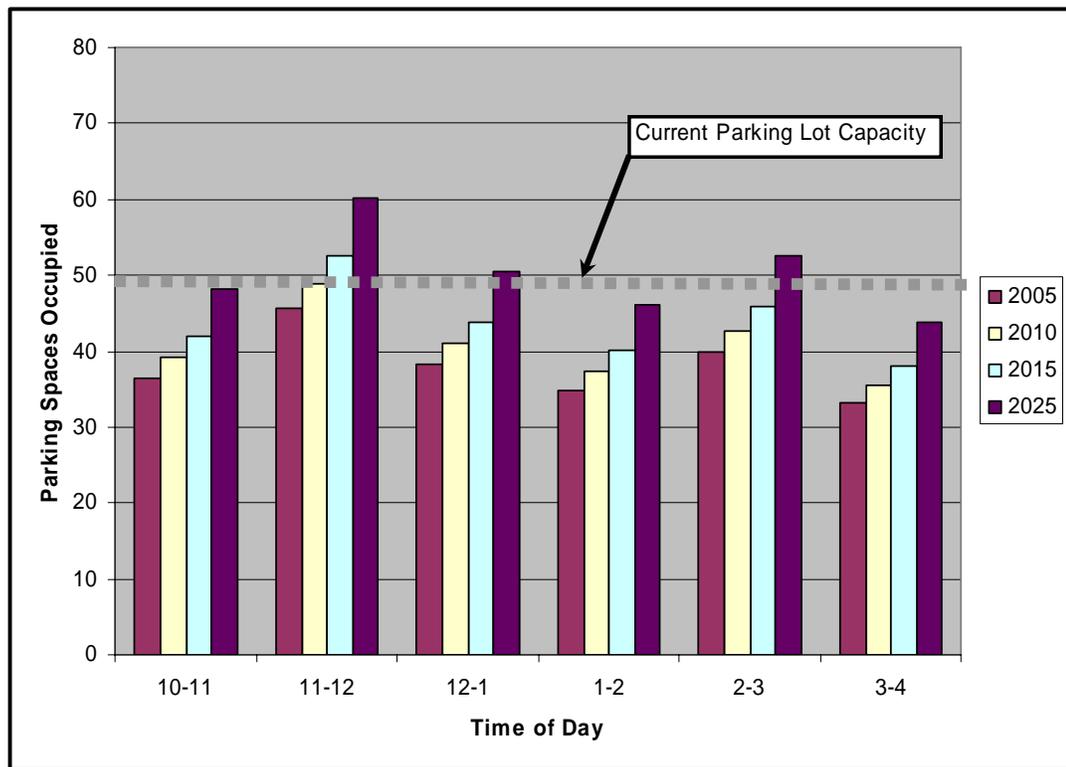
<sup>42</sup> Capacity of the Overlook is difficult to determine because the dirt overflow area is not marked, and cars tend to park haphazardly, which significantly reduces the effective capacity.

<sup>43</sup> Projected parking demand at the Overlook is based on projected growth in overall visitation, but does not account for possible changes in access to the Point that may occur if a shuttle system or other alternative transportation programs were to be implemented. Capacity of the Overlook in [Figures 6 and 7](#) is based on the six paved parking spaces with an average turnover of 6 times per hour or once every 10 minutes, for an hourly capacity of 36 vehicles.

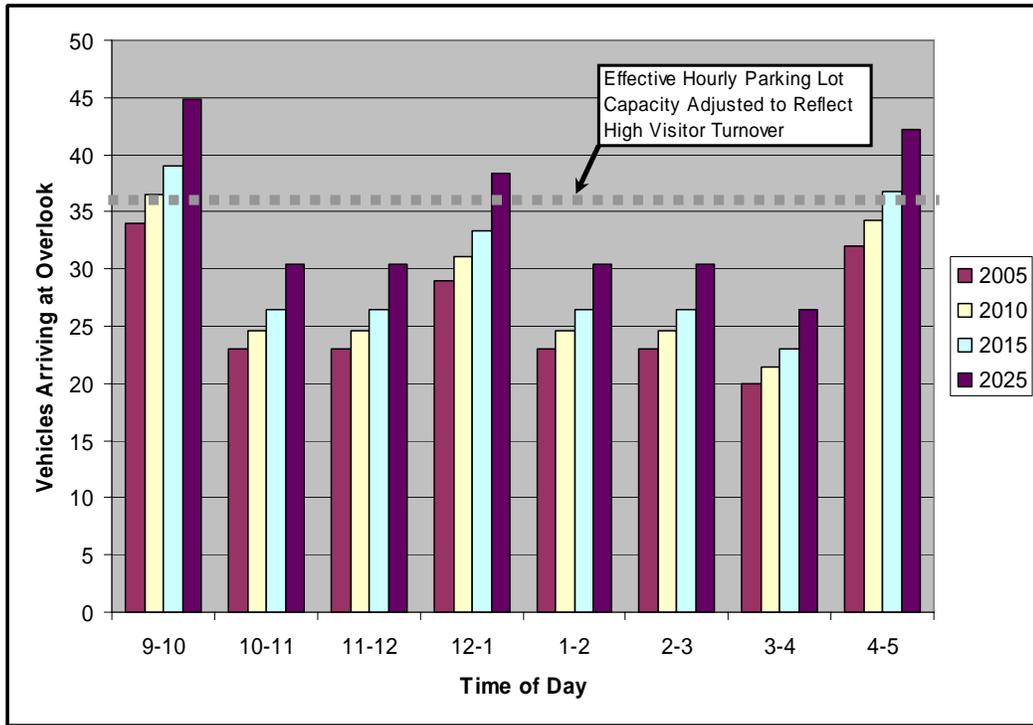
**Figure 5. Projected Demand for Parking at the Point – Peak Season**



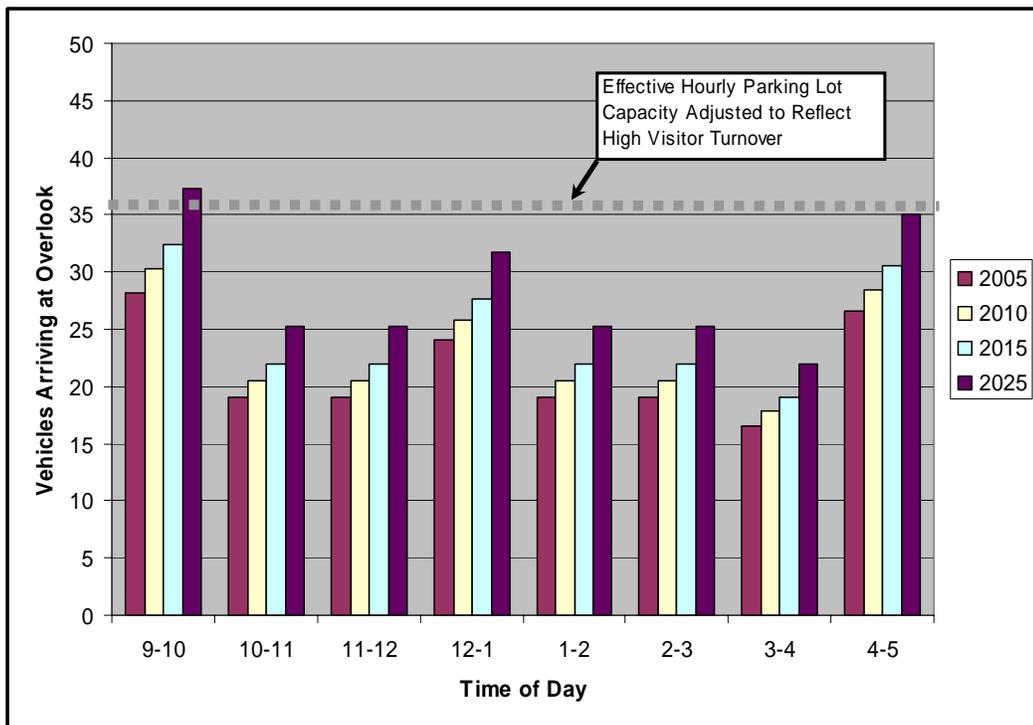
**Figure 6. Projected Demand for Parking at the Point – Off-Peak Season**



**Figure 7. Projected Demand for Overlook Parking – Peak Season**



**Figure 8. Projected Demand for Overlook Parking – Off-Peak Season**



## **Effect of each Conceptual Transportation Alternative on Projected Demand for Parking**

### Alternative 1: No-Build

As mentioned earlier, the No-Build Alternative assumes no improvements to the parking areas, no short-term changes in entry fees (except for inflation), no significant changes to visitor services, and no implementation of a transit shuttle system or other transportation improvements. Onsite parking capacity at the Refuge (Overlook and Point) would remain at the current level, and all vehicles accessing the Refuge would continue to drive through the Kilauea Town community to access the Refuge.

Under this Alternative, by 2010, parking demand at the Point would approach or exceed existing supply much of the day during peak seasons; and by 2015, parking demand would approach or exceed supply even during certain hours of the day in the off-peak season. Under the No-Build Alternative, there is no attempt to mitigate the unmet parking demand. The result would be a cap on growth in visitation to the Refuge, as visitors are forced to wait in their cars at the entrance gate; or, to circulate in the parking area below, waiting for someone to vacate a parking space; or, to just “give up” and leave the Refuge. Such actions result in a “one in, one out” scenario that is very inefficient, and would negatively affect onsite access, mobility, air quality, and the visitor experience.

Under such congested conditions, it is likely that many potential visitors would be discouraged and instead of attempting to visit the Refuge, would decide to leave and either come back at a different time or day, or choose to visit another Kauai attraction instead of KPNWR.<sup>44</sup> Some Island visitors who are determined to experience KPNWR and are forewarned about parking conditions may choose to join a private tour group or come by taxi. The overall result under this Alternative will be that visitation levels under the No-Build scenario are likely to level off sometime between 2010 and 2015, as parking capacity at the Refuge is reached on a daily basis. This Alternative offers no relief to the through traffic generated in the Kilauea community, due to the growing popularity of KPNWR. It may also exacerbate the problem as increasing numbers of potential Refuge visitors are turned away, likely increasing roundtrips to KPNWR overall.

### Alternative 2: Minor Improvements, Transportation Systems Management (TSM) and Transportation Demand Management (TDM)

Alternative 2 would institute potential low cost techniques to mitigate the unmet demand on the parking facilities. This Alternative would involve few or no onsite physical changes to the Refuge. Instead, changes would focus on improving the

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<sup>44</sup> The PASA Visitor Survey indicated that KPNWR visitors made multiple stops on the same day they visited the Refuge; and there is a high likelihood that, due to time constraints, they would be unwilling to wait for a parking space to open up at the Refuge, and would decide to leave for another destination.

effective capacity of the existing parking lots through better management of the parking resource. These changes could include improved visitor information via signage, a Refuge web page and/or ITS applications, hiring a parking attendant, imposing time limits on parking, increased parking fees, congestion pricing and/or encouraging visitation during times-of-day when parking utilization is lower, and other similar management strategies. Information about parking restrictions and “best times to visit” could be posted on the KPNWR web page, and/or included in brochures given out at hotels and other attractions. An attractive/unobtrusive electronic sign (ITS application) on the main road (Kuhio Highway) could inform visitors about the current status of parking (available or full) at the Refuge.

Collectively, these measures would have the effect of distributing visitation demand by encouraging people to visit during times when the Refuge is less busy. This would increase the effective capacity of the existing parking lots and ultimately serve more Refuge visitors, compared to the No-Build Alternative. As there are many different TSM techniques that could be applied, it is difficult to quantify how much more efficient the existing lots could become; but the overall effect would accommodate growth in visitation beyond what would be seen under the No-Build Alternative, although still below the projected demand seen in [Figures 5 and 6](#). In addition, traffic congestion through Kilauea Town would continue to increase as the number of Refuge visitors grows.

### Alternative 3: Moderate Improvements to Increase Capacity

This Alternative would attempt to improve Refuge access and parking supply to meet long-term demand. It would improve or expand Overlook waiting, parking, and viewing areas and allow private shuttle vans and possibly small tour buses to park inside the Refuge boundary at Kilauea Point. The existing parking lot configuration at the Point, including the installation of a shuttle van pick-up/drop-off area, would be improved and expanded. The Refuge entrance road may be widened to better accommodate shuttle vans. Access for bicycles and/or pedestrians may also be improved or provided, given the environmental constraints referenced earlier.

This Alternative is the only one that includes expanding the number of parking spaces at the Point in an attempt to satisfy projected demand. As seen in [Figures 5 and 6](#), demand for parking already exceeds supply at this location at certain times of the day during the peak season, and this demand will continue to grow. Increasing the supply of onsite parking would accommodate anticipated growth in visitation, but would also route additional traffic through Kilauea Town, and could have a negative impact on Refuge resources. Development and construction of shuttle bus loading areas, providing parking for vans, and building sidewalks or bike paths would likely increase the number of people using alternative modes, although the vast majority of visitors would continue to drive into the Refuge.

The number of additional parking spaces provided under this Alternative would depend on physical constraints at the site and decisions about how other modes of access are accommodated, if at all. The overall result of increased parking capacity would be growth in visitation that resembles the projected demand seen in [Figures 5 and 6](#), until the new parking capacity level is reached. To satisfy average peak-hour demand during the peak season in 2010, 10 additional parking spaces (59 total) would be needed, while by 2015, about 14 more spaces would be needed (63 total). That amount of additional parking could be accommodated by converting the grassy overflow area (which currently accommodates about 20 cars) into a parking lot. However, this alternative would necessitate eliminating or altering part of the wildlife habitat in the grassy overflow area. The projected number of total parking spaces needed at KPNWR by 2025, is about 73, or 24 more than currently provided. Provision of that many new spaces would require converting all of the grassy overflow area into permanent parking, plus utilizing an additional area onsite not currently used for parking.

#### Alternative 4: Voluntary Shuttle with Private Vehicle Access

This Alternative would provide a voluntary shuttle service from an offsite “Hub” transit facility that would also offer KPNWR visitor services such as parking, restrooms, entry fee payment, a bookstore, and other resources. For purposes of this Final Report, the potential Hub is assumed to be either at a site on Kuhio Highway or near the Kilauea Post Office<sup>45</sup> ([See Figure 4](#)).

Improvements at the Refuge Overlook and Kilauea Point would be limited to those needed to serve the shuttle service, and possibly provide access for other alternative modes, such as private shuttle vans, pedestrians, and bicycles, if found to be desirable. The Overlook improvements would also attempt to eliminate existing morning congestion at the entrance gate, which often hinders access to the Point. Changes in the existing parking lot(s) on the Point may be needed to accommodate shuttle vehicle waiting/loading zones and improved circulation. Such changes in parking capacity at the Point, and/or the use of “congestion pricing,” where parking costs vary by hour based on the anticipated level of demand, may result in negative spill-over effects at the Overlook, creating increased demand for the limited parking there. An example of what might be needed is shown in [Appendix D, Figures 5-1 through 5-7](#). The amount of parking at the Point may actually need to be reduced to accommodate shuttle boarding and waiting facilities.

As mentioned earlier, Refuge-bound traffic would be directed to the Hub first, where visitors would pay their entry fee, be provided information about the Refuge, and be given the choice of riding the free shuttle with guided narration or

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<sup>45</sup> The Draft Kilauea Town Plan: An Update of the Kilauea Sub-Area Plan (September 2005) indicates that a transit center may be accommodated on a parcel fronting Kuhio Highway. Other potential sites inside Kilauea Town, not adjacent to Kuhio Highway, have been discussed, such as those parcels reserved for “civic” uses, and are noted in the Draft Kilauea Town Plan.

driving to the Refuge. Visitors would be provided with real-time information about the availability of parking, and would be encouraged to ride the shuttle (even if parking is available at the Point). If parking at the Point is not available, visitors would be directed to take the shuttle or to wait until parking becomes available.

As discussed in the Transit section later in this Final Report, it is estimated that 10-20 percent of visitors would choose to use the voluntary shuttle, meaning that 80-90 percent would still continue to drive. The result is that the available parking spaces at the Point would be occupied most of the day during the peak season. Growth in parking demand at the Point would be limited by supply, while overall growth in visitation could be accommodated by the use of alternative modes such as the shuttle. Refuge-bound private vehicle traffic through Kilauea Town would be reduced somewhat, as some visitors would choose to park at the Hub facility and ride the shuttle.

#### Alternative 5: Access by Mandatory Shuttle Only

This Alternative would eliminate public parking inside the Refuge (Kilauea Point), although it would still be allowed at the Overlook. Visitors would be directed to drive to the offsite Hub facility and to ride the shuttle to the Refuge. Signage on Kuhio Highway, in Kilauea Town and at the Refuge, and/or website information and ITS applications would “intercept” potential visitors, informing them to proceed first to the Hub facility. However, because a transfer to a shuttle bus is mandatory, this option would not appeal to some potential visitors. This may be offset by the anticipated provision of interpretive presentations on the shuttle, which serves to encourage visitors to use this mode of access. Other visitors would use private tour vans or taxis, and some may bicycle or walk from Kilauea Town, if facilities to accommodate those modes were made available.<sup>46</sup>

The result of this approach would be that demand for parking would shift from Kilauea Point to the offsite Hub facility and to the Overlook. It is assumed that adequate parking would be provided at the Hub to meet visitor demand well into the future, and at a minimum would address the 2025 planning horizon. If the Hub were located on Kuhio Highway, Refuge visitor traffic (in private vehicles) passing through Kilauea Town would be dramatically reduced as the vast majority of visitors would park at the Hub facility. If the Hub were located near the Kilauea Post Office, visitors would continue to drive through part of Kilauea Town unless a bypass road was built.<sup>47</sup>

So that the Overlook is not overwhelmed with visitors parking there and then attempting to walk directly into the Point (which is not currently permitted),

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<sup>46</sup> One consideration for pedestrian access is that some people may try to park at the Overlook and walk to the Point, if such access were allowed. Visitors may effectively be able to avoid the fee booth, if fees are collected only at the Hub, and not at the Point. Therefore, operational and management considerations may make providing pedestrian access undesirable.

<sup>47</sup> A potential future by-pass road is being explored by others, and has been identified in the Kilauea Town Plan.

pedestrian access controls must be instituted. Also, a parking management program establishing parking time limits or parking fees at the Overlook should be considered<sup>48</sup>.

The growth in parking demand under Alternative 5 would be less than the projected demand data shown in [Figures 5 and 6](#), reflecting a somewhat reduced demand due to the mandatory inter-modal transfer at the Hub, and the higher entry fee that would likely be required of all Refuge visitors to pay for the shuttle service whether or not they use transit to access the Refuge. However, as long as there is adequate parking at the Hub, growth in visitation to KPNWR could be accommodated under this Alternative. Onsite management of this Alternative is also expected to be easier and more cost effective than Alternative 4, especially if pedestrian access is not allowed into the Point.

### Overlook Parking

A potential issue under all of the transportation alternatives considered is the policy of unrestricted free parking at the Overlook, while simultaneously managing or restricting parking at the Point. As seen in [Figures 7 and 8](#), parking congestion at the Point will become a larger problem over time. If the entry fee charged to all visitors is increased to pay for transit options, some visitors may try to park at the Overlook or along Kilauea Road and then walk into the Refuge. Private tour operators may also attempt to “cheat the system” by dropping off passengers at the Refuge gate, passively or actively encouraging them to access the Refuge on foot. This situation could result in traffic and/or safety problems that would need to be addressed by management policies and/or physical barriers. As stated earlier, the issue of Overlook parking and management policies should be examined in more detail during the next phase of the study.



**Photo 7. Visitors at the KPNWR Overlook (view from Kilauea Road)**

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<sup>48</sup> Another concern was that visitors to the Overlook would attempt to board a shuttle bus into the Refuge (beyond the entrance gate). The ATS Study Team decided that any potential shuttle service that stops at the Overlook should only do so only after stopping at the Point.

## Estimating Transit Demand

The purpose of this section is to discuss the feasibility of operating various transit-based services for providing access to the Refuge, and to estimate the potential demand for, as well as the cost and feasibility of such services. Given the projected rise in visitor and parking demands at KPNWR, as outlined in the previous sections, KPNWR may need to pursue a long-term access strategy that offers an alternative to providing more parking at the Refuge.

Several factors and considerations contributed to this analysis to estimate transit demand at KPNWR. The first part of this section describes such background information considered in the development of the estimation methodology, namely the following factors: transit experience at similar facilities; the impact of increased entry fees; methods that would encourage transit ridership at KPNWR; and peak season versus year-round transit service. The latter part of this section then describes the methods and results of estimating transit demand for Alternatives 4 and 5.

### Considerations for Estimating Transit Demand

#### Transit Experience in the National Park System

There are a variety of studies addressing transit experience in the national parks, such as those available via the National Park Service website.<sup>49</sup> This literature was consulted to identify situations that could serve as lessons for KPNWR.

At Acadia National Park in Maine, 200,000 visitors (8.3% out of 2.4 million per year) use transit<sup>50</sup>. Other national parks that are phasing out the use of private vehicles and have either created or are in the process of creating vehicle-restriction areas (such as Zion, Yosemite, and Denali National Parks) have experienced a significant increase in shuttle usage.<sup>51</sup>

Bryce Canyon NP operates a free shuttle service, funded via allocations from entry fees paid by all visitors (excluding those that have park passes), and also allows private vehicles to enter the national park. There are two locations outside the Park where visitors can park and ride the shuttle bus, and visitors can also catch the shuttle from a number of locations within the Park. Either way, the

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<sup>49</sup> National Park Service website, Alternative Transportation Program, <<http://www.nps.gov/transportation/alt/mp.htm>>.

<sup>50</sup> Wilkinson, Todd. "Buses and Trains Amid Towering Cliffs: At More Parks, Visitors Leave the Car Behind." Christian Science Monitor, May 2001.

<sup>51</sup> There are differences in the shuttle systems operating in national parks, as compared to the transit alternatives being considered for KPNWR. Zion NP, for example, has a shuttle that leaves from a location inside the park; and also has a separate shuttle from Springdale into the park, where visitors can transfer to the internal circulating shuttle. Bryce Canyon NP has a shuttle that originates outside the park, and then circulates internally. KPNWR's potential transit system would use shuttles originating outside the Refuge and dropping people off at one central location within the Refuge; no additional transportation is needed for internal circulation.

cost to enter Bryce Canyon NP is \$20 per carload of people (or \$10 for visitors traveling alone). Use of the shuttle bus is voluntary and is provided to ease parking lot overcrowding, internal congestion, and air quality impacts, and to improve the visitor experience. Buses loop through the Park and make multiple, scheduled stops every 12 minutes. The shuttle system operates only during the peak summer months, Memorial Day through Labor Day. According to a Bryce Canyon NP official (Dan Cloud, June 2005 phone conversation), shuttle buses carry approximately 20-30 percent of the visitors to Bryce during the peak summer season.

It is worth noting that parks such as Bryce have also had some difficulties implementing financially successful shuttle systems. According to the Alternative Transportation System Action Plan – Bryce Canyon National Park (NPS, 2004), the Bryce Canyon ATS program achieved its operational goals extremely well, although it was a dramatic financial failure.<sup>52</sup> Bryce Canyon's financial woes are due in part to poor contract planning and negotiation, combined with a downturn in visitation following the terrorist attacks of September 11, 2001, but it is worth noting the risks associated with implementing an ATS system. Relevant transit recommendations from the Bryce Canyon experience include: be conservative with financial forecasts, limit contracts to short terms, and solicit for a staging area at no-cost if possible.



**Photo 8: Bryce Canyon Shuttle (NPS/Alice Wondrak Biel)**

<sup>52</sup> National Park Service, Alternative Transportation System Action Plan, Bryce Canyon National Park, 2004. p. 2.

### Impact of Increased Entry Fee on Visitation (to pay for Transit)

One method to underwrite the cost of operating a shuttle service at KPNWR would be to increase the Refuge entry fee for all visitors. Therefore, the impact on total visitation of increased entry fees was examined.

As part of the PASA Completion Report (See Visitor Frequencies Summary, [Table 20.](#)), surveys were conducted to investigate Refuge visitors' preferences and likelihood of visiting KPNWR under a variety of conditions. The current KPNWR entry fee of \$3 is charged to all visitors over the age of 16 who do not have a pass such as Golden Eagle, etc. The surveys indicated that 85% of KPNWR visitors would be willing to pay a \$5.00 entry fee, and about 50% would be willing to pay up to \$12.00.<sup>53</sup> Those surveyed also indicated there was value associated with a shuttle service that included an informational guide. When asked about their probability of visiting the Refuge under a variety of conditions, the mean (average) willingness-to-pay for a shuttle bus that included guided narration and the Refuge entry fee was an average of \$3.75 higher than the willingness-to-pay the entry fee alone (\$15.75 compared to \$12.00).<sup>54</sup>

The PASA survey results indicate that implementing a modest increase in entry fees while offering a "free" shuttle service with guided narration, may actually be more attractive to visitors than the current situation requiring a \$3 entry fee without the shuttle. Some people would choose not to visit the Refuge because of the increased entry fee, while others would be attracted to the idea of a transit ride with guided narration. Thus, while it is difficult to predict human behavior, a shuttle service with guided narration appears to be an attractive feature to potential Refuge visitors, possibly even offsetting the deterrent of a modest entry fee increase.

Therefore, when estimating the transit demand under Alternatives 4 and 5, it is assumed that no reduction in visitation would occur with a modest rise in entry fees (to \$5), as long as a shuttle service with guided narration is provided as an option. If the entry fee were raised above \$5, the PASA survey results indicate that visitation would begin to drop. For the purposes of this Final Report, it is estimated that going from a \$5 to a \$6 entry fee would result in a 5 percent visitation reduction, while raising the entry fee to \$7 would reduce demand by 10 percent, and so on. To see the assumed effect of increased entry fees on KPNWR visitation, please see [Appendix F](#).

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<sup>53</sup> Sexton, N.R., S.C. Gillette, L. Koontz, S.C. Stewart, J. Loomis, and K. Wundrock, 2005, Visitor and Community Survey Results for Kilauea Point National Wildlife Refuge and Lighthouse: Completion Report, U.S. Geological Survey, Biological Resources Discipline, Open-File Report 2005-1420, January 2006, Appendix page E-1.

<sup>54</sup> *Ibid.*, page 4-7.

## Methods to Encourage Transit Ridership at KPNWR

The number of potential visitors who would voluntarily use a shuttle to access the Refuge depends on many factors. These factors include: general public awareness of the service; ease of access from Kuhio Highway to the offsite transit Hub/parking area; services and amenities provided at the Hub (such as a bookstore); presence of on-board interpretive narration; shuttle cost (if not included in the entry fee); and the likelihood of not finding a parking space at the Refuge, among others.

