ENVIRONMENTAL ASSESSMENT

FOR THE

CORAL REEF COMMONS PROJECT
INCIDENTAL TAKE PERMIT
APPLICATION

U.S. Department of the Interior

U.S. Fish and Wildlife Service

March 2017

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Abbreviations/Acronyms

µPa	Micropascal
Applicants	Coral Reef Retail LLC, Coral Reef Resi PH I LLC, and Ramdev LLC (Ram Coral Reef) and the University of Miami (UM)
AQI	Air Quality Index
AU	Agricultural/Residential 5 Acres gross, zoning district, Miami-Dade County
BMP	Best Management Practices
BSHB	Bartram's scrub hairstreak butterfly
BU-2	Business Districts, special, zoning district, Miami-Dade County
CAP	Criteria Air Pollutants
CDMP	Comprehensive Development Master Plan, Miami-Dade County
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CH	Critical Habitat
Corps	United States Army Corps of Engineers
CRC	Coral Reef Commons Project
dB	Decibel
dBA	A-weighted Decibels
DERM	Miami-Dade Department of Environmental Resource Management
DOD	U.S. Department of Defense
EA	Environmental Assessment
EEL	Environmentally Endangered Lands
ENP	Everglades National Park
EPA	United States Environmental Protection Agency
ESA	Endangered Species Act of 1973
FBB	Florida bonneted bat
FDOT	Florida Department of Transportation
FEMA	Federal Emergency Management Agency
FNAI	Florida Natural Area Inventory
FWC	Florida Fish and Wildlife Conservation Commission
GIS	Geographic Information System
HAP	Hazardous Air Pollutants
HCP	Habitat Conservation Plan
HCP Plan Area	All areas within the boundary of CRC and the Off-site Mitigation Area (188.86 ac)
HVU	Habitat Value Unit (unit of measure in the habitat functional assessment)
Indigo snake	Eastern indigo snake
ITP	Incidental Take Permit
JEI	Johnson Engineering, Inc.
Leafwing	Florida leafwing butterfly
LOS	Level of Service
MBTA	Migratory Bird Treaty Act
MDC	Miami-Dade County
MDMC	Miami-Dade Mosquito Control District
Mgd	Million gallons per day
Mitigation Areas	On-site preserve areas, Stepping Stones and Off-site Mitigation Area (106.25 ac)
MSA	Minor Statistical Area
MTB	Miami tiger beetle
NAAQS	National Ambient Air Quality Standards

NAS	Naval Air Station
NCA	National Climate Assessment
NEPA	National Environmental Policy Act
NFA	No Further Action
NFC	Natural Forest Community
NGVD	National Geodetic Vertical Datum
NHPA	National Historic Preservation Act
NPDES	National Pollutant Discharge Elimination System
NSZ	No School Zone
PAD	Planned Area Development, 20 acres minimum. Mixed residential and convenience retail services. Density depends on Master Plan, neighborhood studies and neighborhood development, zoning district, Miami-Dade County
PBF	Physical and biological features (pertaining to critical habitat designation)
PCE	Primary constituent elements (pertaining to critical habitat designation)
Phase II Assessment	Phase II Environmental Site Assessment
PM	Particulate Mattter
ppm	Parts Per Million
Ram Coral Reef	Coral Reef Retail LLC, Coral Reef Resi PH I LLC, and Ramdev LLC
REC	Recognized Environmental Condition
Richmond Area	Approximately a 4-square mile area, roughly bound by S.W. 152nd Street to S.W. 184th Street, and S.W. 117th Avenue to S.W. 137th Avenue in which the CRC Property and Off-site Mitigation Area are located
RU-4L	Limited Apartment House District, 35.9 units/net acre, zoning district, Miami-Dade County
Service	United States Fish and Wildlife Service
SFESO	South Florida Ecological Services Office
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SLR	Sea Level Rise
UM	University of Miami
USCG	United States Coast Guard
USDA	United States Department of Agriculture

1.0 Introduction

Coral Reef Retail LLC, Coral Reef Resi PH I LLC, and Ramdev LLC; collectively referred to as "Ram Coral Reef" and the University of Miami (UM) (Applicants) are seeking an Incidental Take Permit (ITP) from the U.S. Fish and Wildlife Service (Service) pursuant to Section 10(a)(1)(B) of Endangered Species Act of 1973, as amended (ESA) (87 Stat. 884; 16 U.S.C. 1531 *et seq.*). The ITP would authorize the incidental take of the endangered Bartram's scrub-hairstreak butterfly (*Strymon acis bartrami*; BSHB) and Florida leafwing butterfly (*Anaea troglodyta floridalis*; leafwing), the endangered Florida bonneted bat (*Eumops floridanus;* FBB), the endangered Miami tiger beetle (*Cicindelidia floridana*), and the threatened eastern indigo snake (*Drymarchon corais couperi*; indigo snake), as well as the candidate gopher tortoise (*Gopherus polyphemus*), the petitioned rim rock crowned snake (*Tantilla oolitica*) and the State threatened white-crowned pigeon (*Patagioenas leucocephala*), for the development of the Coral Reef Commons Project (CRC) and the implementation of the associated Habitat Conservation Plan (HCP) located in unincorporated Miami-Dade County (MDC), Florida (**Figure 1**).

The Applicants submitted a HCP in support of the ITP application, which includes the management of both on-site and off-site mitigation areas (Mitigation Areas). Much of the social, economic, and environmental information presented in this Environmental Assessment (EA) has been drawn from the HCP.

The Applicants are requesting an ITP that would cover the incidental take of the above species within the HCP Plan Area for 30 years.

1.1 Project Description and Applicants' Purpose

The HCP Plan Area includes CRC (approximately 86.5 acres [ac] of development) and its associated on-site preserve areas (approximately 55 ac) as well as the management of off-site mitigation lands (approximately 51ac). The total HCP Plan Area is 188.86 ac located in Sections 25 and 26, Township 55, Range 39, in unincorporated MDC, Florida (**Figure 1**). CRC is bounded by SW 152nd Street and residential units immediately to the north, SW 124th Avenue and Zoo Miami to the east, and U.S. Department of Defense (DOD) lands to the south and west (**Figure 1**). CRC is centrally located in MDC and surrounded by urban development, surrounded by numerous roads, including the Florida Turnpike. The majority of existing habitat within the property proposed for development of CRC is pine rocklands (various degrees of disturbance and degradation); a rare and diminishing upland habitat type found in southern Florida.

The Applicants' purpose of the project is to construct a mixed-use development, with "garden-style" apartments capable of sustaining on-site shopping, recreation, and employment; enabling restoration and the perpetual preservation of approximately 106.25 ac of upland wildlife habitat in Mitigation Areas. The protection and perpetual management of the Mitigation Areas would be funded through revenues generated by the development and is intended to offset the effects of construction, operation of the CRC development, and all restoration activities. Development activities include construction and operation of residential units, retail/commercial uses, a school, and infrastructure improvements, including improvements to the existing main spine road within CRC. Restoration activities include the activities in the On-site Preserves Mitigation Plan and the Off-site Mitigation Area Mitigation Plan.

MDC requires certain infrastructure and traffic improvements to be funded by the development, therefore, the CRC property was purchased with the intention of developing an economically sustainable community with a level of residential units and commercial development that would serve this region of MDC and ensure viability of the mixed-use development plan.

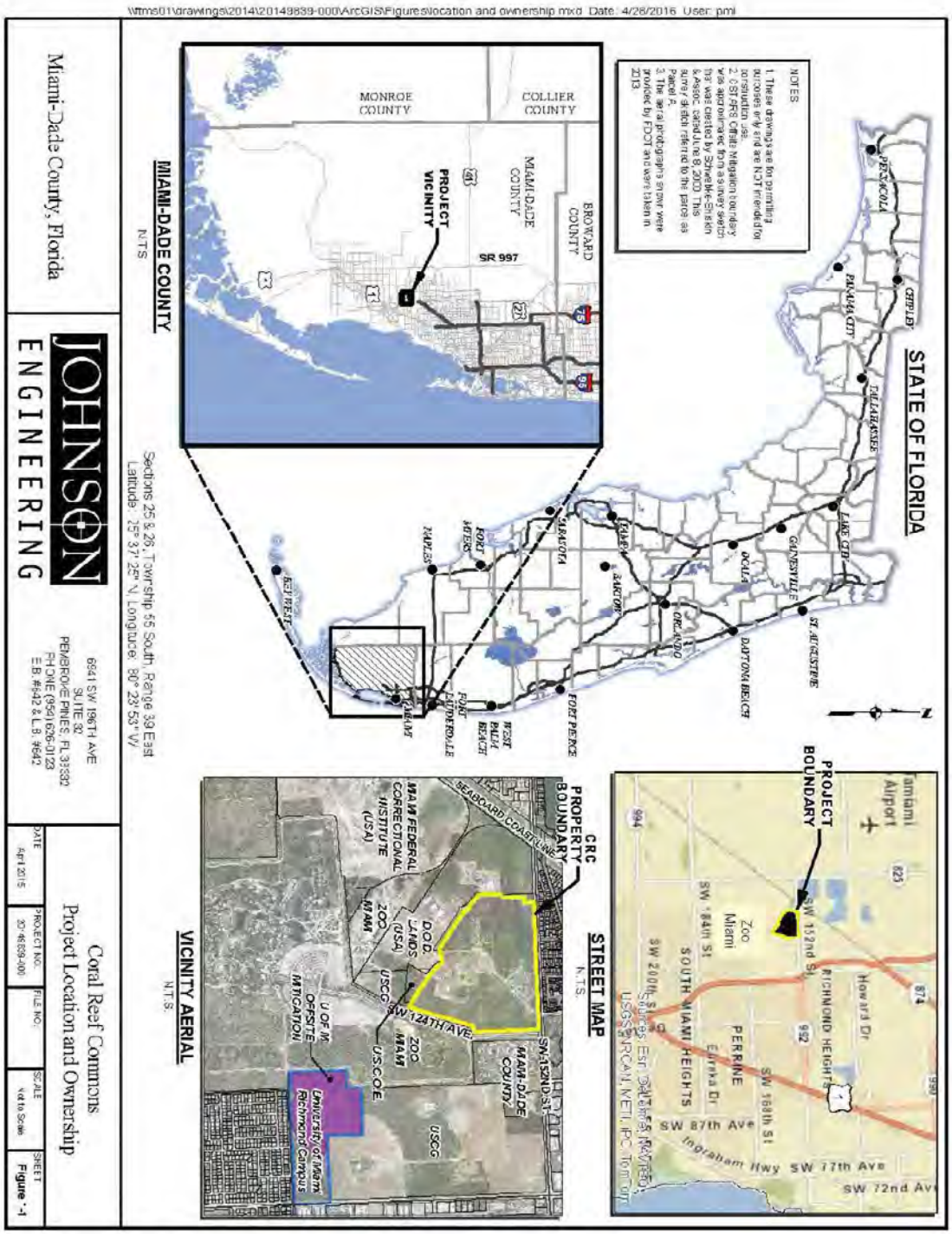

Figure 1. HCP Plan Area including the Coral Reef Commons Project and Off-site Mitigation Area

1.2 Coordination and Consultation

Service personnel at the South Florida Ecological Services Office (SFESO), Vero Beach, Florida, received and reviewed the ITP application in accordance with Section 10(a)(1)(B) of the Act and worked with the Applicants and contractor to analyze data, modify submitted materials where necessary, and develop and prepare completed and final documents for submittal. Service staff in the Southeast Regional Office were also engaged and participated in the evaluation of key issues related to the Act and National Environmental Policy Act (NEPA) regulations. Additionally, the Office of the Regional Solicitor of the U.S. Department of the Interior reviewed the Applicants' HCP and provided comments to the Service's Southeast Regional Office in addition to assisting SFESO throughout planning and design. The Florida Fish and Wildlife Conservation Commission (FWC) was also provided a draft of the HCP and provided input to the Applicants and Service.

The Florida Department of State, Division of Historical Resources, provided a review of historic standing structures and archaeological resources within the CRC property (**Attachment 1**).

2.0 Proposed Action

The proposed action being evaluated by this EA is the issuance of an ITP by the Service that would authorize take of the BSHB, indigo snake, leafwing, FBB, gopher tortoise, rim rock crowned snake, and white-crowned pigeon, incidental to development of CRC and implementation of the conservation plan in the associated HCP, in accordance with the statutory and regulatory requirements of the ESA.

2.1 Purpose and Need of the Proposed Action

The Service's purpose in considering the proposed action is to fulfill our authority under the ESA, section 10(a)(1)(B). Non-Federal applicants, whose otherwise lawful activities may result in take of ESA-listed wildlife, can apply to the Service for incidental take authority so that their activities may proceed without potential violations of section 9 of the ESA.

To carry out these responsibilities, the Service must comply with a number of environmental laws and regulations, Executive Orders, and agency directives and policies. As the Service fulfills these responsibilities and obligations, we will: 1) ensure that issuance of the ITP and implementation of the HCP achieve long-term species and ecosystem conservation objectives at ecologically appropriate scales; and 2) ensure that the conservation actions approved with issuance of the ITP occur within a spatially explicit Landscape Conservation Design capable of supporting species mitigation projects over the long-term, or for a period commensurate with the nature of the impacts.

Section 10 of the ESA specifically directs the Service to issue ITPs to non-Federal entities for take of endangered and threatened species when the criteria in section 10(a)(2)(B) are satisfied by the Applicant. Once we receive an application for an ITP, we need to review the application to determine if it meets issuance criteria. We also need to ensure that issuance of the ITP and implementation of the HCP complies with other applicable Federal laws and regulations. We must ensure our permit decision complies with the National Historic Preservation Act; treaties;

and Executive Orders 11998, 11990, 13186, 12630, and 12962. In addition, the Service enforces the Bald and Golden Eagle Protection Act, the Migratory Bird Treaty Act (MBTA), and other requirements of the ESA in addition to section 10. If we issue an ITP, we may condition the permit to ensure the permittee's compliance with Bald and Golden Eagle Protection Act, MBTA, and all ESA requirements.

On May 5, 2016, the Service received an application from the Applicants for ITP under the authority of section 10(a)(1)(B) of the ESA. If the application is approved and the Service issues a permit, the ITP would authorize the Applicants to take BSHB, indigo snake, leafwing, FBB, gopher tortoise, rim rock crowned snake, and white-crowned pigeon as a result of the development of CRC including construction, habitat restoration and land management activities, and permanent urban community development within the HCP Plan Area.. The ITP would also incorporate measures to mitigate (avoid, minimize, and compensate) for adverse effects to other Service-jurisdiction resources, including listed and proposed listed plants [Blodgett's silver bush (*Argythamnia blodgettii)*, Carter's small-flowered flax (*Linum carteri var. carteri)*, crenulate lead-plant (*Amorpha crenulata*), deltoid spurge (*Chamaesyce deltoidea ssp. deltoidea)*, Everglades bully (*Sideroxylon reclinatum ssp. austrofloridense)*, Florida brickell bush (*Brickelia mosieri)*, Florida bristle fern (*Trichomanes punctatum ssp. floridanum)*, Florida pineland crabgrass (*Digitaria pauciflora)*, Florida prairie clover (*Dalea carthagenensis var. floridana)*, Garber's spurge (*Chamaesyce garberi)*, sand flax (*Linum arenicola)*, Small's milkpea (*Galactia smallii*), tiny polygala (*Polygala smalli)*] and critical habitat for the BSHB, leafwing, Carter's small-flowered flax, and Florida brickell bush. The Service has prepared this EA to inform the public of our proposed action and the effects of the proposed action and its alternatives, seek information from the public, and to use information collected and analyzed to make better informed decisions concerning this incidental take permit application.

The HCP for CRC has been designed to address the objectives of each species' recovery plan and/or protecting, conserving, and minimizing and avoiding actions contributing to these species' population decline. The Service must consider the issues listed below in its evaluation of the HCP developed in support of the Applicants' ITP application for CRC:

1. Is the proposed take incidental to an otherwise lawful activity?

2. Would implementation of the HCP minimize and mitigate take to the maximum extent practicable?

3. Has the Applicant ensured that adequate funding will be dedicated to ensure implementation of the programs and measures proposed in the submitted HCP?

4. Will issuance of the ITP appreciably reduce the likelihood of survival or recovery of the covered species?

5. Are there other measures that should be required as a condition of the ITP?

<u>Bald and Golden Eagle Protection Act</u>

The Bald and Golden Eagle Protection Act, originally passed in 1940, provides for the protection of the bald eagle and the golden eagle (as amended in 1962) by prohibiting the take, possession,

sale, purchase, barter, offer to sell, purchase or barter, transport, export or import, of any bald or golden eagle, alive or dead, including any part, nest, or egg, unless allowed by permit (16 U.S.C. 668(a); 50 CFR 22). Take includes pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb (16 U.S.C. 668c; 50 CFR 22.3). No bald or golden eagles have been documented nesting within the HCP Plan area or are known to nest within 600 feet (ft) of the proposed CRC property. Therefore, no additional measures are proposed to address compliance with the Bald and Golden Eagle Protection Act.

Migratory Bird Treaty Act

The MBTA (16 U.S.C. 703) is the cornerstone of migratory bird conservation and protection in the United States. The MBTA prohibits the "take" or possession of protected species of migratory birds. Under this law, take means to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempts to do so (50 CFR 10.12). Several Best Management Practices (BMPs) would be implemented to avoid and minimize potential impacts to migratory bird species. These BMPs include pre-construction surveys prior to clearing land. These surveys would be conducted by an ecologist and would include all suitable habitats that are within 500 ft of construction activities. If a migratory nesting bird is found to be nesting within 500 ft of the construction area, appropriate avoidance setbacks shall be established, the size and scale of which would be determined by the species of nesting bird and the habitat. Nests would be monitored by the biologist at the appropriate intensity based on the bird species. Setback fencing would not be removed until the nest is no longer occupied and the young have fledged. Based on the Applicants' proposed BMPs and mitigation, no additional measures are proposed to address compliance with MBTA.

2.2 Decision that must be made

The Service must decide whether to issue or deny an ITP. If the ITP evaluation criteria set forth in Section 10(a)(2)(B) of the ESA are satisfied, the Service is mandated to issue an ITP to the Applicants. Within these guidelines, the Service may decide to issue a permit conditioned on implementation of the HCP, as submitted by the Applicants, or to issue a permit conditioned on implementation of the HCP, as submitted, together with other measures specified by the Service. If the ESA's criteria are not satisfied, the Service would deny the permit request.

3.0 The Affected Environment

This section of the EA describes existing or baseline conditions for the portions of the human and natural environment potentially affected by the preferred and alternative actions. This section and the following sections comply with 40 CFR Sections 1502.15 and 1502.16, to describe the affected environment and establish a level of information, upon which the analysis of impacts is based. An analysis of an alternative's effect on each of the resources described in this section is included in Chapter 4 - Alternative and Environmental Consequences.

The Applicants' proposed activity will result in the loss of pine rockland habitat within CRC. The proposed On-site Preserves Mitigation Plan and Off-site Mitigation Area Mitigation Plan would facilitate the restoration and perpetual management and preservation of approximately 106.25 ac of upland wildlife habitat (pine rocklands, marl prairie, rockland hammock), including

designated critical habitat (CH) for the BSHB and leafwing. In addition, the combination of the On-Site Preserves Mitigation Plan and the Off-site Mitigation Area Plan are intended to increase the carrying capacity for the covered species.

Pine rockland forest, unique to southern Florida and the Bahamas, once covered 185,000 ac of MDC (Service 1999). In Florida, they are found on limestone substrates on the Miami Rock Ridge, in the Florida Keys, and in the Big Cypress Swamp. Pine rockland vegetative communities are dominated by a single canopy tree, the South Florida slash pine (*Pinus elliottii var. densa*), a diverse hardwood and palm subcanopy, and a very rich herbaceous layer. The vegetative community of pine rocklands is composed of a slash pine-dominated canopy with a diverse assemblage of tropical and temperate understory shrub species, several of which are endemic. Pine rocklands are a fire sub-climax community and are maintained through periodic burning to control and minimize invading hardwoods, reduce organic accumulation and facilitate nutrient cycling (Service 1999). Threats to spatial extent and persistence are exacerbated by a lack of adequate fire management as pines, including slash pine, most effectively resprout after burns (Olson and Platt 1995).

Historically, lightning-induced fires were a vital component in maintaining native vegetation within this ecosystem (Loope and Dunevitz 1981; Slocum *et al*. 2003; Snyder *et al*. 2005; Salvato and Salvato 2010). More recently, fires in South Florida's fragmented pine rocklands have been mostly incompatible wildfires characterized by excessive heat and duration for the optimal regeneration of desirable species during the dry season (Service 2013a). Some successful fire management has been accomplished by MDC (Service 2013a), Everglades National Park (ENP) and the Service's National Key Deer Refuge in the Florida Keys; however, within more populated areas (*i.e*., Miami and the Florida Keys), these efforts are hampered by the pattern of land ownership and development in addition to residential and commercial properties located proximal to pine rockland habitat (Snyder *et al*. 2005; Service 2014). Without optimal fire frequency and intensity, successional climax from tropical pineland to hardwood hammock can be rapid, and displacement of native species by invasive nonnative plants often occurs.

Pine rocklands provide critical foraging and reproductive habitat for a diverse wildlife community including 15 federally listed plant and animal species in South Florida, with additional species proposed and under review. Other at-risk animal species that depend upon or utilize pine rocklands include but are not limited to the gopher tortoise, and the rim rock crowned snake. The State of Florida has also listed animals and plants as threatened or endangered that depend upon pine rocklands. The single largest fragment of pine rocklands outside ENP on mainland Florida is located within the Richmond Pine Rocklands area (Richmond Area) of MDC where the HCP Plan Area is located.

By 1996, accelerated urban and agricultural development had reduced the extent of pine rocklands by 98 percent outside of ENP (O'Brien 1998). Additional contributions to this decline included fire suppression, exotic plant and animal invasions, collecting pressure, and hydrologic alterations (Service 1999). While significant areas of pine rocklands are now protected within preserves such as ENP, Big Cypress National Preserve, and the National Key Deer Refuge, vulnerable fragments continue to be threatened on the Miami Rock Ridge and in the Florida Keys (Service 1999). This continuing habitat loss has resulted in pine rockland communities of

South Florida becoming imperiled globally (Service 1999; FNAI 2015). The inevitable consequences of climate change throughout the 21st century will impact pine rocklands as sea level rise (SLR) and increased precipitation, storm intensity, and annual average temperatures proceed to transform the hydrology and subsequently, the vegetative communities in South Florida, the Florida Keys and Bahamas.

Factors of the human environment were identified including; the natural environment, built environment, human health, welfare, and safety; for which the effects of the proposed action should be assessed.

3.1 Physical Environment

The CRC property is centrally located in MDC and surrounded by urban development, numerous roads, including the Florida Turnpike. The HCP Plan Area is located north and central within the Richmond Area of the southeast Miami, Florida metropolitan area (**Figure 1**).

MDC climate is described as subtropical and humid with an average temperature of 76.7° F. It has an average annual precipitation of 58.53inches (in), which occurs predominantly during the rainy season (June through October) that also coincides with the hurricane season (http://www.miamidade.gov/info/about_miami-dade_statistics.asp accessed 5/20/2015).

3.1.1 Geology, Soils, and Topography

In MDC, pine rocklands occur in association with the Miami Rock Ridge, a Pleistocene deposit of oolitic limestone (Snyder and Robertson 1990; Green *et al.* 2008). The limestone that forms this ridge serves as a substrate for pine rocklands (Service 1999). The HCP Plan Area is centrally located on the Miami Rock Ridge, in an area known as the Richmond Pine Rockland tract (Richmond Area). This area encompasses approximately 4 square miles (sq mi) and is roughly bound by S.W. 152 Street to S.W. 184 Street, and S.W. 117 Avenue to S.W. 137 Avenue.
This 4 sq mi area contains approximately 883 ac of pine rockland habitat, including 578 ac owned by MDC, 158 ac owned by the federal government, 67 ac owned by UM, and 80 ac within CRC (**Figure 2**). Historically, the Miami Rock Ridge was intersected by a network of transverse glades that enabled water flow from the Everglades eastward towards the coast. These transverse glades were described as winding channel-like sloughs, typically with marl prairies. One transverse glade historically occurred in the northern portion of CRC, trending south and east toward the Black Creek area. Black Creek has since been channelized and historic flows have been altered by residential development and roads to the north, and residential development, Federal development and land uses, and Zoo Miami to the south.

Based on the National Cooperative Soil Survey, soils on CRC consist of Opalocka Rock Outcrop Complex and Urban Land soils (USDA 1990). The U.S. Department of Agriculture's (USDA) soil mapping for MDC was conducted in 1986 and is meant to be a general soil guide; soil characteristics within a site may vary widely from the USDA mapping, as great differences in soil properties can occur within short distances (USDA 1990).

Coral Reef Commons (HCP Plan Area)
Department of Defense (USA)
SW 152ND ST
Gold Coast Railroad Museum Park (Miami-Dade County)
NOAA (USA)
US Army Reserve Center (USA)
Larry and Penny Thompson Park and Campground (Miami-Dade County)
SEABOARD COAST LINE
LEGEND
Pine Rocklands
EUREKA DR
LINDGREN RD
Miami Federal Correctional Institute (USA)
Martinez Pineland (Miami-Dade County)
Zoo Miami (Miami-Dade County)
(US Coast Guard)
SW 117TH AVE
FLORIDA'S TURNPIKE
Southern Anchor Affordable Housing (Miami-Dade County)
(US Army Corps of Engineers)
(US Coast Guard)
University of Miami Richmond Campus
Robert Morgan Educational Center (School Board of Miami-Dade)
SCALE IN FEET
NOTES
1. The Pine Rocklands layer is a combination of field mapping performed recently by Johnson Engineering and Pro Native Consulting for Coral Reef Commons and separately, polygons that were developed by The Institute for Regional Conservation, Miami-Dade County Department of Environmental Resources Management and USFWS. This latter set of polygons was created between 2000 and 2004.
2. Domestic information was provided by Miami-Dade County and was downloaded on December 8, 2014.
3. The aerial photographs shown were provided by FDOT and were taken in 2013.
JOHNSON ENGINEERING
6941 SW 190TH AVE
SUITE 30
PEMBROKE PINES, FL 33332
PH-ONE (954) 435-0123
E.B. #642 & L.B. #642
Miami-Dade County, Florida
Richmond Pine Rockland Tract
Property Ownership and Pine Rocklands
DATE
April 2015
PROJECT NO.
FILE NO.
SCALE
As Shown
SHEET
Figure 2-1

Figure 2. Richmond Area ownership and pine rocklands

Based on-site surveys, representative soils within CRC also include remnants of Biscayne marl, drained soil series found within the historic transverse glade. Biscayne marl is classified as shallow, nearly level, poorly drained series, which occurs in transverse glades that extend into the pineland ridge. Typically, the surface layer is about 5 in of gray marl that has a texture of silt loam. The underlying layer, to a depth of about 15 in, is gray and light gray marl that has a texture of silt loam. Hard porous limestone bedrock is at a depth of about 15 in with scattered solution holes. As its name would indicate, the drained variety of Biscayne marl has been historically drained, commonly for cultivation in the past. In areas of this soil, land grading and filling of depressions is common. Under natural conditions this soil series would have a freshwater or sawgrass marsh plant community; however due to prior draining and grading these areas quickly become overgrown with Brazilian pepper, leatherleaf fern, and a variety of shrubs, broadleaf weeds, and grasses (USDA 1990). Although no evidence of cultivation activities within CRC were found, the areas with remnant characteristics of marl soil community appear to have been altered through historical scraping of the site. Previous scraping and draining alterations have resulted in the removal of much of the gray marl surface layer.

Opalocka Rock Outcrop Complex is classified as well drained soil series, with quartz sand overlaying exposed oolitic limestone. Typically, the surface layer of the Opalocka soil is brown sand about 6 inches thick. Hard porous limestone bedrock is at a depth of about 6 in (USDA 1990). The sand deposits are a defining characteristic of this soil series, and tend to be thicker in the northern extent of their range but become thinner with less coverage in the Richmond Area (URS 2007).

The Urban Land-Udorthents Association soil series is described as built-up areas with moderately well drained or well drained soils consisting of fill material that is 8 to more than 80 in deep over limestone bedrock. Urban land is typically covered by streets, sidewalks, parking lots, buildings and other structures that so obscures the soils that identification of the soil series is not feasible. Udorthents are nearly level areas of fill material over a hard, porous limestone bedrock, which are intricately mixed with areas of Urban land (USDA 1990).

Elevation within the proposed CRC ranges from 7 to 18 ft (NGVD) (average elevation of +9ft NGVD), with a 16-18ft ridge that runs east-west through the center of the site and a low point at the northwestern most portion of the site.

3.1.2 Water Resources

Executive Order 11988 pertaining to floodplain management states that each Federal agency shall “provide leadership and shall take action to reduce the risk of flood loss.” In order for each agency to carry out its responsibility, the order requires that each agency determine whether a project is located within a floodplain and consider alternatives to a project’s location within a floodplain. MDC flood protection requirements are contained in Chapter 24 of the MDC Code. Policy CON-5A of the Conservation, Aquifer Recharge, and Drainage Element of the MDC’s

Comprehensive Development Master Plan (CDMP) establishes the stormwater management level of service standards for MDC, and contains both a flood protection and water quality component. The Clean Water Act provides the Federal authority for addressing water quality protection within the United States. MDC has issued a surface water management permit for the CRC that provides water quality certification per the Clean Water Act. Application of this regulation as it relates to surface water management for the CRC is discussed in section 4.0 Alternatives and Environmental Consequences.

The HCP Plan Area does not contain any State or Federal jurisdictional wetlands, therefore, no regulatory requirements relating to wetlands (*i.e.* section 404 Clean Water Act) are applicable to the Applicant's proposed activity.

The Federal Emergency Management Agency (FEMA) is responsible for predicting the potential for flooding in most areas. FEMA routinely performs this function through the update and issuance of Flood Insurance Rate Maps, which depict various levels of predicted inundation. The property where CRC is proposed occurs in a moderate flood hazard area (Federal Flood Zone X-99), which is an area considered to be between the limits of the base flood (Special Flood Hazard Area or 100 year flood area) and the 500-year flood area. Flood insurance is not required within Flood Zone X. The proposed CRC occurs within C-1 (Black Creek) Drainage Basin. This drainage basin has an area of 56.9 sq mi within southeastern MDC. There are four canals within this basin, which have the collective function to provide drainage and flood protection, supply water to the C-1 and C- 100 basins for irrigation, and to maintain a groundwater table elevation near the lower reach of C-1 adequate to prevent saltwater intrusion in local groundwater (Cooper and Lane 1987).

The property where CRC is proposed has no outfall or existing stormwater treatment facilities, which allows rainfall to percolate into the ground without treatment. The forested areas (proposed on-site preserves) within the proposed CRC occur on either side of the existing development and SW 127th Avenue, which runs north to south bisecting the site. Currently, stormwater drains towards the forested areas without any prior treatment for water quality. The proposed stormwater management system and water quality treatment for CRC is included as **Attachment 2**.

Groundwater levels within the property where CRC is proposed were measured between 7 and 9 ft below the existing ground surface, and are expected to fluctuate within 2 ft of this documented level (Tierra 2013).

3.1.3 Hazardous Material

Prior to purchasing a property, it is standard due diligence for a purchaser to assess environmental risks related to hazardous materials under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA; 42 U.S.C. §9601). This is most commonly performed through conducting a Phase I Environmental Site Assessment. The U.S. Environmental Protection Agency (EPA) promotes the most current version of the American Society for Testing and Materials E1527 as the standard by which Phase I Environmental Site Assessments should be conducted. Phase I Environmental Site Assessments following this standard are intended to identify, through specific types of inquiries (*e.g.* historical records

reviews, onsite visual reconnaissance, interviews), if the site may be contaminated based on the range of contaminants within the scope of the CERCLA, including petroleum products. The goal of a Phase I Environmental Site Assessment is to identify any Recognized Environmental Condition (RECs) on the property. A REC is defined by the American Society for Testing and Materials as "the presence or likely presence of any hazardous substances or petroleum products in, on, or at a property: (1) due to any release to the environment; (2) under conditions indicative of a release to the environment; or (3) under conditions that pose a material threat of a future release to the environment. *De minimis* conditions are not recognized environmental conditions."

When a REC is identified on a property, recommendations may be made on further steps needed to address the potential concern, often times this includes a Phase II Environmental Site Assessment (Phase II Assessment). Phase II Assessments include onsite sampling and laboratory analysis to specifically evaluate if a contaminant is present, and if so, if the concentration exceeds set standards. Sampling can include surficial soil and water samples, subsurface soil borings, groundwater monitoring well installation, dry well monitoring and various other tests specific to onsite conditions, or conditions on adjacent sites.

A series of Phase I and Phase II Environmental Site Assessments have been conducted on the CRC property throughout its history. **Attachment 3** provides a history of the assessments within the proposed CRC property by combining the findings of the reports, and where appropriate, discussing the chronological sequence of events in regards to the historical RECs. Applicable reports and letters releasing the deed restrictions prior to Ram Coral Reef's purchase of the CRC property are included in **Attachment 3**. The CRC property history and prior uses resulted in the identification of numerous RECs; however, through remediation and further Phase II Assessment analyses, these RECs were all considered historical at the time of transfer of ownership and MDC approvals.

The CRC property has had a series of historical uses, briefly described below, that resulted in recommendations for further assessment of certain environmental conditions. A full history of the site can be found in the Phase I and II Environmental Site Assessments and in the cultural and historical assessments conducted (**Attachment 3**). Historically, the proposed CRC property was originally used as part of the Richmond Naval Air Station (NAS), which included buildings and hangars a medical dispensary and an electrical substation. The Richmond NAS was largely destroyed by a hurricane and subsequent fires in the mid-1900s. From 1946 until at least 2011, all sections of the property were utilized by the UM as a wildlife breeding, quarantine, and research program, surgical training program, and a medical device training program and was developed with several buildings, storage trailers, and animal cages. Animal testing was conducted that included the use of radioactive materials and x-ray machines. It has also been reported that agricultural research was conducted.

The RECs have all received a No Further Action (NFA) recommendation and were considered historical RECs at the time of the CDMP amendment and zoning approval conducted by Ram Coral Reef during the MDC permitting process for the proposed CRC. Based on this information, no further analysis of hazardous materials is required; therefore, a hazardous materials section is not included in the analysis of the Environmental Consequences for each alternative.

3.1.4 Air Quality

Air quality standards are regulated under the Federal Clean Air Act and are set by the National Ambient Air Quality Standards (NAAQS) (40 CFR part 50). The EPA is the Federal agency responsible for identifying criteria air pollutants (CAPs), establishing NAAQS, and approving and overseeing state implementation plans (SIPs) as they relate to the Federal Clean Air Act. The EPA has identified six CAPs that are both common and detrimental to human health, and are used as indicators of regional air quality. The six CAPs include: ozone (O_3), nitrogen dioxide (NO_2), particulate matter ($PM_{2.5}$ and PM_{10}), sulfur dioxide (SO_2), carbon monoxide (CO), and lead (Pb). NAAQS standards for each CAP can be found in **Table 1**.

Table 1. National Ambient Air Quality Standards

Pollutant	Averaging Time	Standard (ppm)[1]	Standard (µg/m³)[2]	Violation Criteria
O_3	8 hours	0.075	157	If exceeded on more than 3 days in 3 years
CO	8 hours	9	10,000	If exceeded on more than 1 day per year
PM_{10}	24-hour	N/A	150	If exceeded on more than 1 day per year
$PM_{2.5}$	24-hour	N/A	35	If exceeded on more than 1 day per year
NO_2	Annual	N/A	100	If exceeded
SO_2	1-hour	0.03	80	If exceeded on more than 1 day per year

[1] Parts per million
[2] micrograms per cubic meter

Figure 3 depicts the proposed CRC property's proximity to air quality monitoring stations, as well as the specific CAP monitored at each station. MDC is currently designated as being in attainment for all air pollutants listed in Table 1. Air quality within the CRC property is dependent on several variables including wind direction, turbulence, thermal stratification and sources of pollutants such as vehicular traffic, residential burning and activities, prescribed fires or wildfires, or various construction and development activities.

Ozone can have varying effects dependent on its location in the atmosphere. Ozone occurs naturally in the stratosphere and protects life on earth from the sun's harmful ultraviolet radiation. In the lower atmosphere, where natural ozone levels are low, additional ground-level ozone is formed as a result of human emissions of volatile organic compounds and oxides of nitrogen. Ozone concentrations can reach unhealthy levels when the weather is hot and sunny with relatively light winds. Breathing this ozone can result in damage or irritation to the lungs.

These effects can be further compounded when combined with other CAPs such as PMs produced through prescribed burning. The Florida Department of Environmental Protection lists the Air Quality Index (AQI) for ozone in MDC from 2012-2014, which indicates the average ozone level over the three year period was 0.063 parts per million (ppm), which falls in the Moderate (0.060 to 0.075 ppm) air quality category.

