



United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960



January 12, 2006

Colonel Robert M. Carpenter
District Engineer
U.S. Army Corps of Engineers
701 San Marco Boulevard, Room 372
Jacksonville, Florida 32207-8175

Service Log No.: 4-1-01-F-707
Corps Application No.: 199404520 (LP-VBA)
Date Received: January 16, 2003
Project: Big Pine Key Park Marina Basin Fill
County: Monroe

Dear Colonel Carpenter:

This document transmits the Fish and Wildlife Service's (Service) revised biological opinion based on our review of the above referenced proposed Big Pine Key Park Marina basin fill located on Big Pine Key, Florida (BPK), and its effects on the Key deer (*Odocoileus virginianus clavium*) in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act) (87 Stat. 884; 16 United States Code [U.S.C.] 1531 *et seq.*). This biological opinion supersedes our biological opinion, dated June 21, 2004. It has been revised due to new information about Key deer in and near the action area. The Service upholds its concurrence with the U.S. Army Corps of Engineers' (Corps) determination for the federally endangered West Indian manatee (*Trichechus manatus*) in our letter and biological opinion, dated June 21, 2004. Other federally listed species, including the endangered Lower Keys rabbit (*Sylvilagus palustris hefneri*), the endangered green sea turtle (*Chelonia mydas*), and the endangered hawksbill turtle (*Eretmochelys imbricata*), were addressed in our letter to the Corps, dated March 11, 2003.

This Key deer biological opinion is based on information provided in the January 16, 2003, project proposal; September 23, 2003, information request; telephone conversations; field investigations; and other sources of information. A complete administrative record of this consultation is on file at this office.

In our letter to the Corps, dated March 11, 2003, the Service notified the Corps that we could not concur with the Corps' determination of "may affect, not likely to adversely affect" for the West Indian manatee. The Service has since reviewed plans, maps, and other information provided by the Corps for the permit application, including the conservation measures proposed to reduce adverse effects to the endangered manatee.



The Corps will require during construction of this project that the applicant utilize the *Standard Manatee Protection Construction Conditions*, which will minimize direct adverse effects to the manatee. The project will increase the number of boat slips in Reach 25, Monroe County, Florida.

However, the slips are also located south of the Seven Mile Bridge, below which West Indian manatee mortality caused by boat collisions has never been documented. Therefore, the Service concurs with the Corps' determination of "may affect, not likely to adversely affect" for the West Indian manatee for this project.

Consultation History

On January 16, 2003, the Corps provided a public notice determination of "may affect, not likely to adversely affect" for federally listed species, including the Key deer and the West Indian manatee.

On March 11, 2003, the Service concurred with the Corps' determination for direct effects to the Key deer after review of the 10-acre project, but could not concur with the determination of "may affect, not likely to adversely affect" for the manatee and requested the Corps initiate formal consultation.

On June 10, 2003, the Service suggested the Corps reinstate consultation to address indirect effects from traffic generated by activities proposed at the planned Big Pine Park.

On August 21, 2003, the Service received the Corps' request for reinstatement of consultation by email.

On September 23, 2003, the Service requested additional information from the Corps, specifically, vehicular traffic expected to be generated by activities at the proposed park and any potential conservation measures to avoid and minimize effects to the Key deer.

On December 11, 2003, the Service received from the Corps, via letter, the information necessary to initiate formal consultation on the Key deer, as required in the regulations governing interagency consultations (50 Code of Federal Regulations [CFR] § 402.14).

On February 23, 2004, the Service notified the Corps by letter that we have all materials necessary to initiate formal consultation and will provide the Corps with a biological opinion.

On June 21, 2004, the Service sent the Corps its biological opinion, which evaluated indirect effects of the proposed project.

On August 12, 2004, the Service sent the Corps an amendment to its biological opinion, that addressed two-way roads instead of one-way roads as requested by Monroe County (County).

On November 8, 2005, the Service notified the Corps by email that it had new information about Key deer and requested the Corps reinstate formal consultation.

On November 9, 2005, the Corps sent the Service an email reinitiating formal consultation.

BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

The County applied to the Corps for a permit to fill an existing boat basin. The Service's letter to the Corps, dated March 11, 2003, concurred with the Corps' determination of "may affect, but not likely to adversely affect" for direct effects of the proposed project on the Key deer. Since the fill operation is part of a larger scale project, "Big Pine Park" (Appendix 1), the biological opinion must evaluate the consequences of the entire project as required by 50 CFR § 402.02.

The County has plans to develop a multi-use recreation park on a 10.9-acre parcel it owns at the end of Sands Road on Big Pine Key (BPK), Monroe County, Florida. The proposed park site was formerly a resort and marina, which closed in 1986. The site is fenced and is not being used except for an occupied single-family residence. Five existing structures on the property will be demolished to make way for construction of the park. The plans include a 120-foot (36 meters (m)) by 15-foot (4.5 m) pier and a 30-foot (9 m) by 15 –foot (4.5 m) dock at the location of an existing boat basin, which is proposed for filling. The plans also include the following:

FACILITY	SIZE
• Basketball/roller hockey court	18,000 square-feet (1,620 square-meters(m ²))
• Future pool area	18,000 square-feet (1,620 m ²)
• Two tennis courts	12,840 square-feet (1,156 m ²)
• Skate park	8,000 square-feet (720 m ²)
• Community center	4,000 square-feet (360 m ²)
• Parking	87 spaces
• Playground	not available
• Baseball and softball field	not available
• Multi-purpose court	not available
• Pavilions (2)	not available
• Bocce ball courts (4)	not available
• Shuffleboard courts (4)	not available
• Multi-purpose green space	not available
• Fitness stations (6)	not available
• Walkways	not available

A 25-foot (7.6 m) vegetated setback from the road on Vista Linda Lane and Atlantis Drive, which border the western and southern sides, respectively, is planned. Indirect lighting is planned for the park. In the County's experience, indirect lighting has proven to be agreeable to

adjacent residents of recreation parks (D. Koppel, personal communication, 2005). An existing single-family residence on the property will be retained and used for local law enforcement housing.

Monroe County is also proposing to (1) extend the width of pavement on (a maximum of one foot (0.3 m) each side) Sands Road and County Road from U.S. Highway 1 (US 1) to, and including, Hibiscus Drive; (2) install a five-foot (1.5 m) wide bike path on each side of County Road, Hibiscus Drive, and Sands Road north from Hibiscus Drive to the proposed park entrance to improve vehicular, bicycle, and pedestrian access; and (3) remove exotic vegetation and fences within the road rights-of-way and on adjacent County-owned land. No native vegetation will be removed as a result of the road improvements.

Sands Road is an 18-foot (5.4 m) wide paved road with a 25-foot (7.5 m) to 40-foot (12 m) right-of-way (ROW) that runs north and south. County Road is a 19-foot (5.7 m) wide paved road with a 60-foot (18 m) ROW about 600 feet (180 m) west and parallel to Sands Road.

Hibiscus Drive is a 19-foot wide (5.7 m) paved road with a 25-foot (7.5 m) ROW that connects County and Sands Roads near the proposed park (Appendix 2). The County owns all lands on the south side of Hibiscus Drive and proposes to use County-owned lands for part of the road improvements.

To compensate for any negative impacts to the Key deer, the County proposes to:

- (1) Remove exotic vegetation, brush, and fences on County-owned lands along the road rights-of-way to enhance visibility and aid Key deer movements;
- (2) Install 25 miles per hour (40 kilometers per hour (KPH)) speed limit signs;
- (3) Install two speed humps on County Road to slow traffic;
- (4) Install Key deer caution signs;
- (5) Install a new fence around the property that meets the County's deer-friendly fence code, including a 25-foot (7.5 m) setback from the abutting street rights-of-way; and
- (6) Replace lost habitat.

The County has developed a method of assessing the adverse effects to the Key deer from development on Big Pine and No Name Keys. The County proposes to account for adverse effects to Key deer by replacing an estimated population viability analysis "H-value" (an impact assessment value) of 0.11 for the park site and 0.0158 for road improvements ($H=0.1258$ total) (see calculations in Appendix 2), as determined by County guidelines and described in their draft Big Pine Key Habitat Management Plan (Monroe County, 2005). The County will compensate for these impacts by acquiring parcels to achieve a 3:1 H-value ratio, *i.e.* the County will acquire

one or more parcels with a total H value of 0.3774. The Service calculates that 1.92 acres (0.77 hectares (ha)) (based on 9,300 square-yards estimated by the County) of habitat will be lost; therefore, the County will mitigate the loss by purchasing about 3.84 acres (1.54 ha) of similar habitat or less acreage of higher quality habitat, as determined by H-value. The County's H-value model also predicts an additional human-induced Key deer mortality of 0.18 Key deer per year resulting from the proposed project (see Appendix 2).

The County feels these road improvements will accommodate anticipated traffic volumes, the speed limits and humps will reduce the potential for deer-automobile collisions, and land acquisition will compensate for any adverse effects to Key deer that might occur.

The action area is defined as all areas affected directly or indirectly by the Federal action and not merely the immediate area involved in the action. The Service has described the action area to include the 10.9-acre project area; the rights-of-way of Sands Road, County Road, and Hibiscus Drive; and County-owned lands used for road improvements (Appendix 3). The action area also includes properties within one block adjacent to the project site, Sands Road, County Road, and Hibiscus Drive, including portions of both the Sands Corridor and the US 1 Corridor where they intersect either the project site, Sands Road, County Road or Hibiscus Drive (see description of the Sands Corridor and the US 1 Corridor in the "Environmental Baseline" section).

STATUS OF THE SPECIES/CRITICAL HABITAT

The Use of Best Scientific and Commercial Information by the Service

The Service uses the most current and up-to-date scientific and commercial information available. The nature of the scientific process dictates that information is constantly changing and improving as new studies are completed. The scientific method is an iterative process that builds on previous information. As the Service becomes aware of new information, we will make sure it is fully considered in our decisions, evaluations, reviews, and analyses as it relates to the base of scientific knowledge and any publications cited in our documents.

Specifically, there is one such document cited in this biological opinion the Service acknowledges has been affected in its cited form by new scientific information. The Service has taken these new sources of information into account when using this document to help guide our analysis and decisions. This document is the South Florida Multi-Species Recovery Plan (MSRP) of 1999 (Service, 1999).

South Florida Multi-Species Recovery Plan

The MSRP was designed to be a living document and it was designed to be flexible to accommodate the change identified through ongoing and planned research and would be compatible with adaptive management strategies. These principals are set forth in both the transmittal letter from the Secretary of the Interior and in the document itself. As predicted, this is what indeed occurred in the intervening years since the MSRP was published. The Service uses the MSRP in the context it still presents useful information when taken in conjunction with all the new scientific information developed subsequent to its publication.