Methods to encourage transit ridership at KPNWR include using directional road signs and a website and/or ITS “real time” information applications to direct all Refuge visitors to stop at the offsite Hub facility first. At the Hub, visitors would pay the entry fee, receive information about the Refuge, perhaps visit the bookstore and/or restroom, and then decide whether to board the shuttle bus or drive to the Point (Alternative 4 only). General information about parking and directions to the Hub should be provided on the KPNWR web page, and real-time information may also be made available online. When paying the entry fee, visitors would be informed about the free shuttle bus and the informational narration that will take place on board. Those riding the shuttle would show their entry fee receipt as they board. If permitted, as under Alternative 4, those who choose to drive into the Refuge could be asked to display their entry fee receipt on the dashboard of their car as proof of payment, insert a “pre-paid” card into a reader at the entrance gate, or give a parking token to the gate attendant.

Further incentive to ride the shuttle bus could be mandated. For example, paying the entry fee at the Point may not be an option. Under this scenario, those driving to the Refuge entry gate without a fee receipt would not be permitted access into KPNWR, and would be directed back to the offsite transit Hub facility to pay the entry fee first. However, a drawback of not providing ticket vending services at the entrance gate or on the Point is that visitors would be forced to turn back, and may either proceed to the Hub, or may opt not to visit KPNWR at that time, either of which would generate negative impacts such as increased local vehicle trips, congestion/mobility, safety and air quality issues, reduced efficiencies and public satisfaction, and a reduction in the quality of the visitor experience.

## Peak Season vs. Year-Round Transit Service

In locations such as Bryce Canyon NP and Acadia NP, there are distinct peak seasons with very high demand during summer and very low demand in winter. As a result, shuttle bus service runs only during the peak, summer months.

As shown in the Visitor Projection Report, at KPNWR the visitation difference between the peak winter-spring-summer season, and the off-peak fall season is relatively modest—about 17 percent. While it may be found that certain times of the year, the week, or even the day will have fluctuations in demand for transit

shuttle service, it does not appear from analyzing visitor projections for KPNWR that such fluctuations are explicitly seasonal, or particularly pronounced. Therefore, for purposes of this Final Report, it is assumed that a transit shuttle service would run year-round at KPNWR.

### **Estimating Transit Demand at KPNWR**

As described previously, Alternatives 4 and 5 would involve operating a shuttle from an offsite parking area/transit Hub. In Alternative 4, the shuttle service is voluntary and public parking would still be allowed within the Refuge. Under Alternative 5, use of the KPNWR shuttle service (provided by FWS, other public or private entity) is mandatory, and parking would not be allowed at Kilauea Point (parking still permitted at the Overlook).

As mentioned, Acadia NP (where 8 percent of the visitors use transit) and Bryce Canyon NP (where 20-30 percent use transit) are examples of what other federal lands are experiencing in terms of transit ridership during peak seasons. It should be noted that both of these parks are “destinations,” that visitors usually travel a long distance to visit and at which they are likely to spend at least one entire day. By contrast, KPNWR is smaller and easily accessible, and is just one of many possible destinations in a given day for visitors to Kauai.

The inconvenience of parking in an offsite lot and taking a shuttle may proportionately deter more people at KPNWR than at Acadia and Bryce. Conversely, Refuge visitors surveyed by PASA researchers indicated that there was value associated with a shuttle that included guided narration; and that they would be willing to pay more for such a service. Therefore, the following discussion assumes that interpretive services would be an integral part of the Refuge transit system.

The following transit demand projections for Alternatives 4 and 5 rely on the experience of national parks, as explained above<sup>55</sup>, results of the PASA visitor/resident surveys, and on the KPNWR visitation forecasts outlined in the first section of this Final Report.

#### Alternative 4: Voluntary Shuttle with Private Vehicle Access

Transit demand under Alternative 4 will ultimately depend on many factors, such as the ability to raise public awareness directing them to the “intercept” Hub facility before driving directly to the Refuge; convenience, attractiveness and services offered at the offsite Hub; the cost of entry to the Refuge (including the shuttle); the presence of a knowledgeable guide on the shuttle; and the likelihood of available parking at the Refuge. Based on the PASA survey results and other factors and assumptions described previously, it is estimated that an optional (voluntary) shuttle service to KPNWR from an offsite Hub facility would likely be

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<sup>55</sup> No similar transit experience is available for analysis from other FWS facilities.

used by approximately 10 to 20 percent of visitors to KPNWR (who would otherwise drive to the Refuge).

During the peak season, parking at the Point is more likely to be full, and therefore shuttle ridership would likely be higher (closer to 20 percent). During the off-peak season (fall), ridership would likely be lower (closer to 10 percent) due to the increased likelihood of available parking within the Refuge.

The following basic assumptions were made about Alternative 4 when estimating transit ridership.

- An offsite Hub facility would be developed in a convenient location on Kuhio Highway or near the Post Office in Kilauea Town; providing ample parking and a variety of services and amenities that Refuge visitors would find attractive.
- All potential visitors would be directed to the Hub facility first, where they would receive information about the Refuge (including real-time parking availability), pay the entry fee, and be given the opportunity to ride the free shuttle with guided narration.
- The Refuge entry fee would be increased to offset the cost of operating the shuttle system. This alternative assumes the same entry fee would be charged to all visitors, regardless of whether they take the shuttle or drive.
- A higher entry fee would deter some potential visitors, while the shuttle with guided narration would attract other visitors who may not have visited KPNWR without the shuttle/narration service, resulting in no net change in total visitors anticipated (at the \$5 entry fee level).
- Approximately 10-20 percent of visitors would choose to use the “free,” voluntary shuttle service with guided narration; with a higher percentage of visitors using transit during the peak season and fewer during the off-peak season<sup>56</sup>.
- Depending on the location of the transit Hub, the remaining 80-90% of visitors who choose to drive to the Refuge, rather than using the shuttle, would drive through Kilauea Town, resulting in continued traffic impacts.<sup>57</sup>

Transit demand projections were calculated by multiplying the mid-range person demand (shown in [Table 2](#)) by 10, 15, and 20 percent (transit mode splits) to represent the range of possible ridership scenarios. The results are shown in [Table 7](#) for the peak season (winter-spring-summer) and in [Table 8](#) for the off-peak season (fall).

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<sup>56</sup> Visitors would be supplied with real-time information, at the Hub, about the current availability of parking at the Point. It is assumed more people would choose to use the shuttle when parking at the Point is scarce.

<sup>57</sup> Real-time Refuge parking information, provided to visitors at the Hub or en route via ITS applications, may moderate or distribute such impacts.

**Table 7. KPNWR Transit Demand Forecasts (Daily, Peak Season)<sup>58</sup>  
Alternative 4 – Voluntary Shuttle Plus Vehicle Parking at the Point  
(in number of shuttle bus riders)**

Year	10% Transit Ridership Scenario	15% Transit Ridership Scenario	20% Transit Ridership Scenario
2010 (5-year)	70	105	140
2015 (10-year)	75	113	150
2025 (20-year)	86	129	173

**Table 8. KPNWR Transit Demand Forecasts (Daily, Off- Peak Season)  
Alternative 4 – Voluntary Shuttle Plus Vehicle Parking at the Point  
(in number of shuttle bus riders)**

Year	10% Transit Ridership Scenario	15% Transit Ridership Scenario	20% Transit Ridership Scenario
2010 (5-year)	58	87	116
2015 (10-year)	62	93	125
2025 (20-year)	72	107	143

An estimate of annual ridership for Alternative 4 is shown in [Table 9](#) below, and was calculated by applying the 10, 15, and 20 percent mode splits to the mid-range annual visitation rates shown in [Table 1](#).

**Table 9. KPNWR Transit Demand Forecasts (Annual)  
Alternative 4 – Voluntary Shuttle Plus Vehicle Parking at the Point  
(in number of shuttle bus riders)**

Year	10% Transit Ridership Scenario	15% Transit Ridership Scenario	20% Transit Ridership Scenario
2010 (5-year)	23,050	34,575	46,100
2015 (10-year)	24,710	37,065	49,420
2025 (20-year)	28,390	42,585	56,780

<sup>58</sup> Assumes \$5 entry fee (includes shuttle to Refuge or parking at Refuge). Visitation and therefore ridership would be slightly lower at higher entry fee levels.

It should be noted that under Alternative 4, traffic and safety issues on the Refuge entrance road would need to be examined in more detail. If two-way vehicle traffic was simultaneously allowed by both shuttle buses and private vehicles, the entrance road may need to be widened. Alternatively, an ITS solution may be developed that would facilitate alternating one-way traffic. This issue should be examined in more detail during the next phase of the study.

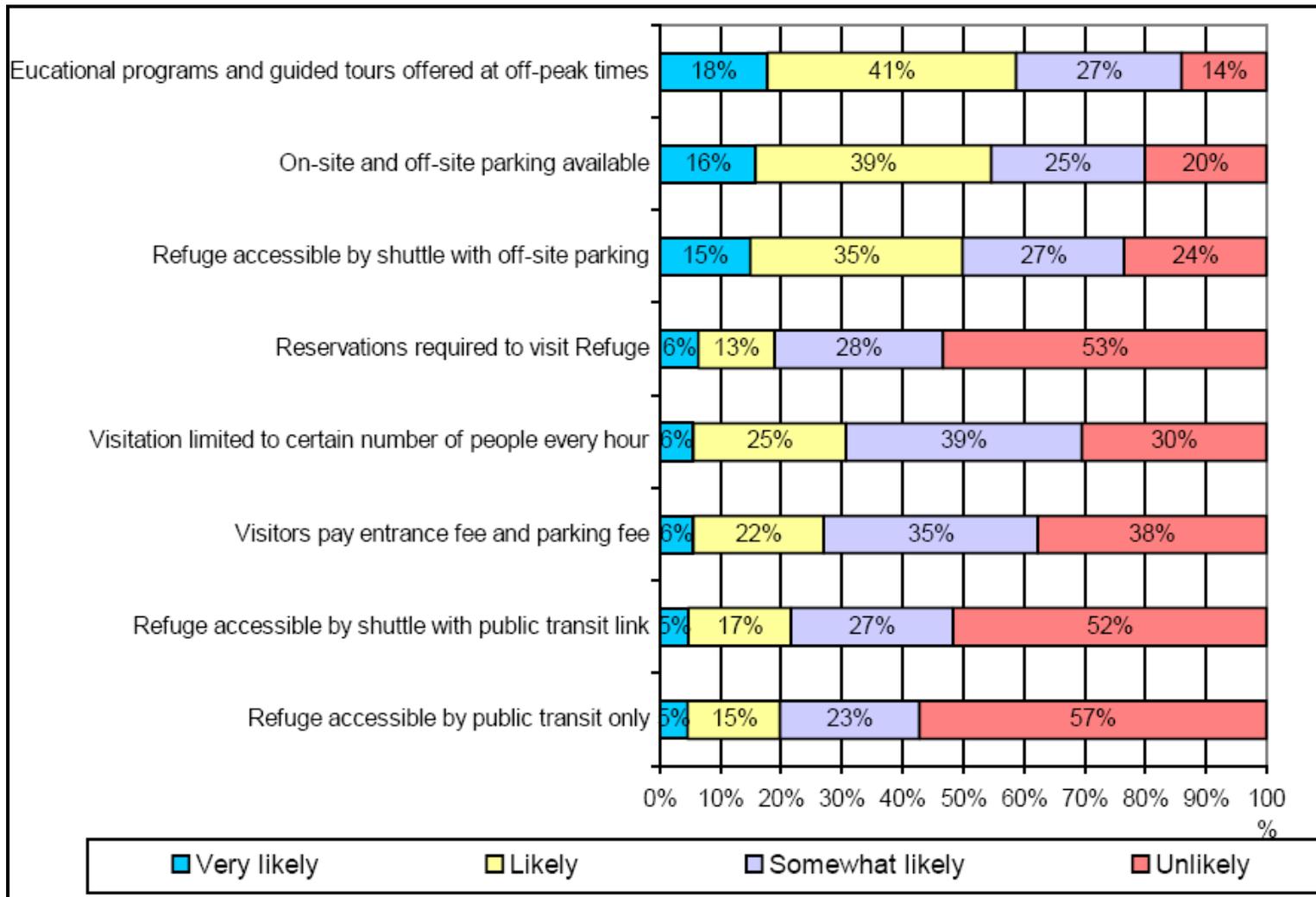
#### Alternative 5: Access by Mandatory Shuttle Only

This Alternative would limit access to the Refuge to permitted vehicles only, including shuttle vehicles and other official vehicles. Based on the public response to PASA survey questions shown in [Figure 9](#) below (third item), it can be estimated how many potential visitors would choose not to visit KPNWR, if use of a shuttle service were required. PASA investigators suggested that the number of people who would decide not to visit because of the transit-only access entry option would be similar to the “unlikely to return” response rate of 24% (PASA staff, August 2005 phone conversation). Given the potential added time and inconvenience associated with using a shuttle, a reduction in demand by this amount seems reasonable. However, as previously explained, it is assumed that visitors are somewhat more likely to visit the Refuge if provided with onboard guided narration. Thus, the actual reduction from the obligatory transit ride would be less than 24%. In order to calculate transit demand under this Alternative, it was estimated that implementing a mandatory shuttle bus system that includes guided narration would reduce overall visitation by 15%, with an entry fee of \$5. As mentioned earlier, raising the entry fee above \$5 would begin to have an impact on visitation. Since prices above \$5 are likely needed to pay for a transit system, ridership projections were made for entry fee levels ranging from \$5 to \$11.

The following assumptions were made to estimate transit ridership under Alternative 5:

- An offsite Hub facility would be in a convenient location with ample parking and a variety of attractive Refuge visitor services and amenities.
- Visitors would be directed to the offsite Hub facility first, where they would receive information about the Refuge, pay the entry fee, and be directed to ride the free shuttle service with guided narration.
- The entry fee would be increased to offset the cost of operating the shuttle system and would be the same for all visitors.
- Mandatory use of a shuttle service (with no public parking at the Point) would result in approximately 15% fewer total visitors, as described above.
- Raising the entry fee above \$5 would also begin to negatively affect visitation. Therefore, ridership projections were generated for entry fees of \$6, \$7, \$8, \$9, \$10, and \$11, as well as \$5.

**Figure 9. Likelihood of Visiting KPNWR versus Management Decisions**



Source: USGS-PASA, May 2005.

Transit demand projections for Alternative 5 were calculated based on the assumptions above, by taking the visitor projections in [Table 1](#), and reducing the numbers by 15% to account for the negative reaction by some to mandatory use of a shuttle. Further reductions were made to account for possible increases in entry fees at the following rates (above \$5): a \$6 entry fee would reduce visitation by 5 percent, a \$7 entry would reduce visitation by 10 percent, an \$8 entry fee would reduce visitation by 15 percent when compared to the \$5 entry fee, etc. These rates were developed based on results of PASA visitor and resident surveys that predicted how much people would be willing to pay for entry fees that included the shuttle and guided narration. See [Appendix E](#) for details.

The resulting ridership projections are shown in [Table 10](#) for the peak season (winter-spring-summer) and in [Table 11](#) for the off-peak season (fall). Annual ridership projections for Alternative 5 are shown in [Table 12](#).

**Table 10. KPNWR Transit Demand Forecasts (Daily, Peak Season)  
Alternative 5 - Access by Shuttle Only  
(number of transit shuttle riders)**

	<b>Low Growth Rate</b>	<b>Mid-Range Growth Rate</b>	<b>High Growth Rate</b>
	<b>\$5 Entry Fee</b>		
2010 (5-year)	584	595	619
2015 (10-year)	614	638	691
2025 (20-year)	678	734	858
	<b>\$6 Entry Fee</b>		
2010 (5-year)	560	572	595
2015 (10-year)	589	613	663
2025 (20-year)	651	704	824
	<b>\$7 Entry Fee</b>		
2010 (5-year)	537	548	570
2015 (10-year)	564	587	635
2025 (20-year)	596	675	790
	<b>\$8 Entry Fee</b>		
2010 (5-year)	514	524	545
2015 (10-year)	540	562	608
2025 (20-year)	596	646	755
	<b>\$9 Entry Fee</b>		
2010 (5-year)	490	500	520
2015 (10-year)	515	536	580
2025 (20-year)	569	616	721
	<b>\$10 Entry Fee</b>		
2010 (5-year)	467	476	495
2015 (10-year)	491	511	552
2025 (20-year)	542	587	687
	<b>\$11 Entry Fee</b>		
2010 (5-year)	444	453	471
2015 (10-year)	466	485	525
2025 (20-year)	515	557	652

**Table 11. KPNWR Transit Demand Forecasts (Daily, Off- Peak Season)  
Alternative 5 - Access by Shuttle Only  
(number of transit shuttle riders)**

	<b>Low Growth Rate</b>	<b>Mid-Range Growth Rate</b>	<b>High Growth Rate</b>
<b>Year</b>	<b>\$5 Entry Fee</b>		
2010 (5-year)	487	497	517
2015 (10-year)	512	532	576
2025 (20-year)	565	612	716
	<b>\$6 Entry Fee</b>		
2010 (5-year)	467	477	496
2015 (10-year)	491	511	553
2025 (20-year)	543	587	687
	<b>\$7 Entry Fee</b>		
2010 (5-year)	448	457	475
2015 (10-year)	471	490	530
2025 (20-year)	520	563	659
	<b>\$8 Entry Fee</b>		
2010 (5-year)	428	437	455
2015 (10-year)	450	468	507
2025 (20-year)	497	538	630
	<b>\$9 Entry Fee</b>		
2010 (5-year)	409	417	434
2015 (10-year)	430	447	484
2025 (20-year)	475	514	601
	<b>\$10 Entry Fee</b>		
2010 (5-year)	390	397	413
2015 (10-year)	409	426	461
2025 (20-year)	452	489	573
	<b>\$11 Entry Fee</b>		
2010 (5-year)	370	377	393
2015 (10-year)	389	405	438
2025 (20-year)	430	465	544

**Table 12. KPNWR Transit Demand Forecasts (Annual)  
Alternative 5 - Access by Shuttle Only  
(number of transit shuttle riders)**

	<b>Low Growth Rate</b>	<b>Mid-Range Growth Rate</b>	<b>High Growth Rate</b>
<b>Year</b>	<b>\$5 Entry Fee</b>		
2010 (5-year)	192,000	196,000	204,000
2015 (10-year)	202,000	210,000	228,000
2025 (20-year)	223,000	241,000	282,000
	<b>\$6 Entry Fee</b>		
2010 (5-year)	184,000	188,000	196,000
2015 (10-year)	194,000	202,000	218,000
2025 (20-year)	214,000	232,000	271,000
	<b>\$7 Entry Fee</b>		
2010 (5-year)	177,000	180,000	187,000
2015 (10-year)	180,000	193,000	209,000
2025 (20-year)	205,000	222,000	260,000
	<b>\$8 Entry Fee</b>		
2010 (5-year)	169,000	172,000	179,000
2015 (10-year)	178,000	185,000	200,000
2025 (20-year)	196,000	212,000	249,000
	<b>\$9 Entry Fee</b>		
2010 (5-year)	161,000	165,000	171,000
2015 (10-year)	170,000	176,000	191,000
2025 (20-year)	187,000	203,000	237,000
	<b>\$10 Entry Fee</b>		
2010 (5-year)	154,000	157,000	163,000
2015 (10-year)	161,000	168,000	182,000
2025 (20-year)	178,000	193,000	226,000
	<b>\$11 Entry Fee</b>		
2010 (5-year)	146,000	149,000	155,000
2015 (10-year)	153,000	160,000	173,000
2025 (20-year)	169,000	183,000	215,000

## Transit Service Operating Cost Estimates

Transit shuttle service for KPNWR could be provided using various types of vehicles, providing different levels of customer service at widely varying costs (See Alternatives 4 and 5.). Vehicles types could include bus, tram, historic-replica trolley, van, or other types yet to be determined. Various propulsion systems have been discussed, including hybrid diesel-electric, hybrid gas-electric, and so on. The decision for what size and type of vehicle is best-suited for KPNWR will be examined in later phases of this Study.

For the purpose of this current analysis, preliminary cost estimates were made for operating a transit shuttle service at KPNWR by examining two basic options, described below.

- Shuttle Bus Operation by KPNWR, with capital costs paid by others. This became known as the Low Cost Estimate.
- Contract Shuttle Bus Service with a Private Company. This became known as the High Cost Estimate.

### Transit Operation by KPNWR (Low Cost Estimate)

This option would require KPNWR to purchase or lease the necessary number of vehicles to facilitate transit service from a potential Hub location to the Refuge. Based on discussions with CFLHD, and FWS, it may be possible to receive discretionary grants for the capital costs associated with a shuttle system. These costs, paid by others, could include purchasing the vehicles, land and related infrastructure development costs for a Hub facility, building a maintenance facility, ticket booth and associated visitor services at the Hub, and installing intelligent transportation systems (ITS) such as real-time variable message boards.

For this estimate, the capital costs described above were specifically excluded from the cost estimates. It was assumed that maintenance, fuel, driver, and other operating costs would be the responsibility of KPNWR, and would need to be covered by increased Refuge entry fees (above the current \$3), a portion of which would be dedicated to transit operation costs (for Alternatives 4 and 5). [Table 13](#) below provides a sample cost estimate for operating a standard 25-passenger shuttle bus in 2005 dollars.<sup>59</sup>

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<sup>59</sup> Based on a phone conversation with Transit Sales International, 12-October-2005.

**Table 13. Sample Operating Costs per Bus – Owned and Operated by KPNWR (Low Cost Estimate)**

<b>Input</b>	<b>Cost</b>	<b>Annual Cost (rounded)</b>	<b>Notes</b>
Fuel	\$1 per mile	\$26,400	Calculation based on: \$3 per gallon, 3 mpg, and 75 miles per day.
Vehicle Maintenance and Storage	\$.50 per mile	\$13,200	Includes maintenance (but NOT construction) of a facility to store and conduct minor maintenance on vehicles. <sup>60</sup>
Driver	\$170 per day	\$60,000	Includes benefits and overhead.
Administration	\$20,000 per year	\$20,000	-
ITS, Information and Signage	\$3,500 per year	\$3,500	Includes signage and ITS operating costs only. (ITS capital costs are assumed to be provided by others.)
<b>SUB TOTAL</b>		<b>\$123,600</b>	-
30% Contingency		\$37,000	-
<b>GRAND TOTAL</b>		<b>\$160,100</b>	-

Using these cost estimates, plus adding a contingency of 30%, results in a per-bus operating cost of about \$160,000 per year, or about \$450 per day.<sup>61</sup>

A mid-sized, 25-passenger bus was selected as the prototype vehicle for this analysis, because it provides a balance of size and needed passenger capacity, while minimizing the need for onsite physical modifications at the Refuge to accommodate bus access, when compared to larger buses.

It should be noted that under Alternative 4, two-way vehicle traffic on the Refuge entry road is assumed to be allowed for simultaneous use by shuttle buses and official and private vehicles. To accommodate these uses, a signalization system (ITS application) may need to be implemented to reverse and control the flow of traffic, limiting flow to one direction at a time and promoting safer ingress/egress. Under Alternative 5, when buses can be scheduled to avoid simultaneous two-way use of the entrance road, these measures are less critical. In both Alternatives, it is assumed that emergency and other official vehicles would have a means to manually control (override) the signalization system and/or communicate with the shuttle drivers as needed.

<sup>60</sup> Major and regular maintenance is included in the cost figures, but is assumed to be conducted by others in a different location (e.g., gas station, etc.).

<sup>61</sup> Based on 352 days of service per year.

It may be advantageous to use other types/sizes and/or a mix of vehicles to better serve the projected demand and unique physical and cultural setting at KPNWR. For example, it would be possible to use 14-passenger vans (or similar sized vehicles) to serve the projected transit demand under Alternative 4. Use of such smaller vehicles would not require changes to the access road and would also be less expensive to operate, on both an individual and system basis, for this alternative. As well, there could be interest by FWS in using other types of vehicles, such as an historic-replica trolley bus, an alternative-fuel vehicle, open air tram, etc. This could involve extra costs or cost savings, depending on the type and size of vehicle used. The Transit Feasibility Matrices (Tables 15-17) compare different size vehicles for key performance and cost metrics. These and other options could be examined in more detail during the next phase of the study.

#### Contracted Transit Service (High Cost Estimate)

Based on quotes provided by Polynesian Adventure Tours (Appendix F), it is estimated that transit/shuttle bus service could be provided through a private company for about \$125 per hour<sup>62</sup>. That estimate amounts to an eight-hour daily operating cost of approximately \$1,000 per day<sup>63</sup>, while the yearly cost would be about \$360,000 per year, per bus. This amount was used as the high cost estimate.

#### Transit Operating Cost Estimates Summary

A cost estimate comparison between two transit options is shown in Table 14 below. There is a wide range between the low cost estimate and high cost estimate. The low cost estimate assumes government operation of the transit system and availability of federal or other funding for initial capital costs (purchase of vehicles, construction of a Hub maintenance facility and appurtenances). The high cost estimate is based on current commercial rates provided by Polynesian Adventure Tours (See Appendix F.).

Based on preliminary estimates described above, it would cost about \$320,000 to \$720,000 per year to operate a two-vehicle shuttle bus transit system (25passenger vehicles) for KPNWR, and about \$640,000 to \$1.4 million for a four-bus system (25-passenger vehicles) per year.<sup>64</sup> It appears to be less expensive for FWS to buy vehicles and assume the cost of operation and

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<sup>62</sup> According to Polynesian Adventure Tours, \$113.50 was the quote for the bus and driver on Kauai. An additional \$11.50 per hour is assumed for administrative costs, ITS operations, signage, and contingency. Note that Polynesian Adventure Tours indicated the corresponding cost on Oahu would be roughly \$92.50 per hour, which is similar to operating cost for the public transit system in Honolulu (TheBus) which is roughly \$98 per hour.

<sup>63</sup> Although KPNWR is open only 6 hours per day, cost estimates include vehicle prep and travel time to and from the Refuge, which would be charged by a private company.

<sup>64</sup> Costs were derived by extrapolating from the cost of operating one bus. No economy of scale was factored into the cost for the bus system operation. However, some savings may accrue for operation of multiple buses, such as savings in administrative costs.

maintenance of a shuttle system, than contracting with a private company to provide a shuttle service to the Overlook and Refuge. However, there may be other benefits from using contracted services. For example, there would likely be cost savings due to reduced transit service coordination and management time required by Refuge staff. Contracting transit service may also minimize the risks and liability to FWS, by not having to operate the transit system directly. Such factors will require management and policy decisions for FWS to consider when comparing the costs of both options. A more refined cost estimate should be developed during the next phase of the study.

**Table 14. KPNWR Shuttle Bus System Cost Estimates (2005 Dollars)**

Number of Buses	Daily Passenger Capacity (25-passenger bus)	Hourly Capacity	Headway between Buses (minutes)	Annual Estimated Operating Cost	
				Low Cost Estimate <sup>1</sup>	High Cost Estimate <sup>2</sup>
2	450	75	20	\$320,000	\$720,000
3	675	113	13	\$480,000	\$1,080,000
4	900	150	10	\$640,000	\$1,440,000

Notes:

1. Estimated cost of government operating vehicles. Assumes capital costs are covered by others.
2. Estimated cost of contracting bus service with a private company.