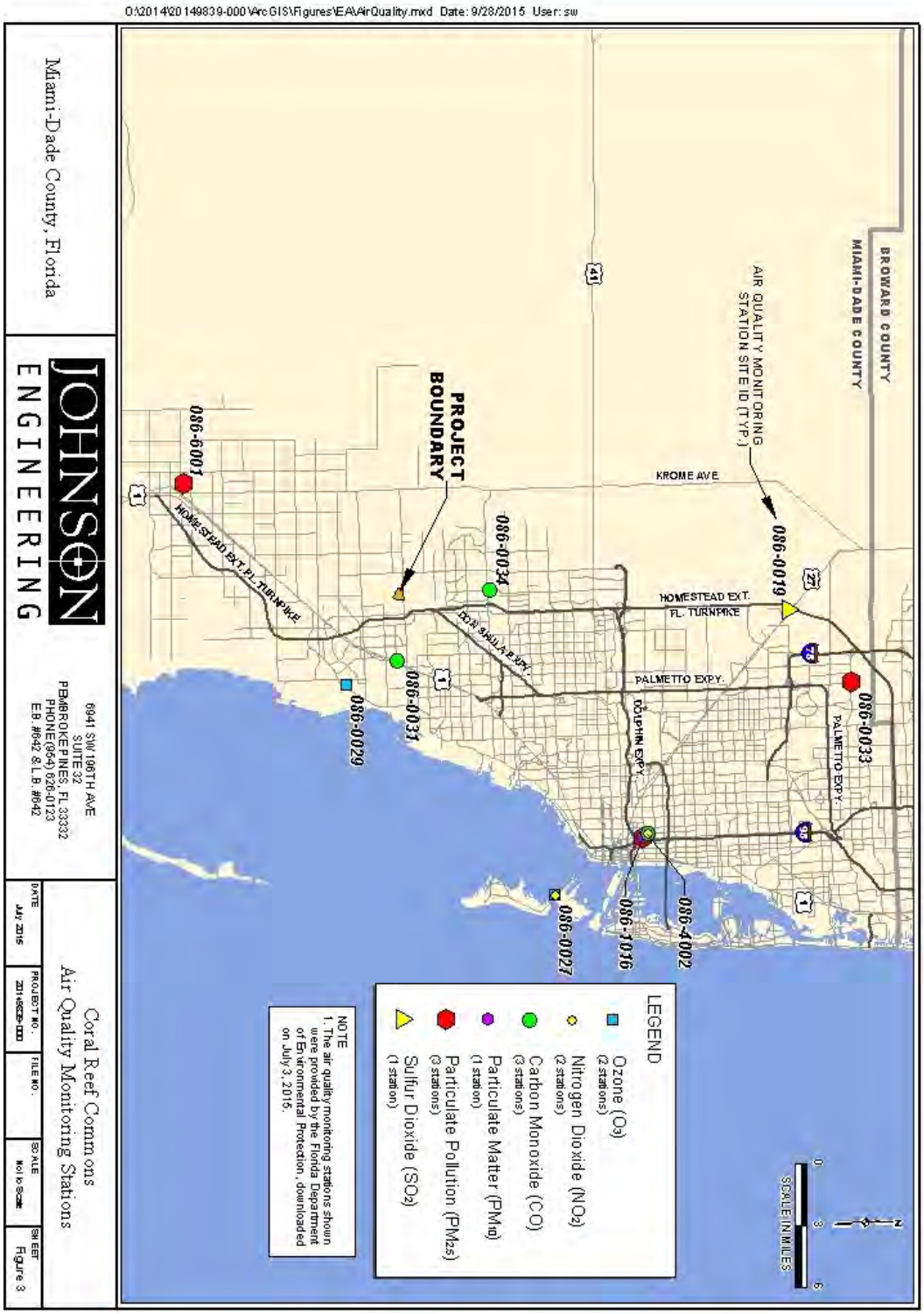

Figure 3. Air monitoring station locations

Ozone levels in 2012, 2013, and 2014 for Miami had only 1 day each year that was recorded as unhealthy for sensitive groups (O_3 levels 0.076-0.095 ppm). For ozone levels in this category it states that active children and adults, and people with respiratory disease should limit prolonged outdoor exertion. **Figure 4** depicts the number of days each year, back to 2000, that ozone levels exceeded moderate levels.

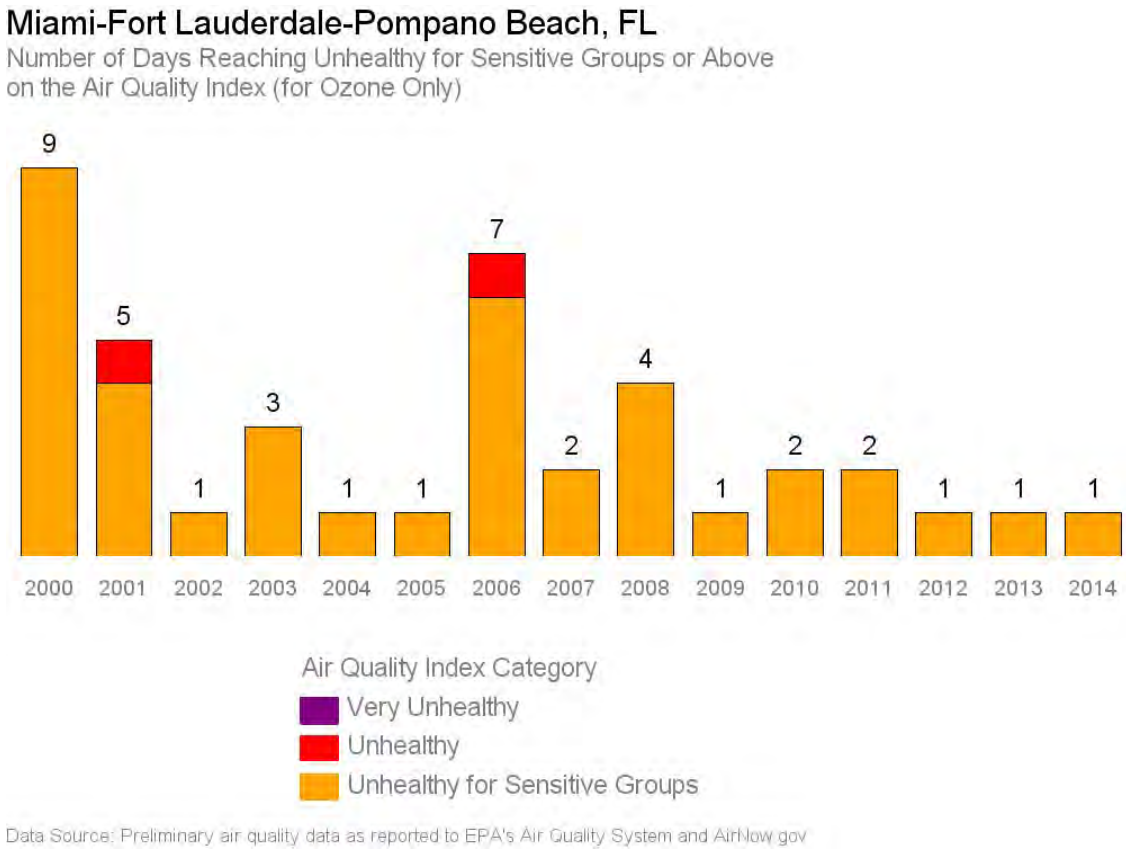

Figure 4. Number of days in Miami ozone was above moderate level

Particle Pollution is the general term used for a mixture of solid particles and liquid droplets found in the air. This pollution, also known as particulate matter, is made up of a number of components, including acids (such as sulfates and nitrates), organic chemicals, metals, soil or dust particles and allergens. The size of particles is directly linked to their potential for causing health problems. Small particles pose the greatest threat. $PM_{2.5}$ describes the particles of concern, they are fine particles (such as those found in smoke and haze), which are 2.5 µm or less in diameter or less. Fine particulates originate from natural and manmade sources including emissions from fuel combustion of motors, power generation, and industrial facilities as well as residential burning, or even fireworks. In some cases, other CAPs can influence particulates such as SO_2, NO, volatile organic compounds. Coarse particles (PM_{10}) refer to particles that are less than or equal to 10 µm and generally are emitted from sources such as vehicles traveling on unpaved roads, materials handling, crushing and grinding operations, and windblown dust.

Based on information provided in the EPA's AirNow website, in 2014, Miami had a total of 2 days that were listed as unhealthy for sensitive groups for $PM_{2.5}$ with the highest level recorded at 27.6 micrograms per cubic meter ($\mu g/m^3$) on July 4th, likely due to firework particulate emissions. For $PM_{2.5}$ levels in this category it states that people with heart or lung disease, older adults, and children should avoid prolonged or heavy exertion. **Figure 5** depicts the number of days each year, back to 2000, that $PM_{2.5}$ levels exceeded moderate levels.

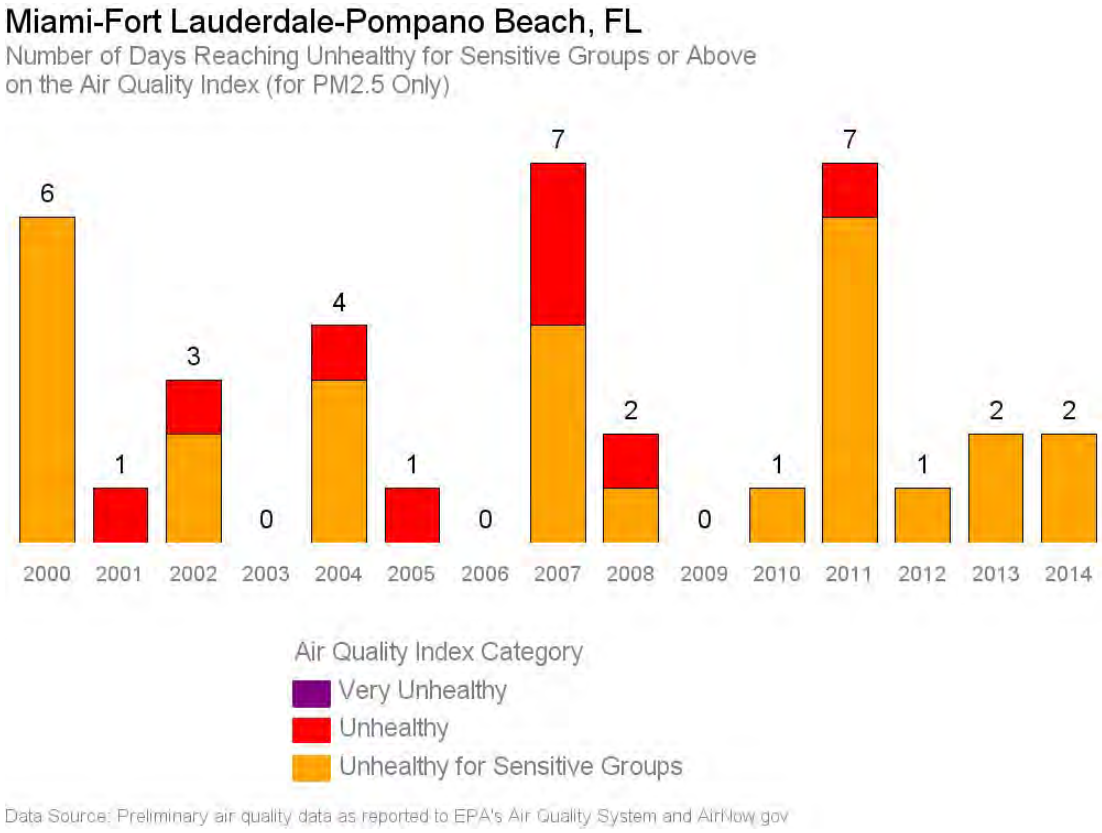

Figure 5. Number of days in Miami PM2.5 was above moderate level

MDC works to reduce human exposure to air pollution (CDMP Objective CON-1) and to reduce carbon emission levels (CDMP Policy CON-1J), in part, through minimizing vehicle emissions through reduced congestions, travel time and vehicle trips. Analysis of existing carbon monoxide levels were performed through a CO model that assumes conservative worst-case parameters related to site conditions, meteorology, and traffic volumes using Florida Department of Transportations (FDOT) screening model, CO Florida 2004. This model uses the EPA-approved software (MOBILE6 and CAL3QHC) to produce estimates of one-hour and eight-hour CO at default air quality receptor location. These estimates can be directly compared to the NAAQS for CO, which are 35 ppm and 9 ppm, respectively. Existing conditions, considered the "no build" alternative, were run for 2016 and 2025, and indicated that CO levels are not expected to meet or exceed the 1 and 8-hour levels and require no further analysis. The complete air quality analysis can be found in **Attachment 4**. Additional details of the existing conditions of the current transportation environment surrounding the HCP Plan Area are discussed in Section 3.6 of the EA.

Fire and Smoke Considerations: Burning vegetation, whether from prescribed fire, wildfire, or residential fireplaces, releases particulate matter along with other CAPs such as nitrogen oxides and carbon monoxide. Depending on the size and intensity of these fires, they have the potential to temporarily decrease atmospheric visibility and may require some sensitive individuals to stay inside to avoid irritations.

Currently several natural areas that are subject to both wildfires and prescribed fires are adjacent to the proposed CRC property. In 2013 and 2014, these surrounding areas had 48.5 ac and 40.5 ac that were burned. Despite these burns, MDC monitoring stations did not report any exceedances of CAPs. Fire managers are aware of the effects of smoke on CAPs and work to ensure that fire emissions to not contribute to any violation of the NAAQS. Additionally, the Florida Forest Service requires managers to account for smoke-sensitive areas (*e.g.* schools, hospitals, nursing homes), and existing and forecasted environmental conditions potentially contributing to smoke effects, prior to issuance of a permit.

Hazardous Air Pollutants: In addition to the criteria for air pollutants, another group of airborne substances, called Hazardous Air Pollutants (HAPs), are known to be hazardous to human health. HAPs are airborne substances capable of causing short-term (acute) and/or long-term (chronic or carcinogenic) adverse human health effects. HAPs can be emitted from a variety of common sources, including fueling stations, vehicles, dry cleaners, industrial operations, and painting operations. Farms, construction sites, and residential areas can also potentially contribute to toxic air emissions. HAPs are regulated under the National Emission Standards for Hazardous Air Pollutants regulations. MDC standard air quality monitoring does not include testing for HAPs.

3.1.5 Climate Change

In 1997, the Council on Environmental Quality (CEQ) circulated an internal draft memorandum (CEQ 1997a) on how global climate change should be treated for the purposes of NEPA. The CEQ draft memorandum advised Federal lead agencies to consider how proposed actions subject to NEPA would affect sources and sinks of greenhouse gases. During the same year, CEQ released guidance on the assessment of cumulative effects in NEPA documents (CEQ 1997b). Consistent with the CEQ draft memorandum, anticipated climate change impacts to South Florida and more specifically, the Richmond Area, are addressed as a subsection of the cumulative effects section in this EA.

3.2 Land Use

3.2.1 Zoning

In 2013, the proposed CRC property was rezoned from AU (Agricultural/Residential, 5 ac gross), Agricultural District to BU-2 (Business Districts, special), PAD (Planned Area Development, 20 ac minimum. Mixed residential and convenience retail services. Density depends on Master Plan, neighborhood studies and neighborhood development) (and RU-4L[Limited Apartment House District, 35.9 units/net ac]. The portion of the site zoned BU-2 is located on the northernmost portion of the CRC property fronting Coral Reef Drive (SW 152nd St). The portions zoned PAD and RU-4L are located on the western and eastern portions of the

property respectively. The zoning change was approved through Resolution Number CZAB14-10-13. Each tract was approved for different land uses. The tract designated BU-2 will allow for a shopping center with 1,326 shopping spaces (Variance #3) and the potential for a new educational facility (Variance #6). The tract designated PAD will permit 997 parking spaces (variance #17) and the tract designated RU-4L will provide for the majority of the residential uses on-site. Uses allowed within each tract are subject to the applicable MDC zoning district regulations as required by Declaration of Restrictions #2(A).

Prior to the 2013 zoning action, the proposed CRC property occurred within the Kendall-Tamiami Executive Airport No School Zone (NSZ). The NSZ is regulated by the following County Codes and Florida Statutes:

> MDC Code §33-395(A) (3) states that no new educational facilities will be permitted within the NSZ airport zoning classification.
>
> Florida Statutes Chapter 333.03 (3) entitled "Power to adopt airport zoning regulations" states that airport zoning regulations shall be adopted to restrict new incompatible uses including the prohibition of public or private educational facilities within an area which extends 5 miles in a direct line along the centerline of the runway and which has a width measuring one-half the length of the runway. Further, this section states that exceptions approving construction of an educational facility within the delineated runway clear zone area may be permitted when the political subdivision administering the zoning regulations makes specific findings detailing how the public policy reasons for allowing the construction outweigh health and safety concerns prohibiting such a location.

As part of Zoning Resolution No. CZAB14-10-13 Request #6, the proposed CRC school site was granted the previously referenced Variance #6 from MDC Code §395(A)(3) and Florida Statutes Chapter 333.03 (3) in accordance with MDC Code Chapter 33 – Zoning, Article XL – Kendall Tamiami Executive Airport Zoning, §33-402(4).

3.2.2 Existing Land Uses

Current land use classification identifies approximately 33.3 ac as Developed Lands, the remaining areas are considered undeveloped. The proposed CRC property can be lumped into four categories: 1) developed lands (33.3 ac), 2) disturbed uplands (20.9 ac), 3) pine rocklands (80.0 ac), and 4) rockland hammock (3.2 ac). Until recently, the property was used as an animal science and medical research facility by UM since 1948 (AHC 2015 – **Attachment 1**). These research facilities remain intact but are currently abandoned. More details on the current land uses are available in Section 2.3 and Figure 2-2 of the HCP.

3.2.3 Surrounding Land Uses

To the east of the proposed CRC property is the former U.S. Coast Guard (USCG) housing facility and existing USCG communication's facility. The former housing facility is currently being utilized as MDC's Southern Anchor Homeownership Program for low and middle income housing. Immediately south and southwest of the proposed CRC property are U.S. government-owned properties (Army Corps of Engineers[Corps] and DOD), further south are the MDC-owned Gold Coast Railroad Museum, Miami Military Museum, and Zoo Miami. This southwest

area is also part of the "Zoo Miami Entertainment Area", established by Board Ordinance No. 10-68, which allows the development of hotels, theme parks, a family entertainment center, a conference center, and restaurants among other uses. Northeast of the proposed CRC property is the Deerwood Town Center, which is comprised of retail and commercial operations. Directly north are the residential housing Deerwood Estates and the Three Lakes communities. **Figure 2** provides additional information on surrounding land ownership.

3.2.4 Farmland

The Agriculture and Food Act of 1981 (Public Law 97-98) contained the Farmland Protection Policy Act (Subtitle I of Tile XV, §1539-1549), which is designed to minimize the impact of Federal programs on the unnecessary and irreversible conversion of farmland to nonagricultural uses.

The soils within the proposed CRC property are characterized as unsuitable for crop production. Although marl series is suitable for shallow-rooted crops, significant site manipulation would be necessary. Only remnant marl soils remain within property, therefore, production of crops, which meet the prime and unique farmland definitions, are not feasible. Additionally, these lands are not currently used for agricultural means, nor is there evidence of historic crop production. Finally, the land within the proposed CRC was rezoned several years ago in accordance with applicable local codes and regulations. Based on these findings, the proposed CRC does not contain any lands that are qualified to be considered under Farmland Protection Policy Act.

3.3 Biological Environment

This section pertains to the existing biological resources that occur within HCP Plan Area and general vicinity. Methodologies used in the assessment of the existing biological resources and additional detailed information regarding these resources can be found in Section 2 and 3 of HCP.

3.3.1 Natural Forest Communities

Since 1984, MDC has provided a level of protection for specific plant communities through its Natural Forest Community (NFC) regulatory program (Code Ordinance §24-5). NFCs are rare upland plant communities, typically consisting of pine rocklands or rockland hammocks that are in good ecological condition without a high degree of disturbance by exotic vegetation. Designation of a NFC requires a minimum community score of 60 points on the Environmentally Endangered Lands (EEL) Tax Covenant Program and NFC Quantitative Evaluation Form (Resolution No. R-1028-12). NFC maps designating covered forested communities that meet the minimum scoring were approved as NFCs by the Board of County Commissioners, pursuant to Resolution No. R-1764-84. These maps may be revised from time to time by resolution in order to reflect current conditions and to ensure that, at a minimum, the canopy and understory of the designated NFC are dominated by native plant species (Code of Ordinance §24-5. Definitions). Protection due to a NFC designation is therefore not ensured, as overtime degradation of a site can lead to a change in the NFC status if the site no longer meets the minimum quantitative

threshold standard for inclusion on the revised NFC maps (Code of Ordinance §24-5. Definitions). Conversely, if site conditions improve, a revision to include an area under the protection of a NFC can be appropriate.

Under the MDC Code, percent allowable development limits have been placed on NFC's. MDC requires a NFC removal permit for activities that result in the removal or damage to any vegetation in a designated NFC, including impacts to any tree, shrub, or groundcover plant. These permits are required to ensure that impacts to the NFCs are minimized and that remaining NFC areas are preserved and managed. NFCs do not receive protection in perpetuity in absence of a valid development permit with an associated covenant, but instead, are protected in exchange for zoning and development approvals.

In 1984, MDC's evaluation of the proposed CRC property identified approximately 49.64 ac as pine rockland NFC. Subsequently, in 2004, a consultant for UM did another evaluation, which MDC concurred with, identifying 44.94 ac pine rocklands as NFC. During this same evaluation, 3.72 ac of rockland hammock NFC were also identified.

3.3.2 Vegetative Communities within CRC

A description of vegetative communities within the proposed CRC can be found in Section 2.0 of the HCP. The vegetative communities generally fall into three (3) different categories, with each category further defined by subcategories. **Table 2** and **Figure 6** depict the current vegetative communities within CRC. In addition to these vegetative communities, a total of 33.3 ac were categorized as developed and are described in the Land Use Section 3.2 of this EA.

Table 2. Summary of vegetative communities within CRC

Vegetative Communities with Subcategories	Subtotal Ac	Total Acreages
Disturbed Upland		**21.0**
Exotic hardwood dominated	*10.1*	
Historically marl prairie, exotic dominated	*9.1*	
Scraped, dominated by turf species	*1.8*	
Pine Rockland		**79.9**
Less than 50% Burma reed	*21.8*	
Burma reed dominated	*26.0*	
Historically scraped with pine canopy	*6.2*	
Historically scraped with pine canopy, Burma reed dominated	*9.0*	
Historically scraped w/o canopy	*6.9*	
Fire suppressed	*1.9*	
Severely fire suppressed, dominated by Burma reed	*8.1*	
Rockland Hammock		**3.7**

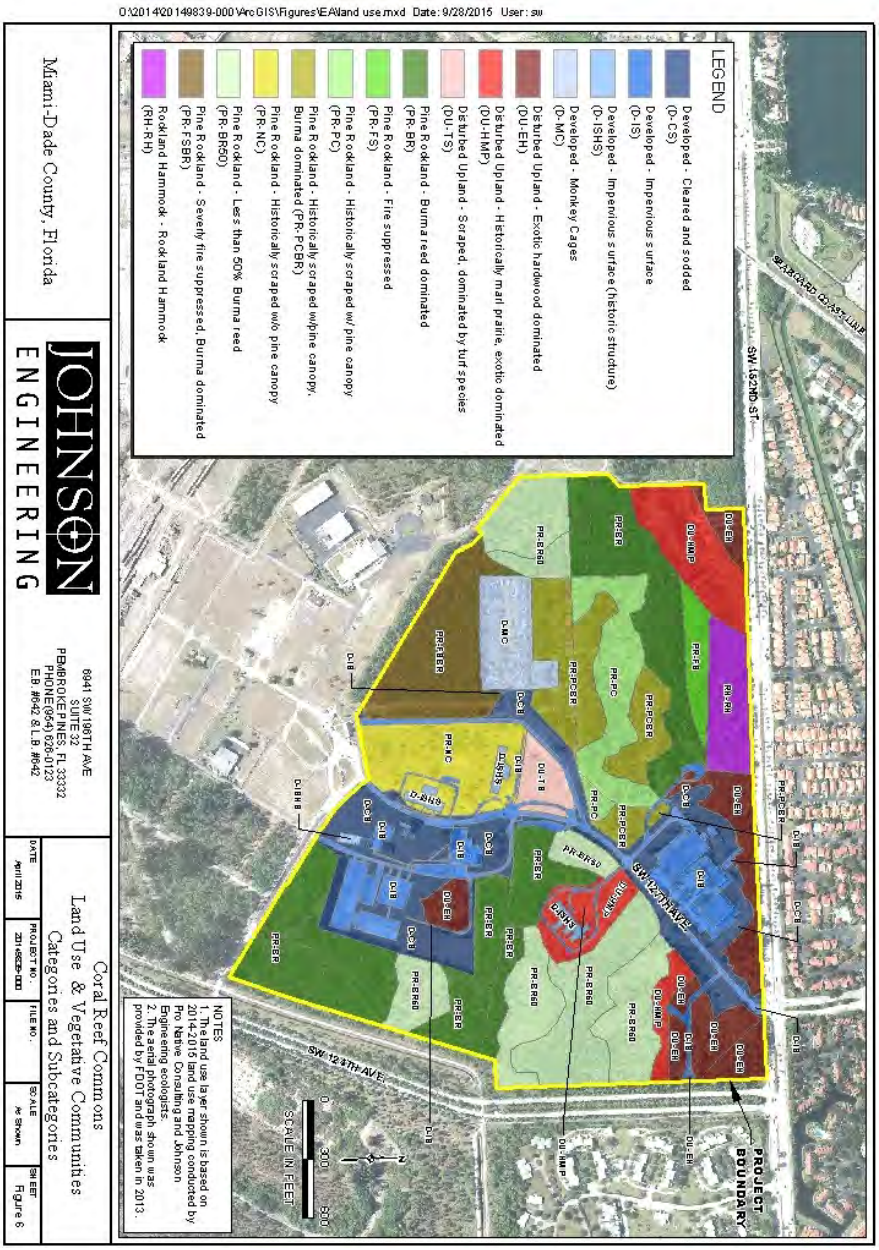

Figure 6. Existing Land Use and Vegetative Communities within property for proposed Coral Reef Commons

3.3.3 Wildlife and Protected Species

Species proposed as covered species in the HCP include species protected under the ESA, which have been detected within the HCP Plan Area (*i.e.*, direct observation or observation of sign), and species protected under the ESA that are likely to occur within the HCP Plan Area based on knowledge of a species' habitat preferences and existing site conditions. Additionally, three animal species: the gopher tortoise (candidate), the rim rock crowned snake (petitioned), and the white-crowned pigeon (State threatened) are proposed to be covered under the HCP and be included in the intra-Service section 7 consultation. Furthermore, the HCP has been designed to provide conservation and BMPs for additional species, including listed and special status plant species.

The life history, status, and distribution of federally-listed/protected species either known to occur or those that could occur in the HCP Plan Area are addressed in detail in **Attachment 5** and Section 3.0 of the HCP.

3.3.3.1 Status of the species within the proposed CRC property

The following is a brief description of the status of each of the covered species in the proposed CRC property. Additional information on species biology can be found in **Attachment 5** and additional information on status of the species within the proposed development can be found in section 3.2 of the HCP.

<u>Bartram's scrub-hairstreak butterfly</u>

During the field surveys by Johnson Engineering, Inc. (JEI), the BSHB was observed a total of three times in two different locations within the proposed CRC property. The first location was in the western portion of the property, and the second location was in the southern central portion. Pineland croton surveys documented a total of 322 pineland croton locations within the property proposed for the development of CRC. Surveys showed that pineland croton appeared to be primarily restricted to open canopy habitat in pine rockland that contained less than 50 percent invasive plants (primarily Burma reed), and pine rocklands with less than 50 percent Burma reed contained the largest number of occurrences (117 observations). Approximately 60 percent of the pineland croton documented occurred within the areas proposed for Alternative 6's on-site preserves. An additional observation of BSHB within the eastern portion of the property was made to the Service in June 2014 (Possley 2014). The property where CRC is proposed includes 90.2 ac of CH for the BSHB.

<u>Eastern indigo snake</u>

Surveys performed during 2014 within the proposed CRC property did not document any indigo snakes (JEI 2017). The Service has a record of an indigo snake observation in 2000 within the Martinez Pinelands within our geographic information system (GIS).

<u>Florida bonneted bat</u>

Acoustic surveys detected FBB using the airspace above the property proposed for the development of CRC. Although the total number of bats is unknown, the survey effort included

25 stations, and FBBs were detected at all 25 stations. Acoustic surveys recorded FBB search, clutter, commute, and feeding calls. No roost chatter was heard (Table 3-2 in the HCP). Five individual calls were recorded within 30 minutes of sunset and no calls were recorded within an hour of sunrise. In addition, Florida Bat Conservancy and JEI conducted roost surveys at the interior and exterior of all abandoned buildings, the chimney site, the pines adjacent to open areas, and the rock cavities within the Rockland Hammock area on September 2 and 3, 2014. The surveys included visual inspections of the building interior and exterior, use of handheld bat detectors (Echo Meter Touch™ and AnaBat SD2™), and visual observations on the exterior of the buildings for 1 hour after sunset. No roosting or other bat activity of any species was detected.

Florida leafwing butterfly

Leafwing butterflies have not been documented within the proposed CRC property, although suitable habitat is present. The property where CRC is proposed includes 90.2 ac of CH for the leafwing.

Miami tiger beetle

Surveys performed during 2014 within the proposed CRC property did not document any Miami tiger beetles (JEI 2017). Dr. Barry Knisley conducted surveys on a small portion of the property (approximately 1.7 hectare [ha] [4.3 ac]) on the eastern side of the proposed development area, and the Miami tiger beetle was not observed (Knisely 2013). Miami tiger beetles have been documented on properties located north, east, and south of the proposed CRC. The property proposed for the development of CRC includes suitable habitat for the species.

Gopher tortoise

This species was not documented within the proposed CRC property during 2014 surveys of the property (JEI 2017). Gopher tortoises have been documented on Zoo Miami (FWC 2017) and burrows were found on the adjacent USCG property (Service 2013b).

Rim rock crowned snake

Surveys performed during 2014 within the proposed CRC property did not document any rim rock crowned snakes (JEI 2017). Literature review indicated this snake was documented in 2009 within the Zoo Miami area (FWC 2011).

White-crowned pigeon

Surveys performed during 2014 within the proposed CRC property did not document any white-crowned pigeons (JEI 2017). The property proposed for the development of CRC includes suitable foraging and wintering habitat for the species.

Special Status Plant Species

Botanical surveys of the proposed CRC property were conducted following the Service's guidelines for botanical inventory. Survey results are summarized in *Coral Reef Commons rare*

plant and floristic inventory (Woodmansee 2014). Blodgett's silver bush, Carter's small-flowered flax, crenulate lead-plant, Florida bristle fern, Florida pineland crabgrass, Florida prairie clover, Garber's spurge, sand flax, and Small's milkpea were not detected during any survey effort, although suitable habitat is available and these plants could be located within the seedbank.

Carter's small-flowered flax

Carter's small-flowered flax was not documented during the 2014 botanical surveys (Woodmansee 2014). The property proposed for the development of CRC includes 104.06 ac of CH for this species.

Deltoid spurge

The deltoid spurge *deltoidea* variety was documented within the property proposed for the development of CRC during the 2014 plant surveys (Woodmansee 2014). Eleven areas were identified that contained deltoid spurge plants. All of the occurrences of this species were within areas slated for preservation, with the exception of one small population that occurred on the edge of pine rockland-Burma reed dominated area, near a firebreak. All of the occurrences of deltoid spurge were within pine rockland habitat with less than 50 percent Burma reed. Young plants, fruiting and flowering were observed during the 2014 survey.

Everglades bully

The more common subspecies recline Florida bully (*Sideroxylon reclinatum* ssp. *reclinatum*) was previously reported by Bradley *et al.* (2000) within the property proposed for the development of CRC. This species is similar in appearance to the Everglades bully; therefore, searches were carefully conducted during the 2014 surveys (section 3.3.12 of the HCP). Despite determined searches, neither subspecies was found or observed.

Florida brickell bush

Florida brickell bush was not documented during the 2014 botanical surveys (Woodmansee 2014). The property proposed for the development of CRC includes 104.06 ac of CH for this species.

Tiny polygala

Two tiny polygala populations were documented within the proposed CRC property during the 2014 botanical surveys (Woodmansee 2014, section 3.3.1 of the HCP). One population of approximately 100 plants is located on the western side of the property; seedlings as well as flowering and fruiting adult plants were observed. This area is proposed as an on-site preserve in Alternative 6 (preferred alternative). The second population consists of nine plants on the eastern side of the property; seedling, flowering, and fruiting plants were observed. This area is proposed for development in Alternative 6. This population was also encountered during a plant salvage event by staff at Fairchild Tropical Botanical Gardens in June 2014, during which time three (3) tiny polygala specimens were collected (Appendix D of the HCP).

Table 3 provides a summary of pine rockland associated wildlife occurring or potentially occurring within the HCP Plan Area. **Table 4** provides a summary of pine rockland associated plants occurring or potentially occurring within to the HCP Plan Area. These tables include species status and known occurrence relative to CRC.

Table 3. Wildlife species occurring or potentially occurring within the HCP Plan Area. Species are proposed for ITP coverage (*i.e.*, covered species) in the CRC HCP.

Common Name	Scientific Name	Status	Documented within CRC	Known Local Distribution
Bartram's scrub-hairstreak butterfly	*Strymon acis bartrami*	FE	Yes	Documented within CRC. Species observed 4 times in 3 different locations. Property contains species host plant. Species has been documented in several locations within Richmond Area. CH present within CRC.
eastern indigo snake	*Drymarchon couperi*	FT	No	One record within Martinez Pineland.
Florida bonneted bat	*Eumops floridanus*	FE	Yes	Acoustic surveys documented occurrence within the property, including foraging. This species has also been documented foraging over a parking lot and lakes within Zoo Miami.
Florida leafwing butterfly	*Anaea troglodyta floridalis*	FE	No	Species is believed to have been extirpated from Richmond Area. Closest known population is 20 miles SW of Richmond Area. CH present within CRC.
gopher tortoise	*Gopherus polyphemus*	FC	No	Suitable soil may be lacking within CRC. Species documented within Zoo Miami and USCG.
Miami tiger beetle	*Cicindelidia floridana*	FE	No	This species has been documented on four other properties in the Richmond Area (Zoo Miami, UM Richmond Campus, USCG, and Larry and Penny Thompson Park). No surveys were conducted on CRC.
Rim rock crowned snake	*Tantilla oolitica*	FPet	No	Species documented within adjacent Zoo Miami property.
white-crowned pigeon	*Patagioenas leucocephala*	ST	No	None currently known

CH Critical habitat
CRC Coral Reef Commons Project
FE Federally endangered
FT Federally threatened
FC Federal candidate
FPet Federal Petitioned for listing
ST State Threatened

Table 4. Pine rockland and rockland hammock associated plants occurring or potentially occurring within the HCP Plan Area

Common Name	Scientific Name	Status	Documented in CRC	Known Local Distribution
Blodgett's silver bush	*Argythamnia blodgettii*	FT	No	Species documented in Larry and Penny Thompson Park.
Carter's small-flowered flax	*Linum carteri var. carteri*	FE	No	No historical documentation of species within Richmond Area. Closest natural population occurs 3 miles east of Richmond Area. CH present within CRC.
crenulate lead-plant	*Amorpha crenulata*	FE	No	Species requires hydrated soils in frequently burned habitats. No suitable habitat within CRC. No known natural occurrence within Richmond Area but it was transplanted into Martinez Pineland. Closest natural population occurs 5 miles NE of the Richmond Area.
deltoid spurge	*Chamaesyce deltoidea ssp. deltoidea*	FE	Yes	Species documented in 11 locations within CRC. All but one population were documented within areas slated for on-site preserves. Species documented throughout Richmond Area.
Everglades bully	*Sideroxylon reclinatum ssp. austrofloridense*	FPT	No	Species previously documented within CRC in 2000 but is believed to have since been extirpated. Species documented in Larry and Penny Thompson Park.
Florida brickell bush	*Brickelia mosieri*	FE	No	Species documented in adjacent properties (Zoo Miami, Martinez Pineland, and Larry and Penny Thompson Park). CH present within CRC.
Florida bristle fern	*Trichomanes punctatum ssp. floridanum*	FE	No	No historical record within Richmond Area. FNAI lists the species as potentially occurring in the area.

Common Name	Scientific Name	Status	Documented in CRC	Known Local Distribution
Florida pineland crabgrass	*Digitaria pauciflora*	FPT	No	Last known occurrence of species within Richmond Area consisted of a single plant documented in 1997. Species is believed to have since been extirpated from Richmond Area (Woodmansee 2014)
Florida prairie clover	*Dalea carthagenensis var. floridana*	FPE	No	No known records within Richmond Area. Closest natural population is 4.5 miles ESE (Woodmansee 2014).
Garber's spurge	*Chamaesyce garberi*	FT	No	No known occurrence within Richmond Area. FNAI listed as potentially occurring in the area.
sand flax	*Linum arenicola*	FE	No	Documented in two locations on adjacent properties (Martinez Pineland and Zoo Miami).
Small's milkpea	*Galactia smallii*	FE	No	Preferred soils are not present within the Richmond Area. FNAI reported occurrence of species in Larry and Penny Thompson Park in 1991 but specimen not photographed. Suspected observation was misidentification given similarity in appearance to other species.
tiny polygala	*Polygala smallii*	FE	Yes	Documented 2 populations within CRC, 1 population is within proposed development and one is within proposed on-site preserves (Alternative 6, preferred alternative). Also documented in several locations within the Richmond Area.

CH Critical habitat
CRC Coral Reef Commons Project
FNAI Florida Natural Area Inventory
FE Federally endangered
FT Federally threatened
FPE Federal Proposed Endangered
FPT Federal Proposed Threatened

3.3.4 Invasive Species

Executive Order 13112, signed on February 3, 1999, established the National Invasive Species Council, as well as defined Federal agencies responsibilities and roles in preventing the spread of invasive species. Among other things, this executive order states that Federal agencies whose actions may affect the status of invasive species shall identify those actions and not authorize, fund, or carry out actions that are believed to cause or promote the introduction or spread of invasive species.

Regular land management, such as prescribed burning and invasive plant treatments, has not occurred within the proposed CRC property for decades. As a result of the historic lack of land management, much of the property is compromised with invasive plant species. Greater than sixty-five percent (65%) of the undeveloped areas are classified as dominated by invasive species. In some areas, these infestations have resulted in a transition from native vegetative communities to exotic dominated communities, to the extent historical communities are difficult to determine. The remaining lands all show some degree of exotic infestation.

3.4 Cultural Resources

Section 106 of the National Historic Preservation Act (NHPA) as amended, and its implementing regulations found in 36 CFR Part 800, require Federal agencies to identify cultural resources that may be affected by Federal actions. The significance of the resources must be evaluated using established criteria outlined 36 CFR 60.4, as described below.

If a resource is determined to be a historic property, Section 106 of the NHPA requires that effects of the development on the resource be determined. A historic property is defined as: "…any prehistoric or historic district, site, building, structure or object included in, or eligible for inclusion in the National Register of Historic Places, including artifacts, records, and material remains related to such a property." (NHPA Sec. 301[5]).