Species/critical habitat description

The deer lives in a complex of native upland and wetland habitats interspersed in a matrix (mixture) of light to dense urban development. The number of Key deer has increased substantially over the past 40 years, due principally to a ban on hunting and protection and management of habitat within the National Key Deer Refuge (NKDR) and surrounding lands. Natural stochastic (random) events and the influences of human development, as manifested through habitat loss, fragmentation, and degradation, continue to negatively affect Key deer survival with road mortality representing the largest known source of documented Key deer mortality (Lopez, 2001).

Life history

Distribution: The Key deer's range probably historically extended from Key Vaca to Key West (Klimstra et al., 1978a). Florida Key deer (*Odocoileus virginianus clavium*) occupy 20–25 islands in the Lower Florida Keys, with about 65 percent (453–517 deer in 2000) of the overall population found on Big Pine Key (Lopez et al., 2004a). The NKDR and the Great White Heron National Wildlife Refuge encompass much of this range. They are managed for the Key deer and other wildlife.

The principal factor influencing the distribution and movement of Key deer in the Keys is the location and availability of freshwater. Key deer swim easily between keys and use all islands during the wet season, but suitable water is available on only 13 of the 26 islands during the dry season (Folk, 1991).

Habitat: Key deer use all habitat types including pine rocklands, hardwood hammocks, buttonwood salt marshes, mangrove wetlands, freshwater wetlands, and disturbed/developed areas (Lopez, 2001). Uplands are used more than wetlands (Lopez et al., 2004b). Key deer use these habitats for foraging, cover, shelter, fawning, and bedding. Pine rocklands hold freshwater year round and are especially important to Key deer survival. About 34 percent of the range is pine rocklands and hardwood hammocks (Lopez et al., 2004b). Over 85 percent of the fawning occurs in pine rocklands and hardwood hammocks (Hardin, 1974). Five of 26 islands occupied by Key deer have significant pine rocklands. Key deer also use residential and commercial areas extensively where they feed on ornamental plants and grasses and can seek refuge from biting insects. No critical habitat has been designated for the Key deer.

Behavior: Key deer have well-defined patterns of activity and habitat use, and established trails from years of daily use are visible in many areas within Key deer habitat (Klimstra et al., 1974). Roadkill hotspots are evident from the Service's long-term mortality database, further illustrating the habitual movement patterns of Key deer.

The social structure of the Key deer varies throughout the year with the reproductive cycle. Bucks associate with females only during the breeding season and will tolerate other males when feeding and bedding only during the nonbreeding season. Does may form loose matriarchal groups consisting of an adult female with several generations of her female offspring, but these associations are not stable (Hardin et al., 1976).

Home ranges of Key deer are variable (Lopez, 2001). Average monthly home range size for adult males is about 296 acres (118 ha) and about 128 acres (51 ha) for adult females, while yearly ranges are larger with an average of 790 acres (316 ha) for males and 432 acres (173 ha) for females. Males tend to disperse from their natal (birth) range as fawns or yearlings. Adult males range over larger areas during the breeding season and may shift to an entirely new area (Silvy, 1975; Drummond, 1989; Lopez, 2001). Territorial behavior is limited to a buck's defense of a receptive doe from other bucks, rather than the defense of a specific territory (Klimstra et al., 1974). Aggressive male behaviors (combat) between rutting males are common in Key deer, especially during the fall breeding season or rut. A recent study indicates that Key deer home ranges have become smaller and tolerance for other deer has increased in recent years as the result of development and feeding (Lopez et al., 2005).

Urbanization: Key deer have become more urbanized over the last 45 years, a trend reported in Folk and Klimstra (1991c). Key deer are regularly fed at several private locations on BPK, which exacerbates urbanization (Folk and Klimstra, 1991c; Lopez et al., 2005). Past research has shown that the Key deer on BPK are habituated to human noises, lights, and vehicular traffic (Folk and Klimstra, 1991c). "Urbanized" is the term most often used to describe this behavior. Folk and Klimstra (1991c) observed that Key deer "often bedded in open sites within seven feet (two meters) of a road and were not disturbed by cars, pedestrians, and cyclists. Loud noises from within 31 feet (40 meters), such as circular saws, lawn leaf-blowers, and wood chippers brought little response." Several studies have documented that deer in general quickly become habituated to noise and lights. Bashore and Ellis (1982) found that deer quickly became accustomed to noise and lights on Pennsylvania airfields. Krausman et al. (1993) investigated the effects of low-altitude jet aircraft noise on the behavior and physiology on captive mule deer and mountain sheep, finding that all study animals became habituated to noise levels ranging from 92 to 112 decibels. According to Dr. Phil Frank, former NKDR manager, Key deer research biologist, and co-author of several papers on Key deer, less than ten percent of Key deer on BPK are believed to exhibit "wild", or natural, characteristics (P. Frank, personal communication, 2005).

Foraging: The Key deer is capable of exploiting a variety of foods over a range of habitat conditions. Diet varies seasonally with resource availability and changes in nutritional requirements of deer (Carlson et al., 1993; Klimstra and Dooley, 1990). Key deer forage on over 160 plant species including red mangrove (*Rhizophora mangle*), blackbead (*Pithecellobium keyense*), acacia (*Acacia pinetorum*), indian mulberry (*Morinda royoc*), and pencil flower (*Stylosanthes hamata*). Red and black mangroves (*Avicennia germinans*) constitute 24 percent by volume of the diet of the Key deer (Klimstra and Dooley, 1990). Key deer require a freshwater source for survival (Folk et al., 1991).

Population dynamics

Population size: The Key deer population was estimated at 360 to 375 individuals in 1972, the last official survey (Silvy, 1975), and has increased, but estimates of density and structure are lacking (Lopez, 2001). Based on habitat condition and the presence of density-dependent disease in the population, the Key deer may be at or near ecological carrying capacity (Lopez, 2001; Lopez et al., 2004a; Nettles et al., 2002).

Key deer are wide ranging and use virtually all available habitats, including developed areas (Lopez, 2001). The Key deer population on BPK and No Name Key has increased by about 240 percent since 1972. Collectively, 450 to 515 deer occupy Big Pine and No Name Keys; the highest recorded estimate for these two islands (Lopez, 2001). The increase in the population is believed to be due to the protection of Key deer from hunting through law enforcement, habitat protection, and the positive response of the deer population to low levels of urban development (Lopez et al., 2004a).

Population variability: Key deer produce fewer young per female than any other white-tailed deer population in North America. Fecundity (number of fetuses per female) and productivity (percent of females reproducing) are low, mean age of first breeding is high, and twinning is infrequent, resulting in relatively low reproductive potential. The sex ratio of Key deer is initially weighted towards males; with a 1.75 to 1 fetal ratio and 2 to 1 fawn ratio. However, significantly higher male mortality at maturity serves to balance adult sex ratios more evenly. Annual deer mortality is a function of deer density and population size (Lopez et al., 2003a).

Status and distribution

Reasons for listing: Prior to human arrival in the Keys in the early 18th century, the Key deer had few natural competitors or predators. Key deer have evolved to withstand natural phenomena such as drought, hurricanes, fire and disease, but were not adapted to human hunting pressures. However, once a human population was established on the Lower Keys, hunting of Key deer for food and loss of habitats resulting from development ensued and diminished their population. By the 1940s, it was estimated that as few as 25 Key deer remained. In response to the threat of extinction from over hunting and habitat loss from development, the NKDR was established in the 1950s and the Key deer were listed as federally endangered on March 11, 1967 (Service, 1967).

Rangewide trends: The protection afforded the Key deer through prohibitions on hunting, habitat management, and habitat protection through acquisition has resulted in an apparent significant increase in (240 percent) in the BPK Key deer population. Despite the apparent increase in population levels of Key deer, there has been a contraction of the range of Key deer from 1970 to 1999 (Lopez, 2001). Key deer have become increasingly abundant on BPK and adjacent islands, but have decreased to near extirpation on more distant islands such as Cudjoe and Sugarloaf Keys (Lopez, 2001). Although Key deer were never abundant on Cudjoe and Sugarloaf Keys, they now exist at such low numbers that local extirpation is likely in the near future (Lopez, 2001). This contraction in the range has decreased the overall viability of the Key deer population by increasing the probability that a stochastic event, such as a hurricane or disease epidemic, may have catastrophic impacts to the core population on and around Big Pine Key.

Threats: Loss of habitat resulting from development is the most significant and obvious threat to Key deer (Klimstra et al., 1974). The human population on BPK has increased an estimated 77 percent from 1980 to 1990. An estimated 116 acres per year of Key deer habitat was cleared on Big Pine Key in the early 1970s. Development has been reduced in recent years due to inadequate level of service on the roads and insufficient disaster evacuation time, but habitat loss

from development remains a threat. Fencing associated with development may cause direct Key deer habitat loss by preventing access to areas used for breeding, feeding, and sheltering.

Fencing of private property associated with residential and commercial development has reduced habitat availability for the Key deer. Native habitat that is fenced is no longer available for use by the Key deer and may block access to other areas. This loss of habitat has reduced the availability of food, water, and shelter as well as fawning areas needed by deer to survive and reproduce. Large networks of fencing have fragmented Key deer habitat and restricted movement, which has further reduced the availability and value of these areas to Key deer. Although fencing is regulated under the Monroe County Comprehensive Land Use Plan, many areas important to Key deer continue to be impacted by fences. An additional concern is the injury or loss of deer as a result of attempting to jump these fences.

Fire suppression promotes ecological succession in pine rockland communities, resulting in increased hardwood cover, dense brush, decreased herbaceous cover, reduced light penetration, and a general deterioration of habitat quality for Key deer (Klimstra, 1986; Carlson et al., 1993). Exotic plant species such as Australian pine (*Casuarina equisetifolia*), Brazilian pepper (*Schinus terebinthifolius*), and latherleaf (*Colubrina asiatica*) are invading Key deer habitat, out competing native vegetation, and reducing habitat quality.

Exotic vegetation and underbrush restrict Key deer movements and concentrate their movements along established trails. Since useable habitat is limited, Key deer must move more to access preferred areas, which involves crossing streets and roads. This results in more Key deer crossing roads at fewer access routes or walking along roads, increasing their vulnerability to traffic. Invasive exotic vegetation out-competes native vegetation, resulting in areas of formerly high quality habitat becoming unusable.