## **Feasibility of Conceptual Transportation Alternatives at KPNWR**

A cursory examination of financial feasibility of the five conceptual transportation alternatives was conducted as part of this ATS Study effort.

### Alternative 1: No-Build

The No-Build Alternative assumes a continuation of the policies and conditions currently in place at KPNWR. No fiscal investments in transportation services or infrastructure, on- or offsite are anticipated with this alternative, beyond routine maintenance of existing facilities. On-going costs associated with this No-Build Alternative include diversion of staff resources to deal with increasing traffic congestion and visitor safety issues, reduced visitor satisfaction due to parking shortages, reduced community satisfaction due to increased traffic through town.

From a financial perspective, this alternative is feasible as the costs listed above are generally absorbable within the current management structure, or are paid by others (community residents, visitors). Entry fees may need to be raised to keep up with inflation, but not likely as a result of this alternative.

### Alternative 2: Minor Improvements, Transportation Systems Management (TSM) and Transportation Demand Management (TDM)

This Alternative would require a capital investment in physical infrastructure to improve the efficiency of the current parking supply, and to implement operational strategies to help manage visitor demand. Possible strategies include re-striping paved areas, and/or marking non-paved parking areas to promote efficient parking patterns; providing variable message signs (using ITS technology) to indicate "real-time" parking availability; regular updates to the FWS/KPNWR web page, implementing parking charges (meters) or time limits, and others. Each of these strategies would require an investment of staff and money, and could be implemented all at once or, more likely, phased over time. Some strategies, such as parking meters, could actually generate revenue for the Refuge, depending on rates.

Given the wide variety of potential strategies that fall into this alternative, it is not possible to determine exact cost. However, most of these strategies could be implemented for a relatively modest investment, and a small increase in the entry fee would likely cover the cost. In addition, the increased efficiency and effective capacity this would add to the Refuge could provide cost savings by allowing staff to focus on matters other than parking control and access management. Therefore, it is reasonable to say this alternative is financially feasible.

### Alternative 3: Moderate Improvements to Increase Capacity

This alternative would involve the construction of additional parking spaces, possibly including the paving of currently unpaved areas, and widening the entry road to accommodate more and/or larger vehicles, in addition to possible strategies identified in the previous alternative. General cost estimates for these types of improvements are shown in [Appendix C](#). A modest increase in the entry fee may be required to pay for the improvements, but based on PASA research (visitor and resident surveys), this would have only a minor impact on visitation. It is likely that the incremental increase in visitation these physical improvements would facilitate, combined with the relatively moderate cost of the improvements (paving and striping), indicates that this alternative is financially feasible<sup>65</sup>.

### Alternative 4: Voluntary Shuttle with Private Vehicle Access

Generally, fiscal feasibility of the transit alternatives is established by comparing estimated costs of operating a shuttle system with estimated revenue at various Refuge entry fee levels. That is, to be feasible, revenue must cover the costs of a system designed to meet the estimated ridership. Transit feasibility matrices comparing a list of options, including costs, ridership projections, and resulting feasibility for 2010, 2015, and 2025 are shown in [Tables 15, 16, and 17, respectively](#). The matrices show how various assumptions such as entry fee, vehicle number and size, trip frequency, daily and hourly capacity, ridership, and operating cost can combine to form transit options that may or may not be feasible. As can be seen in the matrices in [Tables 15, 16, and 17](#), either Transportation Alternative 4 or 5 could be feasible under the right combination of entry fees and vehicle size in each target year.

Alternative 4 incorporates a voluntary transit shuttle system to the Refuge from an offsite Hub facility, which would offer ample parking and other amenities that visitors may find attractive. All potential visitors to the Refuge would first be directed to the Hub facility to pay entry fees, which would be the same amount for all visitors, regardless of how they reach the Refuge<sup>66</sup>. Although they would not be obligated to use the shuttle, visitors may find the convenience and amenities, such as the on-board interpretive narration by a volunteer docent, to be compelling. It is estimated that 10-20% of all visitors would choose to use the shuttle under this alternative<sup>67</sup>; resulting in about 70 to 140 visitors using the shuttle during an average peak-season day in 2010, with about 14 to 28 riders

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<sup>65</sup> That does not mean, however, this alternative would be desirable or even acceptable. Many of the improvements discussed here would require the paving of land that is currently dedicated to species habitat. The environmental cost of this alternative would be examined in a future phase of this study.

<sup>66</sup> It should be noted that all revenue estimates include a reduction in anticipated fees to account for visitors under 16 and those with passes such as Golden Eagle, etc., who would not be charged to enter the Refuge nor to ride the shuttle.

<sup>67</sup> At the Hub, visitors would be made aware of current parking conditions at the Refuge using real-time information. It is estimated that more visitors would choose to ride the free shuttle on days when parking is less likely to be available at the Point.

during the daily peak hour of 11:00 a.m. to noon. By 2025, projections increase those numbers to 86 to 173 daily peak-season riders, and about 17 to 34 peak-hour riders.

A major assumption is that part of the revenue collected from entry fees would be used to underwrite the operation of the transit shuttle system. With the on-board narration provided by a knowledgeable docent, the “free” shuttle would be seen as attractive by many visitors. As more visitors use this option, impacts on the existing parking, access/circulation, and related FWS staffing activities at the Refuge; negative impacts to the Refuge’s natural resources; and transportation impacts to the Kilauea Town community would be reduced proportionally. There may also be a corresponding reduction in the consumption of fossil fuels and an incremental benefit to local air quality.

Preliminary cost estimates for operating a transit shuttle system were outlined in preceding sections of this Final Report, assuming the use of a 25-passenger bus (Gillig Spirit, 27 feet long). It is now understood that using a vehicle of this size on the narrow entrance road may prove difficult if general, two-way traffic is allowed to continue (which is one of the key assumptions of Alternative 4). However, it is not necessary to use a vehicle of this size for Alternative 4, and as shown in [Tables 15 through 17](#), it would in fact be more efficient to use a smaller shuttle, such as a 14-passenger van or a vehicle providing similar capacity and operating cost. A 14-passenger vehicle, operating on 20-minute headways<sup>68</sup>, provides a daily capacity of 252 riders, and an hourly capacity of 42. This capacity is well in excess of expected visitor demand, even in 2025.

In all three future years examined (2010, 2015, and 2025), operating 14-passenger vans on 20-minute headways was found to be a feasible option for Alternative 4 with a \$5 entry fee, using the low-cost estimate (transit service provided directly by FWS). When assuming the high-cost estimate (shuttle service provided by a private contractor), this transit scenario was found to be feasible at a \$7 entry fee<sup>69</sup>.

It should be noted there could be additional operating costs and issues associated with Alternative 4 that should be identified, including public parking (and associated management issues) at two locations (the Hub and the Point)

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<sup>68</sup> One bus every 20 minutes.

<sup>69</sup> As noted earlier in the Report, the cost estimates assume an offsite Hub facility would be located on Kuhio Highway. That location was assumed because it is further from the Refuge than the alternative location (near the Post Office), and would therefore provide a more conservative (more expensive) cost estimate. However, if the potential alternate site were used, it would result in operational cost savings. As can be seen in each of the Feasibility Matrices, a potential Hub site in Kilauea Town near the Post Office, translates into an estimated 30-minute round trip to KPNWR for the shuttle, compared with 40 minutes for the Kuhio Highway site. That round-trip time savings results in operational cost savings, and makes Alternative 4 and 5 more feasible, compared with the Kuhio Highway Hub site. It should be noted that these cost estimates are preliminary, and more detailed cost estimates may need to be conducted during the next phase of the study.

rather than just one. Additionally, some of the same parking issues present now (overflow problems, waiting for vacancies, traffic through Kilauea Town, etc.) are likely to continue.

#### Alternative 5: Access by Mandatory Shuttle Only

Alternative 5 would require Refuge visitors to park at an offsite Hub facility, and transfer to a shuttle. No private vehicle parking will be allowed at the Point, although limited parking would still be available at the Overlook. However, parking at the Overlook would not facilitate access into the Point, as pedestrians are not permitted access through the gate into the Refuge. Some potential visitors may decide not to visit the Refuge because of the mandatory transfer to the shuttle, but as previously stated most visitors (about 85%) would still choose to visit the Refuge. As a result, based on the mid-range growth estimate, a transit shuttle service would need to accommodate about 476 to 595 daily visitors during the peak season in 2010, including 95 to 119 visitors during the peak hour (11:00 a.m. to noon), depending on the entry fee imposed. By 2025, 587 to 734 visitors will be using the shuttle bus each day during the peak season, and 117 to 147 during the peak hour.

That level of anticipated ridership could be accommodated using different size vehicles. In Alternative 5, private vehicles would be prohibited from using the entrance road into the Refuge (the Point); and as a result, there would not be operational problems using a larger vehicle on the entrance road, such as a 25-passenger (or possibly larger) bus. The most cost-effective solution (for each year examined – 2010, 2015 and 2025) is to use large vehicles (40-passenger, for example) operating every 20 minutes. That scenario provides an all-day capacity of 720 riders and a peak-hour capacity of 120. That would provide adequate capacity for 2010 and 2015, but by 2025 the Refuge would need to run buses more frequently. Expected revenue from entry fees would be adequate to run this system with a \$6 entry fee, assuming the low-cost estimate, and a \$10 entry fee with the high-cost estimate.

Another way to increase feasibility of a transit shuttle system would be to locate the transit Hub closer to the Refuge. For the feasibility analysis described above, the Hub is assumed to be located on Kuhio Highway. If the Hub were instead located near the Post Office site, as has been discussed, that would make the system more viable by decreasing the estimated round-trip time from 40 minutes to 30 minutes. Under this scenario, operating 25-passenger vehicles every 10 minutes was found to be viable in 2010 and 2015 with an entry fee of \$7 with the low-cost estimate and \$10 under the high-cost estimate.

## Conclusions about Feasibility of the Five Conceptual Transportation Alternatives

Based on preliminary data presented in this Final Report, any of the five conceptual transportation alternatives appears to be financially viable. That is, a portion of the entry fees (set at the appropriate level) can cover the costs of making the identified improvements and/or operating a Refuge transit shuttle system that is able to serve expected visitor demand. It should be noted in particular that the feasibility of Alternatives 4 and 5 is based on examining the operational costs only and that an assumption is made that discretionary grants can be obtained to construct the Hub and provide other capital costs as needed.

These calculations are preliminary, and detailed financial estimates may need to be made during the anticipated next phase of the ATS Study effort. In that phase, other types and sizes of vehicles such as rubber-tired historic-replica trolleys or open air trams and vehicles that operate on alternative fuels, should be evaluated; and, additional details of all options still under consideration should be delineated for proper screening and evaluation. Other options, such as using an expanded parking area at the Overlook for overflow parking during peak periods, should be examined during the anticipated next phase. A summary of key findings, recommendations based on findings to date, and a list of issues to be resolved and next steps can be found after the Transit Feasibility Matrices.

Table 15. Transit Feasibility Matrix - 2010

General Options				Revenue				Ridership			System Capacity					Annual Operating Cost & Feasibility (7)				Cost per Passenger		Annual Service and Platform Hours					
Transit Vehicle Option	Conceptual Transportation Alternative	Potential Hub Location	Hub-to-Refuge Round Trip Time (minutes)	Refuge Entry Fee Options	Amount of Entry Fee dedicated to Transit Operation	Projected Annual Revenue for Transit (2010)	Projected Annual Revenue for Transit (6)	Peak-Hour Peak Season Riders	Daily Peak Season Riders	Annual Riders	Vehicle Capacity (seated)	Number of Vehicles in Operation	Headway (minutes between vehicles)	Peak-Hour Capacity	Daily Capacity	Low Cost Estimate (2010\$)	Feasible? (Is revenue greater than Low Cost Estimate?)	High Cost Estimate (2010\$)	Feasible? (Is revenue greater than High Cost Estimate?)	Cost per passenger (Low Cost Estimate)	Cost per passenger (High Cost Estimate)	Annual service hours	Cost per service hour (Low Cost Estimate)	Cost per service hour (High Cost Estimate)	Annual Platform Hours (includes deadhead time)	Cost per platform hour (Low Cost Estimate)	Cost per platform hour (High Cost Estimate)
25-Passenger Vehicles (1)	4	Kuhio Hwy.	40	\$5	\$2	231,000	\$369,000	14-28	70-140	35,000	25	2	20	75	450	\$353,306	Yes	\$794,938	No	\$10.09	\$22.71	4,224	\$83.64	\$188.20	5,632	\$62.73	\$141.15
	4	Kuhio Hwy.	40	\$6	\$3	221,000	\$531,000	14-27	67-135	33,000	25	2	20	75	450	\$353,306	Yes	\$794,938	No	\$10.71	\$24.09	4,224	\$83.64	\$188.20	5,632	\$62.73	\$141.15
	4	Kuhio Hwy.	40	\$7	\$4	212,000	\$679,000	13-25	64-129	32,000	25	2	20	75	450	\$353,306	Yes	\$794,938	No	\$11.04	\$24.84	4,224	\$83.64	\$188.20	5,632	\$62.73	\$141.15
	4	Kuhio Hwy.	40	\$8	\$5	203,000	\$811,000	12-24	62-123	30,000	25	2	20	75	450	\$353,306	Yes	\$794,938	Yes	\$11.78	\$26.50	4,224	\$83.64	\$188.20	5,632	\$62.73	\$141.15
	4	Kuhio Hwy.	40	\$9	\$6	194,000	\$929,000	12-24	59-118	29,000	25	2	20	75	450	\$353,306	Yes	\$794,938	Yes	\$12.18	\$27.41	4,224	\$83.64	\$188.20	5,632	\$62.73	\$141.15
	5	Kuhio Hwy.	40	\$5	\$2	196,000	\$313,000	119	595	196,000	25	4	10	150	900	\$706,612	No	\$1,589,876	No	\$3.61	\$8.11	8,448	\$83.64	\$188.20	11,264	\$62.73	\$141.15
	5	Kuhio Hwy.	40	\$6	\$3	188,000	\$451,000	114	572	188,000	25	3	13	113	675	\$529,959	No	\$1,192,407	No	\$2.82	\$6.34	6,336	\$83.64	\$188.20	8,448	\$62.73	\$141.15
	5	Kuhio Hwy.	40	\$7	\$4	180,000	\$577,000	110	548	180,000	25	3	13	113	675	\$529,959	Yes	\$1,192,407	No	\$2.94	\$6.62	6,336	\$83.64	\$188.20	8,448	\$62.73	\$141.15
	5	Kuhio Hwy.	40	\$8	\$5	172,000	\$690,000	105	524	172,000	25	3	13	113	675	\$529,959	Yes	\$1,192,407	No	\$3.08	\$6.93	6,336	\$83.64	\$188.20	8,448	\$62.73	\$141.15
	5	Kuhio Hwy.	40	\$9	\$6	165,000	\$790,000	100	500	165,000	25	3	13	113	675	\$529,959	Yes	\$1,192,407	No	\$3.21	\$7.23	6,336	\$83.64	\$188.20	8,448	\$62.73	\$141.15
5	Kuhio Hwy.	40	\$10	\$7	157,000	\$878,000	95	476	157,000	25	3	13	113	675	\$529,959	Yes	\$1,192,407	No	\$3.38	\$7.59	6,336	\$83.64	\$188.20	8,448	\$62.73	\$141.15	
5	Kuhio Hwy.	40	\$11	\$8	149,000	\$953,000	91	453	149,000	25	3	13	113	675	\$529,959	Yes	\$1,192,407	No	\$3.56	\$8.00	6,336	\$83.64	\$188.20	8,448	\$62.73	\$141.15	
14-Passenger Vans (2)	4	Kuhio Hwy.	40	\$5	\$2	231,000	\$369,000	14-28	70-140	35,000	14	2	20	42	252	\$264,979	Yes	\$596,204	No	\$7.57	\$17.03	4,224	\$62.73	\$141.15	5,632	\$47.05	\$105.86
	4	Kuhio Hwy.	40	\$6	\$3	221,000	\$531,000	14-27	67-135	33,000	14	2	20	42	252	\$264,979	Yes	\$596,204	No	\$8.03	\$18.07	4,224	\$62.73	\$141.15	5,632	\$47.05	\$105.86
	4	Kuhio Hwy.	40	\$7	\$4	212,000	\$679,000	13-25	64-129	32,000	14	2	20	42	252	\$264,979	Yes	\$596,204	Yes	\$8.28	\$18.63	4,224	\$62.73	\$141.15	5,632	\$47.05	\$105.86
	4	Kuhio Hwy.	40	\$8	\$5	203,000	\$811,000	12-24	62-123	30,000	14	2	20	42	252	\$264,979	Yes	\$596,204	Yes	\$8.83	\$19.87	4,224	\$62.73	\$141.15	5,632	\$47.05	\$105.86
	4	Kuhio Hwy.	40	\$9	\$6	194,000	\$929,000	12-24	59-118	29,000	14	2	20	42	252	\$264,979	Yes	\$596,204	Yes	\$9.14	\$20.56	4,224	\$62.73	\$141.15	5,632	\$47.05	\$105.86
	5	Kuhio Hwy.	40	\$5	\$2	196,000	\$313,000	119	595	196,000	14	6	7	126	756	\$794,938	No	\$1,788,611	No	\$4.06	\$9.13	12,672	\$62.73	\$141.15	16,896	\$47.05	\$105.86
	5	Kuhio Hwy.	40	\$6	\$3	188,000	\$451,000	114	572	188,000	14	6	7	126	756	\$794,938	No	\$1,788,611	No	\$4.23	\$9.51	12,672	\$62.73	\$141.15	16,896	\$47.05	\$105.86
	5	Kuhio Hwy.	40	\$7	\$4	180,000	\$577,000	110	548	180,000	14	6	7	126	756	\$794,938	No	\$1,788,611	No	\$4.42	\$9.94	12,672	\$62.73	\$141.15	16,896	\$47.05	\$105.86
	5	Kuhio Hwy.	40	\$8	\$5	172,000	\$690,000	105	524	172,000	14	5	8	105	630	\$662,448	Yes	\$1,490,509	No	\$3.85	\$8.67	10,560	\$62.73	\$141.15	14,080	\$47.05	\$105.86
	5	Kuhio Hwy.	40	\$9	\$6	165,000	\$790,000	100	500	165,000	14	5	8	105	630	\$662,448	Yes	\$1,490,509	No	\$4.01	\$9.03	10,560	\$62.73	\$141.15	14,080	\$47.05	\$105.86
5	Kuhio Hwy.	40	\$10	\$7	157,000	\$878,000	95	476	157,000	14	5	8	105	630	\$662,448	Yes	\$1,490,509	No	\$4.22	\$9.49	10,560	\$62.73	\$141.15	14,080	\$47.05	\$105.86	
5	Kuhio Hwy.	40	\$11	\$8	149,000	\$953,000	91	453	149,000	14	4	10	84	504	\$529,959	Yes	\$1,192,407	No	\$3.56	\$8.00	8,448	\$62.73	\$141.15	11,264	\$47.05	\$105.86	
20-Passenger Vehicles (3)	4	Kuhio Hwy.	40	\$5	\$2	231,000	\$369,000	14-28	70-140	35,000	20	2	20	60	360	\$300,310	Yes	\$675,697	No	\$8.58	\$19.31	4,224	\$71.10	\$159.97	5,632	\$53.32	\$119.97
	4	Kuhio Hwy.	40	\$6	\$3	221,000	\$531,000	14-27	67-135	33,000	20	2	20	60	360	\$300,310	Yes	\$675,697	No	\$9.10	\$20.48	4,224	\$71.10	\$159.97	5,632	\$53.32	\$119.97
	4	Kuhio Hwy.	40	\$7	\$4	212,000	\$679,000	13-25	64-129	32,000	20	2	20	60	360	\$300,310	Yes	\$675,697	Yes	\$9.38	\$21.12	4,224	\$71.10	\$159.97	5,632	\$53.32	\$119.97
	4	Kuhio Hwy.	40	\$8	\$5	203,000	\$811,000	12-24	62-123	30,000	20	2	20	60	360	\$300,310	Yes	\$675,697	Yes	\$10.01	\$22.52	4,224	\$71.10	\$159.97	5,632	\$53.32	\$119.97
	4	Kuhio Hwy.	40	\$9	\$6	194,000	\$929,000	12-24	59-118	29,000	20	2	20	60	360	\$300,310	No	\$675,697	No	\$10.36	\$23.30	4,224	\$71.10	\$159.97	5,632	\$53.32	\$119.97
	5	Kuhio Hwy.	40	\$5	\$2	196,000	\$313,000	119	595	196,000	20	4	10	120	720	\$600,620	No	\$1,351,395	No	\$3.06	\$6.89	8,448	\$71.10	\$159.97	11,264	\$53.32	\$119.97
	5	Kuhio Hwy.	40	\$6	\$3	188,000	\$451,000	114	572	188,000	20	4	10	120	720	\$600,620	No	\$1,351,395	No	\$3.19	\$7.19	8,448	\$71.10	\$159.97	11,264	\$53.32	\$119.97
	5	Kuhio Hwy.	40	\$7	\$4	180,000	\$577,000	110	548	180,000	20	4	10	120	720	\$600,620	No	\$1,351,395	No	\$3.34	\$7.51	8,448	\$71.10	\$159.97	11,264	\$53.32	\$119.97
	5	Kuhio Hwy.	40	\$8	\$5	172,000	\$690,000	105	524	172,000	20	4	10	120	720	\$600,620	Yes	\$1,351,395	No	\$3.49	\$7.86	8,448	\$71.10	\$159.97	11,264	\$53.32	\$119.97
	5	Kuhio Hwy.	40	\$9	\$6	165,000	\$790,000	100	500	165,000	20	4	10	120	720	\$600,620	Yes	\$1,351,395	No	\$3.64	\$8.19	8,448	\$71.10	\$159.97	11,264	\$53.32	\$119.97
5	Kuhio Hwy.	40	\$10	\$7	157,000	\$878,000	95	476	157,000	20	3	13	90	540	\$450,465	Yes	\$1,013,546	No	\$2.87	\$6.46	6,336	\$71.10	\$159.97	8,448	\$53.32	\$119.97	
5	Kuhio Hwy.	40	\$11	\$8	149,000	\$953,000	91	453	149,000	20	3	13	90	540	\$450,465	Yes	\$1,013,546	No	\$3.02	\$6.80	6,336	\$71.10	\$159.97	8,448	\$53.32	\$119.97	
40-Passenger Vehicles (4)	4	Kuhio Hwy.	40	\$5	\$2	231,000	\$369,000	14-28	70-140	35,000	40	2	20	120	720	\$406,302	No	\$914,179	No	\$11.61	\$26.12	4,224	\$96.19	\$216.42	5,632	\$72.14	\$162.32
	4	Kuhio Hwy.	40	\$6	\$3	221,000	\$531,000	14-27	67-135	33,000	40	2	20	120	720	\$406,302	Yes	\$914,179	No	\$12.31	\$27.70	4,224	\$96.19	\$216.42	5,632	\$72.14	\$162.32
	4	Kuhio Hwy.	40	\$7	\$4	212,000	\$679,000	13-25	64-129	32,000	40	2	20	120	720	\$406,302	Yes	\$914,179	No	\$12.70	\$28.57	4,224	\$96.19	\$216.42	5,632	\$72.14	\$162.32
	4	Kuhio Hwy.	40	\$8	\$5	203,000	\$811,000	12-24	62-123	30,000	40	2	20	120	720	\$406,302	Yes	\$914,179	No	\$13.54	\$30.47	4,224	\$96.19	\$216.42	5,632	\$72.14	\$162.32
	4	Kuhio Hwy.	40	\$9	\$6	194,000	\$929,000	12-24	59-118	29,000	40	2	20	120	720	\$406,302	Yes	\$914,179	Yes	\$14.01	\$31.52	4,224	\$96.19	\$216.42	5,632	\$72.14	\$162.32
	5	Kuhio Hwy.	40	\$5	\$2	196,000	\$313,000	119	595	196,000	40	2	20	120	720	\$406,302	No	\$914,179	No	\$2.07	\$4.66	4,224	\$96.19	\$216.42	5,632	\$72.14	\$162.32
	5	Kuhio Hwy.	40	\$6	\$3	188,000	\$451,000	114	572	188,000	40	2	20	120	720	\$406,302	Yes	\$914,179	No	\$2.16	\$4.86	4,224	\$96.19	\$216.42	5,632	\$72.14	\$162.32