A Phase I cultural resource assessment was performed within the proposed CRC property in 2015 by the Archaeological & Historical Conservancy, Inc. The assessment was conducted in accordance with the above regulations, as well as, Florida Statute Chapter 267, MDC Preservation Ordinance Chapter 16-A. The assessment included an archival review, pedestrian survey, and shovel testing. Additionally, from June to August, 2015, the Archaeological & Historical Conservancy, Inc. conducted a Phase II assessment, which included additional archival review, pedestrian surveys, surface collecting, and metal detection. These reports are included in **Attachment 1** and summarized below.

Prior to World War II, much of MDC was logged by several sawmills. Around 1924, the Richmond Lumber Company came to the area and the resulting community was named Richmond. In 1942, the Federal Government purchased 2,107 ac from the Model Land Company and the U.S. Navy established the air station. Although the community was displaced, the U.S. Navy inherited the community's name. Since the Federal Government's purchase in 1942, proposed CRC property has been utilized for a variety of land uses.

The Richmond NAS was the Navy's second largest airship station and resulted in several structures being constructed within the proposed project site. In 1946, UM entered into a 50 year

lease with the Federal Government and began operating a new South Campus within the 139 ac proposed CRC. Initially, the South Campus was used as a general education facility serving up to 1,100 students, utilizing the buildings constructed by the Navy, for student housing, dining, and recreational facilities. From 1948 until 2012, UM used the property for a medical research facility.

A search with the Florida Division of Historic Resources indicated one previously recorded site, the 1942-1945 NAS Richmond Mess Hall (8DA13846), located within the proposed project site. This building was demolished in the late 1990s.

MDC has designated several structures on County property adjacent to the CRC property as part of a Richmond NAS Historic Site (8DA11731) (Dunn 2007). Documented during the 2015 cultural assessment, there are two historic structures associated with Richmond NAS located within the proposed CRC: the remains of the naval base dispensary consisting of the building foundation and steps and chimney of its incinerator (8DA143421); and a wood frame pump house (8DA14322). Scatters of munitions, including shell casings and a smoke grenade handle, found within the proposed CRC suggest that some portion of the property was used for military exercises. During the Phase II assessment, this area was further delineated and evaluated to determine extent and significance of the site. The site was named 8DA14396.

Archaeological & Historical Conservancy, Inc. identified four sites, 8DA14320 (possible moonshine still site), 8DA14321, 8DA14322, and 8DA14396, as potentially eligible for listing in the National Register of Historic Places. By letter dated December 9, 2015, the State of Florida Division of Historical Resources State Historic Preservation Officer (SHPO) provided its opinion regarding the potential resources described in the Phase I and Phase II reports. The SHPO found that resources 8DA14321, 8DA14322, and 8DA14396 were ineligible for the National Register of Historic places and there was insufficient information to determine the eligibility of site 8DA14320. Based on the information provided to SHPO, they concluded that should 8DA14320 be protected from development, the proposed CRC would have no adverse effect on resources eligible for or listed on the National Register of Historic Places (**Attachment 1**).

3.5 Socioeconomic Environment

3.5.1 Population and Demographic

The U.S. Census Bureau census summary for 2010 lists the MDC population at 2,496,435 people and is expected to grow to 2,721,930 by 2019. The proposed CRC property occurs within MDC's District 9 and Minor Statistical Area (MSA) 6.2. The latter is expected to be the primary market area for the mixed-use development. Statistics for population, demographic, employment and income data is included for the smaller analysis area (MSA 6.2) when it was available. However, when certain statistics were not available at this level, District 9 statistics have been provided for comparative purposes against countywide statistics.

Based on the MDC Commission District Profile, the population within District 9 has increased very rapidly since the 2000 census at a rate of 37 percent, four times faster than the population

growth countywide (MDC 2011). District 9 is the second highest district with percent children under 18 (27.4 percent) and has the lowest percent elderly (8.7 percent) of all the districts (MDC 2011).

The 2010 US Census population within MSA 6.2 was reported to be 146,136 with the majority of the population reporting Hispanic race. Population by race for MSA 6.2 can be found in **Table 5**. Population by race for all of MDC has been included in **Table 6**.

Table 5. Minor Statistical Area (MSA) 6.2 Population by Race

Race	Population	Percent Composition
White (Non-Hispanic)	13,624	9.3%
Hispanic	108,191	74%
Black	11,226	7.7%
American Indian	238	0.2%
Asian	4,018	2.7%
Pacific Islander	39	0%
Other Race	4,691	3.2%
Two or More Races	4,109	2.8%
Total	146,136	100%

Table 6. Miami – Dade County (MDC) Population by Race

Race	Population	Percent Composition
White (Non-Hispanic)	218,028	8.7%
Hispanic	1,623,859	65%
Black	472,976	18.9%
American Indian	5,000	0.2%
Asian	37,699	1.5%
Pacific Islander	675	0%
Other Race	79,351	3.2%
Two or More Races	58,877	2.4%
Total	2,496,435	100%

The median age for this area based on 2010 U.S. Census data is listed as 36.8 years. The population within MSA 6.2 is comprised of 45,483 households, of which 81.9 percent (37,238) reported being a family household with an average family size of 3.46 individuals.

Housing occupancy rates based on the U.S. Census data list a total of 48,344 housing units with a 94 percent occupancy rate within MSA 6.2. Of the occupied units, 74.3 percent (33,772) are owner occupied with the remaining 25.7 percent (11,711) renter occupied. Based on MDC's residential supply and demand analysis, the supply of single-family and multi-family units within the MSA 6.2 is projected to be depleted in the year 2017 (MDC Comments on CRC Zoning Application No. 3, October 2011 Cycle).

3.5.2 Environmental Justice for Minority and Low Income Populations

All projects involving a Federal action must comply with Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*,

as amended, which directs Federal agencies to take the appropriate and necessary steps to identify and address disproportionately high and adverse effects of Federal projects on the health or environment of minority, low-income, and Native American populations to the greatest extent practicable and permitted by law. Low income is defined based on U.S. Census Bureau established poverty thresholds.

As previously identified above, the proposed CRC property occurs within MSA 6.2, which has the majority of the population identified as Hispanic or other minority population with only 9.3 percent of the population attributed to a white (non-Hispanic) race. When compared to the regional demographics of MDC this is not a significant variance. However, the percent of households listed in poverty within District 9 is 21.3 percent, which is higher than the national average of 15 percent.

3.6 Public Services

3.6.1 Water Supply

The Biscayne Aquifer is the primary water supply source for the millions of people living in South Florida. It is recharged by seepage from the Water Conservation Areas and the Everglades South Florida Water Management District canals that traverse the Lower East Coast. In order to ensure that continued development of the aquifer is consistent with the Comprehensive Everglades Restoration Project, the South Florida Water Management District adopted a Regional Water Availability Rule to establish allowable future increased withdrawals from the Biscayne Aquifer consistent with the projected water supplies required to implement future individual Comprehensive Everglades Restoration Project projects. The rule limits water supply demands dependent upon recharge from the regional system to levels that existed prior to April 2006. As a result, cities needing additional water supplies over previous levels will be required to seek sources that are not dependent upon the Everglades for recharge. These alternative water supply solutions include recycling water, using reclaimed water to recharge the Biscayne Aquifer, or drawing water from the deeper Floridan Aquifer.

Effective January 11, 2011, MDC Water and Sewer Department implemented a Water Supply Certification Program to assure water supply is available to all users as required by CDMP Polices CIE-5D and WS-2C respectively, and in accordance with the permitted withdrawal capacity in the Water and Sewer Department 20-year Water User Permit. All new construction, addition, renovation or changes in use resulting in an increase in water consumption will require a Water Certification Letter.

MDC’s adopted Level of Service (LOS) standard for water treatment is based on the regional treatment system. The LOS requires that the regional treatment system operates with a rated maximum daily capacity of no less than 2 percent above the maximum daily flow for the preceding year, and an average daily capacity 2 percent above the average daily system demand for the preceding 5 years (CDMP Policy WS-2A(1)). Based on the 12-month average (period ending November 30, 2011), the regional treatment system has a rated treatment capacity of 439.74 million gallons per day (mgd) and a maximum plant production of 345.8 mgd. As a result, the regional system has approximately 116.13 mgd or 26.40 percent of treatment plant

capacity remaining. In 2014, South Florida Water Management District provided a permit to Coral Reef Retail LLC allocating an annual 10.30 million gallons and a total maximum monthly allocation of 1.50 million gallons (**Attachment 6**).

The property proposed for development of CRC is serviced by the Alexander Orr Water Treatment Plant, which provides water that meets federal, state, and county drinking water standards. The existing development within property is currently connected to MDC water supply via a 16-in water main.

3.6.2 Wastewater Services

MDC's LOS standard for wastewater treatment and disposal requires that the regional wastewater treatment and disposal system operate at a capacity that is two percent above the average daily per capita flow for the preceding 5 years and a physical capacity of no less than the annual average daily sewer flow. The wastewater effluent must also meet all applicable Federal, State, and County standards and all treatment plants must maintain the capacity to treat peak flows without overflow (CDMP Policy WS-2(2)). The regional wastewater treatment system has a design capacity of 368 mgd and a 12-month average (period ending October 31, 2011) of 277.26 mgd. This represents approximately 75.34 percent of the regional system design capacity. The South District Wastewater Treatment Plant is the treatment plant currently receiving wastewater for the area surrounding the proposed CRC. The site is currently connected to MDC wastewater treatment services via an existing sanitary sewer gravity system, which discharges to pump station #0678 and then pump station #0681, located south of the property.

3.6.3 Solid Waste

The proposed CRC is located inside MDC's Public Works and Waste Management Waste Collection Service Area, which consists of all residents of the Unincorporated Municipal Service Area and nine municipalities.

The LOS standard for solid waste is defined in CDMP Policy SW-2A. This policy requires MDC to maintain sufficient solid waste disposal capacity to accommodate waste flows committed to the system through long-term interlocal contracts or agreements with municipalities and private waste haulers, and anticipated uncommitted waste flow for a period of 5 years. The solid waste capacity is assessed on a system-wide basis; therefore, it is not practical to make determination concerning the adequacy of solid waste disposal capacity relative to individual projects.

3.6.4 Human Health and Safety

Law Enforcement

The proposed CRC is located in and serviced by the MDC Police Hammocks District, located at 10000 SW 142 Ave, Miami, FL. Current staffing allows for an average emergency response time of 8 minutes or less.

Fire Protection and Emergency Services

The National Fire Protection Association creates standards and codes for usage and adoption by local governments. National Fire Protection Association Codes 1710 and 1720 identify the standards for the organization and deployment of fire suppression operations and emergency services to the public by career and volunteer fire departments. The Florida Fire Prevention Code defines and adopts minimum standards for fire prevention by municipalities, counties, and special districts with fire safety responsibilities (Chapter 69A-60). These standards require an assembly of 15-17 firefighters on-scene to adequately meet the assignment capabilities identified. This company must arrive within 8 minutes for 90 percent of all incidents to meet these industry standards. Based on data retrieved during calendar year 2012, the average travel time to the general vicinity of the proposed CRC was 5:43 minutes (MDC Fire Rescue Dept. Memorandum dated June 19, 2013; **Attachment 14**). Existing fire protection and emergency services capabilities and locations are detailed in **Table 7**.

Table 7. Fire and Emergency Services within Vicinity of the Proposed CRC

Station	Address	Equipment	Staff
43	13390 SW 152 St.	Rescue, Aerial	7
53	11600 SW Turnpike	Rescue	3
52	12105 Quail Roost Drive	Rescue, Tanker, Battalion	8
4	9201 SW 152 St.	Rescue, Engine, Battalion	8
50	9788 Hibiscus St.	Rescue, Engine	7

3.6.5 Schools

In 2005, the Florida Legislature adopted Senate Bill 360, which amended Chapters 163 and 113 Florida Statutes, making the availability of public schools a prerequisite for the local government approval of residential plats and site plans. Residential projects are evaluated based on effects to the three levels of schools (elementary, middle, and high).

According to the MDC Public Schools service boundaries, the proposed CRC and surrounding communities are within the attendance boundaries of Pine Lake Elementary School (3.5 mi), Richmond Heights Middle School (3.3 mi), and Miami Southridge Senior High (4.9 mi). Additionally, a total of 57 private school options occur within 5 mi of the proposed CRC.

3.6.6 Transportation

The CDMP Transportation Element addresses all modes of transportation within MDC.
A Transportation Analysis was conducted for the proposed CRC property and submitted to MDC to amend the CDMP. The complete CDMP Amendment Transportation Analysis is provided as an appendix (**Attachment 7**; Cathy Sweetapple & Associates, November 2011 [Revised February 2012]). Also provided as an attachment (**Attachment 8**) is the MDC recommendation to amend the CDMP, MDC Zoning Resolution No. CZAB14-10-13, and the Developmental Impact Committee recommendation referenced in the zoning resolution. These documents provide an analysis of the existing conditions, Applicants' commitments for roadway and intersection improvements, and concurrency with the Transportation Element. The existing condition findings from these studies are summarized below.

Existing Traffic Circulation

The proposed CRC property is located on the southwest corner of the intersection of SW 124th Avenue and SW 152nd Street /Coral Reef Drive. The transportation area of influence (study area) around this property includes roadways within the immediate vicinity of the proposed CRC. The study area is bound on the north by SW 104th Street, on the east by US-1, on the south by SW 184th Street, and on the west by SW 157th Avenue and SW 162nd Avenue. North-south arterials and expressways within the area of influence include: SW 167th Avenue, SW 157th Avenue, SW 147th Avenue, SW 137th Avenue, SW 127th Avenue, SW 122nd Avenue, Homestead Extension of Florida's Turnpike (HEFT)/SR 821, SW 117th Avenue, SR 874/Don Shula Expressway, SW 107th Avenue, SW 97th Avenue, and US-1/South Dixie Highway. East-west arterials within the area of influence include: SW 104th Street, SW 120th Street, SW 136th Street, SW 152nd Street/Coral Reef Drive, and SW 184th Street/Eureka Drive (**Figure 7**).

Traffic conditions are evaluated by MDC based on the LOS provided; LOS for traffic is defined as "a qualitative assessment of a road's operating conditions. For local government comprehensive planning purposes, LOS means an indicator of the extent or degree of service provided by, or proposed to be provided by, a facility based on and related to the operational characteristics of the facility. LOS indicates the capacity per unit of demand for each public facility." The LOS is represented by one of the letters "A" through "F", with A generally representing the most favorable driving conditions and F representing the least favorable. The MDC Transportation Element defines the acceptable LOS for roadways based on the type of road and its location within MDC.

As part of the transportation analysis an existing conditions network analysis was prepared for the peak hour period for the roadway network surrounding the subject property. **Attachment 7** (*Table 5B*) provides the analysis of existing traffic conditions for the amendment study area and includes the following:

- The existing lane geometry for study area roadways including geometry for roadways under Construction;
- The functional classification for each of the roadways in the amendment study area;
- The traffic count stations (where applicable) for each roadway segment analyzed;
- The source of the traffic counts and the dates that traffic counts were collected;
- The adopted level of service standards from the CDMP for each roadway segment analyzed;
- The existing Year 2010 peak hour period traffic from the MDC and FDOT Traffic Concurrency;
- Count Station databases dated September 14, 2011 and obtained from MDC Public Works;
- Applicant counts or counts from other studies in unique locations where no county or state data was available;
- The two-way peak hour roadway capacity for County Roads based on ArtPlan calculations provided by Miami-Dade County Public Works from the Traffic Concurrency Count Station database dated September 14, 2011;

- The two-way peak hour roadway capacity for State Roads based upon the FDOT 2009 Quality/LOS Handbook;
- The existing two-way peak hour period level of service for each roadway segment analyzed and the volume to capacity ratio.

Figure 7. Existing transit service for the proposed Coral Reef Commons (Excerpt from Transportation Analysis Report)

MDC staff analysis of existing conditions provided in the recommendation to amend the CDMP (**Attachment 8**) found that all but one roadway segment in the study area was operating at the adopted LOS. Nine roadway segments along SW 147th Avenue, SW 127th Avenue, SW 117th Avenue, SW 107th Avenue, SW 97th Avenue, SW 120th Street, SW 168th Street, and SW 184th Street are operating at their adopted LOS D standard; the segment of US-1 between SW 104th and SW 112th Streets is operating at LOS E+23%, (exceeding its adopted LOS E+20% standard);

and the segment of SW 112th Street between SW 117th and SW 97th Avenues is operating at E+19%, (under its adopted LOS E+20% LOS standard). The rest of the roadways within the study area are operating at acceptable LOS.

Existing Mass Transit Service

The proposed CRC is located adjacent to the existing Coral Reef Max Bus Route 252, which currently provides express bus service (and service at 15 and 20 minute headways during the AM and PM peak hours) between the Dadeland South Metrorail Station, the Busway Corridor and the proposed CRC. A standard bus stop is located adjacent to the project property and provides service from a community urban center approximately 3 mi west of the site to a transit center at SW 117 Avenue and SW 152 Street approximately 1 mi east of the proposed CRC.

Existing Bicycle and Pedestrian System

A bicycle and pedestrian only path runs along SW 152 Street/Coral Reef Drive from just west of the proposed CRC, passing to the north of the property running east to US 1. This path connects to an extensive bicycle and pedestrian path that runs from Miami to Florida City.

3.6.7 Parks and Recreation

MDC's CDMP Policy ROS-2A requires a minimum of 2.75 ac of local recreation open space per 1,000 permanent residents in the unincorporated areas and a MDC-provided, or an annexed or incorporated, local recreation open space of 5 ac or larger within a 3-mi distance from residential development. The acreage/population measure is calculated for each Park Benefit District.

The proposed CRC is located within MDC's Park Benefit District 2, which encompasses the area between SW 8th Street and 184th Street. Currently this district has a surplus capacity of 478.06 ac of parkland and exceeds the above-referenced LOS. MDC lists a total of 26 local parks totaling 193.4 ac within a 3-mi radius of the proposed CRC (**Table 8**). Of the 26 parks, 15 are greater than 5 ac.

Table 8. Miami-Dade County (MDC) Local Parks within a 3-mile Radius of the proposed CRC

Park Name	Acreage	Classification
Wild Lime Park	11.81	Community Park
Sgt. Joseph Delancy Park	10.46	Community Park
Walter A. White Park	1.64	Neighborhood Park
Richmond Triangle Park	0.60	Mini-Park
Eureka Park	4.42	Community Park
Colonial Drive Park	14.34	Community Park
Domino Park	0.15	Single Purpose Park
Rock Ridge Park	4.54	Neighborhood Park
West Perrine Park	9.14	Community Park
Sabal Chase Park	4.43	Neighborhood Park
Fairwood Park	7.93	Neighborhood Park
Ben Shavis Park	0.86	Mini-Park
West Perrine Senior Center	2.59	Single Purpose Park
Arvida Park	7.55	Neighborhood Park
Devon Aire Park	12.43	Community Park
Oak Creek Park	5.03	Neighborhood Park
Deerwood Bonita Lakes Park	11.03	Community Park
Kings Grant Park	6.42	Neighborhood Park
Serena Lakes Park	5.14	Neighborhood Park
Eureka Villas Park	5.30	Neighborhood Park
Quail Roost Park	2.47	Neighborhood Park
Losner Park	0.55	Mini-Park
Charles Burr Park	3.80	Neighborhood Park
Caribbean Park	5.17	Neighborhood Park
Chuck Pezoldt Park	39.88	Community Park
Three Lakes Park	15.72	Single Purpose Park

3.7 Aesthetics

3.7.1 Scenic Value

The areas immediately surrounding the proposed CRC currently range from undeveloped lands that are disturbed or contain great deals of exotic vegetation, to urban forms consistent with suburban development. To the northeast of the property, at the intersection of SW 117th Avenue and SW 152nd Street near the Florida Turnpike, is development consisting of two car dealerships and a shopping area consisting of one gas station and multiple fast food chain restaurants. Each of these areas include sidewalks and well-maintained landscape buffers between roadways and

each building site. On the northeast quadrant of SW 117th Avenue and SW 152nd Street is an existing MDC Transit Metrobus Park & Ride lot. This lot has minimal landscaping consisting primarily of grass and a small number of trees.

To the northeast of the proposed project site, at the northeast corner of SW 122nd and SW 152nd Street, is Deerwood Town Center, a suburban shopping area consisting of big box retail, a supermarket, several fast food restaurants, service uses, and a gas station. Like the areas located to its east, the Deerwood Town Center site includes a sidewalk and well-maintained landscape buffer between the shopping area and SW 122nd Avenue and SW 152nd Street. The architecture and urban form of Deerwood Town Center is typical of a suburban shopping area with buildings painted a variety of neutral earth tones set far back from the street and bounded by surface parking lots. A multi-family residential complex, Emerald Palms, is located at the northwest corner of SW 122nd Avenue and SW 152nd Street. The complex is composed of three story apartment-style buildings painted warm earth tones and includes high-quality landscaping with a low wall heading west along SW 152nd Street.

The segment of SW 152nd Street between SW 127th Street and SW 122nd Avenue consists primarily of landscaped residential buffers for the Emerald Palms and Southern Anchor multi-family communities. Townhomes at Deerwood, a residential community, exists directly to the north of the project site. The community is composed of multi-story residential townhomes painted warm earth tones with red barrel-tile roofs. The Townhomes at Deerwood community continues west for approximately 0.75 mi until a power line right of way.

The power line right of way consists of five power poles evenly spaced over a railway crossing, a maintained landscaped portion of open space, and a number of row crops. Just west of the power line right of way is the Three Lakes residential community. Located on the north side of the intersection at SW 152nd Street and SW 133rd Avenue, Three Lakes consists of a high-quality landscaped entrance with a landscaped buffer and low wall continuing west along SW 152nd Street. On the south side of SW 152nd Street, directly opposite of Three Lakes, is a multifamily residential community surrounding the MDC Richmond Fire Rescue Station. The community consists of multiple large 2-story apartment buildings painted in warm earth tones with red barrel tile roofs. The community provides a concrete wall painted a matching earth tone and includes minimal landscaping.

The southeast, southwest, and northwest corners of Lindgren Road and SW 152nd Street contain strip retail centers, including a U.S. Postal Service facility, numerous gas stations and banks, and other retail and restaurant uses. These retail centers are set back from the street and contain well-maintained landscaping. Architecture in the area is typical of suburban retail in MDC and buildings are primarily painted in warm earth tones with red barrel tile roofs. Landscaping within the medians of SW 152nd Street is of moderate quality and is limited to a small number of trees including cabbage palms and black olive trees.

3.7.2 Noise

Noise is generally defined as unwanted sound that may be emitted from natural and man-made sources. The magnitude of noise is usually described by a ratio of its sound pressure to a reference sound pressure, which is usually twenty micropascals (20 µPa). Since the range of

sound pressure ratios varies greatly over many orders of magnitude, a base-10 logarithmic scale is used to express sound levels in dimensionless units of decibels (dB). The commonly accepted limits of detectable human hearing sound magnitudes fall between the threshold of hearing at 0 dB and the threshold of pain at 140 dB. Environmental noise is typically measured in A-weighted decibels (dBA). A dBA is a dB corrected for the variation in frequency response of the typical human ear at commonly encountered noise levels. In general, A-weighting of environmental sound consists of evaluating all of the frequencies of a sound, taking into account the fact that human hearing is less sensitive at low frequencies and extremely high frequencies than in the mid-range frequencies.

An individual's noise exposure is a measure of noise over a period of time. A noise level is a measure of noise at a given instant in time. Community noise varies continuously over a period of time with respect to the contributing sound sources in the community noise environment. What makes community noise constantly variable throughout the day is the addition of short duration single event noise sources such as aircraft flyovers, vehicle pass-bys, sirens, *etc*. These successive additions of sound to the community noise environment varies the community noise level from instant to instant, requiring the measurement of noise exposure over a period of time to legitimately characterize a community noise environment and evaluate cumulative noise impacts. This time-varying characteristics of environmental noise is described using statistical noise descriptors such as L_{eq} and $L_{eq(h)}$, which averages noise over a specified number of hours. Generally, the noise environment in a community is dominated by traffic noise. Highway traffic noise is usually a composite of noises from engine exhaust, drive train, and tire-roadway interaction. However, part of community noise level can be construction noise. Construction noise is dominated by heavy equipment and is considered intermittent and short-term in nature, generally occurring during the daytime hours. The Department of Housing and Urban Development and the Federal Highway Administration consider outdoor day-night exposure up to 65 dBA, as acceptable under most circumstances. The Federal Highway Administration has developed Noise Abatement Criteria and procedures to help protect the public's health, welfare, and livability (23 CFR 772). The Federal Highway Administration considers 75 dBA as acceptable during construction, if construction is conducted between the hours of 7:00am and 6:00pm (FHWA 2006).

A noise study was conducted for property where CRC is proposed to determine potential noise impacts related to the proposed project. This study is summarized in the Alternatives and Environmental Consequences - Section 4; the complete study has been included as **Attachment 9**. The study was consistent with FDOT Project Development and Environmental Manual, as well as Title 23 Code of Federal Regulations, Part 772.

Ambient noise level is considered to be the existing noise level that may be caused by natural and manmade events. To assess the ambient noise condition for property where CRC is proposed, short-term monitoring was conducted and is detailed in the attached report. **Table 9** provides the ambient noise level measurements recorded during field monitoring, which can be considered the baseline conditions.

Table 9. Ambient noise level measurements for the proposed CRC property

Setup	Monitored Noise Level dB(A)	Average Noise Level dB(A)	Computed (Modeled Noise Level) dB(A)	Calculated Difference	Validated
1.1	50.5	50.1	42.4	-7.7	No*
	49.3				
	50.3				
2.1	49.2	49.4	42.2	-7.2	No*
	49.4				
	49.5				
3.1	54.5	54.8	54.5	-0.3	Yes
	55.3				
	54.7				
4.1	52.6	-	50.1	-2.5	Yes
4.2	49.5	-	47.1	-2.4	Yes
4.3	48	-	46.1	-1.9	Yes
5.1	58.4	58.4	58.9	0.5	Yes
	57.9				
	58.8				
*Traffic noise was determined not to be the dominant noise source at these sites.					

4.0 Alternatives and Environmental Consequences

Federal regulations require that all reasonable alternatives must meet the defined purpose and need of the proposed Federal Action (40 CFR 1502.14). Reasonable alternatives include those that are practical or feasible from a technical and economic perspective. A No Action Alternative is also necessary to provide a benchmark against which potential effects of the action alternatives can be measured (40 CFR 1502.14 [d]). The Applicant's Preferred Alternative was driven by the need to meet MDC's infrastructure, transportation improvements, and environmental preservations requirements, declaration of restrictions, as well as avoiding, minimizing and mitigating for potential impacts to listed species, habitat restoration and perpetual management of the On-Site preserves as well as the Off-site Mitigation Area, when applicable.

Several alternatives were considered through the evolution of the proposed CRC and NEPA process, including steps to avoid and minimize impacts to the extent practicable. As an initial matter, the property where CRC is proposed has previous development, including buildings and an existing spine road through the center of the property. As they occur today, the most undisturbed areas are divided into east and west sections by the previous development and existing spine road. More details regarding alternatives analysis can be found in Section 4 of the HCP.

The Service is presented with two basic options relative to the Applicants' request for an ITP. It can either deny or issue an ITP for the proposed project. The Applicants initially presented six alternatives for the proposed project in the HCP. The No-Action Alternative (Alternative 1),

Alternative 2, and Alternative 3 were excluded as they did not meet the Applicants' purpose and need (Sections 4.3.2 and 4.3.3in the HCP, respectively). For the purpose of evaluating the remaining feasible alternatives (Alternatives 4, 5, and 6), the Service includes the evaluation of the No-Action Alternative to represent the Existing Condition (baseline). In determining whether the remaining alternatives provided a satisfactory range of options, the Service evaluated the following information:

1. social, economic, environmental, and other relevant issues and concerns identified during both internal and public review of the proposal to issue an ITP;

2. biological requirements of federally listed, proposed-listed, candidate, and petitioned species and other flora and fauna potentially affected by issuance of a Permit;

3. the legal mandates of the Service under NEPA and the ESA; and

4. the concerns of the Applicants.

During the process of obtaining local approvals, Ram Coral Reef analyzed the property where CRC is proposed in an effort to avoid and minimize impacts. Together with local government staff, the Applicants conducted site visits to ascertain the relative ecological value of the property. This early analysis led to various iterations culminating in the site plan contained in local government approval (included in the EA as Alternative 4). The development and analysis of Alternative 4 and later Alternative 5 ultimately led to the development of the Applicants' Preferred Alternative (Alternative 6). The Preferred Alternative represents a development plan that is intended to minimized and mitigate impacts to the maximum extent practicable, while insuring the project purpose is met.

Section 4.1 contains the alternatives that were considered and rejected during early planning efforts due to either their failure to meet the Applicants' project purpose and/or their significant negative impacts to natural resources. Section 4.2 contains the alternatives that were considered in detail and that meet the Applicants' project purpose. The No Action alternative is also found in Section 4.2.

The CEQ regulations in 40 CFR 1500 require that certain resources be addressed in an EA. While there are no direct effects to natural resources from the Federal action of issuing a 10(a)(1)(B) permit, these resources must be reviewed and addressed in the preparation of this EA to assess the likelihood that they may be affected by the implementation of the HCP authorized by the ITP. **Table 10** provides a summary description of the alternatives considered.

Table 10. Summary of All the Alternatives Considered

Alt.	Description	Service Action	Commercial (sq. ft)	Residential Units	Develop. Footprint (ac)	Pine Rocklan d Planting (ac)	Preserve (ac)	Total On-Site Conservation Area (ac)
1	No Action	No ITP Issued	0	0	0	0	0	0
2	Redevelopment Only / No restoration	ITP Possible	80,000	250	25.44	0	0	0
3	Maximum Build-out*	ITP Issued	370,000	1,056	100.12	0	37.96	37.96
4	County Approved Zoning (2013)	ITP Issued	370,000	900	94.07	0	43.36	43.36
5	County Approved/Stepping Stones and Southern Corridor	ITP Issued	370,000	900	91.80	2.86	46.09	48.95
6	Reduced Commercial/ Increased Preserve (HCP Preferred Alternative)	ITP Issued	289,000	900	86.35	3.88	51.54	55.31

*Requires canopy and subcanopy replacement for 4.9 ac to be included in landscape plan.

Impacts that were analyzed include direct and indirect effects, and cumulative effects to the affected environment. The CEQ regulations state that direct effects are those that are caused by the action and occur at the same time and place, while indirect effects are caused as a result of the action and occur later in time or further in distance, but are still reasonably foreseeable (40 CFR § 1508.8). Cumulative effects are considered to be the impacts on the environment, which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other action (40 CFR § 1508.7). The effects or impacts could be either beneficial or adverse. A beneficial effect is considered a positive change in the condition or appearance of the resource or a change that moves the resource toward a desired condition. An adverse effect is considered a change that moves the resource away from a desired condition or detracts from its appearance or condition. A cumulative effects analysis has been included in Section 5.0. Consistent with the CEQ's NEPA Regulations Section 1508.8, the term "effects" is used synonymously with the term "impacts." A comparative matrix of each alternative's environmental consequences, along with a discussion of each alternative's feasibility can be found in Section 6.0.

Conservation measures and proposed mitigation activities as well as a general discussion of their potential environmental consequences are discussed in detail in Sections 6, 7 and 8 of the HCP, and are incorporated here by reference. Several of the alternatives include varying levels of these conservation and mitigation activities, the degree to which is discussed in that alternatives section.

4.1 Alternatives Considered but Not Analyzed Further

4.1.1 Alternative 2 – Redevelopment Only / No Restoration

Under Alternative 2 there is a potential that the Service would not need to issue an ITP if the proposed project completely avoided adverse effects to listed species. This alternative is designed to avoid impacts to natural areas by confining the development to only previously developed lands. No restoration activities are proposed for this alternative. In this alternative, the configuration of the existing developed land would limit re-development to approximately 25.44 ac, generally centered around the middle of the property. The development would not likely be visible from SW 152nd Street (**Figure 8**). This alternative would result in 250 residential units / apartments on 13 ac and 80,000 sq ft of commercial / retail on 10 ac.

Feasibility

This alternative was determined not to be feasible for several reasons and was not further analyzed (Section 4.3.2 in the HCP). Alternative 2 does not meet the Applicants' project purpose to construct a mixed-use development anchored by a large commercial retailer that is visible from SW 152nd Street. The large commercial retailer, precluded by this alternative, is expected to act as an anchor store for the development providing incentive and increasing desirability for smaller retail leases, combined with a residential community large enough to in-turn sustain the large commercial retailer and related commercial entities. This alternative only allows for 250 units and 80,000 sq ft of commercial, which would be unable to support the comprehensive development, causing either rents or commercial leases to be economically unfeasible and/or fail to support the community, the infrastructure, or minimal commerce. Alternative 2 does not include development with visibility from SW 152nd Street, which is anticipated to decrease the desirability of the development to commercial retailers and is inconsistent to the socio-economic objectives of the Applicants. The feasibility of Alternative 2 is further reduced because it does not include the construction of a school site in the northwest corner of the CRC property. Loss of the school site would result in a substantial reduction in the anticipated socioeconomic benefits from ad-valorem taxes and the Children Trust Fund.

Alternative 2 also has the potential consequence of further deterioration of the existing pine rockland habitat, which would adversely affect the protected pine rockland dependent species (*e.g.*, BSHB, Miami tiger beetle). This is because is the absence of the larger development, the Applicants would not have the revenue to support the infrastructure improvements needed or the habitat restoration or land management on the remaining lands. If the existing pine rockland habitat remains unmanaged, over time it would likely continue to degrade losing its value and characteristics favored by protected wildlife. This could also ultimately change its status as a MDC NFC designation, if the habitat no longer meets the NFC quantitative criteria. At that point, the pine rockland habitat within the property would no longer be regulated by MDC's §24-49.2 Ordinance and the habitat value to pine rockland dependent species, if any, would be low.

Based the alternative's inability to meet the Applicants' project purpose and its likely adverse effects to protected species, this alternative was not brought forth for further analysis and was determined to be infeasible.

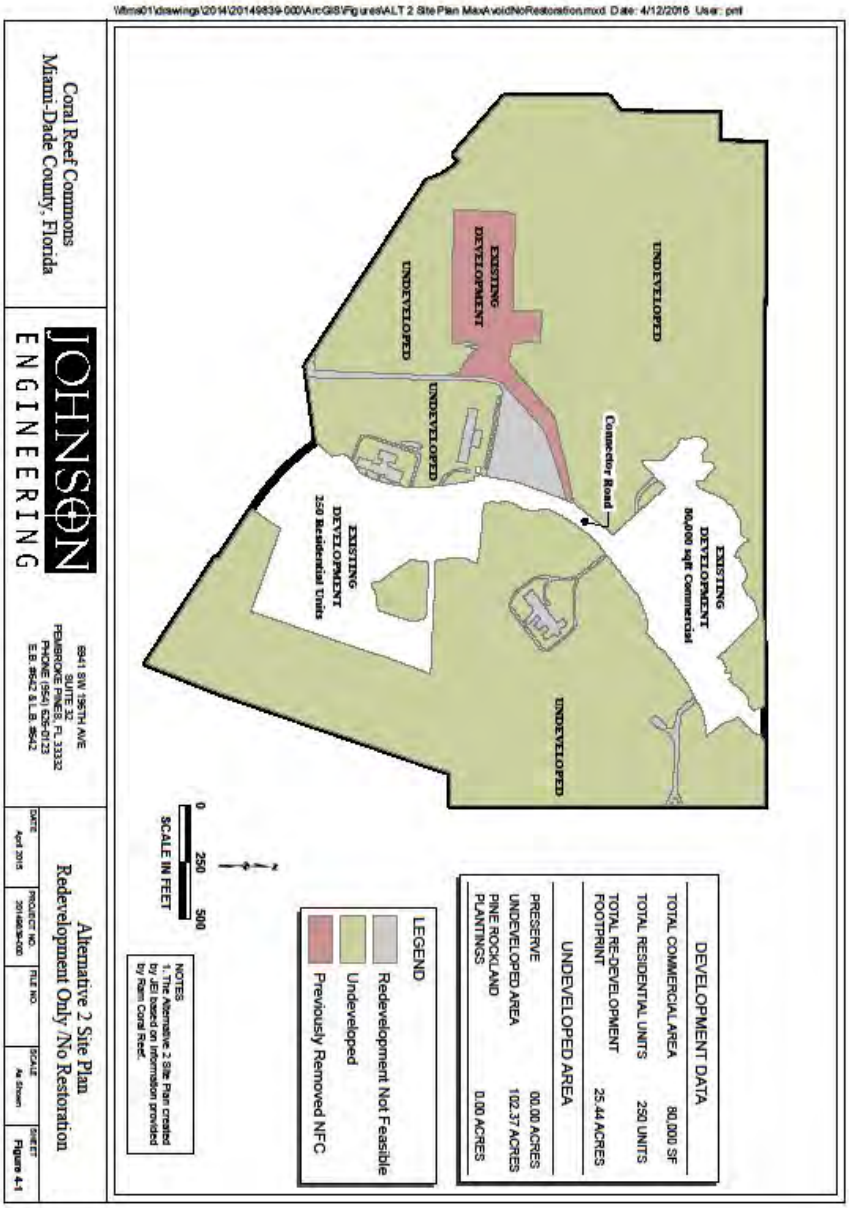

Figure 8. Alternative 2 - Redevelopment Only / No Restoration

4.1.2 Alternative 3 –Maximum Build-out

Under Alternative 3, the Service would issue an ITP for the maximum allowable limits of development that could be permitted under MDC's §24-49.2 Code of Ordinance. This code regulates the development of areas designated as NFCs. MDC has formally designated 49.44 ac as pine rockland NFC and 3.72 ac as rockland hammock NFC with the property proposed for CRC based on quantitative evaluation criteria in Section 24-5 of the Code. The MDC Code allows for the development of 20 percent of pine rockland NFCs for sites greater than 5 ac, with an additional 10 percent allowable development provided the subcanopy and canopy are replaced through site plantings. Additionally, a total of 10 percent of the rockland hammock is allowed to be developed under this Code.