As the population density nears carrying capacity, density dependent disease becomes an increasing problem (Lopez 2001). Deer mortalities are necropsied and tested for infectious diseases. Several diseases have been detected, but only haemonchosis is believed to have affected population dynamics in recent years (Nettles et al., 2002).

Residential and commercial development over the past 20 years has increased the number of vehicles and vehicular traffic in the Keys. This additional traffic has increased the likelihood of Key deer/vehicle collisions. Vehicular mortality is the greatest known source of Key deer deaths, and can impact the population by removing large numbers of animals. Telemetry data suggests that about 50 percent of deer mortality is attributed to roadkills and most of that occurs on US 1 (Lopez, 2001). Although lower speed limits have been imposed in an attempt to reduce traffic mortality, continuing deaths in some areas may also be caused by speeding motorists (R. Lopez, 2001; P. Frank, personal communication, 2005).

Since the 1960s, between 60 and 81 (1996-2000) deer-vehicle collisions (DVCs) have occurred (Silvy, 1975, Lopez et al., 2003b). In 2000, 69 DVCs were recorded on BPK (Service, unpublished data). Additionally, over half (between 35 and 50 DVCs) of the DVCs that

occurred during the period 1996 to 2000 occurred along a 3.5 mile (5.6 km) segment of US 1, which bisects the southern end of BPK. Due to the high occurrences of Key deer-vehicle collisions along this road segment, Service and Florida Department of Transportation (FDOT) biologists have attempted to address DVCs on US 1.

FDOT recently completed two projects on Big Pine Key, one of which adversely affected Key deer. One project was completed to improve traffic congestion on US 1, which traverses BPK and is the only route into BPK or to continue south to the Lower Keys. US 1 was a two-lane highway on BPK traveling in an east-west direction and had limited center turn and storage lanes. The intersection of Key Deer Boulevard and US 1 was enhanced by the addition of an eastbound lane on the south side of the US 1. The total paved area increased by 35 percent in that segment of the roadway. A biological opinion issued by the Service (2001a) determined that the project would result in incidental take of four individual Key deer annually for the duration of the project. The biological opinion stated that the level of incidental take was above the baseline average of nine roadkills per year that already existed on the project segment of US 1. The Service determined that this level of take was not likely to result in jeopardy to the Key deer.

FDOT completed a second project in January 2003, which was designed to reduce Key deer vehicular mortality along US 1 on Big Pine Key from mile marker 29.5 to mile marker 33 (Service, 2001b). The project was accomplished through the installation, management, and monitoring of two wildlife underpasses between mile markers 31 and 33. The underpasses included fencing to direct Key deer toward the underpasses, and deer guards at the intersections of US 1 and access roads along this segment to keep Key deer from entering the highway corridor. Non-structural improvements as well were installed in the US 1 corridor in the unincorporated area and the business district to minimize road mortalities in these areas. These non-structural improvements included: additional signage, radio advisories, speed control, lighting improvements, and pavement markings. Take was anticipated to remain at base levels prior to the installation of the first wildlife undercrossing. However, the level of take associated with the proposed project is estimated to diminish over time.

The wildlife crossings were predicted to reduce Key deer mortality on the average by 25.7 percent of total annual road mortalities (27 Key deer) within the project area, or 44.4 percent of road mortalities (47 Key deer) recorded annually on US 1. The maximum reduction in road mortalities estimated by the Service is 40.4 percent of all road mortalities (43 Key deer) recorded annually within the project area, or 66.7 percent of those road mortalities (78 Key deer) recorded for US 1 annually. This reduction would be expected to extend for the life of the project. A recent study (Braden, 2005) of the effects of the project reported that two vehicular mortalities have been recorded since installation. The study determined DVCs had been reduced 83 to 93 percent inside the fenced area. However, overall DVCs on US 1 did not change.

Key deer move between and over islands more often during the dry season and breeding season to find freshwater and females. During cycles when deer numbers are high, vehicular mortalities may be a less significant negative impact on the Big Pine Key deer population than during low population periods. However, as habitat continues to be degraded and Key deer carrying

capacity is reached, vehicular mortality may become more important. Catastrophes, such as hurricanes, might reduce Key deer numbers to the extent that road mortalities could adversely affect the population (Lopez, 2001).

Analysis of the species/critical habitat likely to be affected

Key deer prefer upland habitat types, which are also the preferred locations for development. Thus, the potential exists for proposed development projects to adversely impact Key deer through direct habitat loss and also from secondary impacts from development such as domestic predators (dogs), urbanization, human disturbance, and traffic.

ENVIRONMENTAL BASELINE

The action area has been defined as the 10-acre project area; the rights-of-way of Sands Road, County Road, and Hibiscus Drive; and County-owned lands used for road improvements (Appendix 3). The action area also includes properties within one block adjacent to the project site, Sands Road, County Road, and Hibiscus Drive, including portions of both the Sands Corridor and the US 1 Corridor where they intersect either the project site, Sands Road, County Road or Hibiscus Drive (see description of the Sands Corridor and the US 1 Corridor in this section).

Status of the species within the action area

Key deer are known to use part of the action area south of the proposed park as a movement corridor. The proposed park would be constructed in an existing developed area on Big Pine Key that is bounded by canals, open water, and development. Two nearby areas, known as the Sands corridor and the US 1 corridor (see Braden, 2005), are considered to be movement corridors for Key deer. The Sands corridor is one of the most densely developed areas on Big Pine Key (R. Lopez, personal communication, 2005; P. Frank, personal communication, 2005). Harveson et al. (2004) reported that deer on north BPK served as a source population for deer populations in south BPK, emphasizing the importance of understanding deer movements between these areas of the island.

As depicted in the Big Pine Key Draft Habitat Conservation Plan (County et al., 2005), the Sands corridor is an elongate area nine-tenths of a mile (1.5 km) long and varying from two-tenths of a mile (0.3 km) wide in the Sands Road area to one-tenth of a mile (0.16 km) wide bordering US 1 (Appendix 4). It begins just south of the proposed park and extends southeast across US 1. The corridor constitutes part of a travel route that connects Key deer habitat north and south of US 1. The US 1 corridor, which also intersects the action area, is “a narrow (less than 500 feet (152 m) natural corridor and the sole land connection between north and south BPK (south BPK also joins Newfound Harbor Keys)” (Braden, 2005). Key deer cross US 1 at various points, including areas outside the action area, to disperse from northern BPK to southern BPK. In the action area, most of the properties along Sands Road and Hibiscus Road are developed. County Road is less developed and more vegetated in the action area.

Key deer density is low and development is dense in the action area. Dr. Roel Lopez, who has conducted extensive research on several aspects of Key deer biology, recorded 15 Key deer observations on or directly adjacent to Sands Road in 3,768 overall deer observations in the period March 1998 to December 2002 (R. Lopez, personal communication, 2005). Seventy-one of 3,768 observations of Key deer in the Sands area (near and away from the road) were recorded in the same period (R. Lopez, personal communication, 2005). Dr. Lopez believes the Sands Road area has the lowest Key deer density (less than two percent) on Big Pine Key (R. Lopez, personal communication, 2005). Because the Sands Road area is densely developed, most deer in and around the action area are acclimated to human activity and development, according to Dr. Phil Frank, former refuge manager of NKDR (P. Frank, personal communication, 2005). Furthermore, Dr. Frank believes wild deer would avoid the action area because it is heavily developed. Instead, they would use comparatively undeveloped lands further to the west.

Factors affecting species environment within the action area

The following five factors have been identified as affecting the Key deer environment in and near the action area.

Canals and Development: As mentioned previously, the project site is a former resort and marina bounded by canalized residential areas and open water. It has been noted that canals act as barriers that restrict Key deer movement and result in deer mortality by drowning (Folk, 1991). Lopez (2001) assumed in his calculations of H-values that areas bordered by canals would have a lower impact because of the reduced likelihood that deer would use these areas.

Vehicular Mortality: Vehicular mortality within the action area has been low. According to Service records dating back to 1966, three Key deer are known to have been the victims of road mortality in the action area in the last 37 years. One was killed on Sands Road and two were killed on County Road (Appendix 5). In the 15-year period from 1990 to 2004, no Key deer were killed in the action area by vehicles, even though the Key deer population has been higher in recent years.

Fencing: Many residential properties adjacent to the action area are fenced and the fences are within the rights-of way of the roads. This occurred before guidelines were established and enforced by the County. Fencing is now regulated under the Monroe County Comprehensive Land Use Plan. Some types of fencing restrict Key deer movements, restrict access to habitat, and are a source of mortality due to entanglement. Salient features of the County's guidelines include setbacks to provide movement corridors along roads and between properties, fencing near canals to impede access and prevent drowning, height requirements to allow deer access, and restrictions on type of fence to reduce entanglement.

Noise and Lighting: The action area is one of the most densely developed residential areas on Big Pine Key (R. Lopez, 2005, personal communication; P. Frank, 2005, personal communication). Therefore, Key deer receive maximum exposure, except for the US 1 corridor, to human disturbance in the form of noise and lighting. Noise is generally from traffic, yard

maintenance, boats, construction, and children playing. There are no streetlights along the roads in the action area, although many homeowners have yard lights at night. Other lighting comes from homes and automobiles.

Exotic vegetation and brush: Exotic vegetation and underbrush are a problem in the action area on unoccupied property adjacent to roads, primarily on County Road. The extent to which exotic vegetation disrupts Key deer movements and the amount of habitat lost is unknown.

EFFECTS OF THE ACTION

This section analyzes the beneficial, direct, indirect, and cumulative effects of the project on the Key deer and Key deer habitat and identifies and analyses interrelated and interdependent actions and their effects on Key deer and Key deer habitat.

Factors to be considered

Residential, commercial, and industrial development projects may have a number of beneficial, direct and indirect effects on the Key deer and Key deer habitat. Beneficial effects of a project are those that are wholly beneficial, without any adverse effects. For example, clearing of brush and removal of fences are beneficial effects that facilitate movements and increase visibility. Direct effects are those effects that are caused by the proposed action at the time of construction. Direct effects are primarily habitat based and are reasonably certain to occur. Direct effects may include: (1) the permanent loss and fragmentation of Key deer habitat and (2) the loss of available habitat for foraging, breeding, and dispersing Key deer. Indirect effects are defined as those that are caused by the proposed action and are later in time, but still are reasonably certain to occur (50 CFR § 402.02). Indirect effects may include: (1) an increased risk of roadway mortality to Key deer traversing the area due to an increase in vehicular traffic and (2) changes to Key deer behavior and movements as a result of human disturbance.