Table 16. Transit Feasibility Matrix - 2015

General Options				Revenue				Ridership			System Capacity					Annual Operating Cost & Feasibility (7)				Cost per Passenger		Annual Service and Platform Hours					
Transit Vehicle Option	Conceptual Transportation Alternative	Potential Hub Location	Hub-to-Refuge Round Trip Time (minutes)	Refuge Entry Fee Options	Amount of Entry Fee dedicated to Transit Operation	Projected Annual Refuge Visitation in 2015	Projected Annual Revenue for Transit (6)	Peak-Hour Season Riders	Daily Peak Season Riders	Annual Riders	Vehicle Capacity (seated)	Number of Vehicles in Operation	Headway (minutes between vehicles)	Peak-Hour Capacity	Daily Capacity	Low Cost Estimate (2015\$)	Feasible? (Is revenue greater than Low Cost Estimate?)	High Cost Estimate (2015\$)	Feasible? (Is revenue greater than High Cost Estimate?)	Cost per passenger (Low Cost Estimate)	Cost per passenger (High Cost Estimate)	Annual service hours	Cost per service hour (Low Cost Estimate)	Cost per service hour (High Cost Estimate)	Annual Platform Hours (includes deadhead time)	Cost per platform hour (Low Cost Estimate)	Cost per platform hour (High Cost Estimate)
25-Passenger Vehicles (1)	4	Kuhio Hwy.	40	\$5	\$2	247,000	\$395,000	15-30	75-150	37,000	25	2	20	75	450	\$390,078	Yes	\$877,676	No	\$10.54	\$23.72	4,224	\$92.35	\$207.78	5,632	\$69.26	\$155.84
	4	Kuhio Hwy.	40	\$6	\$3	237,000	\$569,000	14-29	72-144	36,000	25	2	20	75	450	\$390,078	Yes	\$877,676	No	\$10.84	\$24.38	4,224	\$92.35	\$207.78	5,632	\$69.26	\$155.84
	4	Kuhio Hwy.	40	\$7	\$4	227,000	\$727,000	14-28	69-138	34,000	25	2	20	75	450	\$390,078	Yes	\$877,676	No	\$11.47	\$25.81	4,224	\$92.35	\$207.78	5,632	\$69.26	\$155.84
	4	Kuhio Hwy.	40	\$8	\$5	217,000	\$870,000	13-26	66-132	33,000	25	2	20	75	450	\$390,078	Yes	\$877,676	No	\$11.82	\$26.60	4,224	\$92.35	\$207.78	5,632	\$69.26	\$155.84
	4	Kuhio Hwy.	40	\$9	\$6	208,000	\$996,000	13-25	63-126	31,000	25	2	20	75	450	\$390,078	Yes	\$877,676	Yes	\$12.58	\$28.31	4,224	\$92.35	\$207.78	5,632	\$69.26	\$155.84
	5	Kuhio Hwy.	40	\$5	\$2	210,000	\$336,000	128	638	210,000	25	4	10	150	900	\$780,156	No	\$1,755,352	No	\$3.72	\$8.36	8,448	\$92.35	\$207.78	11,264	\$69.26	\$155.84
	5	Kuhio Hwy.	40	\$6	\$3	202,000	\$484,000	123	613	202,000	25	3	13	113	675	\$585,117	No	\$1,316,514	No	\$2.90	\$6.52	6,336	\$92.35	\$207.78	8,448	\$69.26	\$155.84
	5	Kuhio Hwy.	40	\$7	\$4	193,000	\$618,000	117	587	193,000	25	3	13	113	675	\$585,117	Yes	\$1,316,514	No	\$3.03	\$6.82	6,336	\$92.35	\$207.78	8,448	\$69.26	\$155.84
	5	Kuhio Hwy.	40	\$8	\$5	185,000	\$739,000	112	562	185,000	25	3	13	113	675	\$585,117	Yes	\$1,316,514	No	\$3.16	\$7.12	6,336	\$92.35	\$207.78	8,448	\$69.26	\$155.84
	5	Kuhio Hwy.	40	\$9	\$6	176,000	\$847,000	107	536	176,000	25	3	13	113	675	\$585,117	Yes	\$1,316,514	No	\$3.32	\$7.48	6,336	\$92.35	\$207.78	8,448	\$69.26	\$155.84
5	Kuhio Hwy.	40	\$10	\$7	168,000	\$941,000	102	511	168,000	25	3	13	113	675	\$585,117	Yes	\$1,316,514	No	\$3.48	\$7.84	6,336	\$92.35	\$207.78	8,448	\$69.26	\$155.84	
5	Kuhio Hwy.	40	\$11	\$8	160,000	\$1,022,000	97	485	160,000	25	3	13	113	675	\$585,117	Yes	\$1,316,514	No	\$3.66	\$8.23	6,336	\$92.35	\$207.78	8,448	\$69.26	\$155.84	
14-Passenger Vans (2)	4	Kuhio Hwy.	40	\$5	\$2	247,000	\$395,000	15-30	75-150	37,000	14	2	20	42	252	\$292,559	Yes	\$658,257	No	\$7.91	\$17.79	4,224	\$69.26	\$155.84	5,632	\$51.95	\$116.88
	4	Kuhio Hwy.	40	\$6	\$3	237,000	\$569,000	14-29	72-144	36,000	14	2	20	42	252	\$292,559	Yes	\$658,257	No	\$8.13	\$18.28	4,224	\$69.26	\$155.84	5,632	\$51.95	\$116.88
	4	Kuhio Hwy.	40	\$7	\$4	227,000	\$727,000	14-28	69-138	34,000	14	2	20	42	252	\$292,559	Yes	\$658,257	Yes	\$8.60	\$19.36	4,224	\$69.26	\$155.84	5,632	\$51.95	\$116.88
	4	Kuhio Hwy.	40	\$8	\$5	217,000	\$870,000	13-26	66-132	33,000	14	2	20	42	252	\$292,559	Yes	\$658,257	Yes	\$8.87	\$19.95	4,224	\$69.26	\$155.84	5,632	\$51.95	\$116.88
	4	Kuhio Hwy.	40	\$9	\$6	208,000	\$996,000	13-25	63-126	31,000	14	2	20	42	252	\$292,559	Yes	\$658,257	Yes	\$9.44	\$21.23	4,224	\$69.26	\$155.84	5,632	\$51.95	\$116.88
	5	Kuhio Hwy.	40	\$5	\$2	210,000	\$336,000	128	638	210,000	14	6	7	126	756	\$877,676	No	\$1,974,771	No	\$4.18	\$9.40	12,672	\$69.26	\$155.84	16,896	\$51.95	\$116.88
	5	Kuhio Hwy.	40	\$6	\$3	202,000	\$484,000	123	613	202,000	14	6	7	126	756	\$877,676	No	\$1,974,771	No	\$4.34	\$9.78	12,672	\$69.26	\$155.84	16,896	\$51.95	\$116.88
	5	Kuhio Hwy.	40	\$7	\$4	193,000	\$618,000	117	587	193,000	14	6	7	126	756	\$877,676	No	\$1,974,771	No	\$4.55	\$10.23	12,672	\$69.26	\$155.84	16,896	\$51.95	\$116.88
	5	Kuhio Hwy.	40	\$8	\$5	185,000	\$739,000	112	562	185,000	14	5	8	105	630	\$731,397	Yes	\$1,645,642	No	\$3.95	\$8.90	10,560	\$69.26	\$155.84	14,080	\$51.95	\$116.88
	5	Kuhio Hwy.	40	\$9	\$6	176,000	\$847,000	107	536	176,000	14	5	8	105	630	\$731,397	Yes	\$1,645,642	No	\$4.16	\$9.35	10,560	\$69.26	\$155.84	14,080	\$51.95	\$116.88
5	Kuhio Hwy.	40	\$10	\$7	168,000	\$941,000	102	511	168,000	14	5	8	105	630	\$731,397	Yes	\$1,645,642	No	\$4.35	\$9.80	10,560	\$69.26	\$155.84	14,080	\$51.95	\$116.88	
5	Kuhio Hwy.	40	\$11	\$8	160,000	\$1,022,000	97	485	160,000	14	4	10	84	504	\$585,117	Yes	\$1,316,514	No	\$3.66	\$8.23	8,448	\$69.26	\$155.84	11,264	\$51.95	\$116.88	
20-Passenger Vehicles (3)	4	Kuhio Hwy.	40	\$5	\$2	247,000	\$395,000	15-30	75-150	37,000	20	2	20	60	360	\$331,566	Yes	\$746,025	No	\$8.96	\$20.16	4,224	\$78.50	\$176.62	5,632	\$58.87	\$132.46
	4	Kuhio Hwy.	40	\$6	\$3	237,000	\$569,000	14-29	72-144	36,000	20	2	20	60	360	\$331,566	Yes	\$746,025	No	\$9.21	\$20.72	4,224	\$78.50	\$176.62	5,632	\$58.87	\$132.46
	4	Kuhio Hwy.	40	\$7	\$4	227,000	\$727,000	14-28	69-138	34,000	20	2	20	60	360	\$331,566	Yes	\$746,025	No	\$9.75	\$21.94	4,224	\$78.50	\$176.62	5,632	\$58.87	\$132.46
	4	Kuhio Hwy.	40	\$8	\$5	217,000	\$870,000	13-26	66-132	33,000	20	2	20	60	360	\$331,566	Yes	\$746,025	Yes	\$10.05	\$22.61	4,224	\$78.50	\$176.62	5,632	\$58.87	\$132.46
	4	Kuhio Hwy.	40	\$9	\$6	208,000	\$996,000	13-25	63-126	31,000	20	2	20	60	360	\$331,566	Yes	\$746,025	Yes	\$10.70	\$24.07	4,224	\$78.50	\$176.62	5,632	\$58.87	\$132.46
	5	Kuhio Hwy.	40	\$5	\$2	210,000	\$336,000	128	638	210,000	20	4	10	120	720	\$663,133	No	\$1,492,049	No	\$3.16	\$7.10	8,448	\$78.50	\$176.62	11,264	\$58.87	\$132.46
	5	Kuhio Hwy.	40	\$6	\$3	202,000	\$484,000	123	613	202,000	20	4	10	120	720	\$663,133	No	\$1,492,049	No	\$3.28	\$7.39	8,448	\$78.50	\$176.62	11,264	\$58.87	\$132.46
	5	Kuhio Hwy.	40	\$7	\$4	193,000	\$618,000	117	587	193,000	20	4	10	120	720	\$663,133	No	\$1,492,049	No	\$3.44	\$7.73	8,448	\$78.50	\$176.62	11,264	\$58.87	\$132.46
	5	Kuhio Hwy.	40	\$8	\$5	185,000	\$739,000	112	562	185,000	20	4	10	120	720	\$663,133	Yes	\$1,492,049	No	\$3.58	\$8.07	8,448	\$78.50	\$176.62	11,264	\$58.87	\$132.46
	5	Kuhio Hwy.	40	\$9	\$6	176,000	\$847,000	107	536	176,000	20	4	10	120	720	\$663,133	Yes	\$1,492,049	No	\$3.77	\$8.48	8,448	\$78.50	\$176.62	11,264	\$58.87	\$132.46
5	Kuhio Hwy.	40	\$10	\$7	168,000	\$941,000	102	511	168,000	20	3	13	90	540	\$497,350	Yes	\$1,119,037	No	\$2.96	\$6.66	6,336	\$78.50	\$176.62	8,448	\$58.87	\$132.46	
5	Kuhio Hwy.	40	\$11	\$8	160,000	\$1,022,000	97	485	160,000	20	3	13	90	540	\$497,350	Yes	\$1,119,037	No	\$3.11	\$6.99	6,336	\$78.50	\$176.62	8,448	\$58.87	\$132.46	
40-Passenger Vehicles (4)	4	Kuhio Hwy.	40	\$5	\$2	247,000	\$395,000	15-30	75-150	37,000	40	2	20	120	720	\$448,590	No	\$1,009,327	No	\$12.12	\$27.28	4,224	\$106.20	\$238.95	5,632	\$79.65	\$179.21
	4	Kuhio Hwy.	40	\$6	\$3	237,000	\$569,000	14-29	72-144	36,000	40	2	20	120	720	\$448,590	Yes	\$1,009,327	No	\$12.46	\$28.04	4,224	\$106.20	\$238.95	5,632	\$79.65	\$179.21
	4	Kuhio Hwy.	40	\$7	\$4	227,000	\$727,000	14-28	69-138	34,000	40	2	20	120	720	\$448,590	Yes	\$1,009,327	No	\$13.19	\$29.69	4,224	\$106.20	\$238.95	5,632	\$79.65	\$179.21
	4	Kuhio Hwy.	40	\$8	\$5	217,000	\$870,000	13-26	66-132	33,000	40	2	20	120	720	\$448,590	Yes	\$1,009,327	No	\$13.59	\$30.59	4,224	\$106.20	\$238.95	5,632	\$79.65	\$179.21
	4	Kuhio Hwy.	40	\$9	\$6	208,000	\$996,000	13-25	63-126	31,000	40	2	20	120	720	\$448,590	Yes	\$1,009,327	No	\$14.47	\$32.56	4,224	\$106.20	\$238.95	5,632	\$79.65	\$179.21
	5	Kuhio Hwy.	40	\$5	\$2	210,000	\$336,000	128	638	210,000	40	2	20	120	720	\$448,590	No	\$1,009,327	No	\$2.14	\$4.81	4,224	\$106.20	\$238.95	5,632	\$79.65	\$179.21
	5	Kuhio Hwy.	40	\$6	\$3	202,000	\$484,000	123	613	202,000	40	2	20	120	720	\$448,590	Yes	\$1,009,327	No	\$2.22	\$5.00	4,224	\$106.20	\$238.95	5,		

Table 17. Transit Feasibility Matrix - 2025

General Options				Revenue				Ridership			System Capacity					Annual Operating Cost & Feasibility (7)				Cost per Passenger		Annual Service and Platform Hours					
Transit Vehicle Option	Conceptual Transportation Alternative	Potential Hub Location	Hub-to-Refuge Round Trip Time (minutes)	Refuge Entry Fee Options	Amount of Entry Fee dedicated to Transit Operation	Projected Annual Refuge Visitation in 2025	Projected Annual Revenue for Transit (6)	Peak-Hour Peak Season Riders	Daily Peak Season Riders	Annual Riders	Vehicle Capacity (seated)	Number of Vehicles in Operation	Headway (minutes between vehicles)	Peak-Hour Capacity	Daily Capacity	Low Cost Estimate (2025\$)	Feasible? (Is revenue greater than Low Cost Estimate?)	High Cost Estimate (2025\$)	Feasible? (Is revenue greater than High Cost Estimate?)	Cost per passenger (Low Cost Estimate)	Cost per passenger (High Cost Estimate)	Annual service hours	Cost per service hour (Low Cost Estimate)	Cost per service hour (High Cost Estimate)	Annual Platform Hours (includes deadhead time)	Cost per platform hour (Low Cost Estimate)	Cost per platform hour (High Cost Estimate)
25-Passenger Vehicles (1)	4	Kuhio Hwy.	40	\$5	\$2	284,000	\$454,000	17-35	86-173	43,000	25	2	20	75	450	\$475,503	No	\$1,069,882	No	\$11.06	\$24.88	4,224	\$112.57	\$253.29	5,632	\$84.43	\$189.96
	4	Kuhio Hwy.	40	\$6	\$3	273,000	\$654,000	17-33	83-166	41,000	25	2	20	75	450	\$475,503	Yes	\$1,069,882	No	\$11.60	\$26.09	4,224	\$112.57	\$253.29	5,632	\$84.43	\$189.96
	4	Kuhio Hwy.	40	\$7	\$4	261,000	\$836,000	16-32	79-159	39,000	25	2	20	75	450	\$475,503	Yes	\$1,069,882	No	\$12.19	\$27.43	4,224	\$112.57	\$253.29	5,632	\$84.43	\$189.96
	4	Kuhio Hwy.	40	\$8	\$5	250,000	\$999,000	15-30	76-152	38,000	25	2	20	75	450	\$475,503	Yes	\$1,069,882	No	\$12.51	\$28.15	4,224	\$112.57	\$253.29	5,632	\$84.43	\$189.96
	4	Kuhio Hwy.	40	\$9	\$6	239,000	\$1,145,000	14-29	72-145	36,000	25	2	20	75	450	\$475,503	Yes	\$1,069,882	Yes	\$13.21	\$29.72	4,224	\$112.57	\$253.29	5,632	\$84.43	\$189.96
	5	Kuhio Hwy.	40	\$5	\$2	241,000	\$386,000	147	734	241,000	25	4	10	150	900	\$951,006	No	\$2,139,764	No	\$3.95	\$8.88	8,448	\$112.57	\$253.29	11,264	\$84.43	\$189.96
	5	Kuhio Hwy.	40	\$6	\$3	232,000	\$566,000	141	704	232,000	25	3	13	113	675	\$713,255	No	\$1,604,823	No	\$3.07	\$6.92	6,336	\$112.57	\$253.29	8,448	\$84.43	\$189.96
	5	Kuhio Hwy.	40	\$7	\$4	222,000	\$711,000	135	675	222,000	25	3	13	113	675	\$713,255	No	\$1,604,823	No	\$3.21	\$7.23	6,336	\$112.57	\$253.29	8,448	\$84.43	\$189.96
	5	Kuhio Hwy.	40	\$8	\$5	212,000	\$850,000	129	646	212,000	25	3	13	113	675	\$713,255	Yes	\$1,604,823	No	\$3.36	\$7.57	6,336	\$112.57	\$253.29	8,448	\$84.43	\$189.96
	5	Kuhio Hwy.	40	\$9	\$6	203,000	\$973,000	123	616	203,000	25	3	13	113	675	\$713,255	Yes	\$1,604,823	No	\$3.51	\$7.91	6,336	\$112.57	\$253.29	8,448	\$84.43	\$189.96
5	Kuhio Hwy.	40	\$10	\$7	193,000	\$1,081,000	117	587	193,000	25	3	13	113	675	\$713,255	Yes	\$1,604,823	No	\$3.70	\$8.32	6,336	\$112.57	\$253.29	8,448	\$84.43	\$189.96	
5	Kuhio Hwy.	40	\$11	\$8	183,000	\$1,174,000	111	557	183,000	25	3	13	113	675	\$713,255	Yes	\$1,604,823	No	\$3.90	\$8.77	6,336	\$112.57	\$253.29	8,448	\$84.43	\$189.96	
14-Passenger Vans (2)	4	Kuhio Hwy.	40	\$5	\$2	284,000	\$454,000	17-35	86-173	43,000	14	2	20	42	252	\$356,627	Yes	\$802,412	No	\$8.29	\$18.66	4,224	\$84.43	\$189.96	5,632	\$63.32	\$142.47
	4	Kuhio Hwy.	40	\$6	\$3	273,000	\$654,000	17-33	83-166	41,000	14	2	20	42	252	\$356,627	Yes	\$802,412	No	\$8.70	\$19.57	4,224	\$84.43	\$189.96	5,632	\$63.32	\$142.47
	4	Kuhio Hwy.	40	\$7	\$4	261,000	\$836,000	16-32	79-159	39,000	14	2	20	42	252	\$356,627	Yes	\$802,412	Yes	\$9.14	\$20.57	4,224	\$84.43	\$189.96	5,632	\$63.32	\$142.47
	4	Kuhio Hwy.	40	\$8	\$5	250,000	\$999,000	15-30	76-152	38,000	14	2	20	42	252	\$356,627	Yes	\$802,412	Yes	\$9.38	\$21.12	4,224	\$84.43	\$189.96	5,632	\$63.32	\$142.47
	4	Kuhio Hwy.	40	\$9	\$6	239,000	\$1,145,000	14-29	72-145	36,000	14	2	20	42	252	\$356,627	Yes	\$802,412	Yes	\$9.91	\$22.29	4,224	\$84.43	\$189.96	5,632	\$63.32	\$142.47
	5	Kuhio Hwy.	40	\$5	\$2	241,000	\$386,000	147	734	241,000	14	6	7	126	756	\$1,069,882	No	\$2,407,235	No	\$4.44	\$9.99	12,672	\$84.43	\$189.96	16,896	\$63.32	\$142.47
	5	Kuhio Hwy.	40	\$6	\$3	232,000	\$566,000	141	704	232,000	14	6	7	126	756	\$1,069,882	No	\$2,407,235	No	\$4.61	\$10.38	12,672	\$84.43	\$189.96	16,896	\$63.32	\$142.47
	5	Kuhio Hwy.	40	\$7	\$4	222,000	\$711,000	135	675	222,000	14	6	7	126	756	\$1,069,882	No	\$2,407,235	No	\$4.82	\$10.84	12,672	\$84.43	\$189.96	16,896	\$63.32	\$142.47
	5	Kuhio Hwy.	40	\$8	\$5	212,000	\$850,000	129	646	212,000	14	5	8	105	630	\$891,568	No	\$2,006,029	No	\$4.21	\$9.46	10,560	\$84.43	\$189.96	14,080	\$63.32	\$142.47
	5	Kuhio Hwy.	40	\$9	\$6	203,000	\$973,000	123	616	203,000	14	5	8	105	630	\$891,568	Yes	\$2,006,029	No	\$4.39	\$9.88	10,560	\$84.43	\$189.96	14,080	\$63.32	\$142.47
5	Kuhio Hwy.	40	\$10	\$7	193,000	\$1,081,000	117	587	193,000	14	5	8	105	630	\$891,568	Yes	\$2,006,029	No	\$4.62	\$10.39	10,560	\$84.43	\$189.96	14,080	\$63.32	\$142.47	
5	Kuhio Hwy.	40	\$11	\$8	183,000	\$1,174,000	111	557	183,000	14	4	10	84	504	\$713,255	Yes	\$1,604,823	No	\$3.90	\$8.77	8,448	\$84.43	\$189.96	11,264	\$63.32	\$142.47	
20-Passenger Vehicles (3)	4	Kuhio Hwy.	40	\$5	\$2	284,000	\$454,000	17-35	86-173	43,000	20	2	20	60	360	\$404,178	Yes	\$909,400	No	\$9.40	\$21.15	4,224	\$95.69	\$215.29	5,632	\$71.76	\$161.47
	4	Kuhio Hwy.	40	\$6	\$3	273,000	\$654,000	17-33	83-166	41,000	20	2	20	60	360	\$404,178	Yes	\$909,400	No	\$9.86	\$22.18	4,224	\$95.69	\$215.29	5,632	\$71.76	\$161.47
	4	Kuhio Hwy.	40	\$7	\$4	261,000	\$836,000	16-32	79-159	39,000	20	2	20	60	360	\$404,178	Yes	\$909,400	No	\$10.36	\$23.32	4,224	\$95.69	\$215.29	5,632	\$71.76	\$161.47
	4	Kuhio Hwy.	40	\$8	\$5	250,000	\$999,000	15-30	76-152	38,000	20	2	20	60	360	\$404,178	Yes	\$909,400	Yes	\$10.64	\$23.93	4,224	\$95.69	\$215.29	5,632	\$71.76	\$161.47
	4	Kuhio Hwy.	40	\$9	\$6	239,000	\$1,145,000	14-29	72-145	36,000	20	2	20	60	360	\$404,178	Yes	\$909,400	Yes	\$11.23	\$25.26	4,224	\$95.69	\$215.29	5,632	\$71.76	\$161.47
	5	Kuhio Hwy.	40	\$5	\$2	241,000	\$386,000	147	734	241,000	20	4	10	120	720	\$808,355	No	\$1,818,800	No	\$3.35	\$7.55	8,448	\$95.69	\$215.29	11,264	\$71.76	\$161.47
	5	Kuhio Hwy.	40	\$6	\$3	232,000	\$566,000	141	704	232,000	20	4	10	120	720	\$808,355	No	\$1,818,800	No	\$3.48	\$7.84	8,448	\$95.69	\$215.29	11,264	\$71.76	\$161.47
	5	Kuhio Hwy.	40	\$7	\$4	222,000	\$711,000	135	675	222,000	20	4	10	120	720	\$808,355	No	\$1,818,800	No	\$3.64	\$8.19	8,448	\$95.69	\$215.29	11,264	\$71.76	\$161.47
	5	Kuhio Hwy.	40	\$8	\$5	212,000	\$850,000	129	646	212,000	20	4	10	120	720	\$808,355	Yes	\$1,818,800	No	\$3.81	\$8.58	8,448	\$95.69	\$215.29	11,264	\$71.76	\$161.47
	5	Kuhio Hwy.	40	\$9	\$6	203,000	\$973,000	123	616	203,000	20	4	10	120	720	\$808,355	Yes	\$1,818,800	No	\$3.98	\$8.96	8,448	\$95.69	\$215.29	11,264	\$71.76	\$161.47
5	Kuhio Hwy.	40	\$10	\$7	193,000	\$1,081,000	117	587	193,000	20	3	13	90	540	\$606,267	Yes	\$1,364,100	No	\$3.14	\$7.07	6,336	\$95.69	\$215.29	8,448	\$71.76	\$161.47	
5	Kuhio Hwy.	40	\$11	\$8	183,000	\$1,174,000	111	557	183,000	20	3	13	90	540	\$606,267	Yes	\$1,364,100	No	\$3.31	\$7.45	6,336	\$95.69	\$215.29	8,448	\$71.76	\$161.47	
40-Passenger Vehicles (4)	4	Kuhio Hwy.	40	\$5	\$2	284,000	\$454,000	17-35	86-173	43,000	40	2	20	120	720	\$546,829	No	\$1,230,364	No	\$12.72	\$28.61	4,224	\$129.46	\$291.28	5,632	\$97.09	\$218.46
	4	Kuhio Hwy.	40	\$6	\$3	273,000	\$654,000	17-33	83-166	41,000	40	2	20	120	720	\$546,829	Yes	\$1,230,364	No	\$13.34	\$30.01	4,224	\$129.46	\$291.28	5,632	\$97.09	\$218.46
	4	Kuhio Hwy.	40	\$7	\$4	261,000	\$836,000	16-32	79-159	39,000	40	2	20	120	720	\$546,829	Yes	\$1,230,364	No	\$14.02	\$31.55	4,224	\$129.46	\$291.28	5,632	\$97.09	\$218.46
	4	Kuhio Hwy.	40	\$8	\$5	250,000	\$999,000	15-30	76-152	38,000	40	2	20	120	720	\$546,829	Yes	\$1,230,364	No	\$14.39	\$32.38	4,224	\$129.46	\$291.28	5,632	\$97.09	\$218.46
	4	Kuhio Hwy.	40	\$9	\$6	239,000	\$1,145,000	14-29	72-145	36,000	40	2	20	120	720	\$546,829	Yes	\$1,230,364	No	\$15.19	\$34.18	4,224	\$129.46	\$291.28	5,632	\$97.09	\$218.46
	5	Kuhio Hwy.	40	\$5	\$2	241,000	\$386,000	147	734	241,000	40	2	20	120	720	\$546,829	No	\$1,230,364	No	\$2.27	\$5.11	4,224	\$129.46	\$291.28	5,632	\$97.09	\$218.46
	5	Kuhio Hwy.	40	\$6	\$3	232,000	\$566,000	141	704	232,000	40	2	20	120	720	\$546,829	Yes	\$1,230,364	No	\$2.36	\$5.						

## Summary of Key Findings

The following is a summary of the key transportation system findings for Kilauea Point National Wildlife Refuge.

1. Annual visitation to KPNWR is estimated at 215,000 in 2005, and is expected to increase to between 262,000 and 332,000 by 2025.
2. The growing popularity of KPNWR is generating operational, access, and safety issues, both at the Refuge and in the nearby Kilauea Town.
3. Roughly 20 to 25 percent of all traffic on Kilauea Road is headed to the Refuge, including the Overlook and/or the Point<sup>70</sup>.
4. By 2010, existing Refuge parking capacity will be approached routinely or exceeded (by an average of 10 spaces during the daily peak hour), under a mid-range growth scenario during peak season (winter, spring, and summer).
5. By 2015, daily parking demand will approach or exceed existing capacity at the Refuge (by an average of 14 spaces during the peak hour/peak season). This deficit condition will occur all day during the Refuge's public hours of operation during the peak season, and for approximately one to two hours of the day during the off-peak season (fall).
6. Five conceptual transportation alternatives were developed, analyzed, and given cursory evaluation: No-Build; Minor Improvements, Transportation System Management (TSM) and Transportation Demand Management (TDM); Moderate Improvements to Increase Capacity; Voluntary Shuttle Service with Private Vehicle Access; and, Mandatory Shuttle Service with no public parking at the Point.
7. All five transportation alternatives were found to be economically feasible, based on preliminary analysis and certain specified parameters.
8. Based on preliminary estimates, it would cost about \$160,000 (low-cost estimate<sup>71</sup>) to \$360,000 (high-cost estimate<sup>72</sup>) per year to operate one 25-passenger shuttle bus for KPNWR.

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<sup>70</sup> Parsons Brinckerhoff Quade & Douglas, KPNWR Traffic Visitor and Parking Counts Study, p.8.

<sup>71</sup> The low-cost estimate assumes government operation, combined with grants by others to provide capital improvements such as vehicles, onsite improvements, and a Hub visitor and maintenance facility.