Based on MDC's NFC requirements, under the maximum allowable development of NFCs, only 34.6 ac of pine rockland habitat would be required for preservation, provided 4.9 ac of plantings were included in the landscape plan to replace understory and canopy loss. Additionally, only 3.3 ac of the rockland hammock area would be required to be preserved. For Alternative 3 a total of 37.9 ac of NFC habitat would be required to be preserved and would be placed under a restrictive covenant. Prescribed fires and other land management activities (*e.g.* exotic removal) would be implemented within the NFC preserves.

Alternative 3 has a development footprint of 100.12 ac and includes approximately 370,000 sq ft of commercial development and 1,056 residential units (**Figure 9**). Total preservation would include 34.6 ac pine rockland, 3.3 ac of rockland hammock and 4.9 ac of landscape planting, which is required to replace the canopy and understory. There is no requirement under MDC Code for the planting to consist of pine rockland species.

Feasibility

Alternative 3 provided the most socioeconomic benefits of all the alternatives and was found to have either beneficial or minimal adverse effects to all natural resources with the exception of vegetative communities, wildlife and protected species (Section 4.3.3 in the HCP). The maximum build out of Alternative 3 does not provide enough on-site conservation to offset the adverse effects to wildlife resources. Based on the adverse effects to these resources, this alternative was not brought forth for further analysis and was determined to be infeasible.

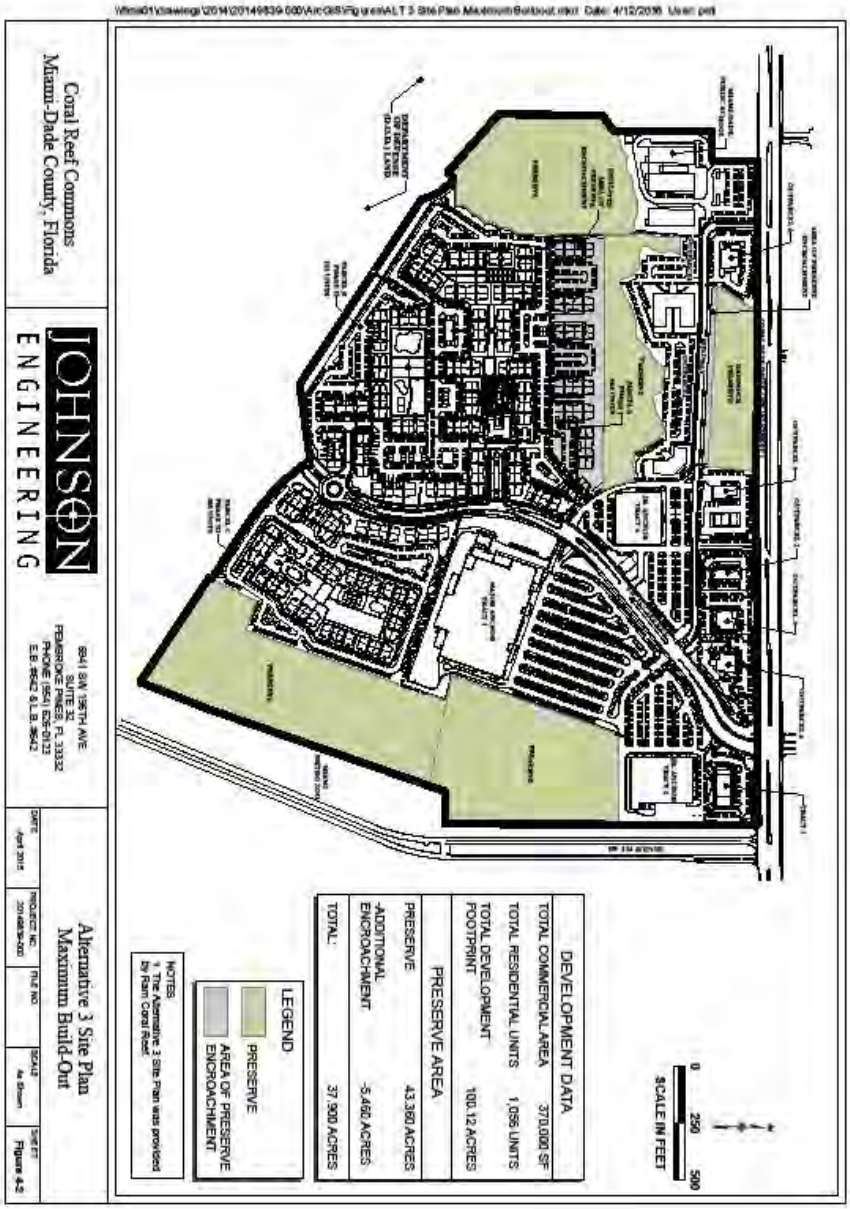

Figure 9. Alternative 3 –Maximum Build-out

4.1.3 Alternative 6b – Modified Reduced Commercial/Increased Preserve

Alternative 6b is based upon the elements of Alternative 6 with modification to the primary anchor retail design plan. The intent of the alternative was to decrease the area under development and increase connectivity across the community for wildlife. Alternative 6b moves the anchor store north approximately 150 ft and proposes the construction of a multi-level parking garage either north or south of the anchor store. The change is the parking garage is intended to minimize the project footprint while meeting the community's parking needs.

Feasibility

Based on feedback from the Applicants, Alternative 6b was not considered further because it does not meet the Applicants' purpose and need. A financial analysis performed by the Applicants indicated that the construction of a parking garage would lead to significant additional costs that could not be offset or otherwise recovered and would make the project financially infeasible. In addition, the anchor tenant has indicated to the Applicants that the project design changes in Alternative 6B are unacceptable, and the anchor tenant could not proceed with the project with the revised parking garage configuration. Optimizing the anchor store is an important element to the Applicants' purpose and need because it supports the mixed use development, including the smaller commercial tenants, and promotes walkability for residents both within the community and nearby.

4.2 Alternative 1 – No Action

Under Alternative 1, no action, development or restoration, would occur. Based on 2014 habitat delineations, approximately 33.4 ac are considered developed within the proposed CRC property, 20.9 ac are considered disturbed uplands, 3.7 ac rockland hammock, 21.8 ac of pine rockland with less than 50 percent Burma reed, and 58.1 ac of moderate to severely degraded pine rockland. All of the pine rocklands within the property proposed for CRC show varying levels of degradation from fire suppression and infestation of exotic plant species and some successional habitat change appears to be occurring with dense stands of native hardwoods and pines present, atypical of pine rockland habitat. As described in Alternative 2, without any habitat restoration and management it is likely that habitat quality will continue to degrade and exotic infestation and hardwood encroachment will continue to deteriorate the habitat for pine rockland dependent species. Under the Alternative 1 there is no information that there would be foreseeable incentives for restoration or perpetual management to be implemented for the benefit wildlife species. The "No Action" alternative is a baseline for alternative analysis and will not result in any change to the existing condition of resources found within the HCP Action Area.

Alternative 1 does not meet the project purposes and objectives, precluding both mixed development and restoration and perpetual management of pine rockland preserves.

4.2.1 Geology, Soils and Topography

Alternative 1 would have minimal effect on the geology or topography and through natural processes soils would gradually transition from the Opalocka Rock Outcrop soils to an organic

based soil series. This would occur the pine rockland habitat continues its transition to habitats dominated by non-pyrogenic hardwood communities and accumulated organic soils.

4.2.2 Water Resources

Under the baseline conditions of Alternative 1, stormwater runoff exhibiting urban pollutants will continue to drain off of existing developed areas into the natural areas without any pre-treatment. The continued absence of treatment of stormwater is considered an adverse effect to water resources.

4.2.3 Air Quality

Alternative 1 would likely have no effect on air quality.

4.2.4 Land Use/Zoning

Alternative 1 would have no effect on land use or zoning.

4.2.5 Natural Forest Communities

Under the baseline conditions of Alternative 1, a development permit through MDC would not be required. Consequently, the lands currently designated as NFCs would not receive any additional long term protection (*e.g.*, restrictive covenant) per MDC Code because no development of NFCs would occur. Additionally, in absence of the Service's authorization of land management activities, habitat restoration would not likely occur. As a result, areas currently designated as NFCs would likely continue to degrade resulting in the loss of NFC designated status when/if the site no longer meets the minimum quantitative threshold standard for inclusion in MDC's NFC Maps (¶ 2, Code of Ordinance §24-5. Definitions). The presumed loss of NFC status would likely result in fewer restrictions to future development and therefore could be considered an indirect adverse effect of Alternative 1.

4.2.6 Vegetative Communities

The majority of vegetative communities within the property proposed for CRC are characterized by an upland mosaic of pine rocklands demonstrating various stages of succession, exotic infestation and/or converted to sodded lawn or open bare ground. Within that mosaic, are small parcels of rockland hammocks and historic marl prairies. Vegetative communities located within central half of the property are predominantly disturbed from previous urban land uses (medical research and education) and several derelict structures and roads transect the previously developed area (**Figures 6 and 8**). This portion of the proposed CRC property exhibits a dominance of invasive/exotic species and impervious surface (roads, parking lots, foundations, structures). Greater detail regarding historical land use and the current status of vegetative communities are presented in proceeding sections of this EA and in the HCP (Sections 1.0 , 2.0 and 5.0).

Under the baseline conditions of Alternative 1, vegetative communities would not be directly impacted by development and no additional habitat would be lost. However, as previously discussed in this alternative and Alternative 2, it is likely that adverse effects to the pine rockland

habitat vegetative communities could continue to occur through lack of habitat management and transition of pine rocklands to non-pyrogenic hardwood communities. Therefore, under Alternative 1, no effect to the vegetative communities in terms of loss of habitat would be anticipated; however, adverse effects to the pine rockland habitat could occur assuming no land management would be implemented and instead further infestation from exotics and natural successional transition would occur.

4.2.7 Wildlife and Protected Species

As discussed above, it is likely that under Alternative 1 vegetative communities will continue to degrade if no land management occurs. The anticipated increase in exotic vegetation and transition from pine rockland habitat to hardwood will adversely affect the wildlife and protected species that currently occupy (documented or assumed present) the property and are dependent on pine rockland habitat. In the absence of habitat management, it is reasonably foreseeable that any populations of pine rockland dependent species within the property would likely experience ongoing stress as the habitat degraded, decreasing the area's potential to benefit the survival and recovery of these species. In some cases, these species could (re-)establish themselves within adjacent managed lands but extirpation of some covered species from the proposed CRC could occur should the habitat fail to meet their minimum requirements. The future status of species currently occupying lands within the proposed development area and their designated CH would depend upon the status of inter- and intra-specific competition, available/suitable habitat for population maintenance or re-establishment, and sensitivity to anthropogenic activities.

Under baseline conditions, the Service considers the current pine rockland and other upland habitats in the proposed CRC property to provide adequate resources to support populations of the covered species. As discussed above, over time continued lack of habitat management could compromise the condition of the habitat and its ability to support the covered species.

Under the baseline conditions of Alternative 1, CH would not be directly impacted by development and no CH would be lost. However, as previously discussed above and under *Vegetative Communities*, the vegetation within the CH could decline in quality through lack of habitat management and transition of pine rocklands to non-pyrogenic hardwood communities. Therefore, under Alternative 1, no effect to the CH would be anticipated in terms of acres lost; however, quality of the CH could decline assuming no land management would be implemented and instead further infestation from exotics and natural successional transition would occur.

4.2.8 Invasive Species

Under the baseline conditions of Alternative 1, natural communities within property proposed for CRC would most likely continue to be degraded by invasive species. In the absence of the Service's authorization of land management activities, no prescribed burning, chemical treatment, or hardwood removal could occur. Therefore, it is reasonably foreseeable that the lack of land management under baseline conditions would result in an indirect adverse effect to wildlife and protected species as a result of the continuing increase of invasive species.

4.2.9 Cultural Resources

Alternative 1 would likely have no effect on cultural resources.

4.2.10 Socioeconomic

Availability of single and multi-family units (residential capacity) is expected to be depleted by 2017 (MDC Comments on CRC Zoning Application No. 3, October 2011 Cycle). Under Alternative 1, there would be no contribution of additional family units from the proposed project and current housing shortfalls would continue at current rates. Although further contributions to residential capacity would be considered positive socioeconomic benefits, Alternative 1 would neither benefit nor adversely affect current baseline socioeconomic conditions of MDC (**Attachment 10**). Therefore, Alternative 1 would have no effect on socioeconomics.

4.2.11 Water Supply, Wastewater, Solid Waste

Alternative 1 would likely have no effect on water supply, wastewater, or solid waste.

4.2.12 Human Health and Safety

Under Alternative 1, the property where CRC is proposed would continue to experience vegetation fuel load increases because no land management or vegetation removal would occur. This increase in fuel load has the potential to increase the threat of wildfires in the area. Evidence of this is based on the historic occurrence of wildfires both within and adjacent to the property. High fuel loads and uncontrolled conditions of wildfires generate greater amounts of smoke than prescribed fire. Uncontrolled wildfires also burn at higher intensities, potentially spreading to adjacent properties and threatening human health and safety in surrounding communities. Alternative 1 would result in no change potential wildfire regimes. As such, continuing baseline conditions under Alternative 1 may have an adverse effect to human health and safety from wildfires.

4.2.13 Schools

Under Alternative 1, a 4-ac parcel would not be donated to MDC Public School District and the anticipated economic gains in ad valorem taxes to the MDC Public School District and Children's Trust would not be met. However, this would not facilitate a change in the baseline status of the local school district. Therefore, baseline conditions under Alternative 1 would likely have no effect on schools.

4.2.14 Transportation

Under Alternative 1, the anticipated long-term transportation deficiencies identified in the Affected Environment section would not be addressed. However, this would not change the baseline transportation status. Therefore, Alternative 1 would likely have no effect on transportation.

4.2.15 Parks and Recreation

Alternative 1 would likely have no effect on parks and recreational resources.

4.2.16 Scenic Value

Under baseline conditions of Alternative 1, land management activities would not be authorized and invasive species are anticipated to continue to spread and dominate the natural communities. For some people this could be considered a decrease in the aesthetic scenic appearance of these communities. Additionally, the abandoned buildings would not be removed and would continue to decrease the scenic value for the community, although these structures are minimally visible from the roadways. Alternative 1 is considered to have minimal but potentially adverse effects on scenic value.

4.2.17 Noise

Alternative 1 would likely have no effect related to noise.

4.3 Alternative 4 –County Approved Zoning (2013)

MDC issued a permit (Permit # NFC2012-012) for Alternative 4 on July 8, 2013. The permit authorized the clearing of 9.8 ac of pine rockland habitat but required the preservation and management of the remaining NFC habitat, 39.64 ac of pine rockland and 3.72 ac of hardwood hammock (rockland hammock). The permit allowed for the clearing of 3.2 ac of pine rockland NFC for the purpose of development, and reconciled the previous removal of 6.6 ac of pine rockland habitat by UM for the research facility. Alternative 4 has a development footprint of 94.07 ac. This includes 370,000 sq ft of commercial development, 900 residential units, and a total of 43.36 ac of on-site preserves (**Figure 10**). Land management activities related to restoration of the on-site preserves would include prescribed burning and chemical treatment of exotic vegetation within the 43.36 ac.

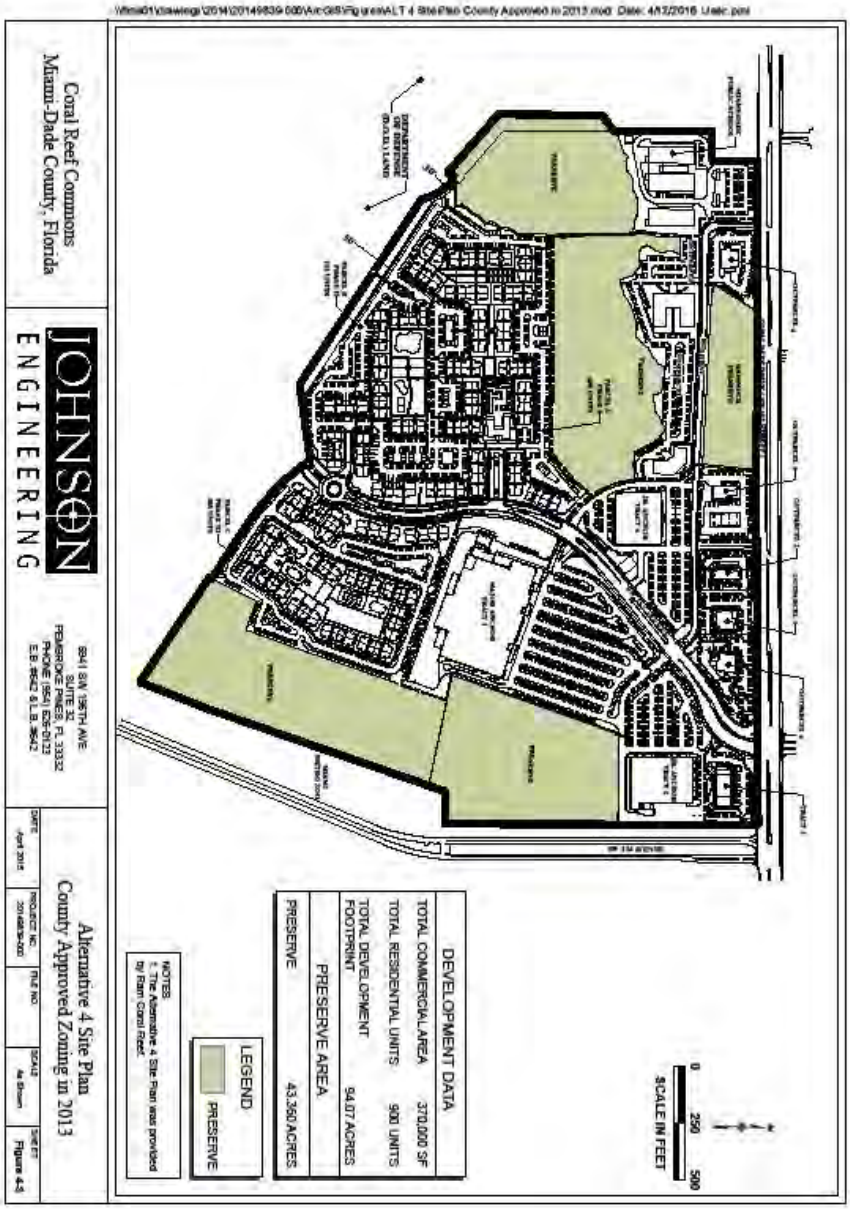

Figure 10. Alternative 4 - County Approved Zoning (2013)

4.3.1 Geology, Soils, and Topography

Under Alternative 4 potential impacts to geology, soil and topography would be related to construction and prescribed burning activities. Direct impacts to soils would include the conversion of just less than 61 ac of Opalocka Rock Outcrop and Biscayne marl drained series soils to Urban Land Complex soils and erosion of soils during construction. Approximately 34 ac of these soils have already been altered through historic scraping activities. Any soil impacts would be minimized through compliance with all applicable local, State, and Federal regulations for erosion and sedimentation control during construction. Prescribed fires could also result in a loss of ground cover and organic matter within the on-site preserves. This would be considered a beneficial effect within the preserved pine rockland habitat. Other potential effects to the soils include possible compaction of soils within preserve areas as the result of the use of heavy equipment during land management activities. These impacts would be eliminated or minimized through the use of the BMPs included in the HCP, such as the use of rubber-tracked vehicles.

Potential impacts to geology and topography would be primarily limited to the areas affected by construction. MDC Code of Ordinances Chapter 11c-3(m) requires that the lowest finished floor be at a minimum of 4 in (non-residential) above the back of sidewalk, or the highest crown of road elevation abutting the building, whichever is higher. Large portions of the development areas under Alternative 4 have been previously scraped, filled, and/or leveled to allow for the existing development. Elevations within the development area ranges from ±9 ft NGVD to ± 11 ft NGVD, and would require minimal addition of fill to meet the local ordinance requirement. Additionally, the entire property is above the county identified flood criteria level (+9.0 ft NGVD) and is outside of the 100 year flood zone. Due to much of the site already being developed and/or being previously scraped or altered, alterations to topography would be minimal due to prior development and existing elevation. Modifications would be primarily limited to minor grading and filling to meet local ordinance requirements.

Potential impacts to geology outside of development activities could result from alteration of geology from the use of heavy machinery during restoration activities in the on-site preserves, although some of the geology has already been altered through historic scraping activities. Impacts would be minimized through the use of previously mentioned BMPs. Furthermore, potential use of heavy machinery would primarily be restricted to the most degraded areas during pine thinning and hardwood removal. Where feasible, hand removal of hardwoods would be utilized. The use of heavy machinery is primarily expected to occur during initial hardwood removal and reduction. Following these initial restoration activities any use of heavy machinery would be limited and would primarily consist of maintenance of firebreaks.

Based on prior alterations to these resources, proposed minimization and avoidance (BMPs), Alternative 4 is expected to have no significant adverse effect on geology, soils, and topography.

4.3.2 Water Resources

Under Alternative 4, the stormwater management plan originally approved by MDC during 2013 County approvals would be implemented (**Attachment 11**). The stormwater system design concept allows runoff from the proposed development to collect in a series of catch basins and be

treated by underground exfiltration trenches before staging in the parking lots and forested areas where it would be allowed to percolate back into the ground water in a treated state. Stormwater quality treatment would provide for greater than 1 in over the entire site or 2.5 in over the impervious area. Runoff volume for the 5 year-24 hour, 10 year-24 hour, 25 year-72 hour and 100 year-72 hour storm events would be attenuated through the use of exfiltration trench, soil storage and surface water storage in the parking areas and undeveloped forested areas. Undeveloped areas would be hydraulically connected through use of spreader swales, baffles and other similar BMPs. As they exist now, the undeveloped areas are not hydrologically connected.

In Alternative 4, surface water management design standards would meet all applicable regulations including State and County requirements. All applicable State and local permits would be obtained prior to construction and operation of a surface water management system. Short-term impacts may result from construction; however, these impacts would be minimized through the use of standard BMPs.

Existing water resource management within the property proposed for CRC allows for discharge of untreated runoff into natural areas and percolation into groundwater. Alternative 4 would likely result in a beneficial effect on water resources through the creation of a stormwater management system that facilitates treatment of runoff prior to discharge.

4.3.3 Air Quality

Under Alternative 4, the MDC required transportation improvements (see 4.3.13 Transportation) may have a mitigating effect on air quality resulting from vehicular omissions. However, Alternative 4 includes prescribed burning as part of the restoration plan. Direct and indirect effects of prescribed burning on air quality may include temporary reduction in air quality both on CRC and in adjacent areas. Smoke emissions may also result in temporary reduction in visibility in some locations. These adverse effects would be expected to be brief and minimal. Any adverse effects would be minimized through implementation of standard BMPs: including a smoke management plan, obtaining a Burn Day spot forecast from the National Weather Service to evaluate atmospheric conditions and ensure any burn activities would not result in affecting MDC's attainment status; conducting burns during favorable conditions when smoke would be carried away from sensitive areas; conducting small burns on a rotational basis and utilizing burn techniques that minimize smoke emissions, as well as including other standard smoke management BMPs that may be applicable to a specific burn given site conditions. Details of smoke management activities and BMPs are included in the On-site Preserves Mitigation Plan and Off-site Mitigation Area Mitigation Plan Appendix J and J1of the HCP, respectively. Additionally, implementing a regular fire regime would reduce fuel load and further minimize smoke emissions when a fire takes place, as well as reduce potential for wildfires, which can have greater uncontrolled smoke emissions and adverse effects on air quality. Based on the above analysis, Alternative 4 would likely have no significant adverse effect on air quality.

4.3.4 Land Use/Zoning

Currently, the proposed CRC property is inactive and is a combination of open space and an abandoned animal science and medical research facility. Under Alternative 4, the property would be redeveloped and would ultimately function as a mixed-use development that would

include 370,000 sq ft of commercial real estate and provide 900 residential units. Land use categorized as developed land would be increased from 33.4 ac to 94.07 ac. Existing zoning for the site allows up to 1,200 unit density. The 900 residential units proposed in Alternative 4 would be allowable under current zoning. The proposed commercial development intensity would also fall within the zoning restrictions; therefore, Alternative 4 would likely have no effect on zoning.

4.3.5 Natural Forest Communities

Under Alternative 4, a restrictive covenant for the existing NFC permit (Permit # NFC2012-012) would be recorded and the NFC would be protected and managed in accordance with the terms of the 2012 permit. This would require the preservation and restoration of 43.36 ac of NFC, which includes 39.64 ac of pine rockland and 3.72 ac of rockland hammock. Although the permit allows for the additional loss of 3.2 ac of NFC habitat and a total loss of 9.8 ac of NFC, this permit places the remaining NFC habitat under long term management and protection requirements. Therefore, despite the loss of additional habitat, the long term management and protection of the remaining NFC is likely to have a beneficial effect to the resource.

4.3.6 Vegetative Communities

Alternative 4 has a development footprint of 94.07 ac, of which approximately 33 ac is previously developed. The remaining land use within the development footprint would include a conversion of 20.8 ac of disturbed upland and 39.9 ac of pine rocklands to a developed land use category. Additionally, just over 43 ac of preserves (39.6 ac pine rockland, 3.7 ac rockland hammock) would be placed under a restrictive covenant with a land management plan.

The Applicants worked with the Service to develop a habitat functional assessment for the pine rocklands and specifically the property proposed for CRC (see Section 5.0 HCP). Evaluating the significance of the proposed project's impact on vegetative communities has been based, in-part, on this habitat functional assessment. Details of the Alternative 4 functional assessment scoring can be found in Section 4.0 of the HCP. The functional assessment for post restoration conditions (functional value of the proposed CRC property following development and implementation of the land management activities including achievement of the success criteria in the on-site preserves) indicates Alternative 4 would result in a habitat function decrease (-4.02 habitat value units [HVU]). A functional assessment specific to rockland hammocks was not developed; however, based on beneficial restoration activities and perpetual management balanced against the development impacts, a net decrease in habitat function of the rockland hammock is also expected to occur under this alternative. Alternative 4 is expected to result in adverse effects to the vegetative communities and is quantified as a loss of 4.02 HVU, per the habitat functional assessment.

4.3.7 Wildlife and Protected Species

The habitat functional assessment described in 4.3.6 (above) and described in detail in Section 5 of the HCP, was also developed to assist in evaluating the effects of the proposed CRC development on wildlife and protected species. Because the health and quality of pine rockland habitat is correlated to the health and abundance of pine rockland dependent species this was

identified as a useful tool (surrogate) for evaluating impacts (negative and beneficial) to the covered species and other sensitive species (Table 3 and 4). Although some of these species are not pine rockland dependent, in general, high quality native habitat is commonly considered to be beneficial for other native generalist species. The details of the functional assessment for Alternative 4 can be found in Section 4.0 of the HCP and details of direct and indirect impacts of the proposed activities are included in Section 8.0 of the HCP.

Although beneficial effects would be anticipated from the restoration, perpetual preservation, and management of the on-site preserves, based on the functional assessment, these benefits would not be expected to offset the adverse effects. Accounting for the presence, quality and availability of essential resources (*e.g.* foraging, shelter, and reproductive habitat, pineland croton, and other herbaceous nectar-producing plants), time-lag between perturbations (mechanical vegetation/debris removal, prescribed burns, other potential restoration and management actions), and habitat connectivity between and among habitat polygons that would be restored, preserved and managed under this alternative, the functional assessment indicates that 16.22 HVU would be impacted under Alternative 4 and there would be an overall decrease in habitat function of -4.02 HVU from baseline conditions. Consequently, Alternative 4 would be expected to result in an overall adverse effect to the covered species.

CH occurs both within the proposed developed areas and within the on-site preserves of Alternative 4. Designated CH for BSHB and leafwing overlap entirely within the proposed CRC (90.2 ac), as does the designated CH for Carter's small- flowered flax and Florida brickell bush (104.06 ac). Alternative 4 would result in the loss of 46.84 ac of CH for the butterflies and 60.64 ac of CH for the plants. CH within the on-site preserves would be temporarily disturbed during restoration activities; however, the success criteria, which the land will be managed to reach, include the physical and biological features (PBF's) and support the primary constituent elements (PCEs) of the CH for the species. Under Alternative 4, further development of 43.36 ac of CH for the butterflies and 43.36 ac of CH for the plants would be avoided through the commitments to protect the on-site preserves under a conservation easement.

Section 4.5.7 includes an in-depth discussion on the effects of Alternative 6 on the covered species (Table 3) as well as the special status plant (Table 4) that have the potential to occur within the HCP Plan area. Similar effects would be anticipated for Alternative 4 although the magnitude of the effects would vary based on the amount of development and restoration activities.

4.3.8 Invasive Species

Under Alternative 4, invasive species would be managed within the 43 ac of on-site preserves. Therefore, Alternative 4 would likely benefit efforts to control invasive species and increase populations of native pine rockland species. Consequently, Alternative 4 is anticipated to have a beneficial effect on controlling invasive species.

4.3.9 Cultural Resources

The SHPO found that they did not have sufficient information to determine the eligibility of one site (8DA14320) assessed during the cultural resource assessment (**Attachment 1**). This site

would be located in an area proposed for restoration and conservation. The restoration activities included in the HCP are compatible with cultural resource preservation (see discussion and Appendix I in Phase I assessment report, Archaeological & Historical Conservancy, Inc. Technical Report #1052 – **Attachment 1**). Consequently, no adverse effects to cultural resources would be anticipated under Alternative 4.

4.3.10 Socioeconomic

Alternative 4 would house an estimated population of 1,971 people based on the MDC Regulatory and Economic Resources calculations of 2.19 persons per unit included in the August 23, 2013 Planned Area Development Agreement (CFN 2013R0923724). Availability of single and multi-family units (residential capacity) is expected to be depleted by 2017 (MDC Comments on CRC Zoning Application No. 3, October 2011 Cycle). Alternative 4 would have a beneficial effect on housing availability by alleviating the majority of anticipated deficiency of available residential units in 2025. Alternative 4 would also serve to address commercial deficiencies identified for this area.

Anticipated economic benefits of Alternative 4 have been extrapolated from the economic analysis conducted in 2011 for the proposed project (Miami Economic Associates, Inc. Letter dated October 17, 2011). Based on the proposed development of Alternative 4, CRC could be expected to generate more than 780 temporary jobs during construction and approximately 740 full-time positions following build-out. Additionally, the construction of the proposed CRC would be expected to funnel $115 million into the economy during construction. Alternative 4 would also place nearly $170 million on the MDC tax roll and could be expected to generate $1,647,000 in ad valorem taxes for unincorporated MDC Municipal Service Area, as well as an additional $1,354,000 in ad valorem taxes for the MDC Public School Districts and $85,000 for the Children's Trust. Based on this information, Alternative 4 would be expected to have a beneficial effect on socioeconomic resources.

4.3.11 Water Supply, Wastewater, Solid Waste

Based on MDC's Water Demand Multiplier (§ 24-43.1) Alternative 4 would have a total projected water demand of 199,000 gallons per day, with an equivalent demand in wastewater to accommodate the water supply. Pump Station 0678 is located within the proposed CRC. The age of this station would require replacement to handle any water demand from the development of the proposed CRC; however, this replacement would be completed by the Applicants. Based on the existing available water supply capacity and identified LOS, both the Alexander Orr Water Treatment Plant and South District Wastewater Treatment Plant would be able to supply and receive water and wastewater, respectively (**Attachment 12**). Under Alternative 4, solid waste collection would be provided by a private waste hauler, therefore no impacts to solid waste management LOS would be anticipated within the surrounding communities. Based on this information Alternative 4 would likely have no effect on these resources.

4.3.12 Human Health and Safety

Based on MDC's estimates for impact on Miami-Dade Police Department resources for maximum development limits (September 18, 2012 Memorandum, **Attachment 13**), Alternative

4 would require 3 additional sworn officers to maintain current LOS within the Hammocks District service area. Per the Miami-Dade County Police Department request, in an effort to assist the police in accommodating the additional demand from the development, a police work station will be provided within the proposed CRC. This station would include, but not be limited to, a desk/work table, telephone, computer terminal, restroom, and a "Police Only" parking space located near the work station. Based on this commitment, it was found there would not be a significant impact on the LOS provided by the police department.

In MDC's findings for the approved zoning and the current stations serving the proposed CRC, it was determined that the proposed development would not have significant impacts on fire and rescue LOS (June 19, 2013 Memorandum, **Attachment 14)**.

Furthermore, the implementation of a regular prescribed burning regime within the on-site preserves would likely have a beneficial impact on threats to human health and safety because the risk of wildlife would be reduced. In addition, the reduction in fuel load from the practice of regular prescribed burns would also reduce the amount of smoke generated during burning. These would both be beneficial outcomes for human health and safety within the community.

Based on this information, Alternative 4 would likely have a beneficial effect on human health and safety.

4.3.13 Schools

Under Alternative 4, the Applicants would donate a 4-ac parcel in the northwest corner of the property proposed for the development of CRC to MDC Public School District. Additionally, Alternative 4 would result in approximately $1,354,000 in ad valorem taxes for the MDC Public School Districts and $85,000 for the Children's Trust. Consequently, Alternative 4 would likely have a beneficial effect on schools.

4.3.14 Transportation

Traffic analysis for Alternative 4 is summarized from the complete analysis included in the CRC UM South Campus Property Transportation Analysis report by Cathy Sweetapple & Associates Transportation and Mobility Planning, dated November 2011 (revised February 2012). Based on this report, Alternative 4 would generate approximately 468 trips from residential development, just over 930 trips from commercial development, 148 trips from the school site, and potentially 107 trips from the library (should MDC accept the donation of the proposed library site). At this trip generation rate the projected adopted maximum service volume would be consumed by more than 5 percent at SW 127th Avenue and SW 152nd Street, adjacent to the proposed CRC property.

The CDMP Amendment Transportation Analysis, approved by MDC, identified roadway and intersection improvements to enhance the roadway network and offset the transportation impacts from the proposed development of CRC. These improvements would expand both capacity and accessibility while providing improvements that would also benefit the surrounding area. Access to and from the Amendment Site would be provided through the expansion of directional and signalized project access intersections along SW 152 Street. Offsite roadway improvements

include the expansion of SW 152 Street to add an additional eastbound travel lane from east of the Hammock to SW 124 Avenue for a distance of approximately 1,500 ft. Each of these proposed improvements are described below.

Development Improvements Required for Alternative 4 (2013 MDC permit):

- SW 152 Street Eastbound Lane Expansion - The Applicants shall provide for the addition of a fourth eastbound travel lane on SW 152 Street from east of the Hammock to SW 124 Avenue (a distance of approximately 1,500 ft). Right-of-way to accommodate this improvement will be taken from the north edge of the site along SW 152 Street.

Access Improvements required for Alternative 4 (2013 MDC permit).

The Applicants shall improve project (CRC) access for the eastern driveway at the intersection of SW 152 Street and SW 127 Avenue as follows:

- Provide an exclusive eastbound right-turn lane;
- Provide dual northbound left-turn lanes, a northbound thru lane and an exclusive northbound right-turn lane;
- Extend the existing westbound left-turn to 300 ft;
- Provide a fourth eastbound thru lane on the east leg of the intersection.

The Applicants shall improve project (CRC) access for the middle driveway at SW 152 Street as follows:

- Provide an exclusive eastbound right-turn lane;
- Provide an exclusive westbound left-turn lane;
- Provide two receiving lanes for entering vehicles at the south leg.

The Applicants shall improve project (CRC) access for the western driveway at SW 152 Street as follows:

- Provide an exclusive eastbound right-turn lane;
- Provide an exclusive westbound left-turn lane;
- Provide two receiving lanes for entering vehicles at the south leg.

The required MDC roadway and intersection improvements are intended to ensure that each of the regionally significant roadways serving the property proposed for CRC would operate within the adopted LOS standards as defined by the CDMP. In addition to the CDMP Amendment Transportation Analysis, additional details of the transportation improvements, including detail on how the access points will operate, are provided in the Project Access and Operational Analysis Report (Feb 2012), which is included in **Attachment 7**. The Applicants have also conducted an analysis of the 127th Avenue and 152nd Street intersection, which resulted in a commitment to include additional improvements through a dual southbound left turn lane (**Attachment 7**). These additional improvements would be voluntary and combined with the

MDC requirements would help to alleviate current transportation issues and would address projected transportation deficiencies. Therefore, Alternative 4 would likely have a beneficial effect on transportation.

4.3.15 Parks and Recreation

To meet MDC's LOS for parks and recreation, the increase in permanent residents proposed in Alternative 4 would require 5.42 ac of local parkland. Park Benefit District 2 currently has a surplus capacity of 478.06 ac of parkland (**Attachment 15**). Under Alternative 4 this District would continue to have a surplus of 472.64 ac of parkland. Therefore, this alternative is anticipated to have no effect on parks and recreation.

4.3.16 Scenic Value

Alternative 4 would result in the demolition of existing abandoned buildings and removal of invasive species from natural areas. Although the buildings are not currently visible to the public, removal of abandoned buildings is generally considered an improvement in scenic value. Removal of exotic species and maintenance of native natural communities within the on-site preserves is expected to provide a benefit to local scenic value. Finally, the façade of the proposed development would be consistent with surrounding communities and could be considered to have a beneficial effect on scenic value. Based on this information, Alternative 4 would be expected to have a beneficial effect on the scenic value.

4.3.17 Noise

The noise impact analysis for Alternative 4 predicted that noise levels related to temporary construction and post-development condition would be between 51-62 dBA. This is below regulatory requirements and would therefore not be considered significant. Based on this information Alternative 4 would likely have minimal to no effect on noise.

4.4 Alternative 5 –County Approved Zoning/Stepping Stones and Southern Corridor

Alternative 5 was developed in response to the Service's July 15, 2014 letter indicating the potential presence of federally listed species within property proposed for CRC **(Figure 11)**. Under Alternative 5, the Service would issue an ITP for the following mixed use development: residential and commercial development parameters (370,000 sq ft of commercial and 900 residential units). Portions of areas planned for development were eliminated in Alternative 5 to provide for a 2.16 ac corridor of additional preserve along the southern boundary of the property (Southern Corridor), for a total of 46.09 preserves and a development footprint of 91.8 ac. This corridor is intended to provide connectivity for wildlife between the east and west preserves. The addition of the Southern Corridor as a preserve supports several Service recovery objectives for pine rocklands including Objective 6, to connect existing pine rocklands by acquiring lands for conservation between them (Service 1999). The proposed Southern Corridor would also be contiguous with a section of undeveloped DOD land south of the proposed CRC. Alternative 5 also includes 2.86 ac of native landscaped areas that would be planted with pine rockland species throughout the development, considered to be "Stepping Stones".