Analyses for effects of the action

Beneficial effects: Beneficial effects of the project include clearing of brush to improve sight lines and aid movement, removing or altering fences, which reduces mortality and aids movement, and installing traffic slowing measures such as speed humps and speed limit signs to reduce DVCs. In addition, the County will protect over three acres of habitat in perpetuity to offset road expansion and the bike lanes.

Compensatory measures proposed by the County to benefit the Key deer are:

- (1) Remove exotic vegetation, fences, and brush on County-owned lands in the action area, which will increase visibility and facilitate Key deer movements;
- (2) Install 25 miles per hour (40 kph) speed limit signs along action area roads;
- (3) Install two speed humps on County Road to slow traffic;

- (4) Install Key deer caution signs along action area roads;
- (5) Install a new fence around the Mariner's park property that meets the County's deer-friendly fence code; and
- (6) Replace habitat lost by purchasing 3.84 acres (1.54 ha) of habitat of similar, or less acreage of higher quality habitat, as determined by H-value for BPK, which will be preserved in perpetuity.

Direct Effects: We have identified two types of direct effects that could result from the proposed action. The two types are: (1) the permanent loss of habitat and fragmentation of habitat, and (2) impacts from harassment by construction activities (traffic, noise, and lighting).

Direct effects of the proposed action will occur continuously, five or six days a week primarily during daylight hours, for a period of one year, constituting a complete Key deer life cycle.

Permanent Loss and Fragmentation of Habitat

The loss of habitat at the park was addressed in the Service's concurrence letter, dated March 11, 2003, in which the Service concurred with the Corps' determination of "may affect, not likely to adversely affect." The Service determined the site is not available as habitat because it is enclosed by a fence. Habitat fragmentation will not occur since the action area is heavily developed and the site of the proposed park is encompassed by canals and open water. There will be no loss of available habitat at the proposed park site.

Habitat loss from the road widening is estimated to be about 1.92 acres (0.77 ha) of low quality habitat. The 1.92 acres (0.77 ha) is existing road shoulder, consisting primarily of scarified areas or areas covered in exotic or otherwise non-palatable plant species. However, road shoulder habitat lost will be compensated for by the County through purchase of 3.84 acres (1.54 ha) of habitat of similar, or less acreage of higher quality habitat, as determined by H-value for BPK, which will be preserved in perpetuity.

In conclusion, the Service believes that 1.92 acres (0.77 ha) of existing, low quality road-shoulder habitat will be lost or disturbed as a result of road improvements. Of that, about 1.2 acres (0.5 ha) will be paved for the bike paths and will be lost permanently. This loss of habitat is considered to be insignificant due to its location and low quality. The Service also believes habitat fragmentation will be insignificant because of the location of the project site in an area bordered by canals and open water.

Harassment by Construction Activities

Road Way Improvements

An increase in traffic during construction will also occur due to transport of materials, workers, and equipment. However, the proposed use of standard DOT traffic management and worker safety protocol during construction will minimize the potential adverse effects on Key deer,

including construction activities occurring in the evening and early morning hours when Key deer are most active. The Service believes the proposed improvements will be a loss of 1.92 acres (0.77 ha) of low quality habitat.

Construction of the park

Total construction time is estimated to be one year. During construction, associated traffic will increase due to transport of materials, workers, and equipment. However, the proposed use of standard DOT traffic management and worker safety protocols during construction will minimize these potential adverse effects. The Service further believes the impacts of construction on the Key deer will not disrupt behavior or movement patterns due to low density of deer in the action area and the resulting low probability of Key deer–vehicle encounters.

Based on the use of DOT traffic management and worker safety protocols during construction, the Service believes that the increase in traffic during construction, coupled with the low density of deer in the action area, reduces the probability of Key deer–vehicle encounters and therefore the disruption of behavior and movement patterns is discountable and insignificant.

Interrelated and interdependent actions: An interrelated action is an activity that is part of the proposed action and depends on the proposed action for its justification. An interdependent action is an activity that has no independent utility apart from the action under consultation. The Service has identified no interrelated or interdependent actions.

Indirect effects: The Service has identified traffic, noise, lighting, and human activity, including movements and behavior, as potential indirect effects of the proposed action.

Indirect effects of the proposed action will be permanent and most likely occur in morning and evening when Key deer are most active. These effects will continue throughout the year, including breeding season and other seasonal events when Key deer activity and movements are at a peak. The frequency of disturbance is anticipated to be intermittent, but continuous from early morning to evening on a daily basis and continuous throughout the year. The indirect effects of the proposed action on Key deer are expected to peak on weekends when activity would increase at the proposed park. They will occur during breeding season when Key deer are most active and during dry periods when Key deer move more in search of fresh water and forage.

Traffic

The Sands corridor intersects about 220 feet (66 m) of County Road and about 660 feet (198 m) of Sands Road. The corridor boundary, as drawn by Monroe County, terminates about 100 feet (161 m) to the west of County Road. The Service calculated that 3.5 percent, or less, of the existing road network and attendant traffic within the Sands corridor will be directly impacted by this project.

As mentioned previously, deer/vehicle collisions (roadkills) have been determined to be responsible for 50 percent or more of all known Key deer mortality. Braden 2005 found a strong relationship between mean hourly Key deer-vehicle collisions and average hourly Key deer movement distances around 6:00 a.m. and 6:00 p.m. Therefore, the volume of traffic generated

by the proposed facility in the evening is of concern to the Service. Morning traffic will likely be less consequential, since the park will probably not generate much traffic in early morning hours. Monroe County commissioned a traffic analysis and trip generation analysis to determine the potential affects of the project on traffic in the area. Trip generation is the method by which the amount of traffic, or the number of trips to and from a site, is estimated. In May 2003, URS Corporation, as the County's consultant, submitted a traffic analysis, "Big Pine County Park Final Traffic Impact Study." The acreage of the proposed park was the basis for the estimates of traffic impacts caused by the park in this study. Another study, "Big Pine Park Traffic Circulation Analysis" (Miles Moss and Associates, 2002), evaluated "recent traffic reports" for the proposed recreation park. This study addressed the County's methodology in determining traffic volumes, but produced no new or revised estimates of traffic volume resulting from the proposed park that the Service could use to estimate impacts. URS responded to criticism of its traffic survey by saying that it was particularly conservative in its projection of daily trips generated by the new facility and that it is confident in its estimate (R. Shanmugam, URS, personal communication, 2005).

The URS determination for traffic was calculated on a park size of 9.7 acres. This estimate did not include a 1.2-acre boat basin that is to be filled. The filled boat basin would make the park 10.9 acres. Since the trip generation analysis is based on the size of the facility, we have increased the following traffic volumes projected for the park by URS by 12.4 percent, which is the proportionate increase based on the increase in the size of the facility. An email from URS provided the methodology for the increase (R. Shanmugam, URS, email, 2005). URS (2003) determined the current average numbers of daily trips are 1,629 on Sands Road and 1,970 on County Road. Any trips on Hibiscus Road should be included in these figures, since Sands Road or County Road must be used. The URS (2003) adjusted average estimates 43 trips per day (15,695 trips per year) would initially be generated as a result of the proposed facility. The adjusted average daily trip rate resulting from the project would increase to 80 trips per day with future development. The initial figure of 43 trips per day is based on adjusted estimates of an average of 25 weekday daily trips, 133 Saturday daily trips, and 45 Sunday daily trips. Assuming the park is open to the public 12 hours a day and 7 days a week, the facility would generate an average of one trip every 17 minutes. Assuming a worst-case scenario, if all projected 133 Saturday daily trips occurred within 1 hour, on one road, one trip would occur every 27 seconds as a result of the proposed project. Another worst case scenario, if 87 (the number of parking spaces in the park) vehicles entered and left the park in 1 hour and on one road, there would be one trip every 20 seconds in that hour. This provides an estimate of what the resultant traffic volume could be like on one road in a worst-case scenario. The projected average number of daily trips, 43, resulting from the proposed project represents a 1.3 percent increase above the combined 3,801 current average numbers of daily trips on Sands Road (1,831 trips) and County Road (1,970 trips). The worst-case estimate of 133 trips per day represents a 3.5 percent increase above current average daily trips on Sands and County Roads.

According to Service records dating back to 1966, three Key deer are known to have been the victims of road mortality in the action area in the last 37 years. One was killed on Sands Road and two were killed on County Road (Appendix 5). In the 15-year period from 1990 to 2004, no Key deer were killed in the action area by vehicles, even though the Key deer population has been high in recent years.

Key deer annual mortality rate on Sands and County Roads with different daily traffic rates.

TRIPS PER DAY	TRIPS PER YEAR	INCREASE IN MORTALITY PER YEAR	NEW ANNUAL MORTALITY RATE PER YEAR	YEARS PER DEER MORTALITY*
Existing 3,382/day	1,234,430	N/A	0.0811	12.50
Add 43/day	15,695	0.0010	0.0821	12.18
Add 240/day	87,600	0.0058	0.0869	11.51
Add 398/day	145,270	0.0095	0.0906	11.04

* “Years per Key deer mortality” in the table above are calculated by dividing 1 (year) by the annual mortality rate.

The current Key deer mortality rate on Sands Road, Hibiscus Drive, and County Road is 0.08 Key deer per year (3 deaths/37 years). At 43 trips per day, which is the URS 2003 estimated average daily trip increase plus the additional trips generated by a larger park (an additional 12.4 percent or 5 trips), the annual increase in Key deer deaths resulting from the project would be about 0.009 deer mortalities per year, $(15,695/1,234,430 \times 0.0811 = 0.0010)$, which is a 1.23 percent increase above the base mortality of 0.0811 Key deer per year.

Using the same reasoning and an average trip rate of 240 trips per day (3 times the URS 2003 *highest* projected average daily trip rate of 71 plus an additional 9 for a 1 acre larger park), which is a future estimate that includes continued development, the annual Key deer deaths on Sands and County Roads would be 0.0018 mortalities as a result of the project, $(87,600/1,234,430 \times 0.0811 = 0.0058)$, which is a 7.15 percent increase above the base mortality of 0.0811 Key deer per year.

At a trip rate of 398 trips per day (three times the URS 2003 highest projected daily rate of 118, plus an additional 15 trips for a 12.4 percent larger park, the Key deer annual death rate as a result of the project would be 0.0084 mortalities $(145,270/1,234,430 \times 0.0811 = 0.0095)$, which is an 11.71 percent increase above the base mortality of 0.0811 Key deer per year. An 11.71 percent increase for this worst-case scenario may seem large, but the value is small. An increase in annual mortality rate of 0.0095 equates one additional Key deer death every 102 years.