<sup>72</sup> The high-cost estimate assumes contracting with a private company to provide turnkey operation. Capital improvements needed under this scenario, such as the offsite Hub visitor

9. Assuming development of a new offsite transit center “Hub” facility, providing visitors with convenient, ample parking; restrooms; ticket sales, and attractive, informative visitor services, it can be expected that a “free” (cost included in Refuge entry fee) voluntary shuttle system with guided narration (Alternative 4) would be used by about 10% - 20% of KPNWR visitors.
10. With a voluntary shuttle system in place, it is estimated that 80% - 90% of visitors would still choose to drive to KPNWR rather than use the shuttle.
11. Raising the current entry fee from \$3 to \$5, while adding a voluntary shuttle service with on-board guided narration, would discourage some visitors from entering due to increased cost, but would be attractive to others, resulting in no net change in visitor projections.
12. If the Refuge entry fee is raised above \$5, visitation will begin to drop, either with or without a shuttle system in operation.
13. To provide enough additional revenue to operate a voluntary shuttle system (Alternative 4) using 14-passenger (or similar) vehicles in 2010, the Refuge entry fee would need to be raised from the current fee of \$3 to \$5, assuming the low-cost estimate for the provision of transit is valid, or raised to \$7 under a high-cost estimate.
14. A mandatory shuttle system with on-board narration (Alternative 5) to be used by all visitors, with no private vehicle access permitted into the Refuge, would reduce visitation by about 15% below projected demand.
15. A mandatory shuttle bus system (Alternative 5), using 40-passenger vehicles, would be feasible in 2010 with an entry fee of \$6 under the low-cost estimate, and \$11 assuming the high-cost estimate.

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facility, are assumed to be provided with grants by others and are not included in the high-cost estimate.

# Recommendations Based on Findings to Date

## Short-Term Recommendations (1- 5 years)

Based on findings to date, FWS management should implement the following transportation strategies in the short-term (1 to 5 years) to help relieve transportation problems at KPNWR.

1. Seek/secure funding to initiate the next transportation planning, conceptual design, and environmental (NEPA) processing phase of the ATS Study efforts for KPNWR. Establish, evaluate, and confirm the preferred transportation alternative(s), combinations, and/or phasing of alternatives, which most comprehensively address/integrate the short-, medium-, and long-range transportation system needs for the Refuge.
2. Immediately begin to implement low-cost transportation system management (TSM) and transportation demand management (TDM) strategies. These include updating visitor information available on the FWS/KPNWR web page, in published literature, and via phone message; to educate potential visitors about “the best times to visit” based on anticipated availability of parking and/or other considerations such as the scheduling of interpretive programs. If possible, monitor and record the level of success of each strategy as it is implemented.
3. Ensure that the current onsite parking and internal circulation system configuration is most efficient. Properly identify non-paved, dedicated parking spaces (e.g., gravel area at the Point) to promote efficient and safer public parking.
4. Develop and implement a formal monitoring program to track incidents when public demand for onsite parking exceeds supply. Document temporary road closures, required to prohibit additional public access into the Refuge for limited periods of time on any given day, due to parking capacity issues.<sup>73</sup>
5. Seek funding for “Intelligent Transportation System” (ITS) applications, specifically the design/installation of an aesthetically pleasing and context-sensitive electronic sign, to be placed on Kuhio Highway. Information to be provided to the public via such technology can be changed remotely, in real time, to direct potential Refuge visitors and/or to inform them of current conditions at the Refuge which may restrict access. Such “variable message” applications will prevent visitors from wasting time and resources driving to the Refuge if no parking is currently available. Conversely, it may encourage additional visitation when access to the Refuge is unrestricted. It will also diminish safety, access, and circulation

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<sup>73</sup> Refuge staff have recently begun this type of monitoring program.

problems at the Refuge; and will reduce round-trip traffic (and associated noise and air quality impacts) in Kilauea Town.

6. Pursue from the County of Kauai, fee-simple purchase (or other long-term conveyance) of all or a portion of the County's parcel of land adjacent to the Overlook (west of Kilauea Road). This parcel is currently used informally for overflow visitor parking; and, control of this parcel by FWS will foster comprehensive management of the Overlook parking area, and may lead to a more successful ATS program, while enhancing the visitor experience.
7. Develop a phased transportation plan for KPNWR that starts with implementing the low-cost techniques listed above, and creates "trigger points" (based on congestion levels at the Refuge) for moving toward more capital intensive access and transportation solutions.
8. Based on the outcome of the anticipated NEPA phase of the Study, begin to pursue funding for potential medium- and long-term capital improvements that could include both onsite and/or offsite infrastructure improvements.
9. Promote the "3C" planning process; i.e., to facilitate "continuous, collaborative, and cooperative" endeavors to inform and work with the Kilauea community, Kauai County, and other stakeholders including the public at large, to minimize adverse transportation impacts generated by the increasing popularity of KPNWR.
10. Based on the outcome of the anticipated NEPA phase of the Study, pursue funding of a "demonstration project" to test the viability of transit applications for KPNWR; utilizing leased vehicles, over a limited period of time.
11. Fully document and analyze the utilization of transit, as currently provided by FWS during "special event days" held at KPNWR each year.

### **Medium-Term Recommendations (6-10 years)**

The following transportation strategies are medium-term (6 to 10 years) recommendations for KPNWR, based on findings to date.

1. Consider implementing more aggressive TSM and/or TDM strategies not already in place, such as installation of onsite parking meters or a pay station, and a visitor reservation system.
2. Consider increasing KPNWR entry fees, and subsequently dedicating all or a portion of the additional revenue generated toward the implementation of transportation facilities determined to be preferred during the anticipated NEPA phase of the Study.

3. Consider formalizing and expanding parking capacity on the parcel of land adjacent to the Overlook, to accommodate overflow parking when demand exceeds capacity at the Point and/or at the Overlook.
4. If the preferred alternative includes a transit system, operating from an offsite location, pursue funding for construction of Hub facility and purchasing transit vehicles.
5. Continue to work with the Kilauea community to minimize adverse transportation impacts related to increasing visitation demand at KPNWR.
6. Continue to monitor and evaluate transportation programs for success.

### **Long-Term Recommendations (11-20 years)**

The following transportation strategies are long-term (11 to 20 years) recommendations for KPNWR, based on findings to date:

1. If the preferred alternative includes a transit option from an offsite location, and if this was not already done during the medium-term, construct Hub facility and move all visitor ticket sales (entry fees), transit and some general maintenance activities/storage, and the KPNWR book store to new location.
2. If the preferred alternative includes a transit option from an offsite location, and if this was not already done during the medium-term, implement voluntary or mandatory shuttle system operations, based on current conditions.
3. Continue to work with the Kilauea community to minimize adverse transportation impacts.
4. Continue to monitor and evaluate transportation programs and address emerging issues to ensure ongoing success.

## **KPNWR Transportation-Related Issues to be Resolved and Next Steps**

The following issues have been identified as needing further study and/or resolution, and should be addressed or completed during the next phase of study.

1. Secure Funding for the next phase of ATS Project Planning/NEPA Processing and Preliminary Design.
2. Determine Lead Agency/Cooperating Agency Status and Secure Contractual and Funding Agreements.
3. Initiate NEPA Analyses and Processing, including Public Involvement.
4. Reconfirm the Feasibility of all previously identified Transportation Alternatives. Identify any new alternatives that should be considered and confirm their feasibility.
5. Coordinate Comprehensive Transportation Planning/Integration with the scheduled FWS Comprehensive Conservation Plan (CCP) process.
6. Coordinate with Community Plans and Local Partners: ATS plans and transportation strategies, including but not limited to the five Transportation Alternatives identified to date for KPNWR, should be consistent with the goals of the Kilauea Town Plan and other long-term planning efforts by Kauai County, Kauai Bus, Hawaii Department of Transportation (HDOT), FHWA, and other stakeholders. Interagency coordination and public involvement will be important to ensure success.
7. Determine Potential Need for Participation in the Development of a Proposed Bypass Road: FWS and CFLHD are unable to make any commitments at this time about federal participation/funding in the potential development of a bypass road for Kilauea Town. Before NEPA environmental review documents can be completed, relative to KPNWR transportation issues (as is anticipated during the next transportation planning/NEPA processing phase); FWS should determine if a successful ATS strategy for KPNWR, specifically transit, is dependent upon the use of a bypass road. If so, it should subsequently be determined if the development of such transportation infrastructure improvements can/should be funded; and, how potential development joint ventures (public-public and/or public-private), ongoing facility ownership, liability, and maintenance issues may be addressed.
8. Determine Preferred Location and Impacts of Potential Transit Hub Site: If transit is determined to be a preferred alternative for KPNWR, explore the benefits, costs, and impacts of each potential hub site, and work with the

community to determine the ideal location, considering the needs of the Refuge and the intent of the Kilauea Town Plan.

9. Evaluate FWS Operational Preferences for a Potential Transit Shuttle System: FWS will need to examine various operational issues for a shuttle system, including parking and management policies, direct access to the Point by private commercial transit operators (under Alternative 5), and ticket vending options and locations, among others.
10. Conduct a Traffic Study: A traffic study will be needed to evaluate the differing impacts on the local system, of all conceptual transportation alternatives under consideration. This study should include potential transit routes and stops, alternate Hub locations, and needed improvements to local roadways.
11. Acquire Topographic Survey Data: A topographic survey will be needed to verify the engineering feasibility of potential improvements at KPNWR, such as vehicle access, entrance road widening, and expanding public facilities at the Overlook.
12. Acquire Flora and Fauna Habitat Mapping: Mapping, available from FWS, would help determine where onsite construction/expansion at KPNWR is environmentally feasible. A formal Endangered Species Act "Section 7" consultation should be conducted by FWS specialists; to reconfirm the accuracy of mapped habitats, to assess potential impacts and/or to identify mitigation measures relative to endangered species from the potential development/intensification of transportation facilities at KPNWR.
13. Update Refuge Visitor and Parking Counts: The last onsite counts were taken at the Refuge in 2003. Changes to the fee collection system, visitor use patterns, growth in the inter-island cruise ship industry, and general growth in visitations to Kauai, have all likely impacted KPNWR visitor patterns since 2003.
14. Specify all Key FWS Management Objectives and Actions to be Proposed: For example, Refuge staff would like to move administrative and maintenance functions off of the Point, perhaps to the potential Hub site. This issue was not clearly addressed in the initial Purpose and Need Statement, as developed for the current transportation Study project.
15. Refine the Purpose and Need Project Statement: The Purpose and Need statement should be refined at the start of the next planning/ environmental processing phase.
16. Refine Transportation Alternatives Cost Estimates: Conduct detailed cost estimates for all viable alternatives, including combinations and/or phasing of compatible alternatives; to be developed to a level that is appropriate

for the screening process, as conducted during the alternatives analysis task of the anticipated environmental phase of the ATS Study.

17. Evaluate Transit Vehicle Types: If it is determined that transit is to be included in the preferred alternative “solution set,” conduct research on vehicles currently available; addressing attributes such as unit cost, capacity and size, reliability, aesthetics, visitor experience, legality, and applicability for the location and climate. Types of vehicles examined could include rubber-tired historic-replica trolleys, trams, electrically powered and/or alternative fuel vehicles. Specification of additional details/needs of the transit system will be required, which could affect cost and feasibility of transit options.
18. Determine/Prepare the Appropriate Type of NEPA Environmental Review Document: Although preparation of a Categorical Exclusion (CE) may be sufficient for some of the potential minor transportation improvements at KPNWR, it seems more likely that preparation of an Environmental Assessment (EA) or Environmental Impact Statement (EIS) will be required, considering the full extent of the various alternatives. All germane social, economic, and environmental (“SEE”) considerations must be addressed. Because it is likely that both federal and state/county resources would be utilized, environmental documentation would need to be prepared in accordance with both the National Environmental Policy Act (NEPA) of 1969, as amended, and the Hawaii Revised Statutes (HRS) Chapter 343, the State’s environmental review law. Additional federal requirements, such as Section 7 of the Endangered Species Act, Section 106 of the National Historic Preservation Act, and other federal and/or state regulations, would apply.
19. Conduct Public Outreach Activities: Public involvement meetings and/or hearings will be required if the Draft EA or EIS scoping and review processes are pursued. Other public forums may be advisable and/or required to obtain public input and to further develop each conceptual transportation alternative to be considered and processed under NEPA.
20. Develop Conceptual Site Plans: Develop conceptual site plans and related architectural, engineering, and/or landscaping plans at an appropriate level of detail; in an effort to document and accommodate the proposed transportation functions, sizes, aesthetics, and costs of each potential significant transportation facility improvement.
21. Analyze Biological, Cultural, Historic, and Archaeological Impacts and Constraints at the Potential Transit Hub Sites, the Point, and Overlook: Resources at the Refuge will need to be addressed in the context of the EA or EIS. In addition, the following actions will also be needed: consultation with the State Historic Preservation Officer and concurrence with Coastal Zone Management regulations. Other issues such as

Hazardous Materials clearance and aesthetics and visual impact may need to be addressed.

22. Consider how the individual Transportation Alternatives, their integration and/or phasing opportunities would affect the Visitor Experience at KPNWR.
23. Establish Selection Criteria for Transportation Alternatives.
24. Develop Phasing Plan for Improvements: The preferred alternative for KPNWR could be a phased approach that incorporates elements of several of the conceptual alternatives to be integrated and implemented in cohesive stages over time. In determining appropriate phases, "trigger points" should be developed to determine when to move into subsequent phases. Examples of trigger points include metrics of visitation, congestion, visitor comments/complaints, resource impacts, etc.

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## **APPENDICES**

**Appendix A: Refuge Visitor Projections Report (RVP Report)**

**Appendix B: Testimony by FWS on Kilauea Town Plan**

**Appendix C: Conceptual Transportation Alternatives Matrix**

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**Appendix A:**

**KILAUEA POINT NATIONAL WILDLIFE REFUGE  
ALTERNATIVE TRANSPORTATION SYSTEMS STUDY  
REFUGE VISITOR PROJECTIONS REPORT**



**Conducted on behalf of the U.S. Fish and Wildlife Service**

**by the U.S. Department of Transportation  
Federal Highway Administration  
Central Federal Lands Highway Division**

**Contract No. DTFH68-02-D-00001  
Task Order DTFH68-03-T-00044**

**Prepared By:**

**Parsons Brinckerhoff Quade and Douglas**

**March 2006**

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## Introduction

The U.S. Fish and Wildlife Service (USFWS), with support from the Federal Highway Administration Central Federal Lands Highway Division (CFLHD), is exploring alternatives to the existing transportation system at the Kilauea Point National Wildlife Refuge (KPNWR), located on the Island of Kauai, Hawaii.

As part of the Alternative Transportation Systems Study (ATS Study) visitation, parking and traffic conditions were sampled at KPNWR and documented in the Traffic, Visitor, and Parking Counts (TVP) Study (January 2004). The TVP Study relied on data collected at the Refuge in early and mid-2003, as well as, counts taken in 2002, as part of a research report, "Visitor Use Study Summary: Kilauea Point National Wildlife Refuge," prepared by Shayna Graham (graduate student at the University of California –Chico). The TVP Study indicated that growth in visitation to KPNWR has occurred over time. It also analyzed impacts of the recent economic recession and the war in Iraq, on the number of visitors recorded at the Refuge during the 2003 counts.

The purpose of this document, the Refuge Visitor Projections Report (RVPR), is to characterize future visitation at KPNWR, and in concert with the subsequent document Transit and Parking Projections Report (TPPR) is intended to help determine viable improvements and alternatives to the existing transportation system, including possible institution of a transit "shuttle" system. This analysis considers a variety of factors likely to affect the level of visitation, including projected growth rates for overall visitation to Kauai Island, seasonal variations in visitation, and possible changes to visitor services.

In a related research effort, the U.S. Geological Survey – Policy Analysis and Science Assistance (PASA) team was retained by CFLHD; to conduct surveys and prepare a report delineating the results and implications of visitor and community attitudes. This Visitor Perceptions and Economic Valuation Research for the KPNWR (Final Completion Report, January 2006), addresses some of the issues referenced above, also in support of the ATS Study.

The first section of this RVPR document, "Growth Projection Methodology" summarizes the methods and assumptions used to develop visitor projections for KPNWR. "Growth Trends," describes the factors used to develop forecasts for KPNWR visitation; the results of which are detailed in the "Visitation Forecasts" section. These visitor projections will influence the conceptual designs of alternative transportation options being developed during the ATS Study.

## Growth Projection Methodology

To forecast growth in KPNWR visitations over both the short-term and long-term, a variety of factors must be considered. As growth rates tend to fluctuate over time, resulting in a wide array of projections, a range of rates was developed to allow the evaluation of transportation strategies under a variety of scenarios.

To capture the wide range of variations possible in visitor growth rates, this study identified and examined the potential impacts of four factors on the visitor growth rate:

- Past and recent growth trends in Kauai visitation, including cruise ship arrivals
- Potential changes in the type of visitor services offered at the Refuge
- Potential changes in access options to the Refuge
- Potential changes in Refuge entrance fees

For purposes of this study, the following three growth scenarios were developed with the above four factors in mind:

- **Low Growth Scenario**, which accounts for economic downturns, reduced services at the Refuge, and other factors which could limit the growth in visitation to the Refuge
- **Mid-Range Growth Scenario**, which uses a combination of past trends and market growth projections from the State of Hawaii Department of Business, Economic Development and Tourism (DBEDT), to represent moderate projected growth; and
- **High Growth Scenario**, based on recent trends, which assumes continued growth in tourism and potentially an increase in visitor services at the Refuge (although at this time the Refuge staff have indicated there are no immediate plans to increase visitor services).

These low, medium, and high growth rate projections were combined with other variables of interest to the USFWS, including:

- **Changes Over Time** - Future visitor projections were developed for short-term (5-year or 2010), medium-term (10-year or 2015), and long-term (20-year, or 2025) periods.
- **Seasonal Variability** - Visitation forecasts were developed for peak and off-peak seasons. The peak seasons are winter, spring and summer, while the off-peak season is fall. To adjust the available peak data to reflect off-peak counts, seasonal adjustment factors were developed and applied to the peak numbers.

Upon quantifying the projected visitation using the different growth scenarios, incorporating anticipated changes over time and seasonal variability, these variations in visitor forecasts will then be used in the Transit and Parking Projections Demand Report to quantify the following:

- Parking utilization at Kilauea Point NWR (aka, The Point)
- Parking utilization at Kilauea Point Overlook; and
- Potential transit ridership.

The parking utilization and transit ridership estimates will be used to develop and help screen the initial transportation alternatives; and to assist with planning and analysis of viable transportation alternatives, in the future NEPA (National Environmental Policy Act) phase of this transportation planning effort.

#### Visitation Issues at the Overlook

It should be noted that the Refuge visitation data and forecasts are focused on the area known as “The Point” which is inside the Refuge access control gate, with ingress from the cul-de-sac at the end of Kilauea Lighthouse Road. Visitation to the Overlook (on the cul-de-sac, outside the Refuge access control gate), by contrast, is not restricted and has not traditionally been counted. Uncontrolled public access to the cul-de-sac area has the potential to create traffic and access problems in the future, which were not addressed in this report. Possible increases in entry fees, restrictions on parking at the Point, and the implementation of shuttle bus operations, which are being explored in the Transit and Parking Projections Report, could either relieve or exacerbate problems at the Overlook. This issue will be explored in more detail during the NEPA phase of the project.

# Growth Trends

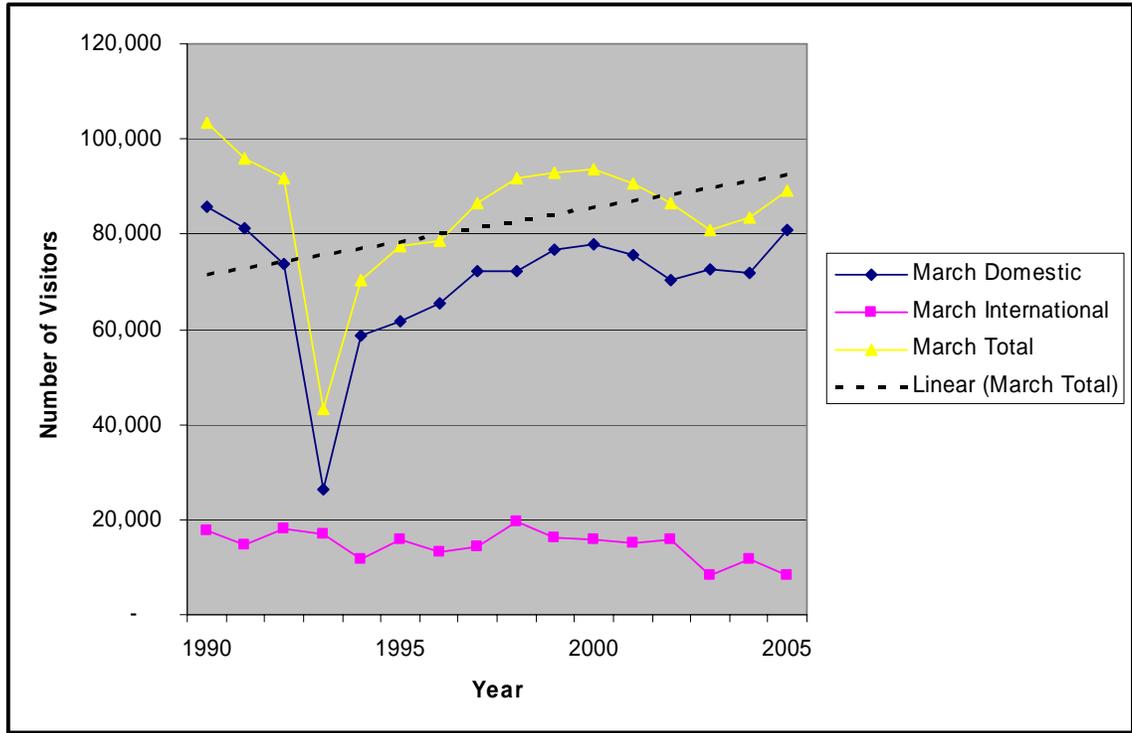
## Past and Recent Growth Trends

### Annual Visitations to Kauai by Air

Figure 1 and Table 1, below, show the visitation counts to Kauai (domestic – from within Hawaii and from the mainland; and international, arriving by air) in the month of March between 1990 and 2005, as provided by the State’s Department of Business, Economic Development, and Tourism (DBEDT). March was selected as being representative of the peak season. It should be noted there was a significant drop in tourism between 1992 and 1994, due to the devastation and lingering effects caused by Hurricane Iniki, which resulted in a rather lengthy period where annual visitations were well below 1990’s level. And a significant drop in international travelers occurred after 2002, potentially due to the September 11, 2001, terrorist attacks and the start of the Iraq War in March, 2003. As a result, the period between 1990 and 2005 indicates an overall downward trend in visitations, rather than the expected increase over time.

Despite these anomalies, it can be said that a more “normal” visitor trend resumed in 1995, and continued with the exception of the slight drop between 2001-2003. Thus, 1995 was used as the basis for determining growth increase trends. Between 1995 and 2005, overall growth in visitors to Kauai was approximately 1.3 percent per year, as summarized in Table 1, below. A trend line in the table shows the growth rate since 1995.

**Figure 1. Kauai Visitors arriving by air during the Month of March 1990 – 2005**



Source: State of Hawaii Department of Business, Economic Development and Tourism.

**Table 1. Kauai Visitors arriving by air during March**

Year	Type of Visitor		
	Domestic	International	Total
1990	85,800	17,700	103,500
1995	61,800	15,700	77,600
2000	77,900	15,700	93,600
2001	75,700	14,900	90,600
2002	70,500	15,800	86,300
2003	72,600	8,500 <sup>74</sup>	81,100
2004	71,900	11,400	83,300
2005	81,100	8,200	89,300
<b>Average Annual Growth Rate, 1995 – 2005</b>	+2.5%	-5.7%	+1.3%

Source: State of Hawaii Department of Business, Economic Development and Tourism.

<sup>74</sup> Iraq War began in March, 2003, impacting International travel.

## Cruise Ship Arrivals

While most visitors to KPNWR arrive to Kauai by airplane, the 2003 KPNWR Traffic, Visitor, and Parking Counts (TVP) Study determined that arrivals of cruise ships in Lihue had an impact on the number and timing of KPNWR visitors. Therefore, visitor projections should take into account the recent growth in the cruise ship industry. The "Visitor Perception and Economic Valuation Research for KPNWR," conducted by the U.S. Geological Survey – Policy Analysis and Science Assistance (PASA) investigators, was based on data collected in 2003 and 2004. This study indicated that approximately 2 percent of KPNWR visitors arrived in Kauai by cruise ship (PASA Survey Table 3, Question 2).

Based on discussions with Mr. Cy Feng of DBEDT (April 2005), and analysis of DBEDT's data for cruise arrivals, it is anticipated that the number of visitors to Kauai arriving by cruise ships will continue to grow at a higher rate than visitation to Kauai as a whole<sup>75</sup>. Similarly, the percentage of KPNWR visitors arriving by cruise ship is likely to increase from the current 2 percent estimated in the PASA report. However, cruise ship passengers typically spend only one day or so on Kauai, compared with seven days for those arriving by air. The short time cruise passengers spend on Kauai tends to reduce the chance they will visit the Refuge. As a result, the vast majority of KPNWR visitors will continue to arrive to Kauai by airplane.

### **Future Growth Rate Scenarios at KPNWR**

Given the information provided above, there are three primary factors that influence past and future growth rates:

- Visitor Services
- Access Options and Infrastructure
- Entrance Fees

This section describes how variations in those factors were used to generate three potential growth scenarios:

- Low Growth Rate
- Mid-Range Growth Rate, and
- High Growth Rate.

These growth rates will be applied to current peak and off-peak visitation levels to achieve the five-year, ten-year, and twenty-year peak and off-peak season projections in the next section (Visitation Forecasts).

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<sup>75</sup> For example, the number of visitors arriving to Kauai by cruise ship jumped by 33 percent in 2005 compared with 2004, representing about 20 percent of total visitors.

### Low Growth Rate Scenario

The Low Growth Rate reflects changes in attendance that could result from reduced tourism due to visitor capacity issues in Kauai, increases in the Refuge entrance fee, and/or reduction in visitor services at KPNWR.

The Hawaii Tourism Authority (HTA) projects a growth rate for Kauai on the order of 1 percent per year (Hawaii Tourism Strategic Plan, 2005-2015, adopted in October 2004; Frank Haas, HTA, August 2005). HTA believes that Kauai is reaching its capacity in terms of accommodations (lodging, short-term housing), and cannot sustain visitation growth rates experienced to date. HTA indicates that unless there is a significant increase in Kauai's infrastructure (water, sewer, and roads), the accommodations capacity - rather than market demand - will become the limiting factor to tourism.