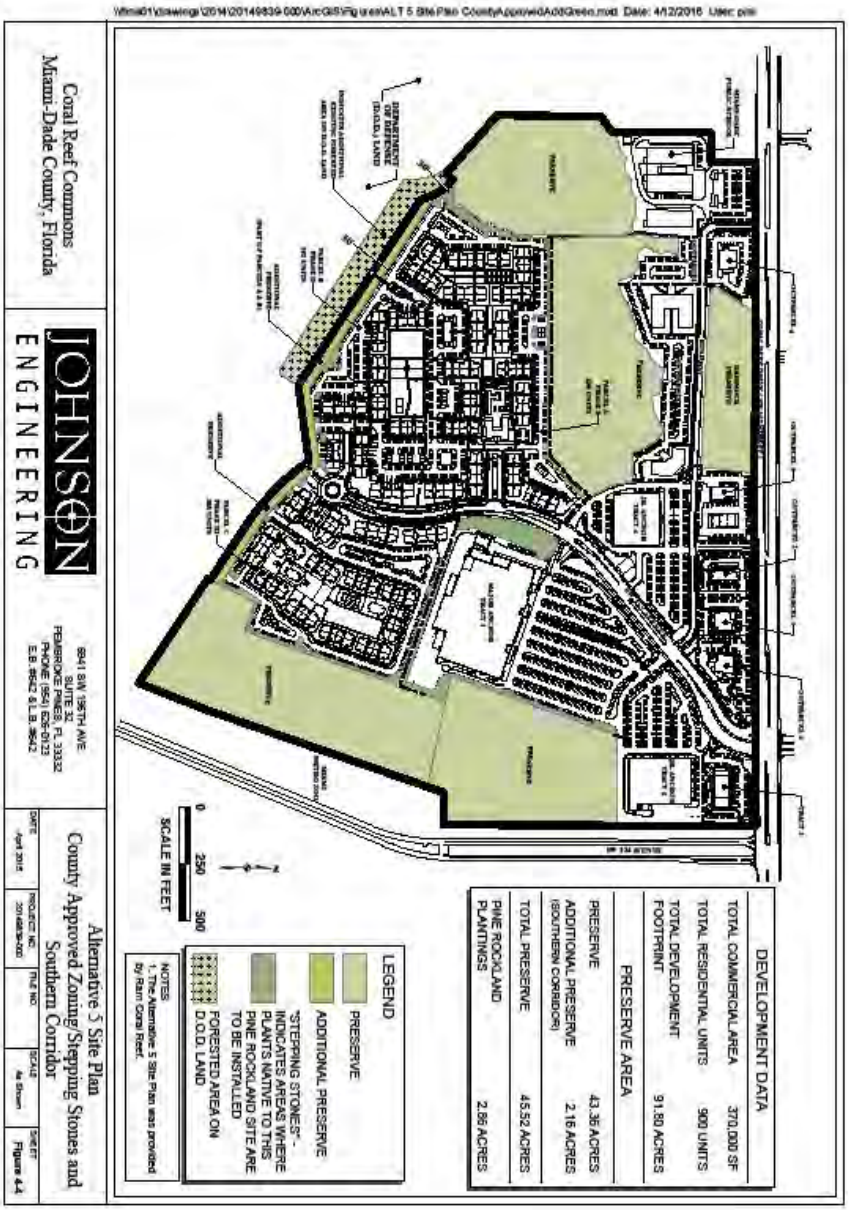

Figure 11. Alternative 5 - County Approved Zoning/Stepping Stones and Southern Corridor

4.4.1 Geology, Soils, and Topography

Under Alternative 5, direct impacts to soils would include the conversion of just under 58 ac of Opalocka Rock Outcrop and Biscayne marl drained series soils to Urban Land Complex soils and erosion of soils during construction. Approximately 34 ac of these soils have already been altered through historic scraping activities. BMPs, minimization measures and benefits from prescribed burning would be the same as those described in Alternative 4. With the exception of the difference in acres of conversion of soil series, impacts to geology, soils, and topography, the impacts of Alternative 5 would be expected to be the same as those described for Alternative 4. Alternative 5 would likely have no significant adverse effects on these resources.

4.4.2 Water Resources

Under Alternative 5, impact to water resources would be addressed through the originally approved design associated with the 2013 county approvals. Standards for this system are summarized under Alternative 4. Under Alternative 5, there would likely be a beneficial effect to surface water management resulting from the implementation of runoff treatment, which currently is allowed to percolate into the groundwater in an untreated state.

4.4.3 Air Quality

Effects to air quality under Alternative 5 would be expected to be the same as those described under Alternative 4. Alternative 5 would likely have no significant adverse effect on air quality.

4.4.4 Land Use/Zoning

Currently, the property proposed for CRC is functioning as an abandoned animal science and medical research facility. Under Alternative 5, the property would be redeveloped and would ultimately function as a mixed-use development that would include 370,000 sq ft of commercial real estate and provide 900 residential units. Land use categorized as developed land would be increased from 33.4 ac to 91.8 ac. Existing zoning for the site allows up to 1,200 unit density; therefore, Alternative 5's proposed density of 900 residential units would be allowable. Under Alternative 5, the proposed commercial development intensity would also fall within the zoning restrictions; therefore, Alternative 5 would likely have no effect on zoning.

4.4.5 Natural Forest Communities

Impacts to NFCs under Alternative 5 are consistent with those described under Alternative 4. These impacts have been permitted by MDC and comply with Section 24-5 of the MDC Code. Consequently, despite the loss of additional habitat, the long term management and protection of the remaining NFC is likely to have a beneficial effect to the resource.

4.4.6 Vegetative Communities

Alternative 5 has a development footprint of 91.8 ac (including the 2.86-ac Stepping Stones), of which approximately 33 ac is previously developed. The remaining land use within the development footprint would include a conversion of 20.8 ac of disturbed upland and 36.2 ac of

pine rocklands to a developed land use category. Additionally, approximately 46 ac of preserves (42 ac pine rockland, 3.7 ac rockland hammock) would be placed under a restrictive covenant and undergo restoration activities. Alternative 5 includes the addition of the 2.16-ac Southern Corridor as part of the preserves on the property. The purpose of the Southern Corridor is to provide connectivity between the east and west preserves. Alternative 5 also includes 2.86 ac of native landscaped areas that would be planted with pine rockland species throughout the development.

As described in Alternative 4, for the purposes of the proposed CRC a habitat functional assessment was developed for the pine rocklands and specifically the property proposed for CRC (see Section 5.0 HCP). The functional assessment evaluates Alternative 5 to be a net decrease in overall habitat value, - 0.64 HVU. Details of the Alternative 5 functional assessment scoring can be found in Section 4.0 of the HCP. The restoration and perpetual management of the approximately 46-ac preserve (with 42 ac of pine rockland habitat) would not fully offset the expected impacts from the development. As previously stated, a functional assessment specific to rockland hammocks was not developed; however, it is likely that perpetual preservation and exotic control within the rockland hammock under Alternative 5 would benefit this vegetative community. Therefore, Alternative 4 is expected to result in adverse effects to the vegetative communities and is quantified as a loss of 0.64 HVU, per the habitat functional assessment.

4.4.7 Wildlife and Protected Species

The habitat functional assessment described in 4.4.6 (above) and described in detail in Section 5 of the HCP, was also developed to assist in evaluating the effects of the proposed CRC development on wildlife and protected species. Because the health and quality of pine rockland habitat is correlated to the health and abundance of pine rockland dependent species this was identified as a useful tool (surrogate) for evaluating impacts (negative and beneficial) to the covered species and other sensitive species (Table 3 and 4). Although some of these species are not pine rockland dependent, in general, high quality native habitat is commonly considered to be beneficial for other native generalist species.

As previously stated in Section 4.4.6, Alternative 5 would result in a loss of the functional value of the pine rockland habitat and a net adverse effect to the vegetative communities considering development and conservation activities. Consequently, resident wildlife populations, particularly pine rockland dependent species would also be expected to also experience some adverse effects. However, wildlife and protected species are also expected to benefit from the restoration and management of the on-site preserve areas proposed in Alternative 5. As the quality of pine rockland habitat within the preserve areas improves through restoration activities including exotic removal and implementation of fire, wildlife populations are anticipated to respond positively and increase in abundance and distribution. In addition, plants within the seed bank may re-establish, and mobile species not currently using the area could migrate to the improved habitat from nearby pine rockland habitat on adjacent lands.

Although beneficial effects to the covered species would be anticipated from the restoration, perpetual preservation, and management of the on-site preserves, based on the functional assessment, these benefits would not be expected to offset the adverse effects. Accounting for the presence, quality and availability of essential resources (*e.g.* foraging, shelter, and

reproductive habitat, pineland croton, and other herbaceous nectar-producing plants), time-lag between perturbations (mechanical vegetation/debris removal, prescribed burns, other potential restoration and management actions), and habitat connectivity between and among habitat polygons that would be restored, preserved and managed under this alternative, the functional assessment indicates that 15.94 HVU would be impacted under Alternative 5 and there would be an overall decrease in habitat function of -0.64 HVU from baseline conditions. Consequently, Alternative 5 would be expected to result in an overall adverse effect to the covered species.

CH occurs both within the proposed developed areas and within the on-site preserves of Alternative 5. Designated CH for BSHB and leafwing overlap entirely within the proposed CRC (90.2 ac), as does the designated CH for Carter's small-flowered flax and Florida brickell bush (104.06 ac). Alternative 5 would result in the loss of 45.36 ac of CH for the butterflies and 55.78 ac of CH for the plants. CH within the on-site preserves would be temporarily disturbed during restoration activities; however, the success criteria, which the land will be managed to reach, include the PBF's and support the PCEs of the CH for the species. Under Alternative 5, further development of 44.84 ac of CH for the butterflies and 48.22 ac of CH for the plants would be avoided through the commitments to protect the on-site preserves under a conservation easement.

Section 4.5.7 includes an in-depth discussion on the effects of Alternative 6 on the covered species (Table 3) as well as the special status plant (Table 4) that have the potential to occur within the HCP Plan area. Similar effects would be anticipated for Alternative 5 although the magnitude of the effects would vary based on the amount of development and restoration activities.

4.4.8 Invasive Species

Under Alternative 5 invasive species would be managed within the 46 ac of on-site preserves. Therefore, Alternative 5 would likely benefit efforts to control invasive species and increase native species composition, abundance and diversity. Overall, Alternative 5 is anticipated to have a beneficial effect on controlling invasive species.

4.4.9 Cultural Resources

Alternative 5 effects on cultural resources would be identical to Alternative 4, which was found to have no adverse effects on cultural resources.

4.4.10 Socioeconomic

Alternative 5 would likely have the same beneficial effects on socioeconomics as Alternative 4.

4.4.11 Water Supply, Wastewater, Solid Waste

Under Alternative 5, the effects to water supply and demand would be the same as those described in Alternative 4. Alternative 5 would likely have no effect on these resources.

4.4.12 Human Health and Safety

Under Alternative 5, the beneficial effects to human health and safety are expected to be the same as those described in Alternative 4.

4.4.13 Schools

Under Alternative 5, the beneficial effects to school resources are expected to be the same as those described in Alternative 4.

4.4.14 Transportation

Under Alternative 5, the beneficial effects to transportation are expected to be the same as those described in Alternative 4.

4.4.15 Parks and Recreation

The effects to park and recreation are expected to be the same under Alternative 5 and those described under Alternative 4. Because the District will continue to a surplus of 472.64 ac of parkland per MDC LOS, Alternative 5 is expected to have no effect on parks and recreation.

4.4.16 Scenic Value

Under Alternative 5, the beneficial effects to the scenic value are expected to be the same as those described in Alternative 4.

4.4.17 Noise

Under Alternative 5, noise levels related to temporary construction and post-development condition are expected to be the same as Alternative 4. Based on this information, Alternative 5 would likely have minimal to no effect on noise.

4.5 Alternative 6 –Reduced Commercial/Increased Preserves (Preferred Alternative)

Alternative 6 is the preferred alternative as it fulfills the Applicants' purpose of creating an economically sustainable community with residential and commercial development, and provides measures to avoid and minimize impacts and increases the on-site preserves, while continuing to include the Southern Corridor and Stepping Stones. Alternative 6 also includes the addition of land management and additional protection on a 50.96-ac parcel of UM land, known as "UM Richmond Campus" (Off-site Mitigation Area). Under Alternative 6, the Service would issue an ITP for activities related to the development and operation of the proposed mixed-use development and on-site preserves and Off-site Mitigation Area. This alternative allows for commercial development along the main spine road, but avoids and eliminates impacts to an additional 5.45 ac of pine rockland habitat, thereby reducing the total proposed commercial development from 370,000 sq ft to 289,000 sq ft commercial units.

Alternative 6 includes a development footprint of 86.49 ac with 289,000 sq ft of commercial units, a school site, and a total of 900 residential units (**Figure 12**). Alternative 6 includes the 3.88-ac Stepping Stones landscaped with native pine rockland species within the development as well as 51.41 ac of on-site preserves. The on-site preserves would be permanently conserved under a conservation easement and are composed of: (1) pine rockland enhancement and preservation, 47.06 ac, (2) pine rockland restoration, 0.39 ac (3) upland enhancement and preservation, 3.85 ac; and (4) firebreak/preserve access, 0.11 ac. The on-site preserves include the Southern Corridor (2.16 ac) that is intended to provide connectivity between the east and west sections of the on-site preserves. The on-site preserves will be managed with the intention of improving the overall habitat quality following the On-site Preserves Mitigation Plan.

The additional 5.45 ac of habitat included in the preserves under Alternative 6 will expand the western on-site preserve and connect two preserve parcels to its north and south. Once restored, this habitat is intended to provide improved connectivity within the on-site preserves areas. **Table 11** provides a break-down of the proposed CRC under Alternative 6.

Table 11. Description of the proposed CRC under Alternative 6

	Acreage
Total Project Area	**188.86**
CRC Property (total)	**137.90**
Off-site Mitigation Area	**50.96**
On-site Preserves (51.41 ac) and Stepping Stones (3.88 ac)	**55.29**
West Preserve	23.92
East Preserve	21.61
Southern Corridor	2.16
Rockland Hammock	3.72
Stepping Stones (On-site Mitigation)	3.88
Development Areas (less Stepping Stones)	**82.61**
Mitigation Areas for Project (On-site and Off-site Total)	**106.25**

Alternative 6 was designed to expand and improve the existing spine road to minimize the development footprint while simultaneously committing to improvements along the spine road. Proposed development areas are placed adjacent to the spine road to increase efficient use of space, maximize preservation of the largest contiguous areas of pine rockland and minimize impacts to areas along the existing spine road and within the hammock area in the northwest portion of the property proposed for the development of CRC when compared to Alternatives 4 and 5. MDC has also required financial commitments, amortized over several years, associated with funding on-site and off-site infrastructure and traffic improvements.

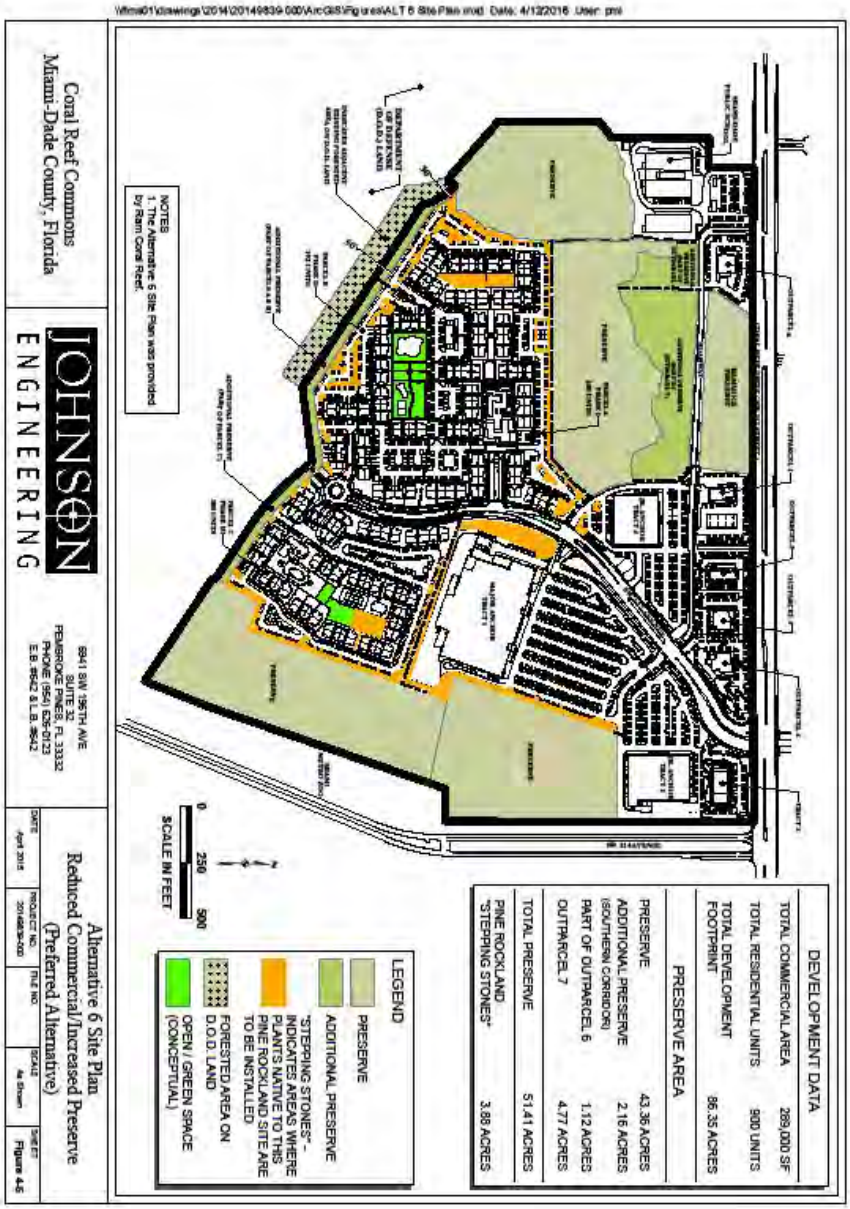

Figure 12. Alternative 6 - Reduced Commercial/Increased Restoration (Preferred Alternative)

In addition, under Alternative 6, the UM would modify the deed restriction of the UM Richmond Campus to incorporate protections for the species in Table 3 and preserve and manage the 50.96- ac parcel of pine rockland habitat in perpetuity (Off-site Mitigation Area). Currently the protection is contingent on the deltoid spurge. The enhanced deed restriction and permit conditions would obligate UM to maintain the property as protected in perpetuity and implement a burn management plan. Pursuant to the Off-site Mitigation Area Burn Plan (Appendix J1 of HCP), habitat management would include removal of invasive exotic species and the implementation of prescribed burning. Currently, exotic vegetation management is conducted on the Off-site Mitigation Area; however, there is no requirement to conduct prescribed burning. The additional habitat management on this land would continue to support and improve conditions for all the covered species and has the potential to increase population abundance at that site. Details regarding this mitigation feature of the CRC HCP are presented in Section 7.9 of the HCP and in Appendix J1 of the HCP.

4.5.1 Geology, Soils, and Topography

Under Alternative 6, direct impacts to soils would include the conversion of just under 54 ac of Opalocka Rock Outcrop and Biscayne marl drained series soils to Urban Land Complex soils and erosion of soils during construction. Approximately 28 ac of these soils have already been altered through historic scraping activities. BMPs, minimization measures and benefits from prescribed burning would be the same as those described in Alternative 4. With the exception of the difference in acres of conversion of soil series, impacts to geology, soils, and topography, the impacts of Alternative 6 would be expected to be the same as those described for Alternative 4. Alternative 6 would likely have no significant adverse effects on these resources.

4.5.2 Water Resources

Under Alternative 6, impacts to water resources would be addressed through the originally approved design associated with the 2013 county approvals. Standards for this system are summarized under Alternative 4. Under Alternative 6 there would likely be a beneficial effect to surface water management resulting from the implementation of runoff treatment, which currently is allowed to percolate into the groundwater in an untreated state.

4.5.3 Air Quality

Effects to air quality under Alternative 6 are expected to be the same as those described under Alternative 4. Alternative 6 would likely have a have no significant adverse effect on air quality.

4.5.4 Land Use/Zoning

Currently, the proposed CRC property is functioning as an abandoned animal science and medical research facility. Under Alternative 6 the site would be redeveloped and would ultimately function as a mixed-use development that would include 289,000 sq ft of commercial real estate and provide 900 residential units. Land use categorized as developed land would be increased from 33.4 ac to 86.35 ac. Existing zoning for the site allows up to 1,200 unit density; therefore, Alternative 6's proposed density of 900 residential units would be allowable. Under

Alternative 6, the proposed commercial development intensity would also fall within the zoning restrictions; therefore, Alternative 6 would likely have no effect on zoning.

4.5.5 Natural Forest Communities

Impacts to NFCs under Alternative 6 are consistent with those described under Alternative 4. These impacts have been permitted by MDC and comply with Section 24-5 of the MDC Code. Therefore, despite the loss of additional habitat, the long term management and protection of the remaining NFC is likely to have a beneficial effect to the resource.

4.5.6 Vegetative Communities

Alternative 6 has a development footprint of 86.35 ac (including 3.88 ac of Stepping Stones), of which approximately 33 ac is previously developed. The remaining land use within the development footprint would include a conversion of 20.8 ac of disturbed upland and 36.2 ac of pine rocklands to a developed land use category. The development footprint includes 3.88 ac of Stepping Stones that will be initially cleared for construction but would be replanted with native pine rockland species. These Stepping Stones are placed strategically in the development to promote movement of species between the preserves. Additionally, 51.54 ac of on-site preserves, including 46.94 ac of pine rockland and 3.74 ac of rockland hammock, would be placed under a conservation mechanism and undergo restoration activities. Alternative 6 also includes the 2.16-ac Southern Corridor, as described in Alternative 5, with the intent to connect the east and west on-site preserves. This alternative also increases the undeveloped lands by 5.45 ac, through incorporating a section of pine rockland habitat into the western on-site preserve. This 5.45-ac parcel allows for additional connectivity between on-site preserves to the north and south of this section.

As described in Alternative 4, for the purposes of the proposed CRC a habitat functional assessment was developed for the pine rocklands and specifically the property proposed for CRC (see Section 5.0 HCP). The functional assessment evaluates Alternative 6 to be a net increase in overall habitat value, + 3.10 HVU. Details of the analysis for Alternative 6 can be found in Section 4.0 of the HCP. The increase in 3.10 HVUs includes the post restoration of the 51.54-ac on-site preserves, of which 46.94 ac are pine rockland. Based on these findings, Alternative 6 would likely result in beneficial effects on the functional value of pine rocklands within the on-site preserves and fully offset functional habitat loss within the development footprint. As previously stated, a functional assessment specific to rockland hammock habitat was not developed; however, restoration and management of adjacent pine rocklands and perpetual preservation and exotic control under this alternative would likely benefit the rockland hammock vegetative community.

Furthermore, the Off-site Mitigation Area Mitigation Plan proposed for the 50.96-ac Off-site Mitigation Area is expected to provide beneficial effects to the pine rockland vegetative communities within this parcel. Educational outreach activities to the public on pine rocklands habitat and the importance of fire, are also intended to promote good stewardship of the on-site preserves by the local community.

Therefore, although Alternative 6 would result in adverse effects the vegetative communities in terms of loss of habitat from development, a net benefit in the functional value of the remaining habitat is expected over time from the ongoing conservation and management of the on-site preserves and the Off-site Mitigation Area.

4.5.7 Wildlife and Protected Species

The habitat functional assessment described in 4.5.6 (above) and described in detail in Section 5 of the HCP, was also developed to assist in evaluating the effects of the proposed CRC development on wildlife and protected species. Because the health and quality of pine rockland habitat is correlated to the health and abundance of pine rockland dependent species this was identified as a useful tool (surrogate) for evaluating impacts (negative and beneficial) to the covered species and other sensitive species (Table 3 and 4). Although some of these species are not pine rockland dependent, in general, high quality native habitat is commonly considered to be beneficial for other native generalist species**.**

As previously stated in Section 4.5.6, Alternative 6 is expected to improve the functional value of the pine rockland habitat that is preserved after development and result in a net benefit to the vegetative communities considering development and conservation activities. Consequently, resident wildlife populations, particularly pine rockland dependent species would also be expected to experience an overall beneficial effect. Regardless, adverse effects would also be expected and are explored briefly here.

Alternative 6 would result in the loss of 82.61 ac of habitat (excluding the 3.88 ac of Stepping Stones), which includes developed, disturbed upland, and pine rockland habitat (Table 4-2; Figure 2-2 of HCP). This loss of habitat would further fragment the Richmond Area, which is the largest remaining patch of pine rockland habitat outside of ENP. Alternative 6 places a residential and commercial development in the center of the on-site preserves, which would inhibit connectivity and dispersal of species across the proposed CRC. In addition, the presence of the community would necessitate elements desired by people that can be detrimental to wildlife, such as pesticides. The community would also contribute other disturbance factors such as noise, lighting, and traffic that can adversely affect the covered species. Furthermore, land management activities (both on-site and off-site), including mechanical, chemical, and prescribed fire treatments also have the potential to harm, harass, and kill the covered species. However, the adverse effects from land management should be considered in the context that these actions are intended to improve the overall quality of the lands and improve its suitability for the covered species. In certain situations, the loss of an individual may be an appropriate sacrifice to realize a greater benefit for the species as a whole.

The placement of the community between the on-site preserves and within the Richmond Area has the potential to make the implementation of prescribed fire more difficult due to concerns over smoke, health effects, and loss of property. In addition, it could further complicate the ability of neighboring land owners to conduct prescribed fire because of the addition of people in the landscape and the need to further manage smoke and property risks. Alternatives to prescribed fire, such as mechanical removal of woody vegetation are not as ecologically effective as fire. Mechanical treatments do not replicate fire’s ability to recycle nutrients to the soil, a

process that is important for many pine rockland species (URS 2007). To prevent organic soils from developing, uprooted woody debris requires removal, which adds to the required labor and the potential for trampling. The use of mechanical equipment can also damage soils and inadvertently include the removal or trampling of other non-target species or CH (URS 2007).

The adverse effects described above would be avoided, minimized, and mitigated through the mitigation plans for the on-site preserves and Off-site Mitigation lands described in Sections 6.0 and 7.0 of the HCP. This includes, but is not limited to: the community BMPs, Southern Corridor, the Stepping Stones and their placement along some of the perimeter of the on-site preserves (provides a buffer to disturbances), the implementation of small (3 to 5 ac) land management units to control factors related to prescribed fire, the permanent conservation of 51.41 ac of on-site preserves, and the implementation of the Off-site Mitigation Area Mitigation Plan on the 50.96-ac Off-site Mitigation Area.

The value of the Southern Corridor for connectivity between the two preserves would vary by species and their dispersal capabilities. Corridor width is positively associated with abundance and species richness for birds, mammals, and invertebrates (Lindenmayer and Franklin 2002 as cited in Environmental Law Institute 2003). Corridors that are too narrow could consist entirely of edge and may actually be a detriment to species. The Stepping Stones are intended to provide additional habitat enhancement for some of the covered species, but were specifically designed for BSHB. In addition, the orientation of the on-site preserves, adjacent to pine rockland habitat to the west and east of the proposed CRC, is intended to increase the value of these preserves to species by providing opportunities for species to disperse from on-site preserves to other portions of the Richmond Area. In particular, this would benefit species with low mobility, such as the Miami tiger beetle or those that must traverse habitat exclusively by land, such as the rim rock crowned snake. The on-site preserves would be managed to improve the functional value of the pine rockland habitat and reach the identified success criteria (Table 7-3 of the HCP), which are based on high quality pine rockland habitat. When the on-site preserves reach the success criteria these lands are expected to provide greater opportunity for population growth of the covered species as well as the pine rockland and rockland hammock associated plants.

In summary, although adverse effects to the covered species would be anticipated from the development, the amount of restoration, perpetual preservation, and management of the on-site preserves is anticipated to result in a net benefit based on the functional assessment. Accounting for the presence, quality and availability of essential resources (*e.g.* foraging, shelter, and reproductive habitat, pineland croton, and other herbaceous nectar-producing plants), time-lag between perturbations (mechanical vegetation/debris removal, prescribed burns, other potential restoration and management actions), and habitat connectivity between and among habitat polygons that would be restored, preserved and managed under Alternative 6, the functional assessment indicates that 14.35 HVU would be impacted under this alternative and the net change would be an overall increase in habitat function of +3.10 HVU from baseline conditions. Consequently, Alternative 6 would be expected to result in an overall beneficial effect to the covered species.

CH occurs both within the proposed developed areas and within the on-site preserves of Alternative 6. Designated CH for BSHB and leafwing overlap entirely within the proposed CRC (90.2 ac), as does the designated CH for Carter's small- flowered flax and Florida brickell bush

(104.06 ac). Alternative 6 would result in the loss of 39.47 ac of CH for the butterflies and 52.85 ac of CH for the plants. CH within the on-site preserves would be temporarily disturbed during restoration activities; however, the success criteria, which the land will be managed to reach, include the PBFs and support the PCEs of the CH for the species. Under Alternative 6, further development of 50.73 ac of CH for the butterflies and 51.15 ac of CH for the plants would be avoided through the commitments to protect the on-site preserves under a conservation easement.

The Off-site Mitigation Area is designated CH for BSHB, leafwing, Carter's small-flowered flax, and Florida brickell bush. As with the on-site preserves, this habitat would experience temporary impacts limited to disturbances associated with restoration and management activities (*i.e.* burning, exotic/hardwood removal, *etc.*). However, baseline PCEs would be maintained long-term, habitat quality would be enhanced, further development precluded, and all remaining wildlife habitat within proposed CRC and the Off-site Mitigation Area would be managed consistently with the species' recovery plans in perpetuity. Additionally, the restoration of the on-site preserves and Off-site Mitigation Area would also provide indirect benefits to adjacent wildlife populations by improving connectivity with potential occurrences within adjacent pine rocklands. Including the 50.96 ac of CH in the Off-site Mitigation Area Preservation, Alternative 6 would place 101.69 ac of CH for the butterflies and 102.11 ac of CH for the plants under a long-term conservation mechanism.

As previously stated, Alternative 6 is expected to result in an overall increase in habitat function of +3.10 HVU from baseline conditions; although this is not specific to CH and acres of CH would be lost to development, the remaining CH, including the Off-site Mitigation Area, would be expected to improve in functional value to the species. Consequently, Alternative 6 could be expected to result in net benefit to CH for all the species.

The following is an in-depth discussion on the effects of Alternative 6 on the covered species (**Table 3**) as well as the special status plant (**Table 4**) that have the potential to occur within the HCP Plan area. We include this level of detail for Alternative 6 because it is the preferred Alternative. Similar effects would be anticipated for Alternative 4 and 5 although the magnitude of the effects would vary based on the amount of development and restoration activities.

Bartram's scrub-hairstreak butterfly

Beneficial Effects

The BSHB is restricted to pine rockland habitat; therefore, the portion of the permanent conservation easement that would benefit the species is on 47.69 ac of pine rockland habitat within the on-site preserves and the Southern Corridor as well as the 50.96-ac Off-site Mitigation Area. In addition, the Applicants would establish pine rockland plantings in 3.88 ac of Stepping Stones, which would provide additional habitat enhancement with pineland croton and other nectaring plants. The on-site preserves, Off-Site Mitigation Area, and additional habitat would be managed to provide pineland croton and other species that would support the lifecycle as well as foraging opportunities of the BSHB. The success criteria include a criterion for pine land croton with the expectation that the plant would be available for the BSBH lifecycle. The functional assessment estimates successful management of the proposed CRC would provide an

overall habitat improvement from the baseline condition (40.72 HVUs) to (43.83 HVUs) for an increase of +3.10 HVUs. This improvement of the habitat quality, including an increased abundance of pineland croton, would be expected to increase the occurrence and abundance of BSBH in these areas.

The orientation of the on-site preserves, adjacent to pine rockland habitat to the west and east of the proposed CRC is intended to increase the value of these preserves to the species by providing opportunities to maintain connectivity to the greater Richmond Area, which is captured in the functional assessment and functional lift. Preserving and managing pine rockland habitat on property proposed for the development of CRC that is contiguous with pine rockland habitat off-site would be a benefit because it would allow for improved dispersal of BSHB to adjacent property and greater stability of the population to natural population fluctuations and stochastic events within the greater Richmond Area. When the on-site preserves are managed at the optimum success criterial (level 3), they have the potential to serve as a source population of BSHB to the adjacent pine rocklands. Establishing the preserves adjacent to pine rockland habitat would also limit the fragmentation of the habitat to the central development of the CRC property.

Adverse Effects

Construction

Permanent removal/loss of habitat

As previously stated, BSHB is restricted to pine rockland habitat. BSHB's only host plant is the pineland croton; eggs and immature stages are directly tied to this host plant. Adult BSHB feed on nectar from pineland croton as well as other nectaring plants; however, the butterfly's lifecycle is dependent on the pineland croton. The construction of the residential and commercial facilities and their associated infrastructure would result in the loss of 86.49 ac of habitat. Approximately 33 ac of pine rockland would be developed that supports pineland croton and potentially immature and adult BSHB. The loss of habitat supporting pineland croton has the potential to injure and kill any immature BSHB that occur within the 33 ac. The development would also remove other habitat (approximately 53 ac) that supports adult BSHB by providing nectaring plants. The removal of this vegetation has the potential to adversely affect adult BSHB that currently occupy and use that habitat by removing a food source, stop-over habitat, and habitat that provides connectivity between the pine rockland habitat. Construction activity and associated equipment has the potential to harm, harass, injure and kill BSHB. However, habitat loss and the associated mortality would be the ultimate impact to BSHB from construction.

Adverse effects from permanent modification of existing habitat in Alternative 6 would be minimized by preserving and restoring the remaining 47.69 ac of pine rockland habitat within the on-site preserves and Southern Corridor within the CRC property. The Stepping Stones would provide additional habitat enhancement in patches across the development. Overall, the loss of occupied habitat (pine rockland and other) has the potential to result in the mortality of individual BSHBs. Mortality could occur as pineland croton plants are removed and immature stages BSHB (eggs, larvae, pupae) are not able to escape and could be crushed and killed. Direct

mortality of adult BSHB would be less likely, as these individuals are expected to be able to disperse when the habitat is removed and could likely avoid injury and/or mortality.

Fragmentation of habitat

Fragmentation of pine rockland habitat is a concern for species with low mobility, such as the BSHB, and could result in the isolation of populations leading to reduced gene flow between sites, localized population declines, and potentially localized extirpation. The property where CRC is proposed contains contiguous vegetative habitat of various quality with minor fragmentation from historic buildings. The quality of the habitat for the BSHB in its current state has been evaluated in the functional assessment (40.57 HVUs). The residential and commercial development (86.49 ac) would further fragment the pine rockland habitat by removing the vegetation down the center of the property. Alternative 6 would establish on-site preserves east and west edges of the property proposed for CRC. To reduce the adverse effect of this fragmentation and to create a pathway for BSHB between the two preserves, the Applicants would establish a 2.16 ac Southern Corridor at the southern boundary of the proposed CRC. In addition, Alternative 6 would plant 3.88 ac of Stepping Stones with pine rockland species (including pineland croton) connected and adjacent to the preserves (Figure 7-1; HCP). South of the main anchor store one stepping stone would extend across the property and is intended to provide some opportunity for additional movement of BSHB between the east and west on-site preserves. Because the BSHB has mobility through flight and the Stepping Stones and corridor would provide habitat to move through, it is likely that individuals in the east and west preserves could remain connected at some level following development, and complete genetic isolation would be unlikely to occur. If a local population decline does occur in one portion of the preserve, recolonization could be supported through the corridor and Stepping Stones provided on site. Fragmentation of the habitat would not be anticipated to result in direct mortality of any individual above what would be anticipated from the loss of habitat. However, because the connective areas across the proposed CRC would be relatively small and narrow, over time, fragmentation could reduce population viability by decreasing the opportunities for genetic exchange and recruitment between preserves during natural population fluctuations or stochastic events.

Other disturbance

Alternative 6 would result in an increased level of disturbance including noise through the increased presence of humans and/or associated equipment, vehicles and/or machinery. For construction these effects would be temporary in nature. Construction activity and associated equipment has the potential to harm, harass, injure and kill BSHB. Although some BSHB bearing pineland croton may be crushed by equipment or adult BSHB harassed out of the development footprint, the ultimate impact to BSHB from construction would be the loss of habitat. The disturbance effects of construction on the on-site preserve areas would be minimized by installing silt fencing around all ground disturbing activities, and by staging all construction material and equipment within previously disturbed areas and outside of the preserve boundaries. In addition, all on-site preserve boundaries would be delineated with enviro-fencing to preclude entry and disturbance during construction. The effects of increased physical disturbance are not known on BSHB. Based on information available at this time, this

disturbance during construction would not be anticipated to have any additional adverse effects to BSHB above those captured during habitat loss.

Residential and Commercial Operation

Increased potential for predation

Human presence could result in the increased potential for predation of individual BSHB from introduced predators such as domestic dogs and cats. These threats would be minimized through the requirement of dogs to be leashed, exclusion of residents from the preserves (through posted signs), and through the educational materials and kiosks. Based on the implementation of the minimization measures, residential and commercial development would not be expected to increase the predation threat to BSHB.

Collection

Rare and endangered butterflies are often subject to collection by enthusiasts. The presence of the community could provide easy access to BSHB habitat and provide a new opportunity for collection. Although the preserves would not be intended to allow for public access, it could be possible that an individual could trespass and collect BSHB from the on-site preserves. BSHB that use the Stepping Stones could also be exposed to the threat of collection. Over time, the population of BSHB would be expected to increase in the on-site preserves. This could draw more collectors to the area and increase the number of butterflies that are collected annually.