The analyses above predict increases of 0.0010, 0.0058 and 0.0095 deer mortalities per year, which equate to increases in deer mortality of one deer death in 12.5 years (baseline) to a worst case of one deer death in 11.31 years. The Service believes this level of increased mortality is discountable and insignificant because the change in Key deer mortality of one deer in 12.5 years to one deer in 11.3 years is biologically discountable and insignificant.

Concerns have been raised that the park will create “a wall of traffic”, thus creating a barrier to Key deer movements. It was shown above that; if all URS projected 133 Saturday daily trips occurred equally spaced over one hour of time, on one road, one trip would occur every 27 seconds. If both Sands and County Roads were used equally, one car would pass every

54 seconds, roughly one minute and hardly a “wall of traffic.” The Service believes that the volume of traffic is so low that traffic jams are not likely. If temporary traffic jams do occur, the Service believes they will be intermittent and temporary, and not likely to significantly affect Key deer movements and behavior. Dr. Frank reports that it is common knowledge of the residents of BPK that urbanized Key deer on Big Pine Key cross roads with stalled traffic, from events such as flea markets, weaving in and out of vehicles to cross the road (P. Frank, personal communication, 2005). Furthermore, Andrew Gude (former Big Pine Key Service biologist) stated, “As far as traffic goes, it is my opinion that church events, community fairs, the flea markets, yard sales, Moose and Elk Lodge functions, and other traffic-generating events seem to cause a much greater increase in traffic in and through more critical deer areas than this project would” (A. Gude, email, 2003).

Therefore, based on the above analysis, the Service believes the increase in traffic resulting from the project under peak and average conditions is insignificant and discountable and will not have adverse effects to the Key deer.

Noise, Lighting, and Human Activity

Recreational activities at the proposed park, maintenance, and increased traffic will generate associated noise. Accessory lighting, allowing use of the site after sundown, may also affect Key deer. The County plans to install indirect lighting to decrease glare in the area surrounding the park. Numerous studies have documented that deer quickly become habituated to noise and lights. Bashore and Ellis (1982) found that deer quickly became accustomed to noise and lights on Pennsylvania airfields. Krausman et al. (1993) investigated the effects of low-altitude jet aircraft noise on the behavior and physiology on captive mule deer and mountain sheep, finding that all study animals became habituated to noise levels ranging from 92 to 112 decibels.

The Key deer on Big Pine Key are habituated to human noises, lights, and human activity. As mentioned previously, Folk and Klimstra (1991c) observed that Key deer “often bedded in open sites within 6.6 feet (two meters) of a road and were not disturbed by cars, pedestrians, and cyclists. Loud noises from within 131 feet (40 meters), such as circular saws, lawn leaf-blowers, and wood chippers brought little response.” Because the Sands Road area is densely developed, most deer in and around the action area are acclimated to human activity and development, according to Dr. Phil Frank (Personal Communication, 2005). In addition, there are few deer in the area to be affected. Dr. Frank and Dr. Lopez agree that the Sands Road area has the lowest Key deer density (less than 2 percent) on Big Pine Key (P. Frank and R. Lopez, personal communication, 2005).

Dogs are also known to be a source of Key deer mortality. Pet owners might bring their dogs to the park to walk them or to let them run free. Since the park is fenced, dogs should not pose a problem to the Key deer.

A concern has been raised by some local residents that traffic, noise, and lighting after dark will have an adverse effect on Key deer movement and behavior. However, based on the above analysis, Key deer in the project area are generally acclimated to traffic, noise, and lighting.

Therefore, the Service believes any traffic, noise, and lighting generated by the action after dark will result in insignificant and discountable effects above baseline.

Movements and behavior

The Service evaluated the potential effects of noise, lighting, and traffic on Key deer movements and behavior. As mentioned above, the Sands corridor intersects a portion of the two roads that will be used as access to and from the proposed park. However, Key deer moving through the area may cross the roads at any point. Urbanized (acclimated) deer may exhibit minor behavioral modifications during periods of highest traffic volume. These modifications may include, moving away from the roads, waiting until traffic subsides, or abandoning crossing of the road. In rare cases, deer may bolt onto or away from the roadway.

No data are available that give the number or percentage of “wild” deer on Big Pine Key, which might be more affected by noise, lighting, and traffic. Dr. Phil Frank, former NKDR manager, believes that less than ten percent of the current population on Big Pine Key may exhibit “wild” tendencies. Dr. Frank also believes that “wild” deer avoid the Sands Subdivision area and their north to south movement is further west, where development, noise, and disturbance are less prevalent (P. Frank, personal communication, 2005). Dr. Monika Folk, in a August 28, 2004, letter to the Corps of Engineers, stated, “These “wilder” deer (if they still exist) might be discouraged from using the corridor...”, suggesting she doubts the existence of wild deer in the Sands area. Few, if any, wild Key deer would likely be in the Sands area (P. Frank and R. Lopez, personal communication, 2005).

Based on the above analysis, the Service believes the effects of the project on Key deer behavior and movements will be insignificant. The estimated increase in traffic volume will be insignificant, Key deer density is low in the area, and the Key deer in the area are likely urbanized and not easily affected by traffic and human disturbance. Therefore, the Service believes the effects will be insignificant and discountable to the Key deer.

Species’ Response to the Proposed Action

The proposed action will result in a direct loss of low quality foraging habitat, therefore there will be less food for Key deer in the area. Indirect effects of increased automobile, pedestrian, and bike traffic; human activity; lighting; and noise in the action area during the construction of the project and the operation of the proposed recreation facility may affect Key deer movements and behavior. However, traffic volume will be low, averaging about one or two percent of the existing volume on an average day and less than four percent at the peak projected rate of URS projected peak daily rate of 118 trips if both access roads are in use. The number of Key deer in the area within and adjacent to the action area is low (P. Frank and R. Lopez, personal communication, 2005). The park site is developed, fenced, and isolated by canals and open water, which isolate it from Key deer and Key deer movements. Key deer in and near the action area are acclimated or acclimate quickly to traffic and human disturbance, which will reduce the effects of traffic, noise, and lighting resulting from the project. There are likely few, if any, wild Key deer in the area. Any wild Key deer in the area may become acclimated to human

disturbance if the deer remains in the area. Consequently, the Service believes the construction and operation of the proposed park will not significantly increase adverse risk to the Key deer, their movements, or their behavior.

The project will widen the existing roadways and install bike paths, resulting in the loss of low quality Key deer habitat (1.92 acres or 0.77 ha). However, the County plans to post warning signs, slow traffic, increase visibility, and provide additional Key deer crossing opportunities, by removing exotic vegetation, brush, and fencing on County lands and rights-of-way adjacent to the action area. These measures should facilitate Key deer movements, ameliorate aberrant behavior responses, and reduce DVC's. In addition, the County will compensate for the habitat loss on a 3:1 basis, based on an H-value, by purchasing additional conservation lands. The Service believes the measures proposed by the County will result in a net benefit to the Key deer.

CUMULATIVE EFFECTS

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

The Service has identified future State, Tribal, local, and private actions that could occur to include residential and commercial development, and road improvements. Road improvements are included in the project and additional improvements are not likely to recur for some years. Within the action area, private actions that could occur include land alteration permits and/or development orders issued by a county agency. However, due to County development regulations, it is highly unlikely that new private or commercial development will occur in the action area in the foreseeable future, with only 10 such developments being permitted in similarly classified areas (Tier 1) on Big Pine Key and No Name Key in the next 20 years. Furthermore, most, if not all, property available for development may be purchased and conserved in perpetuity (Tim McGarry, personal communication, 2005). Therefore, the Service has not identified any cumulative effects in the action area that are reasonably certain to occur.

CONCLUSION

After reviewing the status of the Key deer, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the Big Pine Park, as proposed, is not likely to jeopardize the continued existence of the Key deer. There is no critical habitat designated for the Key deer, therefore none will be destroyed or adversely modified.

Key deer in and near the action area are acclimated or acclimate quickly to traffic and human disturbance, which will reduce the effects of traffic, noise and lighting resulting from the project. Therefore, the Service believes the traffic, noise, and lighting will have an insignificant and discountable effect on Key deer.

In summary, the Service believes there will be no direct take in the form of mortality or injury of the Key deer resulting from this project. The loss of habitat from implementing the project, taking into consideration the status of the species, remaining habitat, and other factors considered by this biological opinion, such as the overall recovery objectives and other cumulative effects from actions in the action area, will be offset by increased visibility and facilitation of movements through exotic species and brush removal, speed limit controls, and the conservation of functionally valuable habitat.

INCIDENTAL TAKE STATEMENT

Sections 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without a special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns such as breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns, which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary, and must be undertaken by the Corps so that they become binding conditions of any grant or permit issued to the County, as appropriate, for the exemption in section 7 (o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps (1) fails to assume and implement the terms and conditions or (2) fails to require the County to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Corps must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement. [50 CFR §402.14(I)(3)]

AMOUNT OR EXTENT OF TAKE ANTICIPATED

Harm and Harass

The Service anticipates that the loss of 1.92 acres (0.77 ha) of low quality habitat will result in the incidental take of the Key deer as a result of the proposed action. The incidental take is expected to be in the form of harm and harassment, as no direct take (kill) of Key deer is anticipated. The habitat will be lost to road improvements, but will be compensated for on a 3:1 basis. Therefore, the Service exempts incidental take of Key deer in the form of harm and harassment resulting from the loss of 1.92 acres (0.77 ha) of low quality foraging habitat. Based on the previous analysis, the Service believes this level of anticipated take is not likely to result in jeopardy to the species.

Direct Take (Kill)

The County's Population Viability Analysis model provides an estimate of the number of additional human-induced Key deer deaths (kill) per year that may result from a proposed action on Big Pine and No Name Keys. For this project, the County's model estimates additional human-induced mortality will be 0.18 deer/year. However, the Service believes, based on the current habitat conditions on the site, the level of development in the adjacent areas, and the low potential for disruption of movements or alteration of behavior, the increase in traffic and human disturbance generated by the proposed development at the site and on the surrounding roads will not significantly increase the risk of mortality (kill) to the Key deer.

In our original biological opinion, dated June 21, 2004, the Service exempted incidental take in the form of direct take (kill) of one deer per year for the life of the project. However, we do not believe, based on the analyses provided in this document that the effects the project will have on Key deer rise to the level of direct take (kill) and, therefore, the Service is not exempting direct take (kill) of Key deer for the proposed action.

In conclusion, the Service is not exempting take in the form of mortality (kill) of the Key deer, but does anticipate incidental take in the form of harm and harassment associated with the loss of 1.92 acres of low quality foraging habitat.

Effect of take

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species, or destruction or adverse modification of critical habitat.