Another factor that could constrain the growth in visitations to KPNWR is an increase in the entrance fee. USFWS has indicated that entry fees may increase by as much as \$2 within the next few years. The USFWS is also considering making changes to visitor services at the Refuge. These changes could decrease or increase the number of visitors and/or the duration of visits to KPNWR.<sup>76</sup> For example, USFWS has stated that there is a possibility they would reduce visitor services offered at the Refuge if adverse impacts to wildlife or ecological concerns are observed. Therefore, it is uncertain at this time what potential changes in visitor services may be made, if any and what impact that would have on the number of visitors.

Given the discussion above, for purposes of this study, the Low Growth Rate Scenario reflects conditions with no significant increase in infrastructure on the island of Kauai; a possible small increase in the entrance fee, and a possible reduction in visitor services. Thus, the Low Growth Rate was assumed to be 1.0 percent per year, consistent with the estimate by the HTA.

### Mid-Range Growth Rate Scenario

The Mid-Range Growth Rate was developed assuming that visitor services offered at the Refuge and the transportation system (parking and vehicle access) both remain at the existing condition ("status quo").

According to the report Population and Economic Projections for the State of Hawaii to 2030 by DBEDT (August 2004) Kauai's growth rates in "de facto" (non-Kauai resident) visitor population, will be approximately 1.4 percent per year between 2005 and 2015, and 1.3 percent per year between 2015 and 2025. This combination results in an approximate overall average of 1.35 percent per year

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<sup>76</sup> Some questions in the PASA surveys indicate that visitation is correlated with visitor service levels. Although the PASA surveys did not ask visitors if they would return if services were reduced; questions were asked whether or not they would extend their stay at KPNWR, if certain services were added for a fee. A significant majority (70 percent or more) said that they would extend their stay if there were a minor increase in fees (\$1-3).

growth rate between 2005 and 2025, which is higher than HTA's more conservative growth rate. This average was rounded up to 1.4% and used for the Mid-Range Growth Rate.

### High Growth Rate Scenario

This scenario represents a high future growth rate, reflecting the increased level of growth in visitation that has occurred on Kauai over the past decade or so.

This scenario factors in a potential increase in visitor services and possible improved access, resulting in more and/or longer visitations at the Refuge. This scenario also accounts for the possibility that infrastructure and accommodations capacity could be increased on Kauai, which would accommodate a higher visitation growth rate.

The Kauai visitation average annual growth rate since 1994 has been slightly more than 2 percent per year. For the purposes of this study, the High Growth Rate Scenario used a growth rate of 2.2 percent per year.

### **Summary of Growth Rate Scenarios at KPNWR**

Given the uncertainty of predicting future growth in visitation at KPNWR, three growth scenarios were established for this report:

- Low Growth Rate of 1 percent per year
- Mid-Range Growth Rate of 1.4 percent per year
- High Growth Rate of 2.2 percent per year

## Visitation Forecasts

Visitation forecasts were developed for three time horizons: short-term (5-year or 2010), medium-term (10-year or 2015), and long-term (20 year or 2025).

### Annual Forecasts

Future visitation for three horizon years was estimated by applying the three growth rates (described in the previous section) to an estimate of existing (2005) visitations. The horizon years are as follows:

- Short-Term forecast – Represents the situation within a five-year period, to the year 2010, which corresponds to the time required to phase-in initial improvements or “stop-gap” transportation measures.
- Mid-Term forecast – Represents the ten-year horizon (2015), which may correspond with a transitional period between short-term and long-term transportation solutions.
- Long-Term forecast – Represents a 20-year period, or the year 2025. This forecast addresses longer-term planning, seeking to design transportation alternatives that will have at least a 20-year lifecycle.

Table 2 below, displays annual visitation forecasts for KPNWR. The annual forecast for calendar year (CY) 2005 was extrapolated from actual visitor count data from a five-month period (July 16 to December 15, 2005). Methods considered for estimating 2005 visitation, as well as available visitor count data, are shown in [Attachment A](#). An examination of fee receipts from fiscal years (FY) 2000-2004 indicates that the period from mid-July to mid-December accounted for 40.51% of annual visitations. Applying this share to the 87,027 visitors counted from July 16 to December 15, 2005 results in an estimate for CY 2005 of approximately 215,000 annual visitors.

During the 2003 TVP survey, auto occupancy rates (persons per vehicle) were found to be slightly higher in summer (3.1 persons per vehicle) than in spring (2.7 persons per vehicle). An average occupancy rate of 2.9 persons per vehicle was applied to the projected visitation numbers to estimate the future number of vehicles shown in the tables below.

**Table 2. KPNWR Visitation Growth Forecasts (Annual)**

Year	Low Growth Rate Scenario	Mid-Range Growth Rate Scenario	High Growth Rate Scenario
<b>Persons</b>			
<b>2005 (estimate of existing annual visitors)</b>	215,000 <sup>77</sup>		
<b>Average Annual Growth Rate</b>	1.0%	1.4%	2.2%
<b>Short-term: 2010 (Five-year projection)</b>	226,000	230,500	239,700
<b>Mid-term: 2015 (10-year projection)</b>	237,500	247,100	267,300
<b>Long-term: 2025 (20-year projection)</b>	262,300	283,900	332,200
<b>Growth 2005-2025)</b>	22%	32%	55%
<b>All Vehicles</b>			
<b>2005 (estimate of existing annual vehicles)</b>	74,100 <sup>78</sup>		
<b>Short-term: 2010 (Five-year projection)</b>	77,900	79,500	82,700
<b>Mid-term: 2015 (10-year projection)</b>	81,900	85,200	92,200
<b>Long-term: 2025 (20-year projection)</b>	90,500	97,900	114,600
<b>Growth (2005-2025)</b>	22%	32%	55%

<sup>77</sup> Based on extrapolation of actual count data from July-December 2005

<sup>78</sup> Based on average occupancy of 2.9 persons per vehicle.

## Seasonal Variation and Daily Forecasts

Another purpose of the ATS Study is to examine Refuge visitation in both the peak and off-peak seasons, to determine if there should be seasonal changes in potential transportation alternatives, such as running a shuttle only during peak seasons. Therefore, seasonal variation in visitation at the Refuge is examined in this report. The Transit and Parking Demand Projections Report will use this information to make recommendations about the applicability of seasonally differentiated transportation services. Daily variations in visitor patterns within the same season may also be present, but were not examined as part of this report.

To calculate seasonal fluctuations, KPNWR entrance fee-box receipts from FY 2000 through 2004 were compiled and averaged by month, season, and combination of seasons<sup>79</sup>. This data is shown in [Attachment B](#). Monthly fluctuations are shown in Figure 2, below, while seasonal variation is shown in Figure 3. For the purpose of this study, winter is defined as January through March, spring is April through June, summer is July through September and fall is October through December. In Figure 4, winter, spring and summer were combined to represent the peak visitation season; whereas, fall represents the off-peak season.

As shown in Figure 3 below, the highest visitor season, winter, is about 18 percent higher than the lowest visitor season, fall. When combined into peak and off-peak, as in Figure 4, visitations in winter, spring and summer are about 17 percent higher than fall.

Daily peak-season visitor forecasts were developed by dividing the annual estimate by a daily-to-annual factor of 329. This factor was calculated by comparing fee receipts from a typical peak season day in March and August to average annual receipts (See [Attachment B](#) for more detail). It is similar to what is used by FHWA, state departments of transportation, the Federal Transit Administration, and transit agencies, when converting from a typical peak daily or weekday number to an annual count, or visa versa. Daily peak-season visitor forecasts are shown in Table 3, below.

Peak visitor projections were adjusted downward by 17 percent to develop the daily off-peak visitor forecast displayed in Table 4, below.

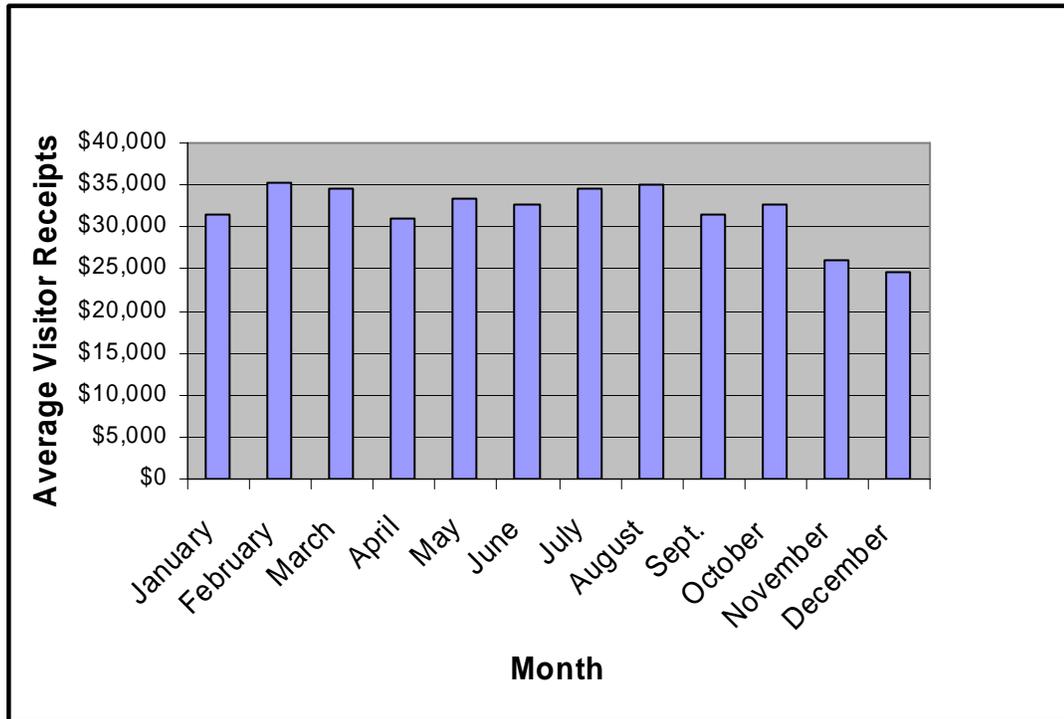
While very large seasonal variations in attendance occur at national parks and similar destinations in the mainland United States, this is not the case at KPNWR. The seasonal change of 17 to 18 percent at KPNWR is not large compared with parks on the mainland. For example, Zion National Park typically attracts about 325,000 visitors per month during the summer but only about

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<sup>79</sup> During this time when the "honor box system was still in place, KPNW staff could not effectively track the number of visitors, due to non-payment by some. However, it is assumed that the rate of non-payment would not vary across months or seasons.

75,000 per month during winter, which is a 77 percent decrease<sup>80</sup>. While visitation at KPNWR does vary from month to month, the difference between the highest (February and August) and lowest (December) month is only about 29 percent.

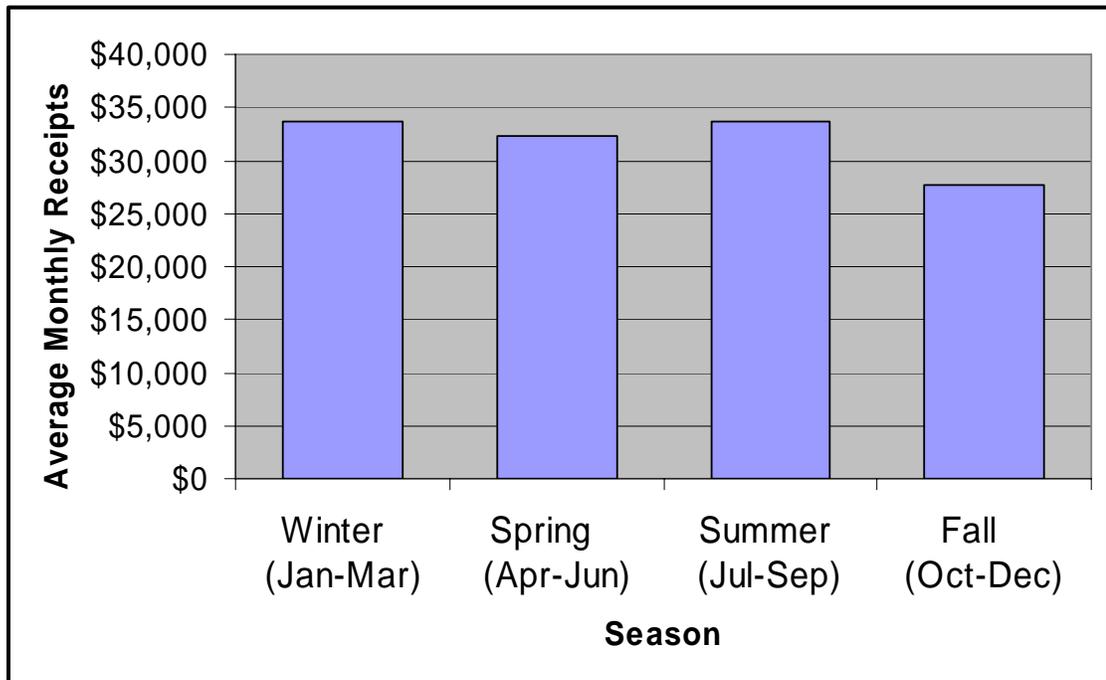
**Figure 2. KPNWR Monthly Dollar Receipts (Entrance Fees)**



Source: PB summary of KPNWR receipt data from FY2000 - 2004.

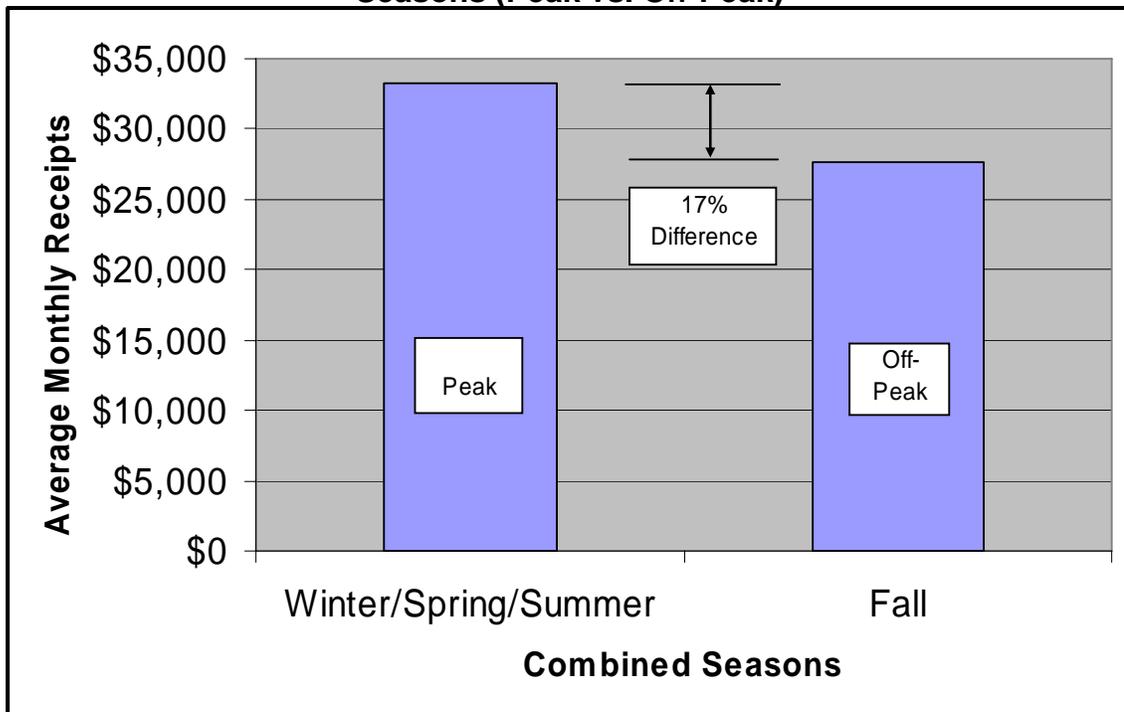
<sup>80</sup> <http://www.nps.gov/zion/visitation%20statistics.htm>

**Figure 3. KPNWR Seasonal Receipts (Entrance Fees)**



Source: PB summary of KPNWR receipt data from FY 2000 - 2004.

**Figure 4. Average Monthly Dollar Receipts (Entrance Fees) by Combined Seasons (Peak vs. Off-Peak)**



Source: PB summary of KPNWR receipt data from FY 2000 - 2004

**Table 3. KPNWR Visitation Growth Forecasts (Daily, Peak Season<sup>81</sup>)**

Year	Low Growth Rate Scenario	Mid-Range Growth Rate Scenario	High Growth Rate Scenario
<b>Persons</b>			
<b>2005 (estimate of existing daily visitors)</b>	653 <sup>82</sup>		
<b>Average Annual Growth Rate</b>	1.0%	1.4%	2.2%
<b>Short-term: 2010 (5-year projection)</b>	690	700	730
<b>Mid-term: 2015 (10-year projection)</b>	720	750	810
<b>Long-term: 2025 (20-year projection)</b>	800	860	1010
<b>Growth Projection (2005-2025)</b>	22%	32%	55%
<b>All Vehicles</b>			
<b>2005 (estimate of existing daily vehicles)</b>	225 <sup>83</sup>		
<b>Short-term: 2010 (5-year projection)</b>	240	240	250
<b>Mid-term: 2015 (10-year projection)</b>	250	260	280
<b>Long-term: 2025 (20-year projection)</b>	280	300	350
<b>Growth Projection (2005-2025)</b>	22%	32%	55%

<sup>81</sup> Peak season is defined as winter, spring and summer, combined.

<sup>82</sup> Based on extrapolation of actual count data from July-December 2005, divided by 329.

<sup>83</sup> Based on average occupancy of 2.9 persons per vehicle.

**Table 4. KPNWR Visitation Growth Forecasts (Daily, Off-Peak Season<sup>84</sup>)**

Year	Low Growth Rate Scenario	Mid-Range Growth Rate Scenario	High Growth Rate Scenario
<b>Persons</b>			
<b>2005 (estimate of existing daily visitors)</b>	547 <sup>85</sup>		
<b>Average Annual Growth Rate</b>	1.0%	1.4%	2.2%
<b>Short-term: 2010 (5-year projection)</b>	580	590	610
<b>Mid-term: 2015 (10-year projection)</b>	600	630	680
<b>Long-term: 2025 (20-year projection)</b>	670	720	850
<b>Growth Projection (2005-2025)</b>	22%	32%	55%
<b>All Vehicles</b>			
<b>2005 (estimate of existing daily vehicles)</b>	189 <sup>86</sup>		
<b>Short-term: 2010 (5-year projection)</b>	200	200	210
<b>Mid-term: 2015 (10-year projection)</b>	210	220	230
<b>Long-term: 2025 (20-year projection)</b>	230	250	290
<b>Growth Projection (2005-2025)</b>	22%	32%	55%

<sup>84</sup> Off-peak season is defined as fall (October-December).

<sup>85</sup> Estimate of daily peak season visitors, adjusted downward by 17 percent.

<sup>86</sup> Based on average occupancy of 2.9 persons per vehicle.

## Summary

- Visitation to the Refuge is estimated to be about 215,000 in 2005.
- Visitor growth over the next 20 years may range from 1.0 to 2.2 percent per year. Under the Mid-Range Growth Rate Scenario (which assumes 1.4 percent growth per year), there would be about 32 percent more visitors in 2025 than today (2005). A Low Growth Rate Scenario would result in 22 percent more visitors, while a High Growth Rate Scenario would result in an increase of 55 percent.
- Seasonal variability in visitation is not large at KPNWR compared to similar destinations on the U.S. Mainland. Visitation to KPNWR tends to peak in the winter, spring and summer, declining about 17% in fall.
- Implications of future visitor projections and seasonal variability on parking and transit demand will be discussed in the subsequent Transit and Parking Projections Report.

## List of References

- Department of Business, Economic Development, and Tourism, State of Hawaii. Population and Economic Projections for the State of Hawaii to 2030. <[www3.hawaii.gov/DBEDT/images/User\\_Files/Images/latestdata/Long-range\\_Projections\\_-\\_2030/Series2030Report\\_rev8-13-04\\_a974.pdf](http://www3.hawaii.gov/DBEDT/images/User_Files/Images/latestdata/Long-range_Projections_-_2030/Series2030Report_rev8-13-04_a974.pdf)>. August 2004.
- Hawaii Tourism Strategic Plan, 2005-2015, adopted in October 2004 (Hawaii Tourism Authority); phone discussion with Frank Haas, HTA, August 2005.
- Parsons Brinckerhoff Quade and Douglas, Inc. Traffic, Visitor, and Parking Counts Study. January 2004.
- Sexton, N.R., S.C. Gillette, L. Koontz, S.C. Stewart, J. Loomis, and K. Wundrock, 2005, Visitor and Community Survey Results for Kilauea Point National Wildlife Refuge and Lighthouse: Completion Report, U.S. Geological Survey, Biological Resources Discipline, Open-File Report 2005-1420, November 2005, 221p.
- U.S. Fish and Wildlife Service. Kilauea Point National Wildlife Refuge entrance fees receipt data, 2000-2004.
- Wilkinson, Todd. "Buses and Trains Amid Towering Cliffs: At More Parks, Visitors Leave the Car Behind." Christian Science Monitor. May 2001.

# Attachment A: Estimate of 2005 Refuge Visitations

## Methods Considered for Estimating 2005 Refuge Visitations

One purpose of this report is to estimate Refuge visitations in calendar year (CY) 2005, which then becomes the base year for developing future-year projections. A new entrance fee booth was installed at the Refuge in the summer of 2005, and from that point forward more reliable visitor data is available. For this report, three methods were considered to update 2003 observations to CY2005 estimates:

1. Use the newly available empirical data, i.e., 2005 fee collections and visitor count data, which was generated after the “honor system” pay box was replaced with the new “mandatory system” fee booth inside the Refuge in July 2005. A visitation estimate for 2005 would be calculated by extrapolating the available five months of data (July 16 to December 15, 2005) into an annual count.
2. Continue counting visitors in 2005 and into 2006, to gather data for a six- or nine-month period, to generate a more accurate annual estimate. This could require waiting until May 2006 to finalize the visitor projections and the subsequent Transit and Parking Demand Projections reports.
3. Compare the August, September and October 2005, fee receipt collection data to prior years, to determine if there is a change in visitation. Previous data would be adjusted to compensate for those who reported “not paying the entry fee” in the PASA surveys, for reasons other than using a pass (approximately 6 percent of total).

The outcome of each method is described below:

Method #1 results in an estimate of 215,000 annual visitors to the Refuge in CY2005. This would appear to be a 15 percent *decrease* from annual projections resulting from the data in the 2003 TVP Study. A decrease in visitation is inconsistent with KPNWR staff observations, and with the overall increase in tourism being reported on Kauai. However, the 2003 annual visitor estimates are based on only four days of data collection extrapolated out to an entire year; while the 2005 data is from five months of actual visitor counts. Therefore, it would seem the 2005 data is more accurate than the 2003 data.

Method #2 would provide a more accurate estimate than Method #1, but would result in a three to six month delay in the Study. CFLHD/USFWS has provided direction not to delay the issuance of the Visitor Projection Report.

Method #3 indicates an overall increase in fee receipts from estimated 2003 conditions. This was determined by observing the August, September and October entry fee collections for FY2003, and adjusting them upward by 6

percent to account for those not paying the fee. Comparing fee receipts from FY2003 to 2005, indicates that visitor fees, and thus the number of visitors, have increased by 12% since 2003. This is logical because anecdotal and other data indicate an overall increase in visitations since 2003. However, the 2003 TVP Report visitor projections may have been high due to the small sample (four days of data).

It was determined that Method #1 would be used for the 2005 estimate of refuge visitation, because it appears to be based on the most accurate data available at this time. A reevaluation of available visitor data will be conducted during the next (NEPA) phase of the ATS Study, and projections may be updated at that time.

#### Estimate of CY2005 Refuge Visitations

Month	Average Fee Receipts (FY2000-2004)	Percent of Annual	Actual CY2005 Visitors
January	\$31,397	8.22%	
February	\$35,163	9.21%	
March	\$34,562	9.05%	
April	\$31,093	8.14%	
May	\$33,269	8.71%	
June	\$32,773	8.58%	
July	\$34,578	9.06%	10,150 (July 16-31)
August	\$35,106	9.20%	18,951
September	\$31,502	8.25%	15,611
October	\$32,547	8.53%	17,677
November	\$25,961	6.80%	17,125
December	\$24,499	6.42%	7,513 (Dec 1-15)
<b>Estimated Annual Visitors for CY2005</b>			<b>215,212</b>

## Attachment B: Estimating Peak-Day to Annual Expansion Factor

### Monthly Visitation Receipts, Averaged for FY2000-2004

Month	Average Receipts for Month
January	\$31,397
February	\$35,163
March	\$34,562
April	\$31,093
May	\$33,269
June	\$32,773
July	\$34,578
August	\$35,106
September	\$31,502
October	\$32,547
November	\$25,961
December	\$24,499
<b>TOTAL YEARLY</b>	<b>\$382,450</b>
March/August monthly average <sup>87</sup>	\$34,834
March/August average day	\$1,161
<b>Conversion factor (annual divided by peak day)</b>	<b>329</b>

<u>Season</u>	<u>Average Monthly Receipts</u>
Winter (Jan-Mar)	\$33,707
Spring (Apr-Jun)	\$32,378
Summer (Jul-Sep)	\$33,503
Fall (Oct-Dec)	\$27,669
Peak Season (winter, spring and summer combined)	\$33,196
Off-Peak Season (fall)	\$27,669
Difference, Peak to Off-Peak	17%

<sup>87</sup> March and August were used to match the dates studied in the Traffic, Visitor, and Parking Counts Study in 2003.

## Appendix B:

### Testimony by FWS on Kilauea Town Plan



**U.S. DEPARTMENT OF THE INTERIOR  
FISH AND WILDLIFE SERVICE**

KAUAI NATIONAL WILDLIFE REFUGE COMPLEX  
KILAUEA POINT  
P.O. BOX 1128  
KILAUEA, HAWAII 96754  
808/828-1413, FAX 808/828-6634  
March 24, 2006



County of Kauai  
Kauai County Planning Commission

Dear Commission Members:

I would like to submit the following written comments for the record on the General Plan Amendment GPA-2006-1 for the Kilauea Town expansion you are considering for approval.

Over the past 3 years the U.S. Fish and Wildlife Service with the assistance of the U.S. Department of Transportation, Federal Highway Administration Central Federal Lands, and the consultant Parsons, Brinkerhoff, Quade & Douglas Inc. has conducted an intensive study and planning effort to address traffic concerns at the Kilauea National Wildlife Refuge and its resulting affects on Kilauea Town. As a part of this effort we have been engaged with the Kilauea Town planning meetings to stay informed on their progress and to inform them of our planning activities.

To date we have nearly completed the preliminary study and planning required for our project and will be entering into the Environmental Assessment phase of the project in the near future. We are considering several alternatives including a shuttle bus system with a park-and-ride located somewhere near Kilauea Town. We have determined that a park-and-ride system would be financially feasible, would require a small increase in the Refuge entrance fee, and would be favorably accepted by the majority of the visiting public. However, we have also determined that implementing a shuttle system and the increased entry fee may result in a slight decrease in future visitation, compared to projected visitation levels, which is consistent with portions of the Kilauea Town Plan that emphasize "visitor demand management" to assist in reducing traffic congestion in Kilauea Town.