Vehicles

The presence of the residential and commercial buildings would greatly increase the amount of vehicle traffic within property proposed for CRC above what is currently on-going. Vehicles have the potential to adversely affect BSHB from hitting and killing butterflies, temporarily obscuring movement across the roadway between the preserves, and potentially crushing a pineland croton or other nectaring plants. The speed limit within the commercial and residential area would be relatively slow, 25 miles per hour (mph) and 15mph, respectively; consequently, it is anticipated to be a rare and unlikely event that a BSHB would be killed by a passing vehicle. Furthermore, the vehicle traffic would be expected to be intermittent, allowing opportunity for BSHB to pass through the main roadway between the preserves unimpeded. Finally, pineland croton and other nectaring plants within the corridor and Stepping Stones should not be crushed unless residents take their cars outside of designated parking and driving areas. Therefore, although vehicles have the potential to adversely affect BSHB within the residential and commercial development, they would not be expected to adversely affect the species.

Pesticide Use and Mosquito Control

Pesticides (insecticides, herbicides, rodenticides *etc.*) would likely to be applied to address infestations of unwanted insects or rodents from the homes and commercial buildings as well as treat unwanted invasive plants in the community and Stepping Stones. Pesticides can kill BSHB and the host plant pineland croton. The Applicants have developed community minimization measures and best management practices (Section 6.2.3 of the HCP) to minimize the adverse effects of pesticide use on BSHB. Application of insecticides within the Stepping Stones would

be restricted and application of herbicides in the area would give preference for systemic herbicides that exhibit low soil activity. Efforts would be made to avoid herbicide application directly to pineland croton and only target nuisance species. In addition, the community Integrated Pest Management would include education for the lessees, property owners, and/or tenants on proper pest management. If BSHB occupy the Stepping Stones and community area, it would be likely that some individuals would be killed during pest management activities; however, the frequency and number would be minimized by the aforementioned minimization measures and best management practices.

Mosquito control within the proposed CRC residence and area would be conducted by Miami-Dade Mosquito Control District (MDMC). MDMC follows application guidance from the Service that avoids and minimizes the likelihood of adversely effecting BSHB by implementing buffers to occupied areas and CH. The presence of the new residence would increase the likelihood of mosquito control application above what is currently occurring; however, because MDMC would implement the appropriate buffers it would be unlikely that BSHB adults or immature stages would be affected by application in the developed area.

Pine Rockland Habitat Management

Pine rockland habitat management would include a combination of mechanical, chemical, and prescribed fire treatment in order to adaptively manage the Southern Corridor and on-site preserves to reach success criteria and maintain pine rockland habitat. The prescribed fire would not be applied to the Southern Corridor due to its size. The Stepping Stones would be planted with pine rockland species and managed as landscaping as described in Section 7.2 of the HCP. Prescribed fire would be the preferred method of long-term management of the preserves; however, mechanical and chemical treatments would occur in most areas as part of the initial site management to address reduction of fuel load and exotics. Mechanical and chemical treatments would continue to be used, as needed, to reach the success criteria.

The mechanical clearing, chemical treatments, and prescribed fire may affect BSHB through disturbance (harassment), injury, and mortality. Disturbances include displacement or alteration of normal behavior due to the presence of fire or the human activities associated with land management treatments. Each land management technique is evaluated below.

Mechanical Treatment

Restoration activities in the on-site preserves would commence in some areas with mechanical removal of vegetation to reduce exotics and lower the fuel load prior to implementing the first burn (Appendix J, *Section 4.4 Annual Work Plan* – HCP). Mechanical treatment would include bringing heavy equipment into the preserves to manipulate vegetation as well as establish fire-breaks in some areas. As proposed, firebreaks around management units totals 21,755 ft. Most the firebreaks are considered existing/paved (11,945 ft), which primarily consist of the existing or proposed development boundary along the outside of the on-site preserves. Firebreaks within the on-site preserves total approximately 9,810 ft; of this approximately 5,397 ft would be new (created) firebreaks, 1,128 ft enhanced along a historically existing trail that has not been maintained, 2,661 ft of existing firebreaks that would be enhanced and 624 ft of an existing asphalt trail. Heavy equipment has the potential to injure or kill immature BSHB by crushing

pineland croton occupied by instar, larval, or eggs stages. Effects from heavy equipment would be minimized by using machinery that is the smallest possible to complete the task (thereby reducing its disturbance foot print) and using rubber tracked and tired vehicles (to reduce crushing pineland croton). Pineland croton would not be strategically avoided because routing heavy equipment around individual plants or small patches could result in additional ground disturbance and harm to the limestone substrate, which would undermine the overall goal of habitat management. In general, pineland croton densities are sparse in management units where mechanical treatment would be need for pine thinning or reduction in Burma reed. However, pineland croton that is present could be crushed and therefore, some individual BSHBs could be killed during this treatment.

Mechanical treatment would continue to be used within the on-site preserves to reach success criteria if prescribed fire cannot be deployed. Fire management of pine rockland habitat can be hampered by the pattern of land ownership and development; residential and commercial properties are embedded within or in close proximity to pine rockland habitat (Service 2014). For example, as noted in Table J2-1 in Appendix J of the HCP, in the Richmond Area, the majority fires occurring in this region over the past 27 years were the result of wildfires, not prescribed burn treatments or other land management. MDC has indicated that some of their inability to put prescribed fire on their property is related to insufficient resources. The proposed CRC would have sufficient resources and residents would sign acknowledgement notices that they are residing within an area where prescribed fire would be conducted; therefore, some of the challenges typically confronting implementation of prescribed fire would be minimized within the community. However, there still would exist the possibility that in some years prescribed fire could not be implemented because of environmental conditions (*e.g.*, too wet or too dry); therefore, implementation of additional mechanical clearing could be needed to reach the success criteria. Although adverse effects from mechanical treatment result through different pathways than prescribed fire (*e.g.* individuals are crushed rather than burned), the overall loss of individuals during preserve management would not be anticipated to be different because the acreages managed would be the same.

Mechanical treatment could be less beneficial than fire because it does not quickly convert debris to nutrients, and remaining leaf litter could suppress croton seedling development; fire has also been found to stimulate seedling germination (Anderson and Henry 2015). If only mechanical treatment is conducted for many subsequent years, adaptive management would be relied upon to reach success criteria; however, because mechanical treatment may not provide the same ecological benefits as fire, there could be indirect effects and populations of both BSHB and pineland croton could decline.

Herbaceous Chemical Treatment

Herbaceous chemical treatment would be deployed to reduce exotic plant species and adaptively manage the Southern Corridor and on-site preserves to reach the success criteria. Herbicide treatment has the potential to adversely affect BSHB if it is applied to an occupied pineland croton plant and it kills the plant, killing BSHB. It can also affect BSHB if treatment kills pineland croton and other nectaring plants that adult BSHB are feeding from. Herbaceous chemical treatment would follow the BMPs for land management (Section 6.2.4.4; HCP) including conducting treatment when drift and damage to non-target species would be minimized

and giving preference for systemic herbicides that exhibit low soil activity. Workers would be educated to identify pineland croton and care would be taken not to apply chemical treatment to pineland croton. Consequently, adverse effects to the species would not be anticipated from chemical treatment in the Southern Corridor or on-site preserves.

Prescribed Fire

Prescribed fire would be the preferred method for long term management of the on-site preserves because pine rockland habitat is a fire adapted ecosystem. Prescribed fire can adversely affect BSHBs by directly killing individuals (adult, immature, and eggs). When fire advances quickly adult BSHB are consumed by an advancing fire. However, Salvato and Salvato (2010) indicate that BSHB can disperse from small-scale prescribed burns. In addition, prescribed fire temporarily modifies the habitat and reduces the abundance and distribution of the host plant, pineland croton. Alternative 6 would minimize the adverse effect of burning by implementing the prescribed fire in a mosaic pattern that creates refuge for adult BSHB to escape during the burn and reducing the intensity of the fire to lower the likelihood that all immature stages and occupied and unoccupied pineland croton burn. In addition, to ensure portions of pineland croton are not burned, wetlines would be established around sections of pineland croton populations during some burns. Prescribed fire could result in temporary displacement of the BSHB within the on-site preserve areas, due to loss of pineland croton and nectar sources. In most instances pineland croton returns to burned pine rocklands within 1 to 3 months post-burn; however, it could take up to 6 months before the BSHB would use the new growth for oviposition (Lenczewski 1980; Salvato and Salvato 2010). Because the on-site preserves would be burned in small units, it would be expected that adult BSHB would be able to find refuge in the adjacent preserved parcels. In addition, because the on-site preserves would be located adjacent to pine rockland habitat off-site, these areas would provide valuable refuge for movement.

Most of the prescribed fire would be conduct by foot, and vehicles are expected to remain on the firebreaks, however, some vehicles within the on-site preserves could be necessary for ignition or fire suppression. Immature BSHB could be killed if the pineland croton plant they are living on is trampled by equipment, vehicles, and people moving in and out of burn units and staging areas or from the creation of fire breaks.

Although Alternative 6 would implement BMPs, described above and in Section 6.2.4.4 of the HCP, to reduce the likelihood that BSHB would be killed during prescribed fire, some pineland croton would be expected to be incidentally crushed and killed as well as damaged or burned by equipment and fire. Therefore, BSHB would be expected to be injured and killed during this land management activity in the on-site preserves.

Invasive Exotic Plants

In general, any of the above land management techniques could adversely affect BSHB if invasive plant species recolonize after disturbance and decrease the opportunity for pineland croton and nectar plant species. However, the success criteria include a criterion that non-native plant species should be less than 5 percent; therefore, adverse effects from non-natives would not be anticipated in the Southern Corridor or on-site preserves if the HCP is in compliance.

Pesticides

Pesticide use, other than herbaceous chemical treatment, in the Southern Corridor and on-site preserves would not be expected to be a regular occurrence. However, pesticides could be needed to manage an invasive species. Insecticides could adversely affect all life stages of BSHB by killing them if applied to the individual. Pest management of insects in the corridor and preserves would be restricted to target those pests that are problematic to the species covered by the ITP and/or meeting success criteria and would be used as part of the adaptive management strategy. Because of the restrictions in their use and the limited application, it is expected to be unlikely that pesticide use in the Southern Corridor and on-site preserves would adversely affect BSHB.

Eastern Indigo Snake

Beneficial Effects

There are expected to be minimal site specific benefits to the indigo snake other than what has been described under *Wildlife and Protected Species*. The Southern Corridor and on-site preserves would be managed to provide native pine rockland and rockland hammock habitat that would be expected to support the lifecycle of the indigo snake. Prescribed fires would be expected to improve vegetative cover and prey species abundance. The indigo snake inhabits fire-adapted vegetation, so the proposed activities would be expected, over a term of several years to a decade, to be beneficial to the indigo snake.

Adverse Effects

Construction

Permanent removal/loss of habitat

Indigo snakes are habitat generalists; they will use everything from the pristine uplands and wetlands to highly disturbed residential areas (Bolt 2006). Indigo snakes historically occurred within the Richmond Area, although little information is available on their current status in the area. Due to their use of subterranean refugia and frequent long-distance dispersal, detectability of indigo snakes is low (Hyslop *et al*. 2012). Indigo snake surveys were not conducted within the property proposed for development of CRC. No individuals were observed during the transect surveys, conducted for other species, nor were any opportunistic observations made of this species.

Indigo snakes are highly mobile and usually have large home ranges. Home ranges may cover several habitat types, including pine flatwoods, scrubby flatwoods, high pine, dry prairie, tropical hardwood hammocks, edges of freshwater marshes, agricultural fields, coastal dunes, human-altered habitats, and agricultural lands (such as citrus) (Service 1999). In Florida, home ranges for females and males range from 5 to 371 ac and 4 to 805 ac, respectively (Smith 2003). In south-central Florida, the home range of adult males averages about 184 ac, and can be as large as 492.2 ac. The home range of an adult female averages about 46 ac and can be as large as 120.1 ac (Layne and Steiner 1996).

Under Alternative 6, the proposed CRC would convert 73.75 ac of vegetated land (86.35 ac of development minus 12.6 ac of currently impervious surfaces) into residential and commercial facilities and their associated infrastructure. This loss of habitat would adversely affect any indigo snakes that currently occupy the development area. Any indigo snake that has a home range that largely overlaps this area would be forced to move or readjust its home range to find resources for feeding, breeding, and sheltering. Although the exact shape and size of the indigo snakes' home range in the area is unknown, based on the average home range sizes of males and females (184 and 46 ac, respectively), approximately one male, overlapping the territories of 2 females, could occupy the construction footprint the proposed CRC. Indigo snakes can use highly disturbed residential areas; however, the community in CRC would not be expected to provide sufficient resource to support the same abundance and distribution of indigo snakes post construction as it would in its current condition. Indigo snakes that would be displaced from their home range could die if they cannot find sufficient resources, either because they are not available (due to other urbanization nearby) or because the adjacent habitat is already occupied by another indigo snake. The Southern Corridor and on-site preserves would provide opportunities for indigo snakes within the construction footprint to disperse and seek new territories.

In addition to habitat loss, the construction of the proposed CRC would result in an increased level of physical disturbance including noise through the increased presence of humans and/or associated equipment, vehicles and/or machinery. The noise and human disturbance from construction would be temporary, but has the potential to harass any indigo snake currently occupying the development footprint. In addition, vehicles and construction equipment have the potential to kill and crush individuals. Alternative 6 would reduce the adverse effects of construction activities to indigo snakes by implementing the Service's Standard Protection Measures for Eastern Indigo Snakes (Service 2013c). However, habitat loss/decreased function of the habitat within the residential and commercial development would be expected to be the ultimate impact to indigo snakes from construction.

Fragmentation of habitat

Fragmentation of habitat is a concern for indigo snakes because it limits the overall amount of habitat available to the species and its recovery. As previously indicated, adults are habitat generalists and they will use everything from the pristine uplands to highly disturbed residential areas. Consequently, although the development of the proposed CRC would remove native habitat and vegetative land, indigo snakes would be expected to be able to live-in and cross the community. The ability of the indigo snake to live-in and cross the developed area should not be misunderstood to indicate that development of land would not have an adverse effect on the species. More information regarding the threats from development are provided below under *Residential and Commercial Operation*. The position of the on-site preserves, adjacent to other undisturbed habitat would be a benefit to the indigo snake because it would provide greater opportunity for individuals to move around the Richmond Area with limited exposure to the risks associated with development. Fragmentation of the habitat from the proposed CRC would not be anticipated to result in direct mortality. However, because the on-site preserves would be relatively small (considering the average home range of indigo snakes in South Florida is

184 ac and 46 ac for males and females, respectively), in general, the development of the proposed CRC would reduce the amount of habitat available to indigo snakes in the greater Richmond Area.

Residential and Commercial Operation

Physical disturbance

Considering the home ranges of indigo snakes and the size of the property proposed for development of CRC, few indigo snakes (approximately 1 male territory overlapping 2 females) are expected to live in the vegetative habitat. Under Alternative 6, once developed, because of the decrease in available resources, even fewer, if any, snakes would be expected to live in the community. It is expected to be more likely that the community would be a portion of an individual snake's territory. The community would result in an increased level of physical disturbance and increased presence of humans and vehicles. Indigo snakes can find refuge in an urban matrix and are known to occupy residential areas. As a precautionary measure to keep indigo snakes from harm, tenants/residents in the proposed CRC would be educated on the appearance of indigo snakes and requested to report observations of indigo snakes in the community to the HCP Coordinator. Based on the species known occurrence within residential areas, increased physical noise and human presence would not be anticipated to adversely indigo snakes. However, vehicles used within the community have the potential to kill any indigo snake residing within the community. Given the low abundance of indigo snakes in the area, the likelihood of an individual being killed in a roadway or parking lot is expected to be low.

Increased potential for predation

Human presence could result in the increased potential for predation of individual indigo snakes from introduced predators such as domestic dogs and cats. These threats would be minimized under Alternative 6 through the requirement of dogs to be leashed, exclusion of residents from the on-site preserves (through posted signs), and through the proposed educational materials and kiosks. Based on the proposed implementation of the minimization measures under Alternative 6, residential and commercial development would not be expected to increase the predation threat to indigo snakes.

Pesticide Use

Following the proposed development of CRC, pesticides (insecticides, herbicides, rodenticides *etc.*) would likely be applied to address infestations of unwanted insects or rodents from the homes and commercial buildings as well as treat unwanted invasive plants in the community and Stepping Stones. Little information is available on the effects of contaminants, particularly modern, in-use, pesticides on reptiles. Abe *et al.* (1994) documented that the pyrethoroid insecticide prallethrin (Etoc®) could kill vipers when the snakes were sprayed with an oil-based formulation. In other lab studies, synthetic pyrethoid insecticides have been demonstrated to be toxic to reptiles but the effects on reptiles in field applications remains unknown (Sparling *et al.* 2010). Insecticide use in the proposed CRC community would be focused on target areas and

species. Indigo snakes would not be directly treated with insecticides. Based on the information available, insecticide use in the community would not be anticipated to adversely affect indigo snakes.

Increased human presence could increase prey sources for indigo snakes, such as rodents. Residents/tenants would be likely to deploy pesticides to reduce any rodent infestations that occur within the developed areas. Consumption of poisoned rodents has the potential to kill indigo snakes from a secondary toxic effect. Tenants would be educated on proper application regulations for pesticide and treatment of rodents and household pests. The number of indigo snakes that are expected occupy the community following development of the proposed CRC would be expected to be low, and therefore, exposure to this threat would be expected to be rare.

Pine Rockland Habitat Management

Under Alternative 6, pine rockland habitat management would include a combination of mechanical, chemical, and prescribed fire treatment in order to adaptively manage the Southern Corridor and on-site preserves to reach success criteria and maintain pine rockland habitat. Prescribed fire would not be applied to the Southern Corridor due to its size. Prescribed fire would be the preferred method of long-term management of the on-site preserves; however, mechanical and chemical treatments would occur in most areas as part of the initial site management to address reduction of fuel load and exotics. Mechanical and chemical treatments would continue to be used, as needed, to reach the success criteria.

The mechanical clearing, chemical treatments, and prescribed fire could affect indigo snakes through disturbance, injury, and mortality. Each land management technique is evaluated below.

Mechanical Treatment

Restoration activities in the Southern Corridor and on-site preserves would commence in some areas with mechanical removal of vegetation to reduce exotics and lower the fuel load prior to implementing the first burn (Appendix J, section 4.4 Annual Work Plan). Mechanical treatment would include brining heavy equipment into the preserves to manipulate vegetation as well as establish fire-breaks in some areas. Heavy equipment has the potential to injure or kill indigo snakes if vehicles drive over and crush individuals. Alternative 6 would include the implementation of the Service's Standard Protection Measures for Eastern Indigo Snake (Service 2013c) when conducting activities with mechanical equipment. Effects from heavy equipment would be further minimized by using machinery that is the smallest possible to complete the task (thereby reducing its disturbance footprint) and using rubber tracked and tired vehicles (to reduce crushing). Based on the proposed implementation of the Standard Protection Measures for the Eastern Indigo Snake during land management activities, mechanical treatment would not be expected to adversely affect indigo snakes.

Herbaceous Chemical Treatment

Under Alternative 6, herbaceous chemical treatment would be deployed to reduce exotic plant species and adaptively manage the Southern Corridor and on-site preserves to reach the success

criteria. Herbaceous chemical treatment would focus on the target species and would follow label instructions. Chemical treatment of exotics would not be anticipated to have any adverse effects to indigo snakes.

Prescribed Fire

Prescribed fire would be the preferred method for long term management of the on-site preserves because pine rocklands are a fire adapted ecosystem. When fire advances quickly, indigo snakes can be consumed by an advancing fire. However, if burrowing and sheltering opportunities are available indigo snakes can escape the fire and survive the event. Alternative 6 would minimize the likelihood that indigo snakes would be killed in a prescribed fire by implementing the burns in a mosaic pattern that creates refugia for individuals to escape during the burn. In addition, the fire techniques proposed and the size of the burns would reduce the intensity of the fire, which would increase the likelihood that any indigo snake taking refuge within the burn would survive the fire.

Any indigo snake occupying a burn unit could incur a brief period of disturbance to its patterns of feeding, breeding, or sheltering. Disturbance from prescribed burns would occur for only 1 day on each of the burn units and the burn units are proposed to be very small compared to the anticipated home range of any individual occupying the area. In addition, the burns would be conducted in mosaic patterns providing alternative habitat for the indigo snakes to use within the on-site preserves. Consequently, disturbance to feeding, breeding, or sheltering from prescribed fire would be expected to be negligible.

Pesticides

Pesticide use, other than herbaceous chemical treatment, in the Southern Corridor and on-site preserves would not be expected to be a regular occurrence under Alternative 6. However, pesticides could be needed to manage an invasive species. As discussed above in *Residential and Commercial Operation*, pesticides could adversely affect indigo snakes through other pathways such as if they significantly reduced prey available within the on-site preserves. Pest management would be restricted to target those pests that are problematic to the species covered by the ITP and/or meeting success criteria and would be used as part of the adaptive management strategy. Because of the proposed restrictions in their use and the limited application, it is expected to be unlikely that pesticide use in the Southern Corridor and on-site preserves would reduce the forage available in a way that would adversely affect the indigo snake.

Florida Bonneted Bat

Beneficial Effects

The Southern Corridor and on-site preserves in Alternative 6 would provide native pine rockland and rockland hammock habitat that provide foraging and potential roosting habitat on the proposed CRC. These areas would be expected to support the lifecycle of the FBB and should provide a more diverse suite of insects and prey items for FBB. In addition, the Applicants would establish six bat boxes within the on-site preserves to provide additional roosting opportunities.

The FBB would also be expected to benefit from the implementation and ongoing prescribed burning activities within the on-site preserves under Alternative 6. No research has been conducted to examine impacts of fire on FBB, but some bat species, such as FBB, have evolved in ecosystems dominated by fire, and their roosting strategies may limit vulnerability to fire (Carter *et al.* 2000). The effects of fire on bats can vary with season of burn, fire intensity, residence time (i.e., amount of time for a flame to move over the ground), and overstory mortality (Carter *et al.* 2000). Fire can create snags which can become suitable roosting sites for tree-roosting bats (Carter *et al.* 2000).

Adverse Effects

Construction

Permanent removal/loss of foraging and roosting habitat

Alternative 6 would develop 86.35 ac of land into residential and commercial facilities and their associated infrastructure. Acoustic surveys confirmed that FBBs use the property where CRC is proposed. FBB calls were detected at all of the 25 sampling locations established on by the Applicants on the proposed site. Foraging calls were detected at 4 of 25 survey locations. Calls were recorded at several sampling locations within 90 minutes of sunset and sunrise, suggesting a likelihood of roosting nearby the detector. Roosting structures, including buildings, trees, and snags exist on the property proposed for the development of CRC. Alternative 6 would result in the permanent loss of FBB (foraging and roosting) habitat due to the conversion of 73.84 ac vegetative and forested lands (total development minus 12.65 ac of impervious surfaces).

Foraging habitat

Acoustic surveys conducted by the Applicants on the property proposed for the development of CRC documented FBB foraging and using the property. The value of this area as foraging habitat to the FBB is not well understood. However, in acoustic surveys for FBB in other portions of the Richmond Area, preferred foraging was found to be in large wide open spaces, which had few obstructions and very little to no artificial lighting (Ridgley *et al.* 2014). In that study, foraging locations all had intact pine rockland habitat bordering the open areas, suggesting that these areas provided sources for suitable or preferred prey (Ridgley *et al.* 2014). In general, natural or semi-natural habitat patches that contribute to prey base and provide suitable foraging conditions (*i.e.*, open habitat structure) are considered to be important in urban or residential areas. Because the property proposed for the development of CRC contains natural vegetation within the urban matrix, it likely provides valuable foraging opportunities not readily found in adjacent urban areas. Alternative 6 would minimize its effects on FBB from the loss of foraging habitat by placing 51.41 ac into permanent conservation (pine rockland and rockland hammock) (on-site preserves) and an additional 50.96 ac under a conservation mechanism on the Off-Site Mitigation Area. The Southern Corridor and on-site preserves on the proposed CRC would be managed to reach the success criteria, which were designed to represent healthy native pine rockland habitat with 1to 15 percent canopy cover. This native habitat would be expected to provide a diversity of insects that would provide forage for FBB. In addition, because FBB are known to use developed areas for foraging, foraging behavior would be expected to continue over the developed portions of the proposed CRC as well.

Roosting habitat

Roosting habitat is present on property proposed for the development of CRC. Roosting habitat includes forest and other areas with large or mature trees or other areas with suitable roost structures. Natural roosts primarily include mature or large live or dead trees snags and trees with cavities, hollows, or crevices but also include buildings and other manmade structures such as power poles. Final roost surveys have not been conducted on the property. Under Alternative 6, the Applicants would conduct roost surveys pre-construction (section 6.2.4.1 of the HCP) following Service guidance. If a FBB roost is identified during the pre-construction roost surveys, the Service would be contacted and the following measures would be implemented to minimize take of individuals. Ecologists would wait until bats have flushed from the roost on their own accord for nighttime foraging. The roost would be peeped to confirm no juveniles or adults remain, and the entrance to the roost structure would be blocked with grating or other appropriate exclusion material. If peeping is not practicable, an observer would be stationed to monitor activity at the roost. The observation monitoring would start 30 minutes to an hour before sundown and the roost structure would be blocked 1 hour after the last bat has been observed leaving the roost. Demolition of building or roosting structure would occur the following day under the supervision of an ecologist to verify that no bats returned to the roost. If pups are found to be present within a roost, a series of minimization measures would be implemented in an effort to reduce the likelihood of injuring or killing any young. Preference would be given to avoidance by establishing a 100 ft buffer around the roost and delaying removal of the roost structure until pups were able to fly and hunt on their own. If avoidance is not possible and the roost can be moved, an artificial bat box would be established in the closest on-preserve and the roost would be transferred intact. The expectation would be that the mother would return to the new location and continue nursing, raising, and training the young on how to forage. If the roost cannot be moved, any pups would be transferred to an artificial bat box established in the closest on-preserve. Pups and bat box would be monitored through daily visual observation or by a remote wildlife camera to record movement at the box entrance. In the event that the pups are abandoned, the pups would be taken to a qualified wildlife rehabilitator, such as the adjacent Zoo Miami, following coordination and approval by the Service. If at any time during construction a roost is inadvertently knocked down and live pups are found, the pups would be rescued as described above.

To minimize adverse effects from the loss of roosting habitat and any roost, under Alternative 6, the Applicants would establish 6 bat boxes within the on-site preserves, at a location yet to be determined. In addition, if an occupied FBB roost is identified within the development footprint adjacent to an on-site preserve, an additional bat house would be established within the on-site preserves near the roost that would be removed. The permanent conservation of the pine rockland and rockland hammock habitat within the on-site preserves that contain potential roosting habitat would also minimize the loss of the roosting habitat from development. However, if a FBB roost is identified during construction, and cannot be avoided, this roost tree would be removed. The Applicants would follow the minimization measures to limit the likelihood that any bat would die during this process. Regardless, the removal of the roost would result in harassment and harm to the FBB that occupied the roost. In addition, while all precautions would be taken to avoid the loss of adults and non-volant young, ultimately, if young are present and salvage attempts fail, some FBB could die.

Fragmentation of habitat

Habitat fragmentation is considered a major threat to the FBB (Service 2013d). Since the FBB is highly mobile, the proposed development would not be expected to fragment habitat in a manner that adversely affects FBB. Any effect that could be realized would be minimized by the permanent conservation of the Southern Corridor and on-site preserves, as well as the Off-site Mitigation Area that would be established, managed and conserved.

Lighting

Nighttime lighting during construction of the proposed CRC has the potential to affect FBBs. The FBB's behavioral response to artificial lighting and ecological light pollution has not been examined, and effects are not known. The species' fast-flight and long range flight capabilities may make it more able to exploit insects congregated at artificial light sources (beneficial effect) or more susceptible to risks such increased predation (adverse effect). The Applicants do not anticipate using nighttime lighting as part of general construction; however, it could be necessary for some elements. Any lighting required for night time construction for safety purposes would direct light towards the intended target for illumination, which is intended to reduce any effects to FBB.

Residential and Commercial Operation

Physical disturbance

The development of the proposed CRC under Alternative 6 would result in an increased level of human activity and noise because of the increased presence of humans and/or associated equipment, vehicles, and/or machinery. Some of these disturbances would be long-term resulting from the increase in human presence adjacent to on-site preserves. Increased human presence and associated activities have the potential to degrade foraging habitat quality over the development and foraging and roosting habitat in the adjacent on-site preserves. Little is known about the effects of urbanization on FBB. Based on the information available at this time and the knowledge that FBB currently reside in and use urban areas, the increase of human activities, including noise, are not expected to be likely to adversely affect the FBB.

Increased potential for predation

Although evidence of predation is lacking, the species is presumably affected by some level of predation from native wildlife (*e.g.*, hawks, owls, raccoons, rat snakes) and the large number of introduced and nonnative reptiles (*e.g.*, young Burmese pythons, boa constrictors) (Krysko *et al.* 2011; Ludlow 2012; Timm 2012). Increased human presence may increase the abundance of species such as raccoons that can live in urban areas and take advantage of human trash. Under Alternative 6, if species such as raccoons become abundant, pest control measures would be implemented because of the desires of the community. Tenants would be educated on proper application regulations for pest control and any pesticide treatment. It is considered to be unlikely that the any predator population would become elevated enough in numbers because of the community's presence that it would result in adverse effects to the FBB.

Lighting

Section 6.2.3.1 of the HCP describes how lighting proposed for parking lots would be engineered to achieve Illuminating Engineering Society of North America requirements as well as would meet municipal/code requirements. These requirements would minimize the amount of ambient light and would be consistent with what the Service commonly refers to as "wildlife friendly" lighting. Similar to the discussion regarding lighting under *Construction* for FBB, the potential effects of lighting around the community are unknown but could have both beneficial and adverse effects to FBB by concentrating foraging opportunities and concentrating predation potential for FBB. The lighting on the proposed CRC would be consistent with what is present in the other residential communities in the area. FBB are believed to use these areas for foraging, although Ridgley *et al.* (2014) documented a preference in the Richmond Area for foraging in areas with little to no artificial lighting. However, FBB are known to use residential areas for roosting and foraging, and based on the persistence of FBB in those communities, the Illuminating Engineering Society of North America lighting at the proposed CRC would not be expected to adversely affect FBBs.

Pesticide and Mosquito Control

The impacts of pesticides and other environmental contaminants on bat species are largely unstudied, particularly in the case of the FBB. The life history of the FBB may make it susceptible to pesticide exposure from a variety of sources. Mosquito control spraying activities commonly begin at dusk when mosquitoes are most active. Because the FBB forages at dusk and after dark, the possibility exists for individuals to be directly exposed to airborne mosquito control chemicals or to consume invertebrates containing pesticide residues from recent applications. Additionally, because the FBB has been documented to roost in residential areas (Belwood 1992), it is possible for individuals to be exposed, either directly or through diet, to a variety of undocumented, localized pesticide applications conducted by homeowners.

A reduction in the number of flying insects is a potential secondary effect to consider when evaluating the impact of pesticides on the FBB. In his status survey for the FBB, Robson (1989) suggested that mosquito control programs are contributing to reduced food supplies for bats.

Mosquito control within the proposed CRC community would be conducted by MDMC. MDMC follows application guidance from the Service that currently avoids and minimizes the likelihood of adversely effecting BSHB by implementing buffers to occupied and CH. The presence of the new residents would increase the likelihood of mosquito control application above what is currently occurring. The buffers instituted for the BSHB are anticipated to protect FBB and its prey base within the community and within the on-site preserves to some degree. With the implemented buffers, direct effects on FBB would not be anticipated and secondary effects through the loss of foraging prey base would be expected to be minimized. Therefore, under the current MDMC program it would be unlikely that FBB would be adversely affected in the proposed CRC from mosquito control. However, it is unknown whether MDMC would continue be able to continue to adhere to the identified buffers considering concerns for human health and safety from the Zika virus. The effects of MDMC's program will be evaluated through consultation with MDMC and the Service; therefore, it will not be considered further in this EA.

Pesticides application (including mosquito control) has the potential to adversely affect FBB by reducing the forage available to individuals. The Applicants have developed several BMPs for pesticide use in the community (section 6.2.3.3 of the HCP) under Alternative 6. Application would adhere to pesticide labels and insecticides would be restricted within the Stepping Stones. Mosquito control would be conducted by MDMC following guidance provided by the Service to avoid impacts to BSHB, which should reduce the overall negative effect on insect abundance and forage for the FBB. As previously stated, FBB are known to occur in residential areas where pesticide use and mosquito control is already taking place. No information is available on the effects that these practices are having on FBB and the ability of FBBs to survive and reproduce in this environment. Based on information available, it appears that although pesticide use and mosquito control occur and reduce the amount of forage available to FBB, individuals continue to survive and reproduce in these environments. The proposed CRC has developed a reduce pesticide application protocol to reduce effects to BSHB; therefore, it would be expected that pesticide use in the CRC community would be lower than surrounding residences. Consequently, pesticide application within the proposed CRC would be minimized and would not be anticipated to adversely affect FBB.

Pine Rockland Habitat Management

Under Alternative 6, pine rockland habitat management would include a combination of mechanical, chemical, and prescribed fire treatment in order to adaptively manage the Southern Corridor and on-site preserves to reach success criteria and maintain pine rockland habitat. Prescribed fire would not be applied to the Southern Corridor due to its size. Prescribed fire would be the preferred method of long-term management of the on-site preserves; however, mechanical and chemical treatments would occur in most areas as part of the initial site management to address reduction of fuel load and exotics. Mechanical and chemical treatments would continue to be used in the on-site preserves, as needed, to reach the success criteria.

The mechanical clearing, chemical treatments, and prescribed fire could adversely affect FBB through disturbance, loss of habitat, injury, and mortality. Each land management technique is evaluated below.

Mechanical Treatment

Restoration activities in the Southern Corridor and on-site preserves would commence in some areas with mechanical removal of vegetation to reduce exotics and lower the fuel load prior to implementing the first burn (HCP: Appendix J, *section 4.4 Annual Work Plan*). Mechanical treatment would include bringing heavy equipment into the on-site preserves to manipulate vegetation and thin the tree canopy to 1 to 15 percent. Thinning has the potential to remove roost trees and equipment noise could disturb FBB roosting in adjacent structures. Under Alternative 6, the Applicants would conduct roost surveys within the Southern Corridor and on-site preserves based on Service guidance (section 6.2.4.1 of the HCP). If an occupied roost tree is found it would be marked and a 100-ft buffer would be established around the roost. Only hand clearing would be used for vegetation removal within the 100-ft buffer. Based on the avoidance and minimization measures that would be in place, mechanical treatments in the Southern Corridor and on-site preserves would not be expected to adversely affect FBBs.

Herbaceous Chemical Treatment

Herbaceous chemical treatment would be deployed to reduce exotic plant species and adaptively manage the Southern Corridor and on-site preserves to reach the success criteria under Alternative 6. Herbaceous chemical treatment would be focused on the target species and would follow label instructions. Chemical treatment of exotics would not be anticipated to have adverse effects to FBBs.

Prescribed Fire

Prescribed fire is the preferred method for long-term management of the on-site preserves because pine rocklands are a fire-adapted ecosystem. The burn plan for the preserves is found in Appendices J of the HCP. Prescribed fire can adversely affect FBBs if a roost tree is consumed by the fire and individuals are injured or killed or if individuals that occupy the roost escape but have no alternative shelter. If burns occur when non-volant (flightless) young are present in the roost, depending on the fire behavior, there is also a possibility that although adults would escape the fire, young would be killed from smoke effects.

In order to minimize the likelihood that FBB would be killed and/or a FBB roost would be removed/destroyed, Alternative 6 would implement several measures as follows. As previously indicated, the Applicants would conduct roost surveys following guidance from the Service to identify any FBB in the Southern Corridor and on-site preserves prior to any habitat manipulation. Identified roosts would be protected during management activities and fuels would be reduced around the base of any roost prior to conducting the prescribed burn. Because the fire management units would be small, the intensity of the fire is expected to be low and the likelihood of trees being consumed in the fire should be low. In addition, six bat houses would be established in the on-site preserves to provide additional roosting opportunities for FBB. Presence of smoke could result in temporary disturbance to resident FBBs. However, FBBs are large bats capable of long flights at higher altitudes than smaller bats and are anticipated to be able to flee an approaching fire and heavy smoke. On Avon Park Air Force Range and Babcock-Webb Wildlife Management Area, prescribed burning is conducted near FBB roosts on a 2 to 3-year fire return interval, and no negative impacts have been documented. Based on the minimization measures that would be implemented, the flight abilities of adult FBBs, and the information from other locations, the prescribed fire activities would not be expected to adversely affect adult FBBs in known roosts.

FBB breeding is not well understood; pregnant females have been documented in July, August, and September, and young have been found in all seasons (Belwood 1992, Timm and Genoways 2004). Therefore, non-volant young could be present in roosts during prescribed fire if a roost is documented on-site. Thus, there would be some potential that non-volant young could be adversely affected if heavy smoke inundates a roost. Fuel loads would be reduced adjacent to any roost, and burn units would be small, which should reduce the likelihood of heavy smoke. Consequently, this potential adverse effect is expected to be minimized.

The Applicants would use annual monitoring of the bat houses and opportunistic identification of new roosts during other monitoring and activities to continue to gather information about FBB roosting in the on-site preserves under Alternative 6. Therefore, it would be possible that over

time, a FBB roost could be established within the on-site preserves that would not be identified prior to a prescribed fire. This roost could be at risk during a prescribed fire because the standard minimization measure of fuel load reduction would not necessarily be in place at the roost. However, if the on-site preserves are maintained in a manner consistent with the success criteria, fuel loads would be expected to be low surrounding the roost from regular implementation of fire and maintenance of exotics. Regardless, in this situation where the roost location would be unknown, it would be possible that a roost would be lost during a prescribed fire.

In addition, studies have shown that prescribed burning may initially reduce insect availability, but may increase long-term prey availability (Lacki *et al.* 2009). This is consistent with red-cockaded woodpecker (*Picoides borealis*) fire foraging work, as well. Some studies show that effects of fire on arthropods can vary by species, and fire can have negative, neutral, or positive effects on various insects (James *et al.* 1997, New and Hanula 1998, Collins 1998, Provencher *et al.* 1998, Provencher *et al.* 2001). Although some short-term impacts could occur from fire, effects would be expected to be mostly beneficial.