The proposed action will result in the preservation of about 3.84 acres (1.54 ha) of Key deer habitat on Big Pine or No Name Keys. It will result in the loss of 1.92 acres (0.77 ha) of mostly low quality deer habitat. The lands proposed for compensation/preservation from the proposed take of Key deer habitat are lands adjacent to other larger tracts of natural and preserved lands and are consistent with the Service's goal to locate, preserve, and restore lands containing sufficient area and appropriate land cover types to ensure the long-term survival of the Key deer.

Therefore, based on the evaluations provided above for project's direct, indirect and cumulative effects, the status of the species, and the compensation proposed by the applicant, the Service believes that the proposed construction and operation of the Big Pine Key Park development will not jeopardize the survival and recovery of the Key deer.

REASONABLE AND PRUDENT MEASURES and TERMS AND CONDITIONS

The Service believes the Corps and the applicant have incorporated all reasonable and prudent measures and terms and conditions necessary and appropriate to minimize impacts of incidental take of Key deer into the design of the proposed action. However, to assist the Corps and the applicant in identifying and fulfilling these measures and commitments, they are listed below:

Reasonable and prudent measures

1. Increase awareness of endangered Key deer in the action area;
2. Enforce speed limits and increase visibility;
3. Facilitate Key deer movements across and along streets in the action area; and
4. Replace lost habitat.

Terms and conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the Corps must comply with the following terms and conditions, which implement the reasonable and prudent measures, described above and outline reporting/monitoring requirements. The terms and conditions described below are non-discretionary, and must be undertaken by the Corps so that they become binding conditions of any grant or permit issued to Monroe County as appropriate, for the exemption in section 7(0)(2) to apply.

The Corps has a continuing duty to regulate the activity covered by this Incidental Take Statement. If the Corps (1) fails to assume and implement the terms and conditions or (2) fails to require Monroe County to adhere to the terms and conditions of the Incidental Take Statement through enforceable terms that are added to the permit or grant document, the protection coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Corps or Monroe County must report the progress of the action and its impact on the species to the Service as specified in the Incidental Take Statement (50 CFR § 402.14(i)(3)).

The Corps will include, as special conditions to the permit instrument, the conservation measures listed below and in the description of the proposed action that commits the applicant to purchase, preserve, and manage Key deer habitat, which is necessary and appropriate to minimize incidental take of Key deer by the proposed action. Specifically, to compensate for impacts to 1.92 acres of Florida Key deer habitat and other actions appropriate to minimize incidental take of Key deer by the proposed action, the Corps will ensure that the applicant:

1. Provide compensation by purchasing conservation lands, equivalent to an H-value of 0.3774 (3.84 acres (1.54 ha)) before construction begins on the park or road improvements;
2. Install 25 miles per hour (40 kph) speed limit signs on County Road, Sands Road, and Hibiscus Drive within 30 days of completion of road improvements or the park, which ever comes first;
3. Install signs on Sands Road and County Road warning motorists to watch for Key deer and obey the speed limit within 30 days of completion of road improvements or park, which ever comes first;
4. Install two speed humps on County Road to reduce vehicle speeds within 30 days of completion of road improvements;

5. Install new fencing around the proposed park that complies with the County's deer-friendly fence code, which includes setting fences back 25 feet (7.6 m) from the edge of the abutting streets rights-of-way prior to completion of the park; and
6. Improve the sight lines for motorists and deer along County Road, Sands Road, and Hibiscus Drive by removing exotic vegetation, underbrush, trash, and fences on County-owned land within the action area prior to completion of road improvements.

The Corps or Monroe County must provide the South Florida Ecological Services Field Office with the following information:

1. Notification of initiation of construction and
2. Notification of project completion.

Upon locating a dead, injured, or sick individual of an endangered or threatened species, initial notification must be made to the Fish and Wildlife Service Law Enforcement Office in Miami, Florida at (305-526-2610) and the NKDR, 28950 Watson Boulevard, Big Pine Key, Florida 33043; (305-872-2239). Additional notification must be made to the Fish and Wildlife Service Ecological Services Field Office at Big Pine Key (305-872-2753). Secondary notification should be made to the Florida Fish and Wildlife Conservation Commission; South Region, 3900 Drane Field Road, Lakeland, Florida, 33811-1299; (1-800-282-8002). Care should be taken in handling sick or injured individuals and in the preservation of specimens in the best possible state for later analysis of cause of death or injury.

CONSERVATION RECOMMENDATIONS

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

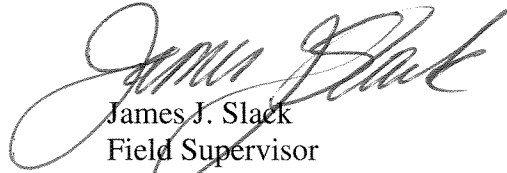
None are being proposed at this time.

REINITIATION NOTICE

This concludes formal consultation on the Immokalee Regional Airport Phase I development project. As provided in 50 CFR § 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; (3) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Thank you for your cooperation and effort in protecting Key deer. If you have any questions on this project, please Winston Hobgood, at 772-562-3909, extension 306.

Sincerely yours,

A handwritten signature in black ink, appearing to read "James J. Slack". The signature is fluid and cursive, with the first name "James" being more prominent.

James J. Slack
Field Supervisor
South Florida Ecological Services Office

cc:

Corps, Marathon, Florida (Rick Milloy)

FWC, Vero Beach, Florida

Director, Monroe County Growth Management, Marathon, Florida

Service, Big Pine Key, Florida (Phillip Hughes)

Service, National Key Deer Refuge, Big Pine Key, Florida

LITERATURE CITED

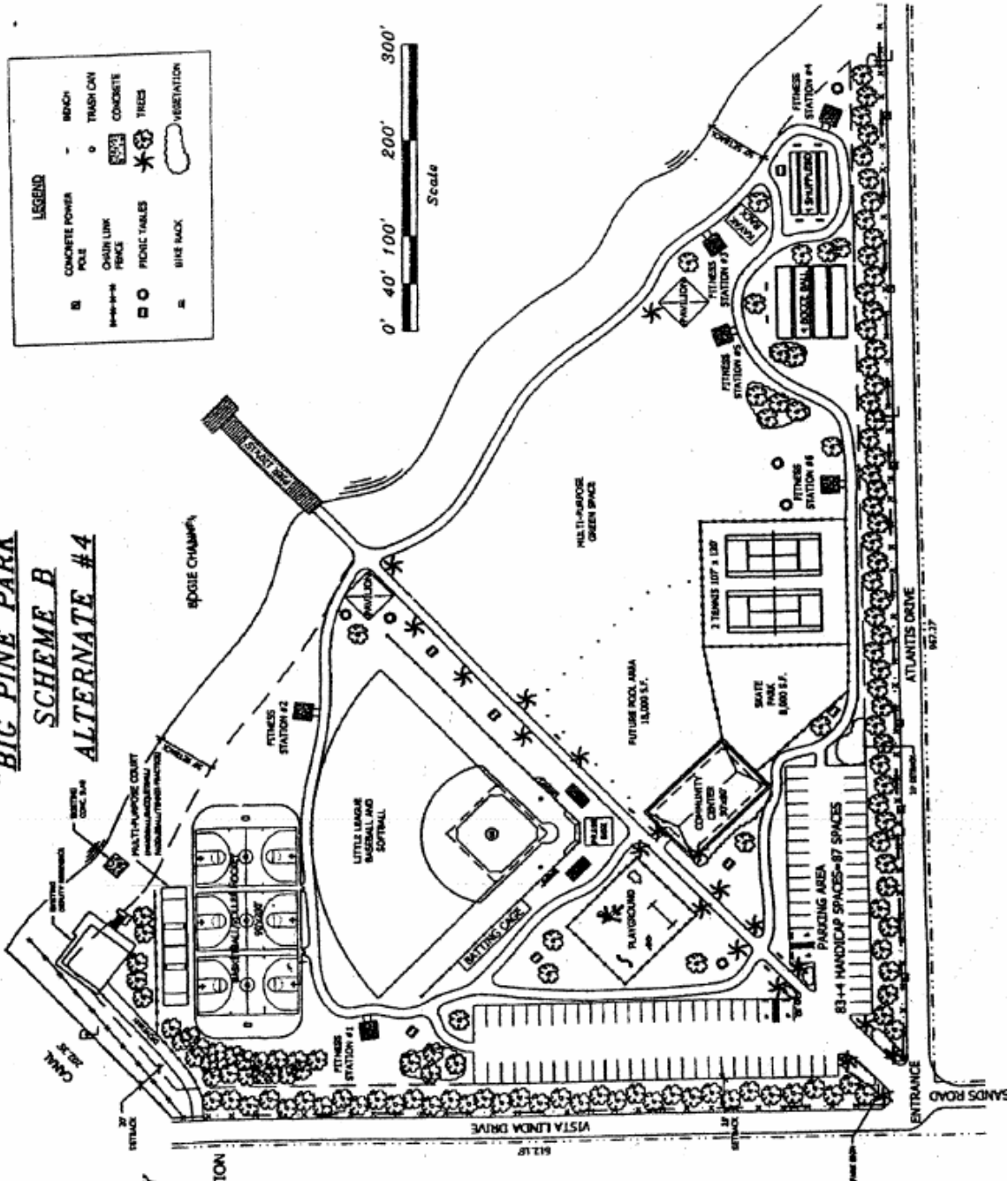
- Barrett, M.A. 2004. An analysis of Key deer herbivory on forest communities in the Lower Florida Keys. Ph.D. Dissertation, University of South Florida
- Bashore, T.L. and E.D. Bellis. 1982. Deer on Pennsylvania Airfields: Problems and Means of Control. *Journal of Wildlife Management* 10: 386-88
- Braden, A.W. 2005. Evaluation of the effects of a highway improvement project on Key deer. Master's Thesis. Texas A&M University, College Station, Texas.
- Carlson, P.C, G.W. Tanner, J.M. Wood, and S.R. Humphrey. 1993. Fire in Key deer habitat improves browse, prevents succession, and preserves endemic herbs. *Journal of Wildlife Management* 57(4):914-928.
- Cox, J.A., and R.S. Kautz. 2000. Habitat conservation needs of rare and imperiled wildlife in Florida. Office of Environmental Services, Florida Fish and Wildlife Conservation Commission, Tallahassee, Florida.
- Drummond, F. 1989. Factors influencing road mortality of Key deer. M.S. Thesis. Southern Illinois University; Carbondale, Illinois.
- Ellsworth, D.L., R.L. Honeycutt, N.J. Silvy, M.H. Smith, J.W. Bickham, and W.D. Klimstra. 1994. White-tailed deer restoration to the southeastern United States: evaluating genetic variation. *Journal of Wildlife Management* 58(4):686-697.
- Folk, M.J. 1991. Habitat of the Key deer. Ph.D. Dissertation. Southern Illinois University, Carbondale, Illinois.
- Folk, M.J. and W.D. Klimstra. 1991a. Antlers of white-tailed deer (*Odocoileus virginianus*) from insular and mainland Florida. *Florida Field Naturalist* 19:97-105.
- Folk, M.J. and W.D. Klimstra. 1991b. Reproductive performance of female Key deer. *Journal of Wildlife Management* 55:386-390.
- Folk, M.J. and W.D. Klimstra. 1991c. Urbanization and Naturalization of the Key deer (*Odocoileus virginianus clavium*). *Florida Field Naturalist*. 19(1): 1-9.
- Folk, M.L., W.D. Klimstra, and C.R. Kruer. 1991. Habitat evaluation: National Key deer range. Final report, Program Project No. NG88-015. Florida Game and Fresh Water Fish Commission Nongame Wildlife Program; Tallahassee, Florida.
- Frank, P. 2005. Personal Communication. Consultant. CES Consultants, Cudjoe Key, Florida
- Gude, A. 2003. Email. Service Big Pine Key Biologist. Big Pine Key, Florida