The Kilauea Town Plan includes two potential locations for a Refuge park-and-ride facility. We would prefer the in-town "civic/commercial" site, located next to the light industrial uses in the center of town because this option would provide more flexibility in our transit operations and is the most convenient access for visitors to other businesses in the center of town. The other identified park-and-ride site next to Kuhio Highway would be acceptable to the refuge but would not offer the benefits of the in-town site. Both of these sites would benefit from a by-pass road access and we would endorse the construction of a by-pass road as the key to reducing traffic congestion through the Kilauea Road neighborhoods.

In conclusion, we have no objections to the Draft Kilauea Town Plan because it includes a park-

and-ride facility which we may want to use if we implement a refuge shuttle transit system. We are in agreement with the possible park-and-ride locations included within the Draft Plan. We would prefer to use a by-pass road for visitor access to the refuge to reduce traffic in Kilauea Town.

Sincerely,

Michael M. Hawkes  
Refuge Manager

## Appendix C:

### Conceptual Transportation Alternatives

Alt.	NAME (Figure #, if any)	DESCRIPTION	Capita l Cost Estim ate	Annual Cost Estimate	Meet Purpose &Need?	PROS	CONS
1	<b>No-Build</b> (Figures 1, 2, 3)	<ul style="list-style-type: none"> <li>• No physical change from existing onsite conditions:               <ul style="list-style-type: none"> <li>○ Limited parking with peak-period overflow parking</li> <li>○ Refuge staff act as parking attendants, as necessary, to maintain visitor safety and manage available space on Kilauea Point</li> <li>○ Pedestrian and large bus access prohibited/restricted</li> <li>○ Manned ticket booth (as of 27Jun05)</li> </ul> </li> <li>• Traffic/parking demand at Overlook and Kilauea Point continues to increase as visitation to Kauai grows</li> </ul> <p>Recommended action:</p> <ul style="list-style-type: none"> <li>• Hire parking attendant</li> </ul>	No initial costs.	\$35,000-40,000/yr	No.	<ul style="list-style-type: none"> <li>• No construction disturbance to community and wildlife</li> <li>• No construction or improvement costs</li> <li>• Additional manpower frees up Refuge staff</li> </ul>	<ul style="list-style-type: none"> <li>• May not fully address future needs: Traffic and parking conditions at Overlook and Point expected to worsen as visitation grows over time</li> <li>• Some visitors may be denied access</li> <li>• Environmental impacts continue</li> <li>• Traffic congestion through town expected to worsen</li> </ul>

2	<b>Minor Improvements/ Transportation System Management</b> <i>(Figure 4)</i>	<ul style="list-style-type: none"> <li>• Little or no physical change from existing onsite conditions; Manage existing access and parking facilities - keep same number of parking spaces: <ul style="list-style-type: none"> <li>○ Provide seasonal / peak-period traffic and parking information on KPNWR website or in tourist information publications</li> <li>○ Provide visitors with “real-time” parking information via signs / radio messages / mobile technologies <i>(Figure 4)</i></li> <li>○ Hire parking attendant</li> </ul> </li> </ul>	Under \$500,000	\$130,000-150,000/yr	Partially  But does not minimize traffic impacts on Kilauea Town.	<ul style="list-style-type: none"> <li>• Little or no construction disturbance to community and wildlife</li> <li>• Minor cost of construction &amp; maintenance</li> <li>• Parking info redistributes parking demand</li> </ul>	<ul style="list-style-type: none"> <li>• Does not fully address future needs: Traffic and parking conditions at Overlook and Point expected to worsen as visitation grows over time</li> <li>• Some visitors may be denied access</li> <li>• Additional signage may be objectionable to locals.</li> </ul>
2.1	<i>Additional options</i>	<ul style="list-style-type: none"> <li>○ Limit number of parking spaces and/or duration (e.g. upper parking area on Point designated for 30-minute parking; Overlook parking designated for 10-minute parking)</li> <li>○ Congestion pricing: Vary entrance fees by season or time of day</li> <li>○ Designate reserved parking spaces or reduce entrance fees to encourage use of (private, tour-operator) shuttle van services</li> </ul>	Similar to above.	Incremental additional management cost likely	Same as above	<ul style="list-style-type: none"> <li>• Encourages quicker parking turnover</li> </ul>	<ul style="list-style-type: none"> <li>• Same as above</li> </ul>
3	<b>Moderate Improvements</b> <i>(Figures 5-1 through 5-4; Figure 6; Figure 7; Figure 8)</i>	<ul style="list-style-type: none"> <li>• Moderate physical changes from existing onsite conditions; improve access and parking supply to meet long-term demand <ul style="list-style-type: none"> <li>○ <u>Overlook Improvements</u> - Improve and/or expand Overlook shuttle van waiting, parking, and viewing areas. Allow private shuttle vans to park at Kilauea Point <i>(Figures 5-1 through 5-4)</i></li> <li>○ <u>Parking Improvements</u> - Improve/expand parking lot configuration at Kilauea Point, including shuttle van pick-up/drop-off area <i>(Figure 6)</i></li> </ul> </li> </ul>	Under \$ 3.5 Million	\$130,000-150,000/yr (same as Alt 2)	Partially  But, does not minimize traffic impacts on Kilauea Town. If habitat is reduced, is also not consistent	<ul style="list-style-type: none"> <li>• Improves parking, shuttle waiting, and/or viewing areas</li> <li>• Reduces current vehicular congestion problem</li> <li>• May encourage more Refuge</li> </ul>	<ul style="list-style-type: none"> <li>• Moderate construction cost</li> <li>• Requires property acquisition</li> <li>• Requires plant removal along driveway</li> <li>• Loss of 2 parking stalls at Point</li> </ul>

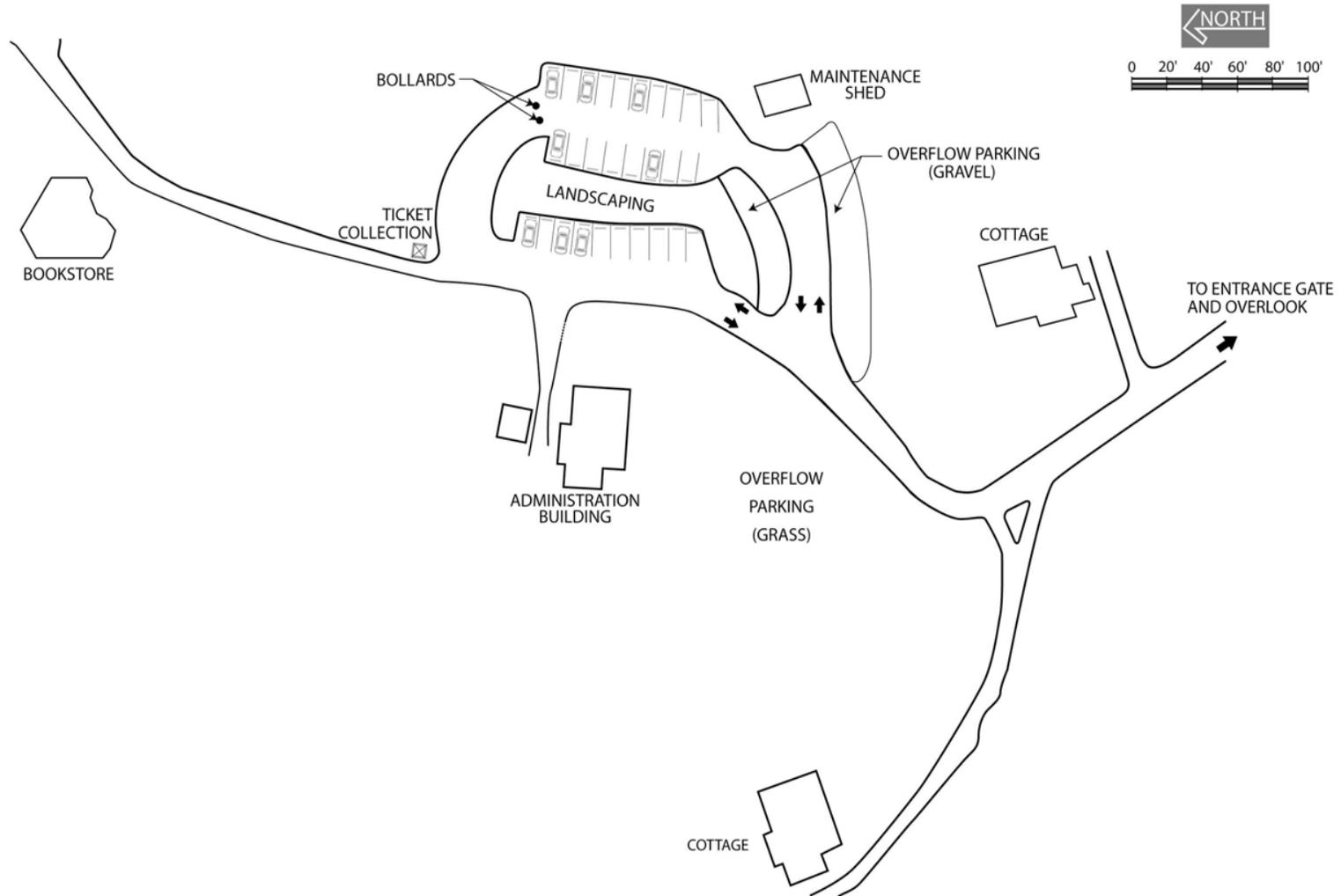
		<ul style="list-style-type: none"> <li>• Optional Elements: <ul style="list-style-type: none"> <li>○ Entrance Road Improvements - Widen refuge entrance road to better accommodate shuttle vans and/or bicycles/pedestrians (walk bikes in); Provide bicycle/pedestrian path to Overlook and/or Point (Figure 7)</li> <li>○ Porous paving – Consider using grass or other environmentally friendly surface for new paved areas (Figure 8)</li> <li>○ Hire parking attendant</li> </ul> </li> <li>• NOTE: <ul style="list-style-type: none"> <li>○ Refuge staff in favor of re-configuring Point parking lot into one-way circulation</li> <li>○ Refuge staff not in favor of expanding parking and reducing habitat</li> <li>○ Hike access at Overlook no longer needed. If Refuge guided hikes are reinstated, they would start at Sea Cliff Estates</li> <li>○ Pedestrian path may not be feasible, given need to widen road and affect bird habitat</li> </ul> </li> </ul>			with conservation programs. Does not meet Refuge Compatibility requirements.	visitation <ul style="list-style-type: none"> <li>• Reduced need for parking management by staff</li> <li>• May improve bike, pedestrian, and/or shuttle bus access</li> </ul>	<ul style="list-style-type: none"> <li>• May reduce areas on Point available for other uses/ open space</li> <li>• Biological and historic properties concerns with Point parking expansion</li> <li>• Expansion may conflict with cultural preservation and ESA mandates</li> <li>• May encourage more Refuge visitation</li> <li>• 4(f) use (Refuge)</li> <li>• Need formal Section 7 consultation</li> </ul>
<u>Overlook Improvements</u>	Scheme 1 (Figure 5-1) (Modified by PB, June 2005; from OTAK, June 2002)					<ul style="list-style-type: none"> <li>• Longer queuing area available</li> </ul>	
	Scheme 2 (Figure 5-2) (OTAK, June 2002)						<ul style="list-style-type: none"> <li>• Transit stops far from Overlook</li> </ul>
	Scheme 3 (Figure 5-3) (Modified by PB, June 2005; from OTAK, June 2002)					<ul style="list-style-type: none"> <li>• Aesthetically pleasing design</li> </ul>	<ul style="list-style-type: none"> <li>• Less stalls than other designs</li> </ul>
	Scheme 4 (Figure 5-4) (PB, June 2005)					<ul style="list-style-type: none"> <li>• Minimal change</li> </ul>	<ul style="list-style-type: none"> <li>•</li> </ul>

4	<b>Refuge Transit with Private Vehicle Access</b> <i>(Figure 9 and others)</i>	<ul style="list-style-type: none"> <li>• <u>Dedicated Refuge Transit system</u> – to provide regularly-scheduled pick-up / drop-off at KPNWR Overlook and Kilauea Point <ul style="list-style-type: none"> <li>○ Two 25-passenger shuttle buses (or smaller) used for cost estimate</li> <li>○ Transit operator is third-party (not USFWS)</li> <li>○ Year-round service, but headways may be lower in off-peak season</li> <li>○ Allow private vehicle access and parking, at same entrance fee price as transit users</li> <li>○ Allow private shuttle vans to park at Kilauea Point</li> </ul> </li> <li>• <u>Offsite Park &amp; Ride in Kilauea Town</u> <ul style="list-style-type: none"> <li>○ Some KPNWR services and facilities re-located to Park &amp; Ride, such as bookstore, ticketing office, some administrative functions; equipment storage and maintenance</li> </ul> </li> <li>• <u>Other Physical Improvements (similar to Alt #3)</u> <ul style="list-style-type: none"> <li>○ <u>Overlook Improvements</u> - same as above (Figures 5-1 through 5-4)</li> </ul> </li> <li>• <u>Optional Elements:</u> <ul style="list-style-type: none"> <li>○ <u>Entrance Road Improvements</u> – same as above (Figure 7)</li> <li>○ Existing parking lot at Point may be reconfigured to provide more open space</li> <li>○ Porous paving – same as above (Figure 8)</li> </ul> </li> </ul>	Under \$6 Million, excluding property acquisition for Park & Ride (\$2.5 Million)	\$320,000 - \$720,000, for two vehicles in operation, including all costs to maintain and driver salaries. Cost may vary more depending on operating assumptions	Yes (Depends in part on location of Hub. Kuhio Highway Hub will remove more visitor traffic from going through town than the Post Office site, unless the bypass is built, in which case both Hub locations are equal)	<ul style="list-style-type: none"> <li>• Potential minor reduction in private vehicle traffic through Kilauea Town (depending on location of Hub)</li> <li>• Increases options for Refuge staff to manage visitation levels and impact on wildlife</li> <li>• Improves traffic safety in Kilauea, at the Overlook, and on the Point</li> <li>• Non-essential KPNWR facilities can be moved to offsite P&amp;R</li> <li>• May improve business opportunities and tourism in Kilauea Town</li> <li>• May improve bike, pedestrian, and/or shuttle bus access</li> </ul>	<ul style="list-style-type: none"> <li>• Has similar cons as No-Build, plus the following:</li> <li>• Relatively high construction, operational, and maintenance cost</li> <li>• P&amp;R may cause traffic impacts or other substantial changes near that site</li> <li>• Construction impacts at Point, Overlook, and P&amp;R sites</li> <li>• May encourage more tourism in Kilauea Town, especially near P&amp;R</li> <li>• Requires additional staff, facilities and administration over and above other alternatives.</li> </ul>
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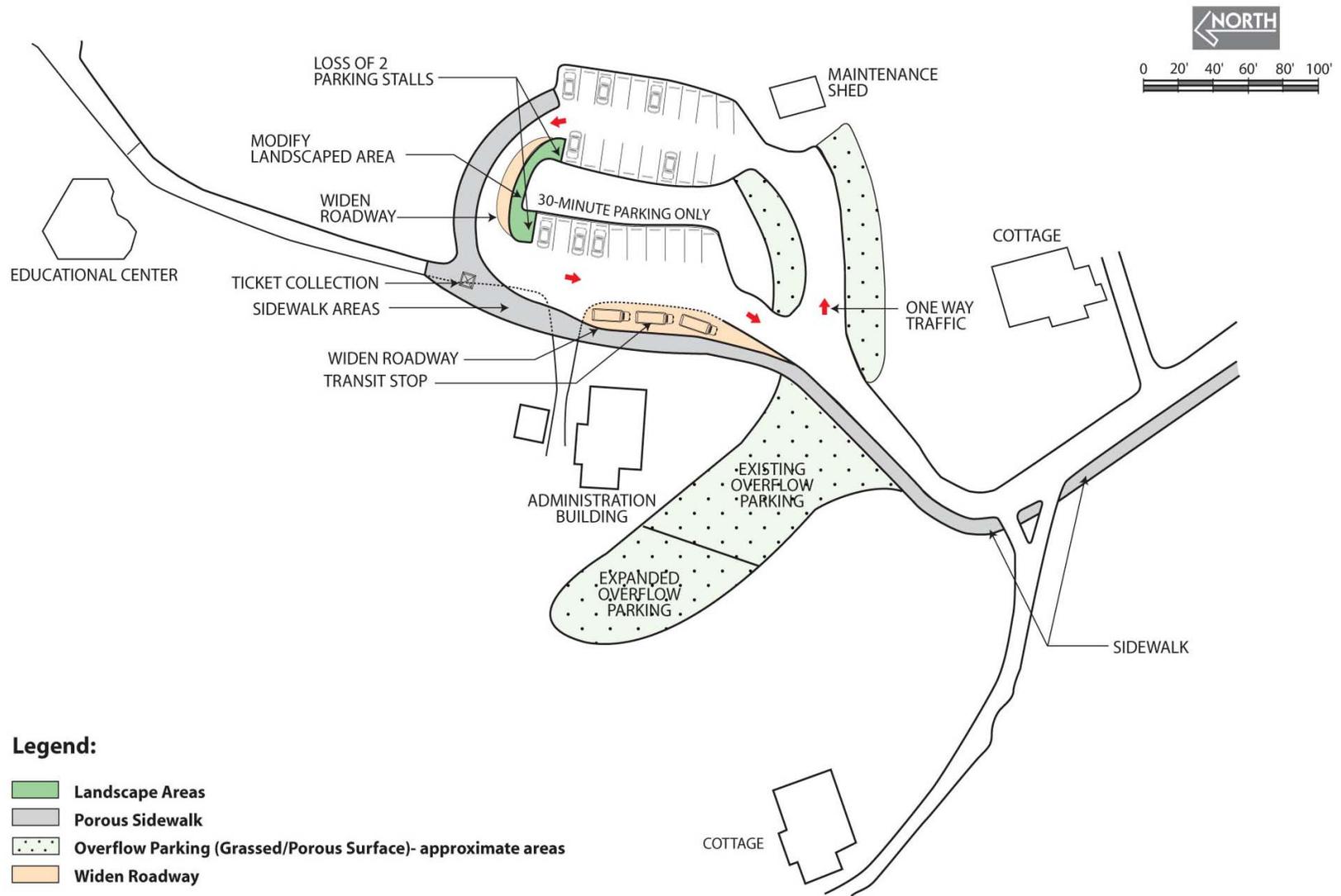
5	<b>Refuge Transit ONLY</b> <i>(Figure 9 and others)</i>	<ul style="list-style-type: none"> <li>• Same as <a href="#">Alternative 4</a>, but private vehicle access is NOT allowed to Point; parking lot improvements limited to shuttle van areas. Private vehicle access is allowed to Overlook.</li> <li>• <a href="#">Three or Four</a> 25-passenger shuttle buses used</li> <li>• Optional Element: <ul style="list-style-type: none"> <li>○ Existing parking lot at Point may be reconfigured to provide more open space</li> </ul> </li> </ul>	<p>Under \$6.5 Million, excluding property acquisition for Park &amp; Ride (\$3 Million)</p> <p>Optional Cost: Parking lot reconfiguration under \$1.0 Million.</p>	<p>\$480,000 – over \$1 Million, including all costs to maintain and driver salaries. <a href="#">Cost may vary more depending on operating assumptions</a></p>	<p>Yes (Depends in part on location of Hub. Kula Highway Hub will remove more visitor traffic from going through town than the Post Office site, unless the bypass is built, in which case both Hub locations are equal)</p>	<ul style="list-style-type: none"> <li>• Similar to <a href="#">Alternative 4</a>, plus the following:</li> <li>• Greatly reduces private vehicle traffic through Kilauea Town, more than <a href="#">Alternative 4</a></li> <li>• Private vehicle access to Refuge prohibited, making visitor management easier</li> <li>• Point parking area may be reconfigured for less congestion (more open space)</li> <li>• Less staff and administrative requirements than <a href="#">Alt. 4</a></li> </ul>	<ul style="list-style-type: none"> <li>• Private vehicle access to Refuge prohibited</li> <li>• Relatively high construction, operational, and maintenance cost.</li> <li>• P&amp;R may cause traffic impacts or other substantial changes near that site</li> <li>• Construction impacts at Point, Overlook, and Park &amp; Ride sites.</li> <li>• May encourage more tourism in Kilauea Town, especially near P&amp;R</li> </ul>
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## Appendix D:

### Conceptual Alternatives - Site Plan Concepts and Sample Technologies

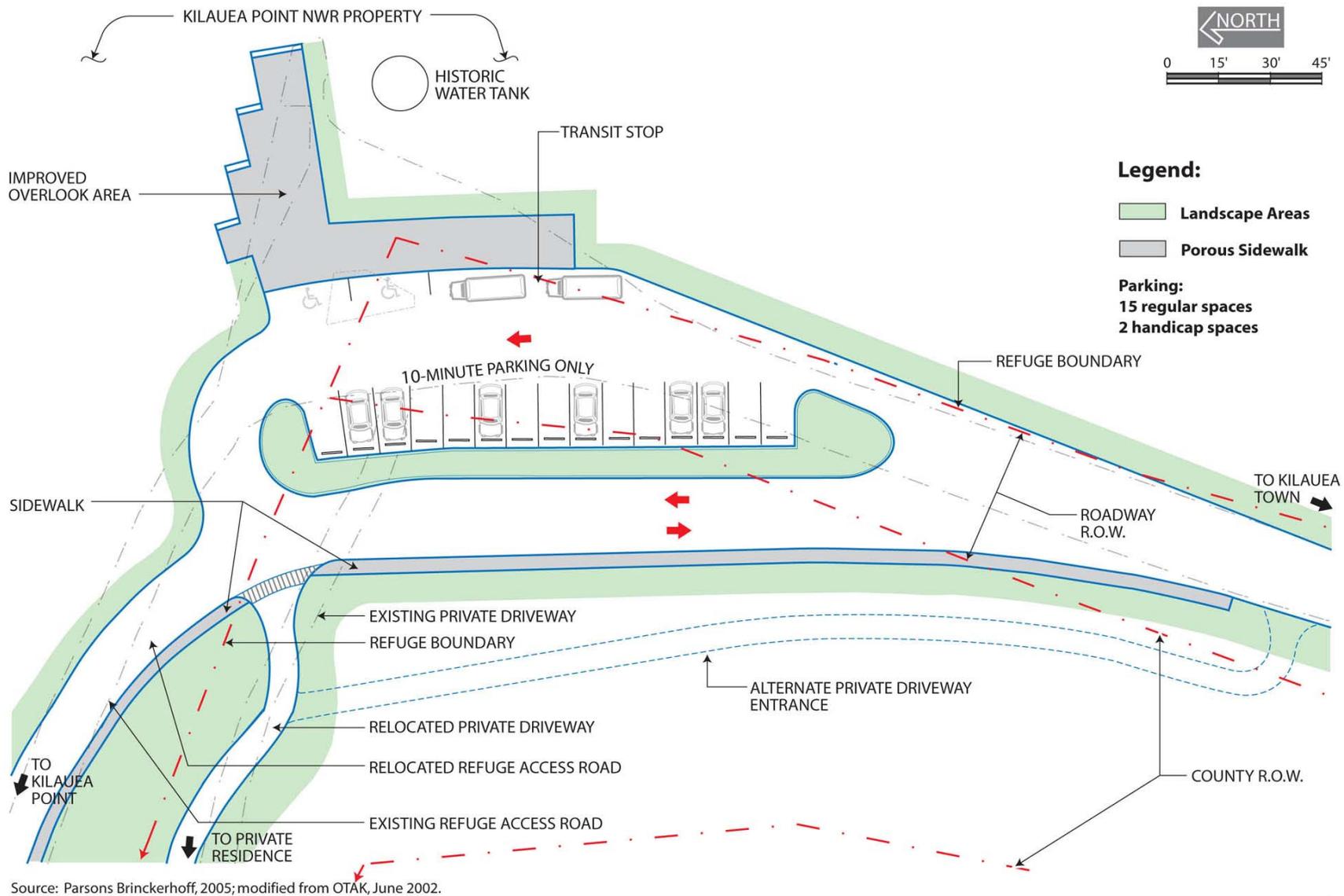


**Existing Parking Lot Configuration at Kilauea Point**

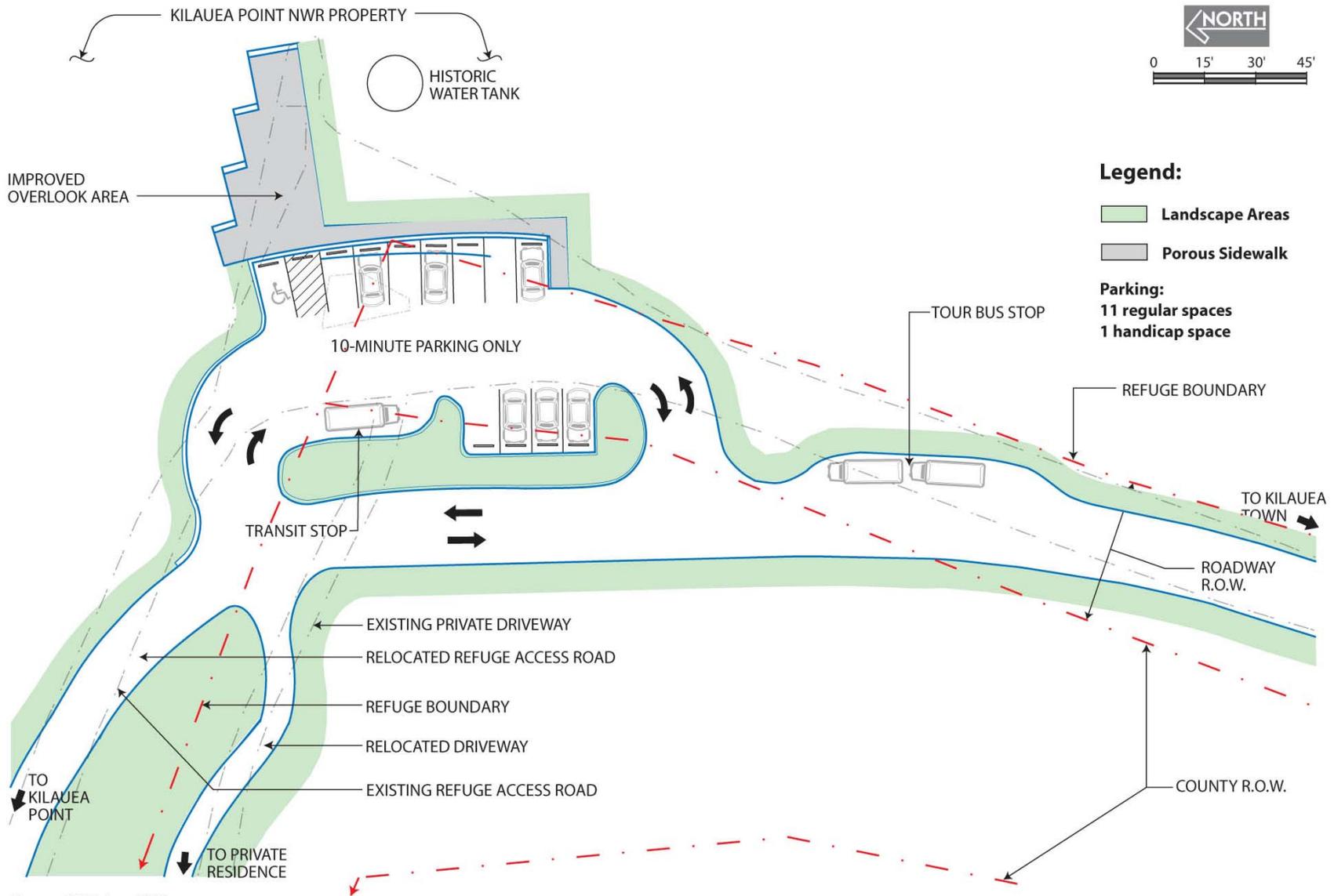


Source: Parsons Brinckerhoff, 2005.