Establishing and maintaining firebreaks has the potential to adversely affect FBB by disturbing roosting bats with machinery and human activity. These effects would be similar to those that may be experienced during mechanical treatment of the Southern Corridor and on-site preserves (see above *Mechanical treatment*). In the on-site preserves, a minimal amount of work would be conducted to create new firebreaks (5,397 ft) or enhance existing trails (4,413 ft). Overall, there would be 21,755 ft total of firebreaks, which includes permanent roadways. Based on the avoidance and minimization measures that would be in place and the minimal amount of disturbance that would be conducted to create and maintain the firebreaks, mechanical treatment to establish firebreaks would not be expected to adversely affect FBB.

Pesticides

Pesticide use, other than herbaceous chemical treatment, in Southern Corridor and on-site preserves would not be expected to be a regular occurrence under Alternative 6. However, pesticides could be needed to manage an invasive species. The life history of the FBB may make it susceptible to pesticide exposure from a variety of sources. Pesticides could adversely affect FBB if they significantly reduce the forage available proposed CRC site or if bioaccumulation were to occur from treated insects. Pest management of insects would be restricted to target those pests that are problematic to the species covered by the ITP and/or meeting success criteria and would be used as part of the adaptive management strategy. Because of the proposed restrictions in their use and the limited application, it would be unlikely that pesticide use in the Southern Corridor and on-site preserves would reduce the forage available or that bioaccumulation would be likely to occur in a manner that would adversely affect the FBB.

Florida Leafwing Butterfly

Beneficial Effects

The leafwing is currently only known to occur in ENP on Long Pine Key. Breeding leafwing populations have not been documented in pine rockland fragments adjacent to ENP for the past

25 years. The smallest of the former breeding populations was Navy Wells Pineland Preserve (owned by MDC and the State, and managed by MDC), which is approximately 296 ac. It is possible that the leafwing requires relatively larger patches of croton-bearing pine rockland habitat to persist than BSHB. Although larger patches of habitat may be more suitable for these butterflies, the relationship between habitat patch size and suitability is not completely understood (Service 2013e). The leafwing's only host plant is the pineland croton; eggs and immature stages are directly tied to this host plant. Based on the expectation that the leafwing requires a patch of pine rockland including several hundred acres, the on-site preserves and Off-site Mitigation Area parcels (proposed CRC [51.41 ac] and the Off-site Mitigation Area [50.96 ac]) individually lack enough suitable habitat to support leafwings. However, on-site preserves and Off-site Mitigation area are both components of the larger Richmond Area, which at 883.1 ac, includes sufficient habitat to support the leafwings. Therefore, although the leafwing is not currently known to within the HCP Plan area, it is part the of the subspecies' historic range. Thus, it is possible that individuals would recolonize the Richmond Area in the future and use either or both of these conservation lands to complete its lifecycle. The concept of recolonization is also supported by the fact that adults have strong flight abilities and are able to disperse over large areas. By placing a conservation mechanism on the 51.41-ac on-site preserves and 50.96-ac Off-site Mitigation Area and managing the habitat to improve its quality, the Applicants would contribute to the overall improved habitat quality of the Richmond Area.

Adult leafwing are not frequently attracted to flowers (Baggett 1982, Opler and Krizek 1984, Worth *et al.* 1996); therefore, the 3.88 ac of pine rockland plantings in the Stepping Stones would not provide the same expected benefit to leafwings that they would for BSHBs. While the Stepping Stones would be planted with pineland croton and other nectaring plants, only the pineland croton plants would provide habitat enhancement for adult and immature leafwing butterflies.

The orientation of the on-site preserves, adjacent to pine rockland habitat to the west and east of the proposed CRC, is intended to increase the value of these preserves to the species by providing opportunities to maintain connectivity to the greater Richmond Area, which is captured in the functional assessment and functional lift. Preserving and managing pine rockland habitat on property proposed for the development of CRC that is contiguous with pine rockland habitat off-site would be a benefit because it would allow for improved dispersal of leafwing to adjacent property and greater stability of the population to natural population fluctuations and stochastic events within the greater Richmond Area should they become established in the area.

<u>Adverse Effects</u>

Construction

Permanent removal/loss of habitat and fragmentation of habitat

As previously stated, the leafwing is not currently known to occur on the property proposed for CRC. Although the loss of habitat from development of Alternative 6 would permanently remove habitat that could be occupied in the future, it would not be expected to have any adverse effects to individuals when construction is anticipated to occur.

Fragmentation of pine rockland habitat is a concern for the leafwing because it limits the overall amount of habitat available to the species and its recovery. In this particular case, the residential and commercial development (86.49 ac) would further fragment the Richmond Area. Alternative 6 would establish on-site preserves on the east and west edges of the proposed CRC. As previously indicated, adult leafwings are rapid fliers and have strong flight abilities; therefore, leafwing would be expected to be able to disperse within the proposed CRC and between the proposed on-site preserves if they became established in the area. Furthermore, if a local population decline were to occur in one portion of the on-site preserves, recolonization could be realized. However, the additional loss and fragmentation of habitat in the Richmond Area that would occur from Alternative 6 could ultimately reduce population viability of leafwing by decreasing the opportunities for genetic exchange and recruitment during natural population fluctuations or stochastic events should they re-establish in the area.

Residential and Commercial Operation and Pine Rockland Habitat Management

If leafwing were to re-establish within the HCP Plan Area, it would likely be affected in the same manner as the BSHB for all the proposed activities under Alternative 6. Therefore, for the purposes of this EA, the discussion will not be repeated. Please see the discussion for BSHB for an evaluation on how Residential and Commercial Operation and Pine Rockland Habitat Management could affect the leafwing should it recolonizes the proposed CRC property during the life of the proposed CRC HCP.

Gopher Tortoise

Beneficial Effects

Under Alternative 6, 51.41 ac of on-site preserves (CRC property) and 50.96 ac (Off-site Mitigation Area) would be managed to provide native habitat that would support forage for gopher tortoises. In particular, the herbaceous vegetation within the pine rockland habitat would provide abundant forage for any individual entering the area. Implementation of prescribed burning within the on-site preserves and the Off-Site Mitigation Area would be expected to increase the amount and quality of suitable gopher tortoise habitat. Although bare patches and sandy soils would be present within the managed pine rocklands within the on-site preserves, it is anticipated to be unlikely they would provide sufficient space and structure to support a gopher tortoise burrow. Restoration and enhancement of on-site preserves and Off-site Mitigation Area under Alternative 6 would be expected to have an overall benefit to the species that could facilitate some adults and/or juveniles to expand into the area and increase the local population in the Richmond Area.

Adverse Effects

Construction

Gopher tortoises have not been documented on the property proposed for the development of CRC; consequently there are not anticipated to be any effects during construction. In the unanticipated event that a gopher tortoise is found on during construction, the Applicants have proposed to relocate the individual, following FWC guidance, to the on-site preserves or an alternatively identified recipient site.

Residential and Commercial Operation

If a gopher tortoise moves into the on-site preserves, the potential exists that an individual would wander into the residential and commercial community. A gopher tortoise traveling in the community has the potential to be adversely affected if it is struck by a vehicle, poisoned by eating vegetation that has been treated with pesticides, or attacked by a dog. The likelihood of any of these events would be expected to be low. The community would have an ordinance that dogs must be leashed, and it would be unlikely that any dog owner with a leashed dog would allow it to attack and kill a gopher tortoise (it would also unlikely that any dog would go unleashed for enough time to find and attack a gopher tortoise). It would be more likely that a gopher tortoise entering the community would be detected by a resident/tenant prior to being killed by a vehicle, consumption of poisons, or a dog. Alternative 6 proposes to educate the community about the gopher tortoise in the educational materials. Residents/tenants would be advised to contact the HCP Coordinator if they observe a gopher tortoise outside of the on-site preserves, and instructed to not collect or move the individual. The HCP Coordinator and/or Preserve Biologist would be responsible for safely collecting the gopher tortoise and returning it to the on-site preserves.

Pine Rockland Habitat Management

As previously stated, gopher tortoises are not known to currently occupy property proposed for the development of CRC; however, the potential exists for individuals to move on to the CRC property over the life of the permit. This potential could increase over time as the on-site preserve lands are managed and the habitat quality is anticipated to improve. For the purpose of this analysis, it is assumed that gopher tortoise would eventually occupy the on-site preserves.

Pine rockland habitat management would include a combination of mechanical, chemical, and prescribed fire treatment in order to adaptively manage the Southern Corridor and on-site preserves to reach success criteria and maintain pine rockland habitat. Prescribed fire would not be applied to the Southern Corridor due to its size. Prescribed fire would be the preferred method of long-term management of the on-site preserves; however, mechanical and chemical treatments would occur in most areas as part of the initial site management to address reduction of fuel load and exotics. Mechanical and chemical treatments would continue to be used in the on-site preserves, as needed, to reach the success criteria.

The mechanical clearing, chemical treatments, and prescribed fire could affect gopher tortoise through disturbance, loss of habitat, injury, and mortality. Each land management technique is evaluated below.

Mechanical Treatment

Restoration activities in the Southern Corridor and on-site preserves would commence in some areas with mechanical removal of vegetation to reduce exotics and lower the fuel load prior to implementing the first burn (Appendix J, section 4.4 Annual Work Plan). Mechanical treatment would include bringing heavy equipment into the on-site preserves to manipulate vegetation as well as establish fire-breaks in some areas. Heavy equipment has the potential to injure or kill gopher tortoise if equipment operators do not see the individual and drive over it. Gopher

tortoise are not known to currently occupy the on-site preserves; however they could move into the area once regular land management activities are under way. Because most of the heavy equipment would be expected to be confined to the initial land management activities, adverse effects to gopher tortoise would not be expected from these efforts.

Ongoing mechanical treatment could be needed if prescribed fire cannot be implemented due to weather conditions or other circumstances. It would be unlikely that a gopher tortoise would establish a burrow in the on-site preserves because of the limited habitat available. However, if a gopher tortoise burrow is documented during regular annual monitoring (qualitative or quantitative), the Applicants would document the burrow, and it would be marked (similar to other non-ephemeral wildlife features) to prevent disturbance during land management treatments. Consequently, should a gopher tortoise move into the on-site preserves, mechanical treatments would not be expected to adversely affect the species.

Herbaceous Chemical Treatment

Under Alternative 6, herbaceous chemical treatment would be deployed to reduce exotic plant species and adaptively manage the Southern Corridor and on-site preserves to reach the success criteria. Herbaceous chemical treatment would focus on the target species and would follow label instructions. Chemical treatment could reduce foraging opportunities for the gopher tortoise; however, the species that would be treated are not typical food items for gopher tortoise, therefore, adverse effects to the gopher tortoise would not be expected from this activity.

Prescribed Fire

Prescribed fire would be the preferred method for long term management of the on-site preserves because pine rocklands are a fire adapted ecosystem. When fire advances quickly, gopher tortoise can be consumed by an advancing fire. However, if burrowing and sheltering opportunities are available, gopher tortoise can escape the fire and survive the event. Alternative 6 would minimize the likelihood that gopher tortoise would be killed in a prescribed fire by implementing the burns in a mosaic pattern that creates refuge for gopher tortoise to escape during the burn and reduces the intensity of the fire, which increases the likelihood that any gopher tortoise taking refuge within the burn would survive the fire. Based on the fire techniques that are proposed to be used (*e.g.*, flanking and backing), the low likelihood the gopher tortoises would be present within the on-site preserves during the time of a fire, and the low fuel loads contributing to the fires, the potential for a gopher tortoise to be killed during a prescribed fire would be minimized.

Any gopher tortoise occupying a burn unit could incur a brief period of disturbance to its behavior patterns including feeding, breeding, and/or sheltering. Disturbance from prescribed burns would occur for only 1 day on each of the burn units, and the burns would be conducted in mosaic patterns, providing alternative areas with forage and refuge for gopher tortoise. Prescribed burning would result in a temporary loss of gopher tortoise foraging habitat; however, recovery of herbaceous growth used by gopher tortoises would be expected to be extremely rapid. Recovery of plants used as forage could be somewhat slower after dormant season fires, but this would be a time when the species is less active, therefore a reduced abundance of food would have less of an adverse effect.

Maintenance of firebreaks has the potential to affect gopher tortoise if they are run over by equipment. Firebreaks would be maintained at regular intervals and vegetation would be low so that it would not be expected to hide a gopher tortoise from the view of the elevated position of the equipment driver. Workers would be educated to watch for gopher tortoise while conducting firebreak maintenance and any gopher tortoise using a firebreak during maintenance would be expected to be avoided. Should gopher tortoises move into the on-site preserves, their density would be expected to be low; consequently, considering the other BMPs proposed in Alternative 6 that would protect the gopher tortoise, the likelihood that an individual would be injured or killed during maintenance of firebreaks would be very low.

Miami-Tiger Beetle

Beneficial Effects

Miami tiger beetle (MTB) are found in pine rockland habitat along the Miami Rock Ridge. Adult MTB within the Richmond Area have also been observed on several types of degraded habitat including: an old degraded road within pine rockland (Ridgley 2015), unpaved roads (Knisley 2014, Thompson 2016, Gray-Urgelles 2016), and an altered pine rockland area that has been cleared and that is mowed (Possley 2014). Individuals use sandy soils for egg-laying and bare open patches for movement and foraging. The larval stage of this insect lives in burrows dug by the larvae at the egg-laying site.

Alternative 6 would establish a permanent conservation easement on 47.69 ac of pine rockland habitat within the on-site preserves and Southern Corridor. This habitat would be managed to reach and maintain the success criteria, which includes a criterion for bare rock and soil at 25 percent. This criterion is part of a healthy pine rockland ecosystem and is intended to support the lifecycle of the MTB. The pine rockland functional assessment estimates successful management of the Southern Corridor and on-site preserves would provide overall habitat improvement from the baseline condition of 40.72 HVUs to 43.83 HVUs, an increase of + 3.10 HVUs. This improvement of the habitat quality is expected to increase the occurrence and abundance of MTB in these areas and these improvements should continue overtime. However, the functional assessment does not incorporate the potential value of the degraded pine rockland habitat (*e.g.*, degraded asphalt and cleared areas), which is unique to the MTB because of its potential to support adult MTB (discussed further under adverse effects below).

The orientation of the on-site preserves, adjacent to pine rockland habitat to the west and east of the proposed CRC is intended to increase the value of these preserves to the species by providing opportunities to maintain connectivity to the greater Richmond Area, which is captured in the functional assessment and functional lift. Preserving and managing pine rockland habitat on property proposed for the development of CRC that is contiguous with pine rockland habitat off-site would be a benefit because it would allow for improved dispersal of MTB to adjacent property and greater stability of the population to natural population fluctuations and stochastic events within the greater Richmond Area. When the on-site preserves are managed at the optimum success criterial (level 3), they have the potential to serve as a source population of MTB to the adjacent pine rocklands. The Stepping Stones would not be managed to retain open spaces and bare ground; therefore, they would not be expected to contribute to the enhancement of the MTB to the same degree as other species.

Adverse Effects

Construction

Permanent removal/loss of habitat

As described above, adult MTB in the Richmond Area have been documented using pine rockland habitat as well as some degraded and mowed areas, which were historically pine rockland habitat. Alternative 6 would develop 86.49 ac of habitat into residential and commercial facilities and their associated infrastructure (includes 3.88 ac of Stepping Stones). This development includes 32.91 ac of pine rockland habitat as well as 53.58 ac of other disturbed lands characterized as "developed" or "disturbed upland" (Table 4-2). The degraded habitat has the potential to support MTB because of the presence of bare patches and sandy soils and its proximity to pine rockland habitat. The loss of the approximately 86 ac of habitat would adversely affect the beetle by injuring and/or killing adult and larval stages of MTB that are expected to occur within the proposed CRC. This mortality would include the adults and immature MTB that could be crushed and killed from construction activity and associated equipment. Because habitat loss and the associated mortality would be the ultimate impact to individual MTB from development, mortality from other components of construction will not be discussed further in this EA.

Depending on the timing of construction, adult beetles may be able to avoid injury or mortality by flying from harm's way. However, since MTBs are estimated to typically only fly 5 to 10 meters at a time, (based on a study on Highlands tiger beetle; Knisley and Hill 2013) this movement would be unlikely to prevent injury or morality unless the flight is into an on-site preserve. Adverse effects from permanent modification of existing habitat would be minimized by preserving, restoring, and enhancing the remaining pine rockland habitat within the on-site preserves. The pine rockland functional assessment estimates successful management of the proposed CRC on-site preserves would provide an overall habitat improvement from the baseline condition (40.72 HVUs) to (43.83 HVUs) for an increase of +3.10 HVUs. However, because the functional assessment was based on the quality of the land as pine rockland, it did not capture the value of the highly degraded-pine rockland habitat (*e.g.*, degraded asphalt and cleared areas) to MTB and the potential for it to be occupied by both adult and larval MTB (largely based on its proximity to pine rockland habitat). Consequently, the net effect of habitat lost and habitat preserved may be less than + 3.10 HVUs and could potentially be a decrease in HVUs.

Fragmentation of habitat

Fragmentation of pine rockland habitat is especially a concern for species with low mobility, such as the MTB, and could result in the isolation of populations leading to reduced gene flow between sites, localized population declines, and potentially localized extirpation. In its current condition, the property proposed for CRC contains contiguous vegetative habitat of various quality with minor fragmentation from buildings and asphalt. The quality of the habitat for the MTB in its existing condition has been evaluated in the functional assessment (40.72 HVUs). As described above, the functional assessment was designed to evaluate the quality of habitat as pine rockland, and there are parcels that have a low functional value as pine rockland habitat *(e.g.*, scraped, dominated by turf species or cleared and sodded) that have value for MTB

because of the open patches with sandy soil or bare ground. In addition to the pine rockland parcels, these additional parcels are expected to provide habitat value for MTB and would also be considered occupied. The developed areas (86.49 ac) in Alternative 6 would fragment the MTB habitat by permanently removing the vegetation down the center of the property for the proposed CRC, and constructing roads and buildings, rendering them unsuitable MTB habitat.

To reduce the adverse effect of this fragmentation and to create a pathway for MTB between the two preserves on the east and west edges of the proposed CRC, Alternative 6 would establish a 2.16-ac Southern Corridor of pine rockland habitat at the southern edge of the property. Corridor width is positively associated with abundance and species richness for birds, mammals, and invertebrates (Lindenmayer and Franklin 2002). Because this corridor is narrow (2,071 ft long and 50 ft wide), it has the potential to create a bottleneck to dispersal. However, the Southern Corridor would be managed to reach the success criterion of 25 percent bare ground, and was designed with the intent to provide live-in as well as move-through habitat. Individuals in the east and west on-site preserves would be expected to retain a limited connection by moving through the Southern Corridor, thereby reducing the likelihood of genetic isolation. If a local population decline does occur in one portion of the on-site preserves, it would be possible that recolonization could be supported through the Southern Corridor. While the on-site preserve and Southern Corridor are intended to limit the adverse effects of fragmentation by providing opportunities for MTB to move across proposed CRC and provide connections with adjacent pine rockland habitat, the addition of barriers and impervious surfaces from the development would make movement and genetic exchange for MTB more difficult.

Other disturbance

Alternative 6 would result in an increased level of disturbance including noise through the increased presence of human foot traffic and/or associated equipment, vehicles and/or machinery. For construction related activities, most of these effects would be temporary in nature, although the damage of soil compaction would be lasting. Construction activity and associated equipment has the potential to harm, harass, injure and kill MTB by altering the substrate and crushing individuals on the ground or in burrows. During construction, some MTB burrows could be collapsed, removed or filled by equipment, and individuals could be crushed by foot traffic or vehicles or MTB could be harassed out of the development footprint. However, the most consequential impact to MTB from construction would be the loss of habitat and associated injury or mortality.

The disturbance effects of construction on the on-site preserves would be minimized by installing silt fencing around all ground disturbing activities, and by staging all construction material and equipment within previously disturbed areas and outside of the preserve boundaries. In addition, all on-site preserves boundaries would be delineated with enviro-fencing to preclude entry and disturbance during construction. The effects of increased disturbance such as noise and vibration are not known on MTB. Based on information available at this time, this disturbance during construction would not be anticipated to have any additional adverse effects to MTB above those captured in the discussion of permanent habitat loss and fragmentation.

Water use

Construction activities, equipment, and material staging have the potential to alter surface water flow on the property of the proposed CRC. This alteration of surface water flow could increase the likelihood of temporary ponding or flooding on or off-site in the preserves, especially because of the use of water during construction to suppress dust in the development areas. If water pools or ponds, it has the potential to kill MTB by drowning immature life stages in burrows or impact reproduction by flooding of adult egg-laying sites (Knisley and Schultz 1997, Brust and Hoback 2009, Lin and Okuyama 2014, Taboada *et al.* 2013, Pearson *et al.* 2015). Studies have documented that tiger beetle larvae of some species can deal with temporary flooding by physiological tolerance to anoxia, relocating from flooded sites, and burrow plugging, as shown in some shoreline species (Knisley and Schultz 1997, Brust and Hoback 2009, Lin and Okuyama 2014, Taboada *et al.* 2013, Pearson *et al.* 2015). The tolerance of the MTB to flooding of larval burrows has not been studied, but may be limited based on its occurrence in pine rockland habitat that is well drained and does not undergo routine flooding. Alternative 6 would minimize potential adverse effects from ponding by adhering to the Storm Water Pollution Prevention Plan and National Pollutant Discharge Elimination System (NPDES) permit. Silt fencing around all ground disturbing activities would also minimize water flow off-site and into the on-site preserves. Based on these minimization measures, water use during construction would not be expected to adversely affect MTB.

Pollution

Pollution from construction activities, such as petroleum products, paints, solvents, cleaners, wood preservatives, cement, nutrients, *etc.*, also has the potential to adversely affect MTB. If these chemicals/products are not properly contained and cleaned up, they have the potential to injure or kill MTB by directly poisoning individuals or contaminating the soils and making them unsuitable for MTB. MTBs currently located on the 86.49 ac slated for development would all be expected to be lost as a result of habitat loss. Therefore, no direct effects from pollutants would be expected in this area. However, if the chemicals are transported into the on-site preserves or Southern Corridor they could have adverse effects on the conservation lands. The NPDES permit would require the Applicants to implement BMPs to contain any spill, and the development areas must be inspected within 24 hours following any 1/2 in rain event; consequently, pollutants would not be expected to be discharged into the on-site preserves or have an adverse effect on MTB.

Residential and Commercial Operation

Disturbance within Community

The CRC community would result in an increased level of disturbance including noise and vibration through the increased presence of humans and/or associated equipment. These disturbances would be ongoing from presence of the community. MTB are not likely to occupy the landscaped portions of the community, including the Stepping Stones because they would be landscaped with mulch and would lack sufficient open space and sandy soil to support MTB. However, some MTB may enter the community by flight or walking through a disturbed open

patch, where they could be killed if stepped on by people or run over by equipment. People and equipment would also produce noise and vibrations; however, there are no known effects to MTB from noise or vibration.

Human use of preserves

Human disturbance, depending upon type and frequency, may or may not be a threat to tiger beetles or their habitats. Knisley (2011) reviewed both the negative and positive effects of human disturbances on tiger beetles. Vehicles, bicycles, and human foot traffic have been implicated in the decline and extirpation of tiger beetle populations, especially for species in more open habitats like beaches and sand dunes. The northeastern beach tiger beetle (*Cicindela dorsalis dorsalis*) was extirpated throughout the northeast coincidental with the development of recreational use from pedestrian foot traffic and vehicles (Knisley et al 1987). However, there are other documented cases of the beneficial effects of these types of disturbances, by creating open areas of habitat for tiger beetles, particularly at sites where vegetation growth has eliminated these open habitat patches (Knisley 2011a). The Ohlone tiger beetle (*Cicindela ohlone*) has been eliminated from nearly all natural grassland areas in Santa Cruz, California, except where pedestrian foot traffic, mountain bike use, or cattle grazing has created or maintained trails and open patches of habitat (Knisley and Arnold 2013). Similarly, over 20 species of tiger beetles, including Badlands tiger beetle (*Cicindela decemnotata*) at Dugway Proving Ground in Utah, are almost exclusively restricted to roads, trails, and similar areas kept open by vehicle use or similar human disturbances (Knisley 2011b). Public utilization of the on-site preserves including residential and commercial tenants would be prohibited and included in the tenant leases, and the preserves would be marked with signs indicating "Nature Preserve Area – Unauthorized Access Prohibited". In addition, the community would be educated on the wildlife resources that live in the adjacent preserves. However, there would be a possibility that community members or visitors could access the on-site preserves. When walking through forested areas, people have a tendency to select open patches of bare ground, therefore they could step on and crush a MTB or burrow. However, as indicated above pedestrian foot traffic can also be beneficial by helping maintain open spaces.

Increased potential for predation

Human presence could increase the potential for predation of individual MTB from introduced predators such as domestic dogs or cats and rats. These threats would be minimized through the requirement of dogs to be leashed, exclusion of residents from the on-site preserves (through posted signs), and through the educational materials and kiosks. For rats, residents of the community would likely deploy pesticides to reduce any rodent infestations that occur within the development areas. Consequently, it would be unlikely that the rat population would be such that it would adversely affect MTBs in the on-site preserves, Southern Corridor or the Stepping Stones. Based on the implementation of the minimization measures, residential and commercial development would not be expected to increase the predation threat to MTB.

Collection

Tiger beetles are the subject of more intense collecting and study than any other single beetle group (Pearson 1988, Knisley and Hill 1992, Choate 1996, Knisley *et al.* 2014). Tiger beetle

collecting and the sale and trade of specimens have increased in popularity in recent years (Knisley *et al.* 2014). Among the professional researchers and many amateurs that collect tiger beetles are individuals that take only small numbers; however, there are also avid collectors who take as many specimens as possible, often for sale or trade. At present, it is estimated that nationally 50 to 100 individuals collect tiger beetles, and approximately 50 individuals are avid collectors (Knisley 2015a).

Markets currently exist for tiger beetles. Specimens of two Florida tiger beetles, the Highlands tiger beetle *(Cicindelidia highlandensis),* and the scrub tiger beetle *(Cicindelidia scabrosa)* scare regularly offered for sale or trade through online insect dealers (The Bugmaniac 2015 and eBay 2015). Considering the recent rediscovery of the MTB and concerns regarding its continued existence, the desirability of this species to private collectors is expected to increase, which may lead to similar markets and increased demand. Collection pressure for the MTB is expected to be high, based upon what has transpired in comparable situations with other federally listed and imperiled tiger beetles and butterflies both nationwide and in Florida. Over collection of the Highlands tiger beetle may have contributed to the extirpation of that species from its type locality in Florida (Knisley and Hill 1992). Most recently, a private collector posted on social media an image of a potentially significant number of adult MTBs (9), which are believed to have been collected at Zoo Miami (Wirth 2016).

The presence of the residential community following the development of the proposed CRC adjacent to occupied MTB habitat would provide additional opportunity for amateur and avid collectors to access the species. Collection would adversely affect the MTB by removing individuals from the already small and rare population. In addition, collection could impact future population growth if adults are taken prior to egg-laying. Populations could potentially be reduced to below sustainable numbers (Allee effect) if collection reduces females and subsequently recruitment. Even limited collection from the remaining populations could have deleterious effects on reproductive and genetic viability of the species and push the MTB population numbers lower. To minimize the threat of collection (including residential and commercial tenants) of the on-site preserves in Alternative 6, public use would be prohibited and included in the tenant leases, the on-site preserves would be marked with signs indicating "Nature Preserve Area – Unauthorized Access Prohibited", and the community would be educated on the wildlife resources that live in the adjacent preserves. However, it would still be possible for a collector to enter the on-site preserves and collect MTB.

The collection pressure at the Off-site Mitigation Area would be expected to be lower to possibly non-existent because this property is secured and patrolled and access must be granted to enter the private area.

Vehicles

The presence of the residential and commercial structures proposed in Alternative 6 would greatly increase the amount of vehicle traffic within the property proposed for the development of CRC above what is currently ongoing. Vehicles have the potential to adversely affect MTB from hitting, crushing, and killing beetles as well as temporarily obscuring movement across the roadway between the on-site preserves. Vehicle traffic along the main road would be expected to be intermittent. MTB would not be likely to occupy the community or Stepping Stones

because those features would be landscaped with mulch and would lack sufficient open space and sandy soil. However, some MTB could enter the community by flight or walking through a disturbed open patch. Consequently, it would be possible that a MTB that entered the community would be killed by a vehicle on the road or in a parking lot. The number of individuals would be expected to encounter this threat over time would be expected to increase as the population of MTB in the Southern Corridor and on-site preserves increases and more beetles move about the proposed CRC.

Pesticide Use and Mosquito Control

Pesticides (insecticides, herbicides, rodenticides *etc.*) would be expected to be applied to address infestations of unwanted insects or rodents from the homes and commercial buildings as well as treat unwanted invasive plants in the community and Stepping Stones in Alternative 6. Pesticides have the potential to kill MTB through direct exposure to adults and larvae, secondary exposure from insect prey, or overall reduction in prey availability for MTB. The use of pesticides for agriculture and mosquito control presents potential risks to non-target insects, especially imperiled insects (EPA 2002, 2006a, 2006b).

The Applicants have developed community minimization measures and BMPs (Section 6.2.3 of the HCP) that would minimize the adverse effects of pesticide use on MTB. These would include but are not limited to, the restriction of application of insecticides within the Stepping Stones. In addition, the community Integrated Pest Management Plan for Alternative 6 would include education for the lessees, property owners, and/or tenants on proper pest management. MTB would not be likely to occupy the community or Stepping Stones because these features would be landscaped with mulch and will lack sufficient open space and sandy soil. However, should MTB occupy the Stepping Stones and community, it would be likely that some individuals would be killed during pest management activities. The frequency and number of MTB killed would be minimized by the aforementioned minimization measures and BMPs.

Based on studies with other invertebrates, it can be concluded that mosquito control activities that involve the use of both aerial and ground-based spraying methods have the potential to deliver pesticides in quantities sufficient to cause adverse effects to non-target species in both target and non-target areas. Pesticide drift at a level of concern to non-target invertebrates (butterflies) has been measured up to approximately 745 ft from truck routes (Pierce 2011, Rand and Hoang 2010) and 1,312 ft from aerial spray zones (Bargar 2012). Some of the studies examining this issue dealt with single application scenarios and examined effects on only one or two butterfly life stages. Under a realistic scenario, the potential exists for exposure to all life stages to occur over multiple applications in a season. In the case of a persistent compound like permethrin, whose residues remain on vegetation for weeks, the potential exists for nontarget species to be exposed to multiple pesticides within a season (*e.g.*, permethrin on vegetation coupled with aerial exposure to naled).

Mosquito control within the proposed CRC would be conducted by MDMC. MDMC follows application guidance from the Service that currently avoids and minimizes the likelihood of adversely effecting BSHB by implementing buffers to occupied and CH. The presence of the new residents under Alternative 6 would increase the likelihood of mosquito control application above what is currently occurring. The buffers instituted for the BSHB are anticipated to protect

MTB; therefore, under the current MDMC program it would be unlikely that MTB adults or immature stages would be affected in the proposed CRC from mosquito control. However, it is unknown whether MDMC will continue be able to continue to adhere to the identified buffers considering concerns for human health and safety from the Zika virus. The effects of MDMC's program will be evaluated through consultation with MDMC and the Service; therefore, it will not be considered further in this EA.

Home insecticide misters could adversely affect MTB if the insecticide released drifts into the Southern Corridor or on-site preserves and kills MTB. Home insecticide misters/foggers that could be used on patios have a relatively small effective zone (*e.g.*, Allclear® Terminix® Mosquito Mister 2000 covers 2,000 sq ft). The residences are 70 to 140 ft from the Southern Corridor and approximately 88 ft from nearest on-site preserve, and misters are ineffective on days with high winds so tenants would be unlikely to operate them under conditions when the mist could reach the Southern Corridor. Consequently, the use of home insecticide systems would not be anticipated to have any adverse effects on MTB.

Pine Rockland Habitat Management

Under Alternative 6, pine rockland habitat management would include a combination of mechanical, chemical, and prescribed fire treatment in order to adaptively manage the Southern Corridor and on-site preserves to reach success criteria and maintain pine rockland habitat. The prescribed fire would not be applied to the Southern Corridor due to its size. The Stepping Stones would be planted with pine rockland species and managed as landscaping as described in Section 7.2 of the HCP. Prescribed fire would the preferred method of long-term management of the on-site preserves; however, mechanical and chemical treatments would occur in most areas as part of the initial site management to address reduction of fuel load and exotics. Mechanical and chemical treatments would continue to be used in the on-site preserves, as needed, to reach the success criteria.

The mechanical clearing, chemical treatments, and prescribed fire have the potential to adversely affect MTB through disturbance, injury, and mortality. Each land management technique is evaluated below.

Mechanical treatment

Restoration activities in the on-site preserves would commence in some areas with mechanical removal of vegetation to reduce exotics and lower the fuel load prior to implementing the first burn (HCP: Appendix J, *Section 4.4 Annual Work Plan*; see also Appendix J1). Mechanical treatment would include bringing heavy equipment into the preserves to manipulate vegetation as well as establish firebreaks (5,397 ft of new and 4,413 ft enhanced). Heavy equipment has the potential to injure or kill MTB by crushing individuals and collapsing burrows. Effects from heavy equipment would be minimized by using machinery that is the smallest possible to complete the task (reducing the disturbance foot print) and using rubber tracked and tired vehicles (reducing ground disturbance). In management units where mechanical treatment would be need for pine thinning or reduction in Burma reed, bare ground and open spaces are likely minimal. However, if MTBs are present they could be crushed or burrows collapsed. Therefore, some individual MTBs could be killed during this treatment.

Mechanical treatment would continue to be used within the on-site preserves to reach success criteria if prescribed fire cannot be deployed. As described in detail in the Pine Rockland Habitat Management section for BSHB, fire management of pine rockland habitat can be hampered by the pattern of land ownership and development when residential and commercial properties are embedded within or in close proximity to pineland habitat (Service 2014). Adverse effects from mechanical treatment result through different pathways than prescribed fire (*e.g.* individuals are crushed rather than burned) and although the overall acreages managed would be the same, for MTB, mechanical treatment would be expected to be more likely to kill more individuals (adults, larval, and burrows) than during fire because of trampling from foot traffic and crushing by machinery.

Herbaceous chemical treatment

Herbaceous chemical treatment would be deployed to reduce exotic plant species and adaptively mange the Southern Corridor and on-site preserves to reach the success criteria. The greatest threat from herbicide treatment would be that MTB would be crushed and killed from individuals or vehicles applying the herbicide. Herbaceous treatment would be conducted in areas where exotic plants dominate the habitat. Areas dominated by invasive plants are unlikely to provide habitat necessary for the beetle; therefore these areas would not be expected to be occupied by MTB. Under Alternative 6, workers would be educated to identify MTB and care would be taken when operating in areas with open sandy soils where MTB could occur. It is unknown whether herbaceous chemicals have an adverse effect on MTB; however, as previously described, the location where treatment would occur are less likely to be occupied MTB. Based on the minimal overlap anticipated between MTB and the activities as well as the minimization measures that would be implemented, adverse effects to the species would not be anticipated from herbicide treatment in the Southern Corridor and on-site preserves.

Prescribed fire

Prescribed fire is the preferred method for long term management of the on-site preserves because pine rocklands are a fire adapted ecosystem. Details of the burn plan for the on-site preserves are found in Appendix J of the HCP. Prescribed fire can adversely affect MTBs by directly killing individuals (adult and immature). For the proposed CRC, implementation of the prescribed fire would be conducted mostly by foot and vehicles used for the burns would be expected to mostly remain on the firebreaks; although some vehicle use within the on-site preserve could be necessary. Because MTB are small and cryptic, and occupy bare patches where people are likely to walk, they could be killed by people implementing a prescribed fire if they are stepped on or a burrow is collapsed. In addition, as indicated under mechanical treatment, vehicles have the potential to kill MTB by crushing individuals and/or collapsing their burrows. Adult MTB can fly from harm's way to avoid pedestrians or vehicles and potentially a slow moving burn, which would minimize the number of individuals that are killed during implementation of the prescribed fire. Alternative 6 would minimize the adverse effect of burning by implementing the prescribed fire in a mosaic pattern that creates refuge for adult MTB to escape during the burn and reducing the intensity of the fire to lower the likelihood fire heat would kill individuals taking refuge in a burrow. In addition, many burns would be

conducted during the winter months based on optimum burn conditions for pine rocklands, and this time would coincide with when the MTB would be less vulnerable; non-flight season [flight season May 15 to October 17, (Knisley 2015b)].

Creating and maintaining firebreaks can adversely affect MTB by crushing and killing adults and burrows within the firebreak. MTB occupy open bare ground and sandy soil and therefore, may be drawn to and occupy the firebreaks. For the proposed CRC, firebreaks must be maintained and created around the on-site preserves in order to successfully conduct prescribed fires. Creation of new firebreaks to avoid MTB that occupy a particular firebreak would damage more pine rockland habitat and would have the potential to kill additional listed species. Consequently, the proposed CRC would not make adjustments to firebreaks to avoid MTB habitat and individuals occupying the firebreak would likely be killed unless they move from harm's way.

Finally, "mop-up", post burn, has the potential to kill MTB if water is applied in excess and pooling or ponding water floods an occupied MTB burrow, drowning its occupant. To minimize this threat, Alternative 6 includes a BMP that mop-up activities would avoid pooling water to the extent practicable. However, in some cases, extinguishing the fire to prevent escape from the burn unit could necessitate additional water application.

In summary, under Alternative 6, the proposed CRC would implement BMPs, described above and in section 6.2.4.4 of the HCP, to reduce the likelihood that MTB would be killed during prescribed fire. However, some individuals would be incidentally injured or killed by equipment and fire.

Invasive Exotic Plants

In general, any of the above land management techniques could adversely affect MTB in the Southern Corridor or on-site preserves if invasive plant species invade or (re)colonize after disturbance and decrease the availability of patches of bare ground needed to support MTB. However, the success criteria in the proposed CRC include a criterion that non-native plant species should be less than 5 percent and that bare ground patches be at least 25 percent of the area. The Southern Corridor and on-site preserves would be monitored annually either quantitatively or qualitatively (section 7.6 of the HCP) to make sure they are in compliance with the success criteria. Additional vegetation removal would be necessary if the percent of invasive exotic plants exceed the success criteria. Regular treatment of the invasive exotics has the potential to affect MTB if personnel are constantly walking through the Southern Corridor and on-site preserves, increasing the likelihood that a MTB could be stepped on. Workers would be educated on the appearance of listed species and advised on avoiding any MTB they might observe. Consequently, adverse effects to MTB from non-natives and any additional management would be minimized.