- Hardin, J.W. 1974. Behavior, socio-biology, and reproductive life history of the Florida Key deer, *Odocoileus virginianus clavium*. Ph.D. Dissertation. Southern Illinois University, Carbondale, Illinois.
- Hardin, J.W., N.J. Silvy, and W.D. Klimstra. 1976. Group size and composition of the Florida Key deer. *Journal of Wildlife Management* 40:454-463.
- Hardin, J.W., W.D. Klimstra, and N.J. Silvy. 1984. Florida Keys. Pages 381-390 in L.K. Halls, editor. *White-tailed deer: ecology and management*. Stackpole Books; Harrisburg, Pennsylvania.
- Harveson, P.M., R.R. Lopez, N.J. Silvy, and P.A. Frank. 2004. Source-sink dynamics of Florida Key deer on Big Pine Key, Florida. *Journal of Wildlife Management* 68(4):909-915.
- Jacobson, B.N. 1974. Effects of drinking water on habitat utilization by Key deer. M.S. research paper. Southern Illinois University; Carbondale, Illinois.
- Klimstra, W.D. 1986. Controlled burning in habitat management: some observations, National Key Deer Refuge. Final Report; Big Pine Key, Florida.
- Klimstra, W.D. 1992. Key deer. Pages 201-215 in S.R. Humphrey, editor. *Rare and endangered biota of Florida, volume 1: mammals*. University Press of Florida; Gainesville, Florida.
- Klimstra, W.D. and A. Dooley. 1990. Foods of the Key deer. *Florida Scientist* 53:264-273.
- Klimstra, W.D., J.W. Hardin, N.J. Silvy, B.N. Jacobson, and V.A. Terpening. 1974. Key deer investigations final report: December 1967-June 1973. U.S. Fish and Wildlife Service; Big Pine Key, Florida.
- Klimstra, W.D., J.W. Hardin, and N.J. Silvy. 1978a. Endangered Key deer. Pages 15-17 in J.N. Layne, editor. *Rare and endangered biota of Florida, volume 1: mammals*. University Presses of Florida; Gainesville, Florida.
- Koppel, D. 2005. Personal Communication. County Engineer. Monroe County, Florida
- Krausman, P.R., M.C. Wallace, M.E. Weisenberger, D.W. DeYoung, and O.E. Maugen. 1993. Aircraft Noise Effects on Captive Desert Mule Deer. ASA 125th Meeting. ([http:// sound. Media.mit.edu/~dpwe/AUDITORY/](http://sound.Media.mit.edu/~dpwe/AUDITORY/)). Ottawa, Ontario.
- Lopez, R.R. 2001. Population ecology of Florida Key deer. Ph.D. Dissertation. Texas A&M University, College Station, Texas.
- Lopez, R.R. 2004a. Florida Key deer (*Odocoileus virginianus clavium*). Effects of urban development and road mortality. Pages 450-458. In: H.R. Akcakaya et al. editors. *Species conservation and management: case studies*. Oxford University Press, Oxford, England.

- Lopez, R. R. 2005. Personal Communication. Wildlife professor and Key deer researcher. Texas A&M University, College Station, Texas.
- Lopez, R.R., Harveson, P.M., Peterson, M.N., Silvy, N.J., Frank, P.A., 2005. From the field: changes in ranges of Florida Key deer – does population density matter? *Wildlife Society Bulletin* 33, 343-348.
- Lopez, R. R., and N. J. Silvy. 1999. Use of infrared-triggered cameras and monitors in aquatic environments. *Proceedings of the Annual Conference of Southeastern Association of Fish and Wildlife Agencies*. 53:200-203.
- Lopez, R. R., N. J. Silvy, B. L. Pierce, P. A. Frank, M. T. Wilson, and K. M. Burke. 2004. Population density of the endangered Florida Key deer. *Journal of Wildlife Management*. 68:570-575.
- Lopez, R.R., M.P. Vieira, N.J. Silvy, P.A. Frank, S.W. Whisenant, and D.A. Jones. 2003a. Survival, mortality, and life expectancy of Florida Key deer. *Journal of Wildlife Management* 67(1):34-45.
- Lopez, R.R., N.J. Silvy, R.N. Wilkens, P.A. Frank, M.J. Peterson, and M.N. Peterson. 2004b. Habitat-use patterns of Florida Key deer: implications of urban development. *Journal of Wildlife Management* 68(4):900-908.
- McGarry, T. 2005. Personal Communication. Director, Monroe County Division of Growth Management, Marathon, Florida.
- Miles Moss and Associates. 2002. Big Pine Park Traffic Circulation Analysis. Miami, Florida.
- Monroe County, Florida Department of Transportation, and Florida Department of Community Affairs. 2005. Habitat Conservation Plan for Florida Key Deer (*Odocoileus virginianus clavium*) and other Protected Species on Big Pine Key and No Name Key, Monroe County, Florida.
- Nettles, V.F., C.F. Quist, R.R. Lopez, T.J. Wilmers, P. Frank, W. Roberts, S. Chitwood, and W. R. Davidson. 2002. Morbidity and mortality factors in Key deer, *Odocoileus virginianus clavium*. *Journal of Wildlife Diseases*. 38:685-692.
- Peterson, M. N., R. R. Lopez, P. A. Frank, M. J. Peterson, and N. J. Silvy. 2003. Evaluating capture methods for urban white-tailed deer. *Wildlife Society Bulletin*. 31:1176-1187.
- Peterson, M.N., R.R. Lopez, P.A. Frank, B.A. Porter, and N.J. Silvy. 2004. Key deer fawn response to urbanization: is sustainable development possible? *Wildlife Society Bulletin* 32(2):493-499.
- Shanmugan, R. 2005. Personal Communication. Traffic engineer. URS Corporation. Miami, Florida.

- Silvy, N.J. 1975. Population density, movements, and habitat utilization of Key deer, *Odocoileus virginianus clavium*. Ph.D. Dissertation. Southern Illinois University; Carbondale, Illinois.
- URS Corporation. 2003. Big Pine County Park: Final traffic Impact Study. Miami, Florida.
- U.S. Fish and Wildlife Service. 1967. Native Fish and Wildlife, Endangered Species. Federal Register 32:4001
- U.S. Fish and Wildlife Service. 1997. Biological opinion on Federal Emergency Management Agency's administration of the National Flood Insurance Program in Monroe County, Florida. Atlanta, Georgia.
- U.S. Fish and Wildlife Service. 1999. South Florida multi-species recovery plan. Atlanta, Georgia.
- U.S. Fish and Wildlife Service. 2001a. Biological Opinion based on review of the Florida Department of Transportation's proposal to install a northbound travel lane on U.S.1 on Big Pine Key, Monroe County, Florida and its effects on the Key deer (*Odocoileus virginianus clavium*). Service Log No. 4-1-01-253. Vero Beach, Florida.
- U.S. Fish and Wildlife Service. 2001b. Biological Opinion based on review of the Florida Department of Transportation's proposal to install wildlife undercrossings on U.S. 1 on Big Pine Key, Monroe County, Florida and its effects on the Key deer (*Odocoileus virginianus clavium*) and Lower Keys marsh rabbit (*Sylvilagus palustris hefneri*). Service Log No. 4-1-98-F-777. Vero Beach, Florida.
- U.S. Fish and Wildlife Service. 2003. Amendment to the June 16, 1997, biological opinion on the effects of the Federal Emergency Management Agency's continued administration of the National Flood Insurance Program in Monroe County, Florida. Atlanta, Georgia.

Appendix 1
"BIC PINE PARK"
SCHEME B
ALTERNATE #4



Appendix 2

MARINER'S PARK

H IMPACT CALCULATION

$$\text{Percent Risk}_{(50)} = 2.2e^{0.58H}, \text{ and}$$

$$\text{Additional Annual Human-Induced Mortality (males plus females)} = -0.65H^2 + 4.85H - 0.34$$

In addition, the following equation is used to estimate H for a redevelopment project:

$$H_{\text{impact}} = H_{\text{parcel}} * \{[M_{\text{land use}} * (\text{sq.ft.dev/sq.ft.parcel})]_{\text{new}} - [M_{\text{land use}} * (\text{sq.ft.dev/sq.ft.parcel})]_{\text{old}}\}$$

Where H_{parcel} is obtained from the GIS H-grid, and M is a multiplier that addresses the differential effect of the type of development on traffic as compared to the effect of a single-family residence. The formula also considers the square feet of development for the new (redeveloped) site and the old site.

While final plans have not been prepared for redeveloping the Mariner property, and assuming that the current (or "old") use is negligible because the site is not active, the County estimates that the H associated with developing the Mariners property as a county park would be estimated as:

$$H_{\text{impact}} = 0.048 * \{[7 * (0.33)] - 0\} = 0.11$$

Where the H of the parcel is 0.048, the multiplier is 7 (see draft HCP), and 1/3 of the parcel is developed. In turn, for $H = 0.11$, then the PVA model estimates the following effects:

1. Risk(50)= 2.3% (an increase of 0.1% with respect to baseline risk; see HCP)
2. Additional Human-Induced Mortality = 0.18 deer/year

Therefore, the effects of a county park at the Mariner property would be an increase of 0.1% in risk and an additional human-induced mortality of 0.18 deer/year. The HCP provides for mitigating these impacts thorough acquiring parcels to achieve a 3:1 ratio for the impact H; therefore, under this scenario the County would acquire one or more parcels for a total $H = .33$ to mitigate for the Mariner impacts.