### Conceptual Parking Lot Configuration at Kilauea Point

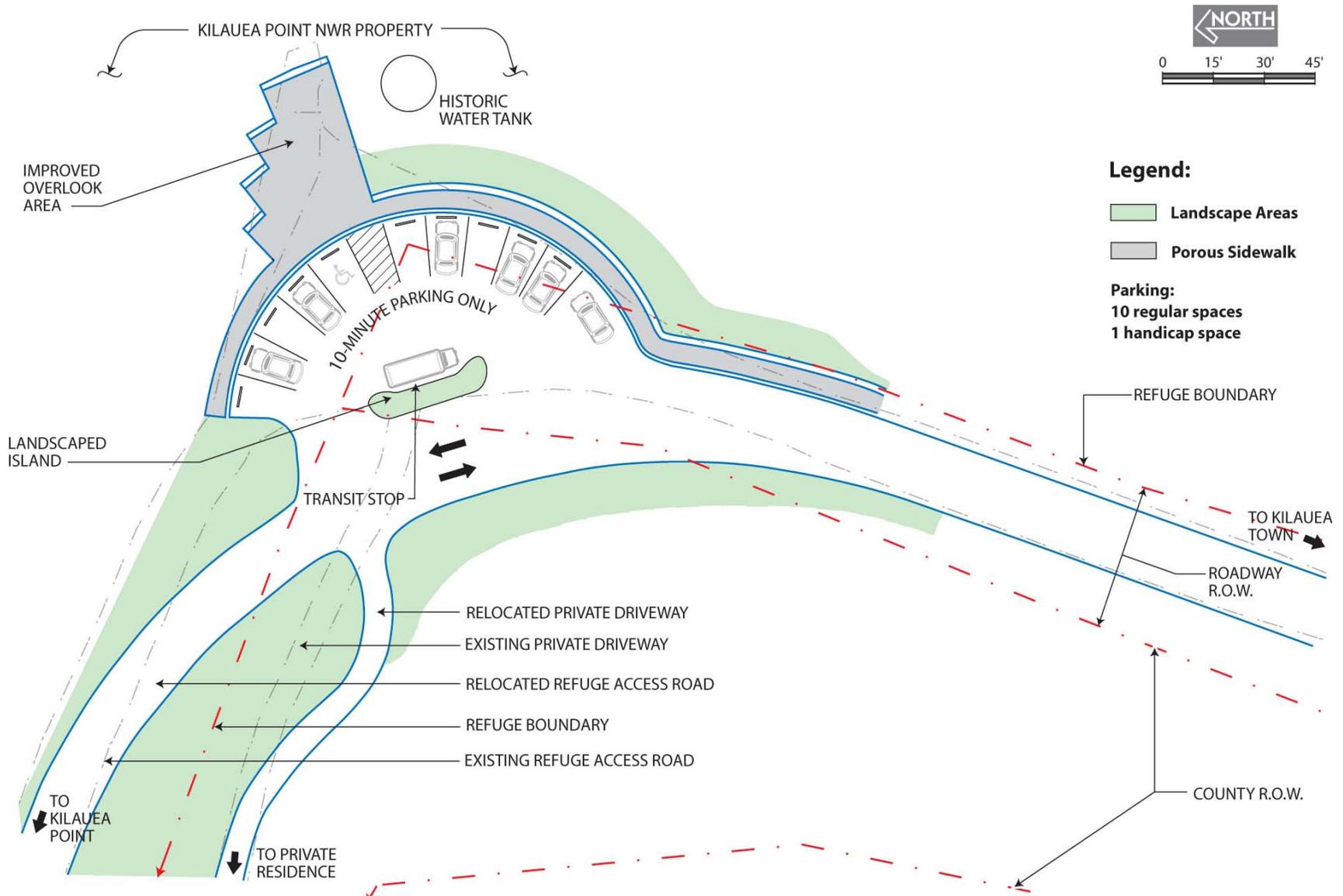


**Conceptual Parking Lot Configuration at the Overlook – Scheme 1**

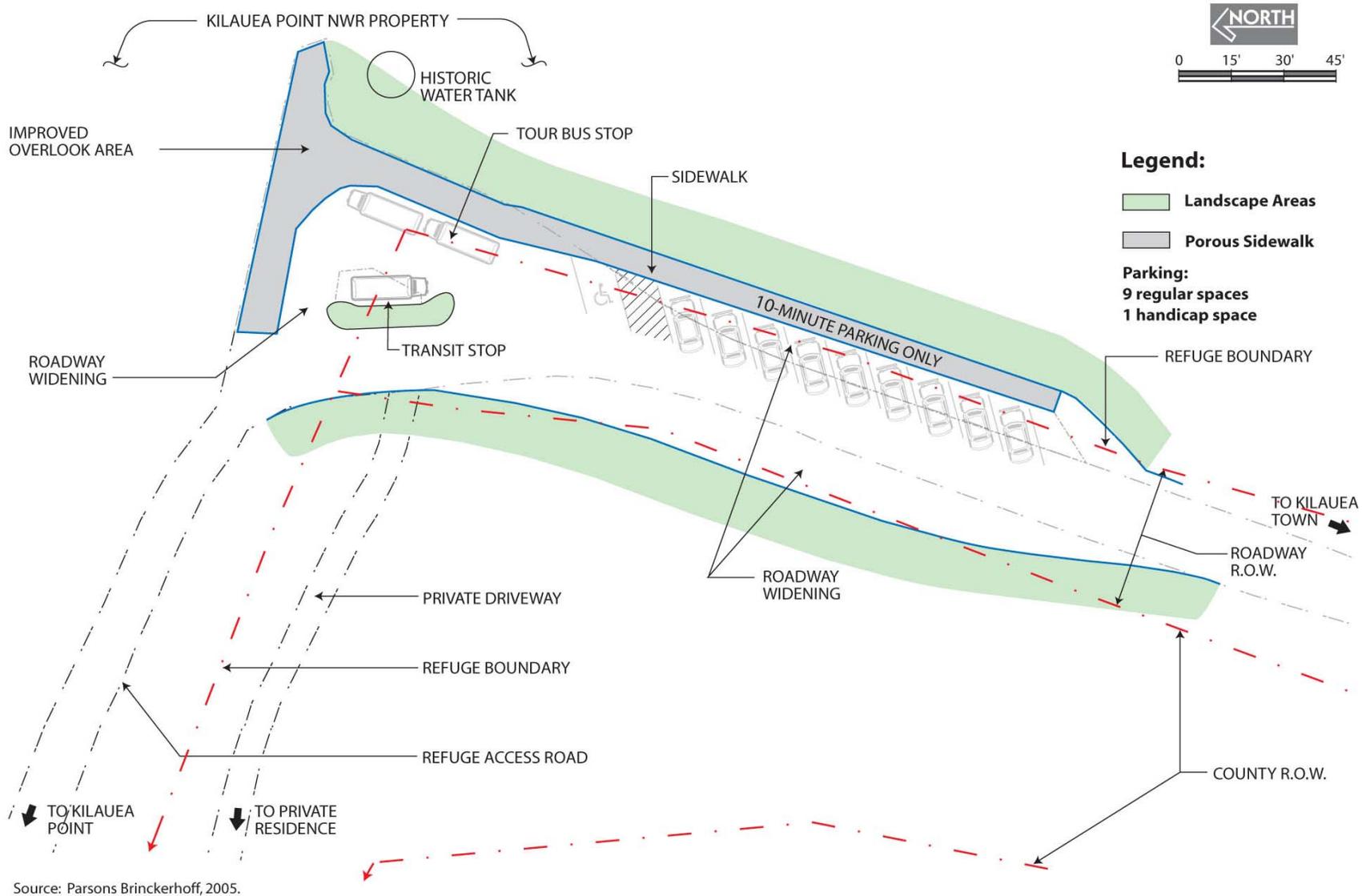


Source: OTAK, June 2002.

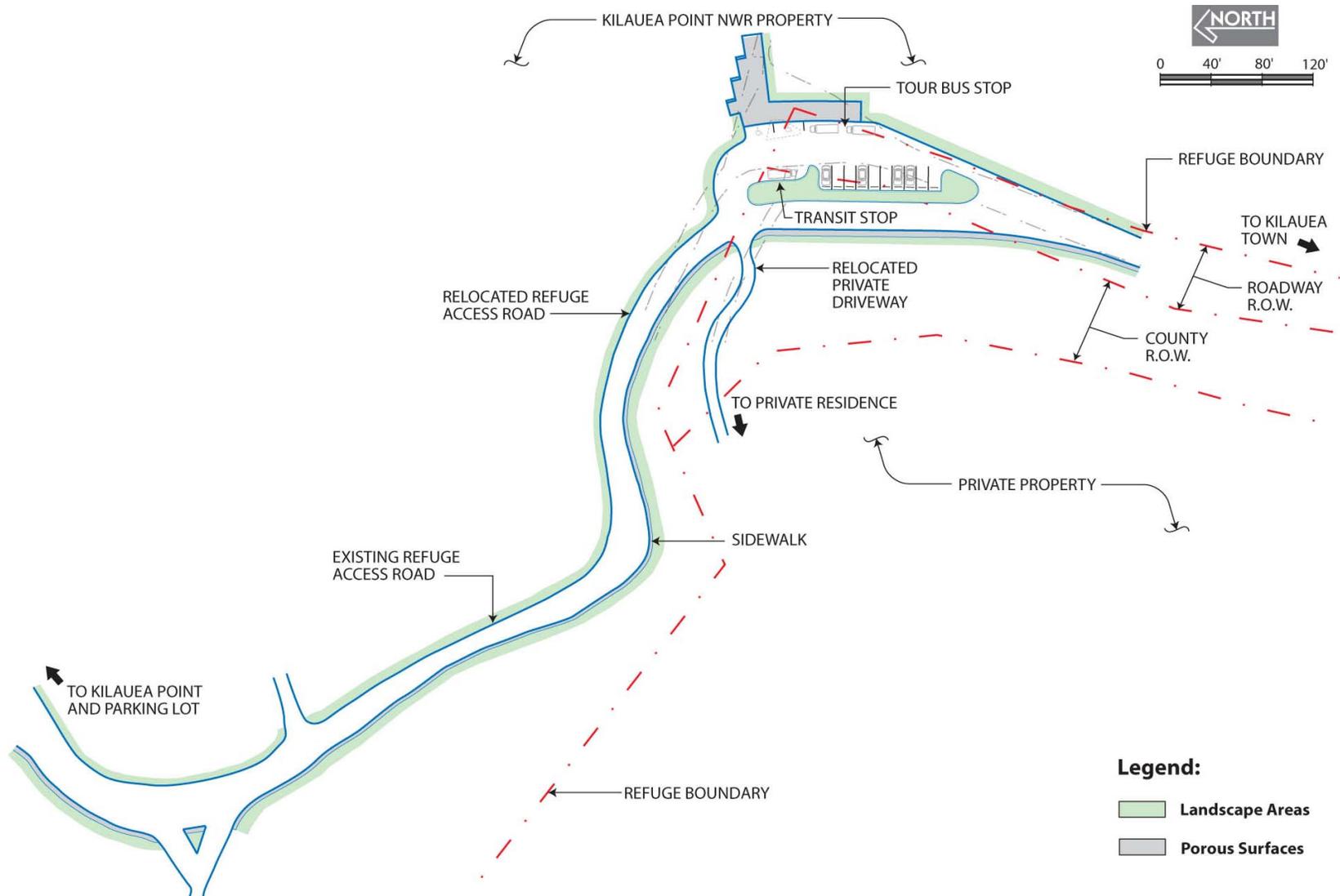
**Conceptual Parking Lot Configuration at the Overlook – Scheme 2**



**Conceptual Parking Lot Configuration at the Overlook – Scheme 3**

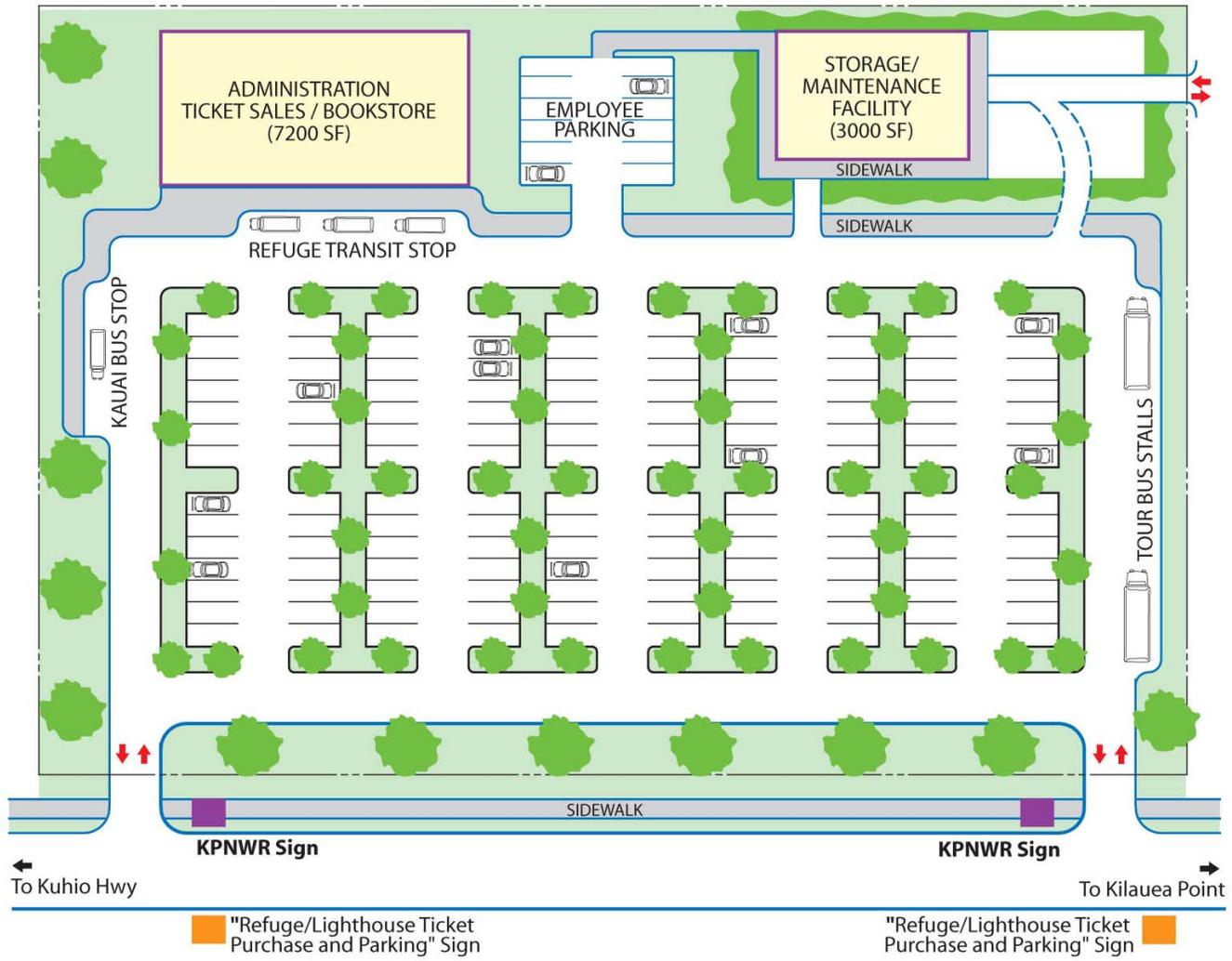


**Conceptual Parking Lot Configuration at the Overlook – Scheme 4**



Source: Parsons Brinckerhoff, 2005.

### Conceptual Access Road Improvements



**Sample Site Description:**

<b>3.0</b>	<b>Acres</b>
<b>140</b>	<b>Visitor Parking Stalls</b>
<b>12</b>	<b>Employee Parking Stalls</b>

- Legend:**
- Landscape Areas
  - Porous Sidewalk
  - Shrubbery

**Note:**  
Additional Signage at Overlook for Ticket Purchase Instructions

Note: Actual size of lot and number of stalls to be determined.  
Source: Parsons Brinckerhoff, 2005.

**Conceptual Parking Lot Configuration at Hub Park-and-Ride**

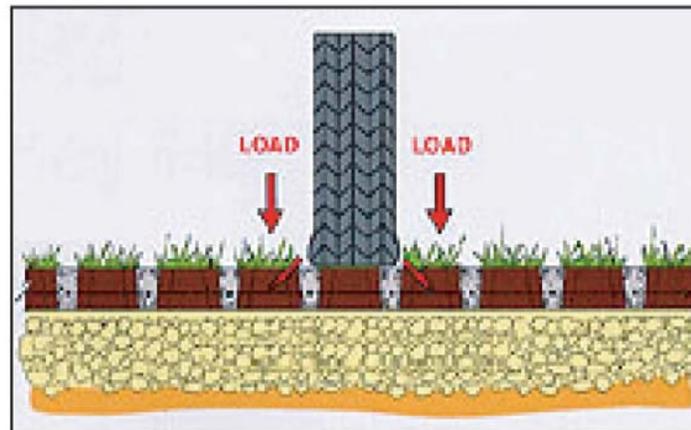
## Grasscrete Examples



Housing Subdivision



Hospital

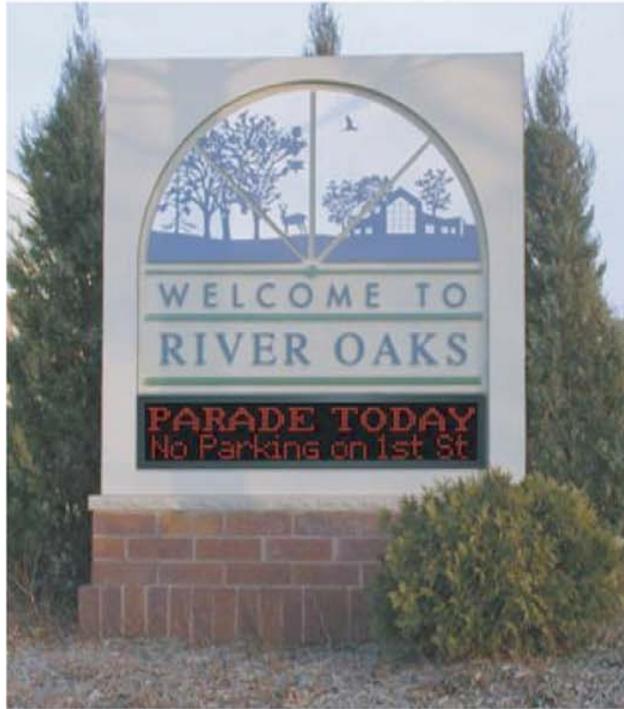


### Cross-section of Grasscrete

- Load bearing up to 40 tonnes gross vehicle weight
- Resists differential settlement
- Reduces sub-base depths
- Eliminates curb edges
- Not reliant upon grass for stability
- Optimum drainage capability

Source: ConcreteNetwork.com; T.B. Penick & Sons, Inc., www.grasscrete.com, 2005.

## Examples of Stabilized Grass Parking Surfaces



Source: Adaptive Micro Systems, LLC., [www.adaptivedisplays.com](http://www.adaptivedisplays.com), 2005.

### Examples of ITS Sign Applications

## Appendix E:

### Assumed Effect of Increased Entry Fee on Visitation

The assumed effect of an increased entry fee on KPNWR visitation was developed using PASA's survey results (Sexton, *et al*, November, 2005), which indicates the possible visitation impact of fee increases. The PASA survey results, however, need to be taken in context. One factor to consider is that the PASA surveys were conducted on visitors who had already entered and experienced the Refuge. (In general, their experience was enjoyable, according to PASA.) Therefore, the survey data may not be a clear indicator of perceptions by people who are first considering paying a fee to enter the Refuge.

An important change also occurred at the Refuge since the PASA surveys were conducted. At the time, the Refuge collected fees using an unstaffed "honor box" system, under which underpayment was common. They now have a staffed fee collection booth. Recent data from the fee booth were used in this Final Report to estimate the number of future visitors.

Keeping in mind these possible limitations of the data, PASA survey results were used as a reference for determining a) willingness to pay for a shuttle service with guided narration, and b) impact of higher entry fees to cover the costs of shuttle operations. Both items are discussed below.

#### Visitor Willingness to Pay for a shuttle with Guided Narration

Offering guided narration would be a key feature of any transit system. As explained in the main body of this report, it is assumed that the attractiveness of guided narration on the shuttle would negate the effect of raising the entry fee to \$5. This conclusion is demonstrated in the table below showing Visitor Willingness to Pay (WTP). Derived from Table 4-4 of the PASA report, Table E1, below, shows the mean WTP for entry to KNPWR among winter and summer visitors.<sup>88</sup>

Mean WTP for visitors for entry fee alone was found to average \$12.00 (average of \$13.58 and \$10.44), while mean WTP for entry fee with a narrated shuttle bus ride was found to be \$15.75 (average of \$17.24 and \$14.27). While it the added "value" of a shuttle with guided narration appears to be \$3.75 at the mean price of \$12.00, it is not clear what the value is at other price points. For purposes of this study, it was simply assumed that visitors currently willing to pay \$3 for entry fee alone, would also be willing to pay \$5 if the price included a shuttle ride with guided narration. Therefore, this report assumes a shuttle system base case of no reduction in visitation at \$5, compared to current visitation the \$3 entry fee.

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<sup>88</sup> Community members were also surveyed, but were not included in the calculations. As would be expected, there is significant difference in willingness to pay the entry fee between visitors and community members.

**Table E1: Visitor Willingness to Pay Entry Fee**

	Refuge Entrance Only		Refuge Entrance with Shuttle and Guide	
	Winter Visitors	Summer Visitors	Winter Visitors	Summer Visitors
Mean WTP per person	\$13.58	\$10.44	\$17.24	\$14.27
Annual Average	\$12.00		\$15.75	
“Value” of Shuttle with Guide	\$3.75 (\$15.75 minus \$12.00)			

Source: PASA, November 2005, as revised by Parsons Brinckerhoff, May 2006.

Impact of Higher Entry Fee

To determine the impact of higher fees, Figure 4-2 of the PASA report was consulted. This graph, entitled “Probability of Paying for Shuttle with Guide,” indicated how many visitors may opt to take the shuttle at each price. It appears that increasing the fee by one dollar may reduce visitation by about 3 percent.<sup>89</sup> However, due to limitations of PASA data described above, this Final Report conservatively assumes a 5 percent visitation reduction per one-dollar increase.

Assuming the 5 percent reduction per dollar, the expected reduction (relative to projected visitation at the current entry fee) in visitation at various entry fees can be expressed in Table E2, shown below:

**Table E2: Expected Reduction in Visitation with Higher Entry Fees<sup>90</sup>**

Entry Fee Charged	Expected Reduction in Visitation
\$5	0
\$6	5%
\$7	10%
\$8	15%
\$9	20%
\$10	25%
\$11	30%

Source: Parsons Brinckerhoff, May 2006.

<sup>89</sup> Based on examining Winter and Summer visitor curves in Figure 4-2 of PASA report, “Probability of Paying for Shuttle with Guide.”

<sup>90</sup> Calculations do not include 4 annual free days.

## Appendix F:

### Private Vendor Operating Costs

POLYNESIAN ADVENTURE TOURS		
Retail Rates (per hour)		
VEHICLE TYPE	OAHU	MAUI, KAUAI, HAWAII
14 PASSENGER VAN	\$73.50	\$86.00
25 PASSENGER MINI-COACH	\$92.50	\$113.50
MOTORCOACH	\$113.50	\$135.50
<i>Sample Charter Hours (Inclusive of vehicle preparation and deadhead time)</i>		
<b>OAHU</b>		
Honolulu Airport to Waikiki or reverse	2.0 hours	
Honolulu Airport to Kahala Hilton or reverse	3.0 hours	
<b>KAUAI</b>		
Airport to Wailua-Waipouli or reverse	2.0 hours	
Airport to Poipu or reverse	2.5 hours	
Airport to Princeville or reverse	3.0 hours	
<b>MAUI</b>		
Airport to Makena, Kihei, Wailea or reverse	2.0 hours	
Airport to Lahaina/Kaanapali or reverse	2.5 hours	
Airport to Honokawai/Kahana or reverse	3.0 hours	
Airport to Napili/Kapalua or reverse	3.5 hours	
<b>KONA</b>		
Keahole Airport to Keauhou through Kailua-Kona	2.0 hours	
Keahole Airport to Kona Village/ Four Seasons or reverse	2.0 hours	
Keahole Airport to Waikoloa/Mauna Lani or reverse	2.0 hours	
Keahole Airport to Mauna Kea or reverse	2.5 hours	
Hilo Airport to Hilo hotels or reverse	2.0 hours	
<ul style="list-style-type: none"> <li>• 4.166% Hawaii State Tax will be added to all charter rates. (tax is calculated on gross transportation rates). Minimum charter time is 2 hours.</li> <li>• Barn to barn time varies and is based on pick-up and drop-off locations.</li> <li>• Airport tax of 7% (Honolulu International Airport) and 3% (neighbor islands) is added to the first two hours of any charter, which originates at the airport. This tax is calculated on the first 2 hours based on gross transportation rates.</li> <li>• All rates are based on Hawaii Public Utilities Commission tariff determinations and are subject to change without prior notification.</li> <li>• <i>Contact our sales department for rate structure and quotations on customized group movements.</i></li> </ul>		

## Appendix G:

### Kilauea Town Plan – Bypass Road Options

The figure below is taken directly from the Kilauea Town Plan – DRAFT. The Plan shows two distinct options for the potential bypass road alignment.