The calculated H_{impact} was based on a multiplier of 7, per the HCP and following daily trip estimates from the Trip Generation Manual by the Institute of Transportation Engineers. However, a recent county study for the Mariner property estimated the park would generate 38 trips/day, for a multiplier of 4.2 (see attached study). Therefore, the estimate obtained under the HCP calculation is more stringent than that obtained if we use the actual multiplier established for the site.

In conclusion:

1. Indirect effects of a county park at the Mariner property are fully addressed in the HCP.

ROAD WIDENING

H IMPACT CALCULATION

Prepared 8 DECEMBER, 2005

County Road to Mariner's Property, Sands Subdivision

Existing width 18 to 19 lf, or about 18.5 ft on average
Widened to 30 ft
Additional width $30 - 18.5 = 11.5$ ft
Length 2,300 lf
In miles $2,300 / 5,280 = 0.44$ mi

H impact = $0.0372 \times (11.5 / 18.5) \times 0.44$
0.0102

Hibiscus

Existing width 19 ft
Widened to 30 ft
Additional width $30 - 19 = 11$ ft
Length 500 lf
In miles $500 / 5,280 = 0.09$ mi

H impact = $0.0372 \times (11 / 19) \times 0.09$
0.0019

Sands Rd, Segment 1

Existing width 18 ft
Widened to 20 ft
Additional width $20 - 18 = 2$ ft
Length 2,300 lf
In miles $2,300 / 5,280 = 0.44$ mi

H impact = $0.0372 \times (2 / 18) \times 0.44$
0.0018

Sands Rd, Segment 2

Existing width 18 ft
Widened to 28 ft
Additional width $28 - 18 = 10$ ft
Length 500 lf
In miles $500 / 5,280 = 0.09$ mi

H impact = $0.0372 \times (10 / 18) \times 0.09$
0.0019

TOTAL H IMPACT

Park 0.1100

County Road 0.0102

Hibiscus 0.0019

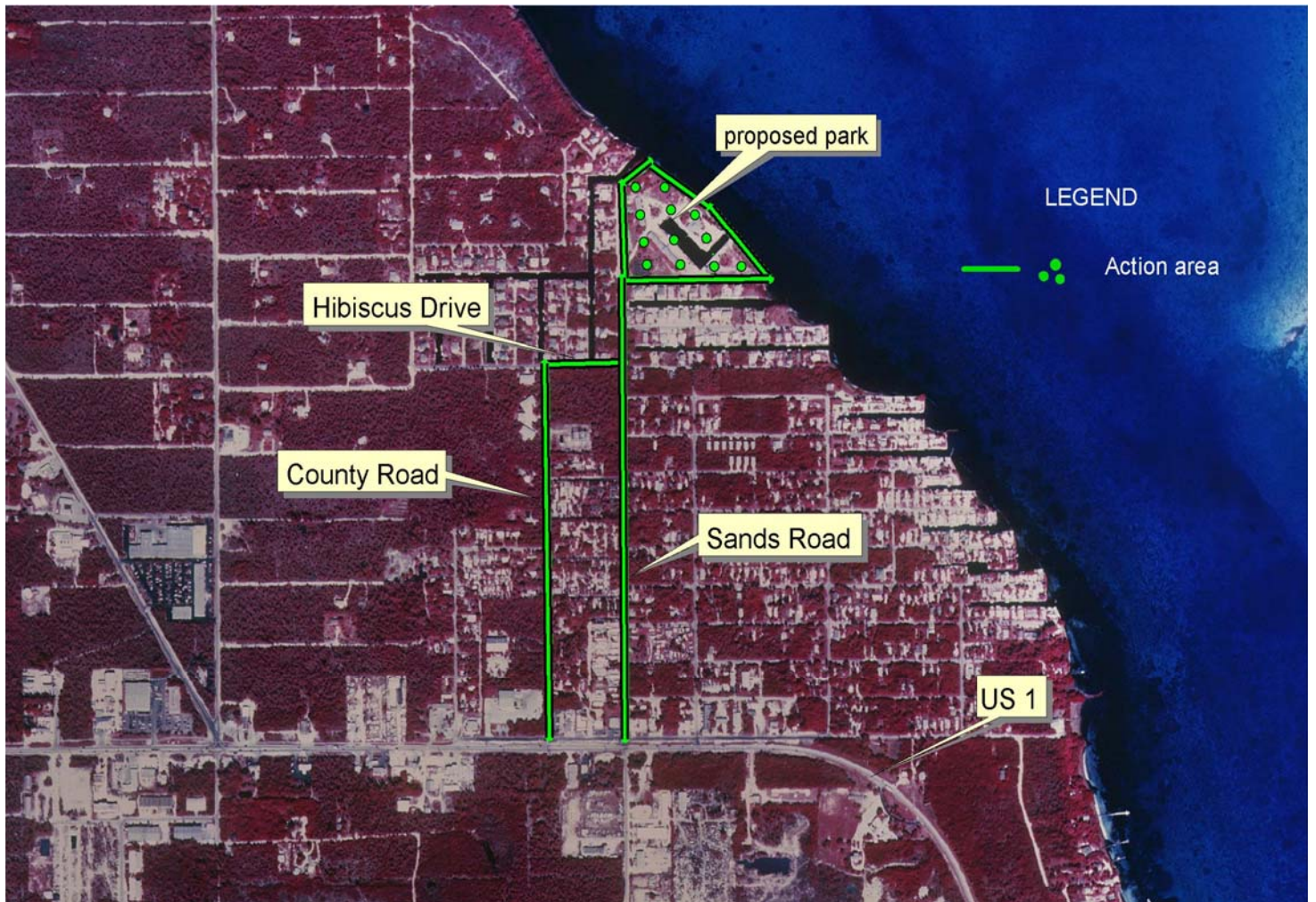
Sands, segment 1 0.0018

Sands, segment 2 0.0019

TOTAL 0.1258

Appendix 3

Action area



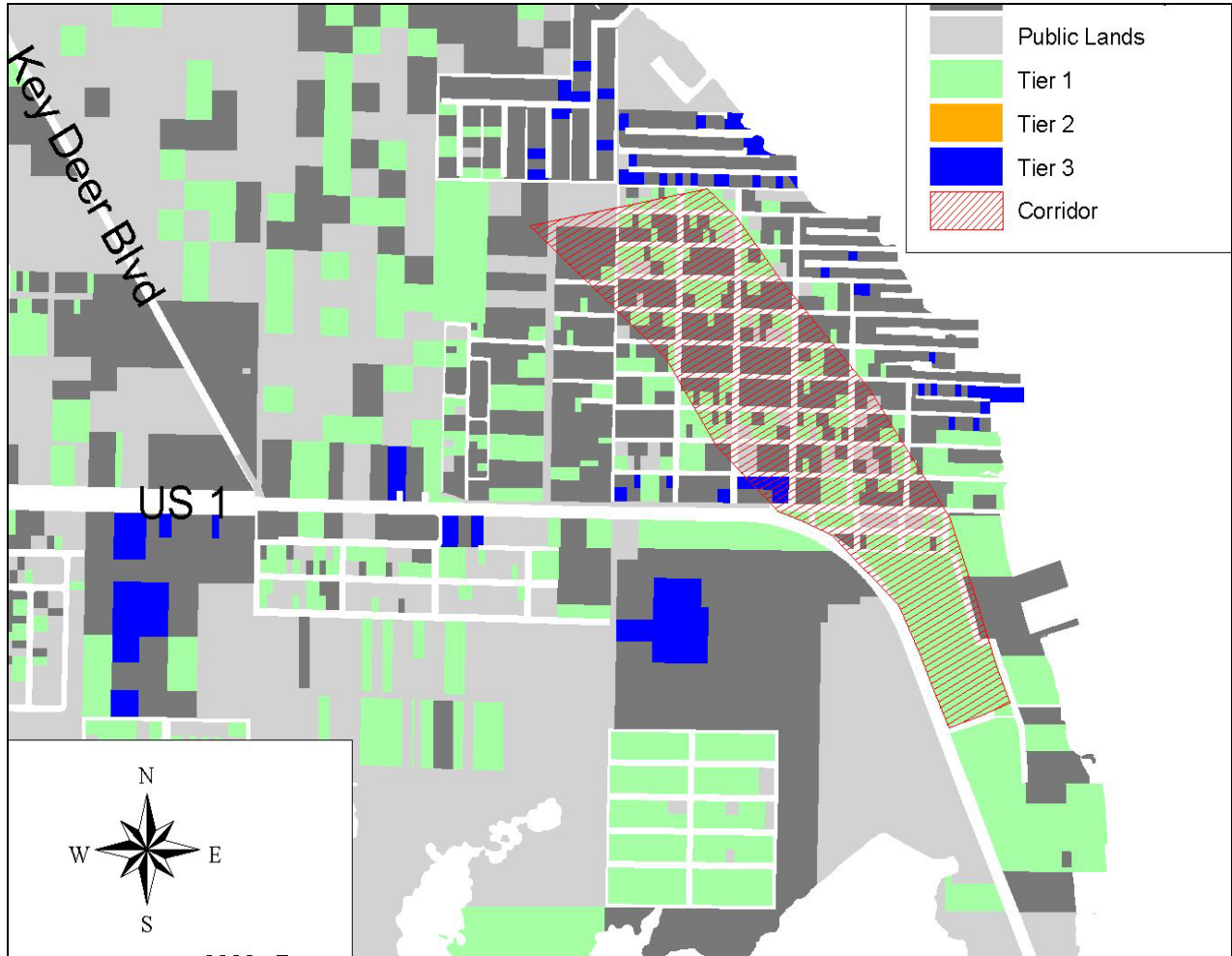
Appendix 4

Analysis of Key deer road mortality for two time periods, from 1990 to 2000 and from 1996 to 2000. Road mortality data was estimated by field examination and necropsy of carcasses recovered by staff at the NKDR. Data were compiled in a Geographic Information System database and are maintained by NKDR.

YEAR	U.S. Highway 1	OFF U.S. Highway1	COMBINED
1990-2000 Annual Average	32 (60 percent)	22 (40 percent)	54
1990-2000 Total	350	241	591
1996-2000 Annual Average	39 (56 percent)	30 (44 percent)	69
1996-2000 Total	195	151	346

Appendix 5

Sands Corridor and Monroe County land classification



Appendix 6

Key deer road mortalities in the action area, 1966 to 2003