Pesticides

Pesticide use, other than herbaceous chemical treatment, in the Southern Corridor and on-site preserves is not expected to be a regular occurrence. However, pesticides could be needed to manage an invasive species. Insecticides would adversely affect all life stages of MTB by killing

them if applied to the individual. Pest management of insects in the Southern Corridor and on-site preserves would be restricted to target those pests that are problematic to the species covered by the ITP and/or meeting success criteria and would be used as part of the adaptive management strategy. Because of the proposed restrictions in their use and the limited application, it would be unlikely that pesticide use in the Southern Corridor and on-site preserves would adversely affect MTB.

Rim rock Crowned Snake

Beneficial effects

There are expected to be minimal site specific benefits to the rim rock crowned snake other than what has been described under *Wildlife and Protected Species*. The Southern Corridor and on-site preserves would be managed to provide native pine rockland and rockland hammock habitat that is expected to support the lifecycle of the rim rock crowned snake, and prescribed fires are expected to improve vegetative cover and prey species abundance. Furthermore, the FWC lists the top three priority actions for this species as: 1) acquire, restore, protect and manage as much suitable habitat as possible; 2) continue the removal of non-native species; and 3) research the species' life history (FWC 2013). Alternative 6 for the proposed CRC addresses two of FWC's top priorities. Alternative 6 would bring 51.41 ac of private land (CRC property) and 50.96 ac (Off-site Mitigation Area) into permanent conservation and manage the habitat with the intent to be high quality native pine rockland and pineland hammock. As part of managing those lands, the Applicants would also remove non-native species from the Southern Corridor, on-site preserves, and Off-site Mitigation Area.

Adverse Effects

Construction

Permanent removal/loss of habitat

The rim rock crowned snake is endemic to Miami-Dade and Monroe counties. Its preferred habitat is pine rocklands and tropical hardwood hammocks near fresh water although it has been documented within human altered habitats (FWC 2013; FNAI 2001). Based upon observations over the years, the species appears to be able to adapt to a multitude of habitats, including rockland habitats, dump sites, roadsides, vacant lots, pastures with shrubby growth and pines, urban and agricultural landscapes, and hammock habitat with closed canopy and loose, dark, moist soil (Duellman and Schwarz 1958, Campbell and Moler 1992, Hines and Bradley 2009). They can be found in holes and depressions in the oolitic limestone (formed by calcium carbonate), but they can also be found periodically in rotten logs and under rocks and trash (Enge *et al.* 2003, Campbell and Moler 1992).

The rim rock crowned snake's geographic range is confined to the southern tip of Florida, including the Florida Keys (FWC 2013). Limited to the Miami Rock Ridge in southeastern MDC and southern Monroe County, the rim rock crowned snake is considered a very rare species with only 12 individuals recorded between 1991 and 2009 (Hines and Bradley 2009). There is no comprehensive assessment of population numbers or trends. One population has been reported to exist within the Barnacle Historic State Park, despite only containing 4 ac of

hammock (FWC 2011). This record suggests that a large expanse of habitat may not be necessary for survival, most likely because home range sizes appear to be small. It is not known what the rim rock crowned snake eats; however, if similar to other members of the genus *Tantilla*, it likely feeds on insects and other small invertebrates (Ernst and Ernst 2003).

No surveys were conducted for rim rock crowned snake on property proposed for the development of CRC, nor was it documented during other biological inventory on the property. Literature review indicated this snake was documented in 2009 within the Zoo Miami area (FWC 2011). Based on available habitat and observation at Zoo Miami, the rim rock crowned snake is expected to be present in the Richmond Area.

Alternative 6 would convert 73.75 ac of vegetated land (86.35 ac of development minus 12.6 ac of currently impervious surfaces) into residential and commercial facilities and their associated infrastructure. This loss of habitat would adversely affect any rim rock crowned snake that currently occupy the development footprint, and any rim rock crowned snake that has a home range that largely overlaps this footprint would be forced to move or readjust its home range to find resources for feeding, breeding, and sheltering. Given the amount of information available on the species it is unknown how many individual rim rock crowned snake could occur on the property proposed for the development of CRC. As indicated above, rim rock crowned snakes can adapt to a multitude of habitats, thus it would be possible that they could use the developed CRC community to some extent. However, post development, the community would not be anticipated to provide sufficient resources to support the same abundance and distribution of rim rock crowned snakes as it does in its current condition. Rim rock crowned snakes that are displaced from their home range could die if they cannot find sufficient resources, either because they are not available (due to other urbanization nearby) or because the adjacent habitat is already occupied by another rim rock crowned snake. The on-site preserves to the east and west of the community would provide opportunities for rim rock crowned snakes to disperse and seek new territories.

In addition to habitat loss, the construction of the proposed CRC would result in an increased level of physical disturbance including noise through the increased presence of humans and/or associated equipment, vehicles and/or machinery. The noise and human disturbance from construction would be temporary but has the potential to harass any rim rock crowned snake currently occupying the development footprint. In addition, vehicles and construction equipment have the potential to kill and crush individuals. Alternative 6 would reduce the adverse effects of construction activities to rim rock crowned snake by applying the principals of the Service's Standard Protection Measures for Eastern Indigo Snakes (Service 2013c) to the rim rock crowned snake. However, habitat loss/decreased function of the habitat within the residential and commercial development would be expected to be the ultimate impact to rim rock crowned snakes from construction.

Fragmentation of habitat

Fragmentation of habitat is a concern for the rim rock crowned snake because it limits the overall amount of habitat available to the species and its recovery. As previously indicated, the species is endemic to Miami-Dade and Monroe counties and its preferred habitat is pine rocklands and tropical hardwood hammocks near fresh water. Although rim rock crowned snakes can use

disturbed habitat, it is unclear to what degree that it will support the lifecycle of the species and how great the dispersal ability of the snake is. Given its fossorial nature, it seems unlikely that it would be able to disperse readily across a developed residential and commercial area, such as the proposed CRC. However, Alternative 6 would include the Southern Corridor, which would provide an opportunity for the species to cross between the east and west preserves. It could also be possible for individuals to use the Stepping Stones to traverse the proposed community. The position of the on-site preserves, adjacent to other undisturbed habitat would be anticipated to be a benefit to the rim rock crowned snake because it would provide greater opportunity for individuals to move around the Richmond Area with limited exposure to the risks associated with development. Fragmentation of the habitat from the proposed CRC would not be expected to result in direct mortality to rim rock crowned snakes. However, because the home range and dispersal ability of the Rim rock crowned snake is unknown, it is unclear to what degree the fragmentation of habitat from the development of the proposed CRC could result in isolated populations of rim rock crowned snake within the east and west preserves and a reduction in population viability because of decreased opportunities for genetic exchange and recruitment between preserves during natural population fluctuations or stochastic events. Regardless, the development of the proposed CRC would reduce the amount of habitat available to rim rock crowned snakes in the greater Richmond Area.

Residential and Commercial Operation

Physical disturbance

Once developed, the CRC community would result in an increased level of physical disturbance and increased presence of humans and vehicles. It is possible, based on the known life history of the species that rim rock crowned snakes could inhabit the green spaces and Stepping Stones located in the community. In fact, the use of water for irrigation could serve as an attractant to the species. However, because of the secretive nature of this fossorial species, it is anticipated to be unlikely that a rim rock crowned snake would be detected/observed in the community. There is no information on whether this species would be adversely affected by the increase in physical noise and human presence that would occur following the development of the proposed CRC; however, because it is fossorial, it is expected to be unlikely that a rim rock crowned snake would be struck and killed by any vehicles.

Pesticide Use

Effects to rim rock crowned snake would be expected to be the same as those described for the indigo snake. Please see *Pesticide Use* under indigo snake for this discussion.

Pine Rockland Habitat Management

Pine rockland habitat management would include a combination of mechanical, chemical, and prescribed fire treatment in order to adaptively manage the Southern Corridor and on-site preserves to reach success criteria and maintain pine rockland habitat. Prescribed fire would not be applied to the Southern Corridor due to its size. Prescribed fire would be the preferred method of long-term management of the on-site preserves; however, mechanical and chemical

treatments would occur in most areas as part of the initial site management to address reduction of fuel load and exotics. Mechanical and chemical treatments would continue to be used in the on-site preserves, as needed, to reach the success criteria.

The mechanical clearing, chemical treatments, and prescribed fire could affect rim rock crowned snakes through disturbance, injury, and mortality. Each land management technique is evaluated below.

Mechanical Treatment

Restoration activities in the Southern Corridor and on-site preserves would commence in some areas with mechanical removal of vegetation to reduce exotics and lower the fuel load prior to implementing the first burn (Appendix J, section 4.4 Annual Work Plan). Mechanical treatment would include brining heavy equipment into on-site preserves to manipulate vegetation as well as establish fire-breaks in some areas. Heavy equipment has the potential to injure or kill rim rock crowned snakes if vehicles drive over and crush individuals on or just below the surface. Alternative 6 proposes to implement the Standard Protection Measures for Eastern Indigo Snake (Service 2013c) and adapt them to include rim rock crowned snakes when conducting activities with mechanical equipment. Effects from heavy equipment would be further minimized by using machinery that is the smallest possible to complete the task (thereby reducing its disturbance foot print) and using rubber tracked and tired vehicles (to reduce crushing). Based on the proposed implementation of the modified Standard Protection Measures for the Eastern Indigo Snake to protect rim rock crowned snakes during land management activities, mechanical treatment would not be expected to adversely affect the species.

Herbaceous Chemical Treatment

Under Alternative 6, herbaceous chemical treatment would be deployed to reduce exotic plant species and adaptively manage the Southern Corridor and on-site preserves to reach the success criteria. Herbaceous chemical treatment would focus on the target species and would follow label instructions. Chemical treatment of exotics would not be anticipated to have any adverse effects to rim rock crowned snakes.

Prescribed Fire

Prescribed fire would be the preferred method for long term management of the on-site preserves because pine rocklands are a fire adapted ecosystem. The burn plan for the on-site preserves can be found in Appendices J. When fire advances quickly, rim rock crowned snakes could be consumed by an advancing fire. However, as a fossorial species, rim rock crowned snakes are likely to burrow down and escape the fire and survive the event. Alternative 6 would minimize the likelihood that rim rock crowned snakes would be killed in a prescribed fire by proposing to implement the burns in a mosaic pattern that creates refuge for individuals and using fire techniques and small burn sizes to reduce the intensity of the fire. With a reduced fire intensity and refuge available it would be expected that most rim rock crowned snakes would survive the prescribed fire activities.

Any rim rock crowned snake occupying a burn unit could incur a brief period of disturbance to its patterns of feeding, breeding, or sheltering. Disturbance from prescribed burns would occur

for only 1 day on each of the burn units. In addition, the burns are proposed to be conducted in mosaic patterns, providing alternative habitat for the rim rock crowned snakes to use within the on-site preserves. Consequently, disturbance to feeding, breeding, or sheltering of rim rock crowned snakes from prescribed fire is anticipated to be negligible.

Pesticides

Effects to rim rock crowned snake would be expected to be the same as those described for the indigo snake. Please see *Pesticides* under indigo snake for this discussion.

White-crowned Pigeon

In Florida, the white-crowned pigeon uses two distinct habitats for nesting and foraging. The property proposed for development of CRC or the Off-site Mitigation Area could potentially serve as feeding habitat for this species, which selects forests which contain a large number of evergreen and semi-evergreen tropical tress species (Snyder *et al.* 1990). Pinelands have a high diversity of understory plants, many of which produce fruit that white-crowned pigeons feed upon. The white-crowned pigeon could also choose the property proposed for development of CRC or the Off-site Mitigation Area as potential winter habitat, as some birds forage in the pinelands and seasonal deciduous forests of Everglades National Park during winter months (BNA 2016).

The white-crowned pigeon was not documented within the property proposed for development of CRC during any of the site surveys and is likely currently absent from the area year-round. Although no surveys were conducted, it is also expected to be absent from the Off-site Mitigation Area. Based on its absence from area, construction of Alterative 6 would not be expected effect the species.

However, there is some possibility that the white-crowned pigeon may occur within the Richmond Area in the future and could visit and use the on-site preserves or Off-site Mitigation Area for feeding or wintering activities. The land management that is proposed could disturb the visiting individual and encourage it to forage elsewhere temporarily, but no adverse effects would be expected from this type of disturbance. In general, the anticipated improvement in habitat quality as a result of the land management activities would be expected to improve foraging opportunities for any white-crowned pigeons that may choose to use the properties in the future.

Special Status Plant Species

Beneficial Effects

The CRC HCP includes 13 plants with a special status ranging from endangered to proposed for listing (Federal status species; Table 1-2 of the HCP; Table 4 of the EA). These include: Blodgett's silver bush, Carter's small-flowered flax , crenulate lead-plant, deltoid spurge, Everglades bully, Garber's spurge, Florida brickell bush, Florida bristle fern, Florida pineland crabgrass, Florida prairie clover, sand flax, Small's milkpea, and tiny polygala. Alternative 6 would establish a permanent conservation easement on 51.41 ac of pine rockland and rockland

hammock habitat (on-site preserves) and a permanent conservation mechanism on 50.96 ac on the Off-site Mitigation Area. Each of these plant species occur within pine rockland habitat. Additional species specific information can be found in **Attachment 5**.

All 13 of the identified plants are adapted to a fire ecosystem; therefore, the proposed implementation of prescribed fire on the on-site preserves and Off-site Mitigation Area would be expected to be beneficial for each of the species. Implementation of prescribed fire would be expected to provide benefits to these plant species through habitat improvement and ongoing maintenance of improved habitat quality. Implementation of regular prescribed fire in pine rocklands would reduce fuel loading, which would lower the intensity of fires, and in turn would lower the amount and frequency that plants would be killed from burning. Regularly occurring fire would also be expected to maintain an open understory that promotes plant species diversity. In addition, many fire dependent plant species respond positively to the occurrence of fire. These responses could include increased flower, fruit and seed production as well as improved germination and seedling establishment.

Adverse Effects

Construction

Permanent removal/loss of habitat

Although all 13 special status plant species have the potential to occur within the property proposed for the development of CRC, botanical surveys only documented 2 species, deltoid spurge and tiny polygala. The Applicants conducted surveys following the botanical inventory guidelines provided by the Service on September 26-27, 2014, and October 10, 2014. Additional field surveys were conducted by Woodmansee on September 28, 2014 and November 4, 2014.

The proposed construction of the residential and commercial facilities and their associated infrastructure would result in the loss of 32.91 ac characterized as pine rockland habitat and 20.78 ac characterized as disturbed upland (exotic hardwood dominated, historically marl prairie, and scraped, dominated by turf species), for a total of 53.69 ac of habitat lost. Although surveys only documented occurrences of deltoid spurge and tiny polygala (described below), the 53.69 ac in the development footprint has the potential to support any of the 13 special status plant species and seeds could be dormant in the seedbank. Any plant that occurs within the development footprint would be destroyed or killed by construction activities.

Deltoid spurge plants were identified at 11 areas within the property (Figure 3-5 of the HCP). Only one location would be within the development footprint of Alternative 6. These individual plants would be destroyed during construction. Two occurrences of tiny polygala were documented during surveys (Figure 3-5 of the HCP). One occurrence is within the development footprint of Alternative 6 and would be lost as a result of construction. This tiny polygala occurrence includes nine individual plants. This occurrence was also encountered during a plant relocation effort that occurred in June 2014 and was conducted by staff at Fairchild Tropical Botanic Garden. At that time, 3 additional tiny polygala specimens were removed from this location (HCP: Appendix D).

Residential and Commercial Operation

Pesticide Use

Under Alternative 6, pesticides (insecticides, herbicides, rodenticides *etc.*) would likely be applied to address infestations of unwanted insects or rodents from the homes and commercial buildings as well as treat unwanted invasive plants in the community and Stepping Stones. With the exception of the Stepping Stones, the special status plants are not expected to persist within any portion of the residential and commercial community. The Stepping Stones would be cleared during construction and then re-planted with pine rockland species (50 to 75 percent of composition) with a focus on plant species favorable for BSHB. It is possible that one or more of the special status plants could opportunistically re-occupy the Stepping Stones if they remain in the seedbank.

To minimize the likelihood that any of these special status plants that re-establishes within a Stepping Stone would be killed, Alternative 6 proposes to implement BMPs for herbicide treatment. Application of herbicides would give preference for systemic herbicides that exhibit low soil activity and conform to the standards established for preserve management (section 6.2.4.4 of the HCP). In addition, if any of the special status plants re-establish and are observed, herbicide treatment would avoid these specimens. There is a low likelihood that one or more of the special status plants would re-establish itself in a Stepping Stone from the seedbank and Alternative 6 proposes minimization measures that would be implemented to avoid killing any of these plants by herbicide, therefore, pesticide use in the community would not be anticipated to adversely affect any of the special status plant species.

Pine Rockland Habitat Management

Pine rockland habitat management would include a combination of mechanical, chemical, and prescribed fire treatment in order to adaptively manage the Southern Corridor and on-site preserves to reach success criteria and maintain pine rockland habitat. Prescribed fire would not be applied to the Southern Corridor due to its size. Prescribed fire would be the preferred method of long-term management of the on-site preserves; however, mechanical and chemical treatments would occur in most areas as part of the initial site management to address reduction of fuel load and exotics. Mechanical and chemical treatments would continue to be used in the on-site preserves, as needed, to reach the success criteria.

As previously stated, 11 of the 13 special status plants are not known to currently occupy property proposed for the development of CRC; however, the potential exists for individuals to re-establish within the on-site preserves as the habitat is managed and prescribed fire is reintroduced into the ecosystem. This potential could increase over time as the on-site preserve lands are managed and the habitat quality is anticipated to improve. For the purpose of this analysis, it is assumed that any/all of the special status plants would eventually occupy the on-site preserves and possibly the Southern Corridor.

The mechanical clearing, chemical treatments, and prescribed fire could affect the 13 special status plant species through injury and mortality. Each land management technique is evaluated below.

Mechanical Treatment

Restoration activities in the Southern Corridor and on-site preserves would commence in some areas with mechanical removal of vegetation to reduce exotics and lower the fuel load prior to implementing the first burn (Appendix J, section 4.4 Annual Work Plan). Mechanical treatment would include bringing heavy equipment into the on-site preserves to manipulate vegetation as well as establish fire-breaks in some areas. As proposed, firebreaks around management units in the on-site preserves totals 21,755 ft. Most the firebreaks would be in areas considered existing/paved (11,945 ft). Firebreaks within the on-site preserves would total approximately 9,810 ft; of this approximately 5,397 ft would be new (created) firebreaks, 1,128 ft enhanced along a historically existing trail that has not been maintained, 2,661 ft of existing firebreaks that would be enhanced, and 624 ft of an existing asphalt trail.

Heavy equipment has the potential crush the special status plants. Effects from heavy equipment would be minimized by using machinery that would be the smallest possible to complete the task (thereby reducing its disturbance footprint) and using rubber tracked and tired vehicles (to reduce the likelihood of crushing plants). In addition, known occurrences of federally listed plants would be marked with flagging and/or delineated on contractor maps to prevent disturbance during hardwood reduction, invasive treatment and establishment of new firebreaks. Currently, the known locations in the on-site preserves include 10 occurrences of deltoid spurge and 1 occurrence of tiny polygala. Over time, as the special status plants establish themselves at new locations, these plants would be documented during opportunistic observations and during annual biological monitoring. Any plants that are not observed have the potential to be crushed or killed during ongoing mechanical treatments. In addition, if a plant re-establishes itself in a firebreak, the plant would not be avoided during firebreak maintenance because the need to maintain a functioning firebreak would be important to the ongoing land management, and the creation of a new firebreak would ultimately do more damage to the landscape and limestone layer than the destruction of the individual plants.

Mechanical treatment would continue to be used within the on-site preserves to reach success criteria if prescribed fire cannot be deployed. Fire management of pine rockland habitat can be hampered by the pattern of land ownership and development when residential and commercial properties are embedded within or in close proximity to pine rockland habitat (Service 2014). For example, as noted in Table 1 in Appendix J of the HCP, in the Richmond Area, the majority fires occurring in this region over the past 27 years were the result of wildfires, not prescribed burn treatments or other land management. MDC has indicated that some of their inability to put prescribed fire on their property is related to insufficient resources. Alternative 6 would be expected to have sufficient resources to implement prescribed fires, and residences would be required to sign acknowledgement notices that they are residing within an area where prescribed fire will be conducted; therefore, some of the challenges typically confronting implementation of prescribed fire would be minimized within the community. However, there still exists the possibility that in some years prescribed fire would not be able to be implemented because of environmental conditions (*e.g.*, too wet or too dry); therefore, the Applicants could need to implement additional mechanical clearing to reach the success criteria. Although adverse effects from mechanical treatment result through different pathways than prescribed fire

(*e.g*. individuals are crushed rather than burned) the overall loss of individuals during preserve management would not be anticipated to be different because the acreages managed would be the same.

Mechanical treatment may be less beneficial than fire because it would not quickly convert debris to nutrients, and remaining leaf litter could suppress the desired plants from establishing; fire has also been found to stimulate seedling germination (Anderson and Henry 2015). If only mechanical treatment is conducted for many subsequent years, adaptive management would be relied upon to reach success criteria. However, because mechanical treatment may not provide the same ecological benefits as fire, there could be indirect effects to the special status plants and occurrences of deltoid spurge, tiny polygala, and any other of the 11 plants that may have established could decline.

Herbaceous Chemical Treatment

Under Alternative 6, herbaceous chemical treatment would be deployed to reduce exotic plant species and adaptively mange the Southern Corridor and on-site preserves to reach the success criteria. Herbicide treatment has the potential to adversely affect deltoid spurge, tiny polygala or any of the other 11 special status plant species if the chemicals are applied directly to the plant and kill it. Herbaceous chemical treatment would follow the BMPs for land management (section 6.2.4.4 of the HCP) including flagging and/or delineating known occurrences of the plants to be avoided during treatment on contractor maps, conducting application when drift and damage to non-target species would be minimized, and giving preference for systemic herbicides that exhibit low soil activity. Workers would be educated to identify plant species of concern so care can be taken not to apply chemical treatment to them. Consequently, adverse effects to the special status plant species would not be anticipated from chemical treatment in the Southern Corridor or on-site preserves.

Prescribed Fire

Prescribed fire would be anticipated to injure or “kill”, to some degree, most of the special status plants that occur in the on-site preserves. Depending on the intensity of the fire at the location of the individual plant specimen, the fire could either: 1) completely consume/destroy the plant and eliminate its ability to regrow; 2) eliminate the above ground vegetation of the plant but leave the seed bank intact and able to germinate; 3) “top kill” the plant (killing all or most of the vegetative structure above ground) and leave the root mass or remaining limbs to re-sprout; or 4) minimally burn or scorch the vegetative structure of the plant and leave the remaining plant to continue to grow. Under Alternative 6 prescribed burns would be conducted in a manner to promote a mosaic pattern (HCP: Appendix J). This would include conducting fires with small burn units, and proposing fire techniques that would reduce the intensity of the fire and/or move it quickly through the landscape to reduce scorching. By using these techniques, the number of plants that would be completely consumed or destroyed would be minimized. Therefore, based on the proposed small burn units and the fire techniques that would be deployed to maintain a mosaic pattern within a burn, and the fact that each of these species are fire adapted, few if any of the individual plants would be expected to be completely lost (no ability to regrow from seed bank or root stock) as a result of the prescribed fires.

The 13 special status plant species could also be damaged, crushed or trampled, and/or killed as a result of equipment, vehicles, and people moving in and out of burn units. The Applicants would minimize the likelihood that plants would be damaged during these activities because known occurrences of federally listed plants would be flagged/delineated on maps and avoided. This information would be updated through opportunistic observations and during annual biological monitoring. Workers would also be educated on the appearance of these plants and would be expected to avoid individual plants if they are observed. However, some plants could re-establish and go undetected during biological monitoring and escape opportunistic detection. Consequently, there would be a potential that some special status plants could be incidentally crushed, damaged or killed by equipment or an individual during implementation of prescribed fire.

Off-site Mitigation Area

Effects of Conservation and Management of the Pine Rockland Habitat

Under Alternative 6, the UM would modify the deed restriction of the UM Richmond Campus to incorporate protections for the covered species (Table 3) and preserve and manage the 50.96-ac parcel of pine rockland habitat in perpetuity (Off-site Mitigation Area). Pursuant to the Off-site Mitigation Area Burn Plan (Appendix J1 of HCP), habitat management would include removal of invasive exotic species and the implementation of prescribed burning. Currently, exotic vegetation management is conducted on the Off-site Mitigation Area; however, there is no requirement to conduct prescribed burning. The additional habitat management on this land would continue to support and improve conditions for all the covered species and has the potential to increase population abundance for the species at that site. Currently only BSHB, Miami tiger beetle, and deltoid spurge are known to be present; however, species surveys have not been recently conducted for all the covered species.

Beneficial and adverse effects from habitat management are expected to be consistent with those effects described for the on-site preserves within the proposed CRC. Habitat management on the Off-site Mitigation Area will include mechanical treatment, herbaceous chemical treatment, prescribed fire, and invasive species management. Please see discussions for each species under effects of "*Pine Rockland Habitat Management*".

4.5.8 Invasive Species

Under Alternative 6 invasive species would be managed within the 51.5 ac of on-site preserves and the Off-site Mitigation Area. Therefore, Alternative 6 would likely benefit efforts to control invasive species and increase native species composition, abundance and diversity. Overall, Alternative 6 is anticipated to have a beneficial effect on controlling invasive species.

4.5.9 Cultural Resources

Alternative 6 effects on cultural resources would be identical to Alternative 4, which was found to have no adverse effects on cultural resources.

4.5.10 Socioeconomic

Alternative 6 would house an estimated population of 1,971 people based on the MDC Regulatory and Economic Resources calculations of 2.19 persons per unit included in the August 23, 2013, Planned Area Development Agreement (CFN 2013R0923724). Availability of single and multi-family units (residential capacity) is expected to be depleted by 2017 (MDC Comments on CRC Zoning Application No. 3, October 2011 Cycle). Alternative 6 would have a beneficial effect on housing availability by alleviating the anticipated deficiency of available residential units until almost 2025. Alternative 6 would also address the commercial deficiencies identified for this area.

Anticipated economic benefits of Alternative 6 have been extrapolated from the economic analysis conducted in 2011 for the project (Miami Economic Associates, Inc. Letter dated October 17, 2011). Based on the proposed development of Alternative 6, the proposed CRC could be expected to generate more than 780 temporary jobs during construction and approximately 575 full-time positions following build-out. Additionally, the construction would be expected to funnel $90 million into the economy during construction. Alternative 6 would also place $132 million on the MDC tax roll and could be expected to generate $1,288,000 in ad valorem taxes for unincorporated MDC Municipal Service Area, as well as an additional $1,058,000 in ad valorem taxes for the MDC Public School Districts and $66,000 for the Children's Trust. Because Alternative 6 reduces the commercial development from 370,000 sq ft to 289,000 sq ft there would be a reduction in the taxable value of the property proposed for CRC, and therefore, a reduction to the funding for the School Board and Children's Trust because they are tied to the assessed value of the property. Regardless, Alternative 6 would have a beneficial effect on socioeconomic resources.

4.5.11 Water Supply, Wastewater, Solid Waste

Based on MDC's Water Demand Multiplier (§ 24-43.1), Alternative 6 would have a total projected water demand of 190,900 gallons per day, with an equivalent demand in wastewater to accommodate the water supply. This is less than the demand under Alternative 4 and 5. The effects to water supply and demand would be slightly less than those described in Alternative 4. Therefore, Alternative 6 would also be expected to have no effect on these resources.

4.5.12 Human Health and Safety

Under Alternative 6, the beneficial effects to human health and safety are expected to be the same as those described in Alternative 4.

4.5.13 Schools

Under Alternative 6, a 4-ac site in the northwest corner of the property where CRC is proposed would be donated to MDC Public School District. Additionally, Alternative 6 would result in approximately $1,058,000 in ad valorem taxes for the MDC Public School Districts and $66,000 for the Children's Trust. Because Alternative 6 reduces the commercial development from 370,000 sq ft to 289,000 sq ft, there would be a reduction in the taxable value of the

property proposed for CRC, and therefore, a reduction to the funding for the School Board and Children's Trust because they are tied to the assessed value of the property. Regardless, Alternative 6 is expected to have a beneficial effect on schools.

4.5.14 Transportation

Traffic analysis for Alternative 6 was extrapolated from the traffic projections provided in the Coral Reef Commons UM South Campus Property Transportation Analysis report by Cathy Sweetapple & Associates Transportation and Mobility Planning, dated November 2011 (revised February 2012). Alternative 6 would generate approximately 468 trips from residential development, just over 730 trips from commercial development, 148 trips from the school site, and potentially 107 trips from the library, should MDC accept the library site donation. This would be a reduction in 200 trips from commercial development from Alternative 4 and 5. At this trip generation rate the projected adopted maximum service volume would be consumed by more than 5 percent at SW 127th Avenue and SW 152nd Street, adjacent to CRC. This would result in implementation of the same transportation improvements proposed in Alternative 4. These transportation improvements would help to alleviate current transportation issues and address projected transportation deficiencies; therefore, Alternative 6 would have a beneficial effect on transportation.

4.5.15 Parks and Recreation

The effects to park and recreation would be expected to be the same under Alternative 6 and those described under Alternative 4. Because the District will continue to a surplus of 472.64 ac of parkland per MDC LOS, Alternative 6 is expected to have no effect on parks and recreation.

4.5.16 Scenic Value

Under Alternative 6, the beneficial effects to the scenic value would be the same as those described in Alternative 4.

4.5.17 Noise

Based on the noise impact analysis for Alternative 4, which includes a higher development intensity, noise impacts related to temporary construction and post-development condition are predicted to be between 51 to 62 dBA. This is below regulatory requirements. The development intensity in Alternative 6 is decreased from that of Alternative 4; therefore, it is reasonable to assume that Alternative 6 predicted noise impacts would fall below the previously mentioned levels and similarly would not be significant. Based on this information, Alternative 6 would likely have minimal to no effect on noise.

5.0 CUMULATIVE EFFECTS

The CEQ, which implements NEPA, requires the assessment of cumulative impacts in the decision-making process for projects including a Federal action. Potential cumulative impacts are discussed in the following section. Cumulative impacts are defined in 40 CFR §1508.7 as the impacts:

> *…on the environment which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.*

The Federal action, issuance of a section 10(a) (1) (B) incidental take permit would not in itself contribute to cumulative effects; however, the activities that would be implemented following the issuance of an ITP may contribute to cumulative effects. The project action area for Alternative 6 is considered to be all lands within the proposed CRC as well as the Off-site Mitigation Area. Under Alternative 6, the only privately owned lands within the Richmond Area; CRC and the UM Richmond Campus, would establish conservation easements on approximately 100 ac of pine rockland habitat as a feature of the proposed project; these habitats would be restored and managed in perpetuity. Remaining undeveloped lands within the Richmond Area are public owned (Federal and MDC) and no current disclosures of permittable plans with secured funding for future development have been presented to the public. The Applicants' HCP discusses a draft proposal by Zoo Miami (section 8.6 of the HCP). The Service has not received any plans for review for this project; we expect to coordinate with MDC on any proposed development should it move forward. No secondary development is expected as a result of the proposed CRC. Consequently, cumulative effects are expected to be less than significant.

6.0 CLIMATE CHANGE

Although climate change outcomes are not within the control of the Service or the Applicants, it is a foreseeable change in circumstances that is reasonably certain to occur which will influence the HCP Plan Area and that has the potential to affect the long-term conservation, management goals, and objectives of the HCP.

Scientific information on climate change and its implications to the Service and its trust resources were summarized by the Service's National Climate Team (NCA 2014). This team also summarized the 2013 publication from the IPCC entitled *Highlights of the IPCC 5th Assessment Report: The Physical Science Basis of Climate Change (WGI); Summary for Policymakers*. The information from these summarizations was further condensed with a primary focus on Florida by the SFESO and documented in **Attachment 16.**

Florida is vulnerable to SLR, extreme heat events, increased heavy downpours, and hurricanes. Projected threats from climate change/SLR include even stronger storm influence. Due to the HCP Plan Area's proximity to the Atlantic Ocean, the upland ecosystems of the greater Richmond Area, including the HCP Plan Area, could experience both direct and indirect effects of SLR, increased temperatures, and increased precipitation as a result of its exposure to long term climate change. Precipitation projections indicate that rainfall patterns will be changing. The fall and winter months in South Florida could increase up to 20 percent more rainfall while the spring and summer months could exhibit a decrease of up to 30 percent of average. Although tropical storms are projected to decrease in number, their intensity is conversely projected to increase which could expose the HCP Plan Area to long duration disturbances from prolonged backwater flooding following each

storm. This increased exposure to both inundation and salt/brackish water would further stress the ecosystem's resiliency to restore ecological services following these disturbances (**Attachment 16**). The NCA (2014) predicts that South Florida precipitation will increase from 5 percent to 10 percent and temperatures will increase 3 to 7 degrees statewide by 2100. The NCA (2014), relying largely on scientific literature available as of 2012 to predict SLR outcomes, projected the world's oceans would rise anywhere from about 8 in to 6.6 ft based on varying types of models and assumptions. The NCA projects that SLR will increase 1 to 4 ft in this century, depending upon dynamics associated with melting ice sheets. Based on the scientific information summarized in **Attachment 16**, the effects of SLR on lands inland from the Miami area coastline, including the HCP Plan Area, would most likely be realized by salt water intrusion or by partial or complete inundation from a combination of salt and fresh water once the rising Atlantic Ocean challenges the dependability of local flood control and protection infrastructure. Depending upon the magnitude and scope of future SLR, some areas of South Florida could experience both. If SLR forces salt water to intrude into the Biscayne Aquifer and pushes the saltwater-freshwater interface (Salt Front) to locations where salt and brackish water penetrate the root zone and/or transition the local hydrology to a wetter environment, existing upland plant communities would transition to varying stages of salt-tolerant and/or wetland species domination. Increasing frequency and higher levels of inundation would additionally exacerbate conditions for salt-sensitive upland vegetation and those wildlife species dependent upon them. Climate change information summarized by the Service (**Attachment 16**) strongly suggests that SLR could cause adverse effects throughout MDC, including the Richmond Area and the HCP Plan Area within this century.

The HCP (section 12.2.3) considers the effects of climate change over the 30-year life of the permit. MDC is actively planning and evaluating potential effects of climate change and SLR and entered into a multi-county effort with Palm Beach, Broward, and Monroe counties, the *Southeast Florida Regional Climate Change Compact* (January 2010) to coordinate climate change mitigation and adaptation activities in the region (Compact 2010). This effort established a Unified Sea Level Rise Projection that estimates a 14 to 26 in rise in sea level by 2060 for the Southeast Florida region (Compact 2015). Considering this prediction, the property proposed for the development of CRC would not be expected to be impacted by sea level rise.

The HCP Plan Area is located within the influence of the Biscayne Aquifer of South Florida. SLR-induced flooding in combination with exposure to higher storm surges may affect the Richmond Area sometime prior to the end of this century, depending upon tidal influences and the effectiveness of flood control/protection infrastructure. Although the timing of long-term SLR effects on the HCP Plan Area is uncertain, the NCA modeled projections suggest that prior to 2100, some or all vegetational communities in the Richmond Area could experience a transition to increased dominance of salt-tolerant species potentially grading to salt-tolerant wetland species. However, current USGS predictive modeling data indicate that the Salt Front in the Biscayne Aquifer should remain stable and unchanged based on a projected rate of SLR estimated by the USACE over the next 30 years (section 12.2.3 in the HCP). Consequently, during the life of the permit, adverse effects from the Salt Front to the HCP Plan Area would not be expected to occur.

Finally, more extreme contrasts between dry and wet weather patterns and trends across the South Florida landscape would also likely result in a higher frequency and intensity of wild fires

during dry spells and higher frequencies of flooding and perennial pooling during wet periods (**Attachment 16**). These dramatic shifts in weather patterns would be expected to decrease ideal prescribed burning opportunities as dry or wet periods extend to their respective peak extremes. These weather changes could contribute to the establishment of long term unnatural fire regimes across the typically pyrogenic pine rockland ecosystem. As these changes occur, this could negatively affect efforts to conduct prescribed burning within the on-site preservers and Off-Site Mitigation Area.

7.0 COMPARISON OF ANALYZED ALTERNATIVES

7.1 Alternative Feasibility

7.1.1 Alternative 1 – No Action Alternative

Alternative 1 does not meet the purpose of the Applicants' project or goals of the HCP and therefore is unfeasible. The No Action Alternative would not result in socioeconomic benefits nor would it contribute additional ad valorem taxes, jobs, commercial services and housing units. Additionally, this alternative would not contribute restoration benefits to counter exotic species dominance and the ongoing transition to a non-pyrogenic plant community within the property proposed for CRC. Under this alternative, a conservation mechanism would not be required to be placed over pine rocklands, facilitating their perpetual preservation. Additionally, in the absence of the Service's authorization of restoration activities, which would subsequently generate revenue from the proposed CRC, restoration and perpetual management of the pine rockland habitats would not occur. The continuing baseline condition within the property proposed for the development of CRC could also decline and eventually the NFC status could be lost when the area no longer meets the quantitative criteria set by MDC. At that point, the pine rocklands within CRC would not be regulated by MDC's §24-49.2 Ordinance.

7.1.2 Alternative 4

This alternative was found to result in adverse impacts to vegetative communities and wildlife and protected species. While this alternative meets the Applicants' goals and objectives, it was not selected as the preferred alternative after comparison to greater substantial increases in benefits to natural resources with minimal decrease in socioeconomic benefits that were found in Alternative 5 and later in Alternative 6 (Preferred Alternative).

7.1.3 Alternative 5

This alternative was found to result in no significant effects to all resources considered and is therefore feasible. The proposed modifications in this alternative include the addition of the 2.16-ac Southern Corridor connecting east and west on-site preserves within the proposed CRC. These modifications provide natural resource benefits without a reduction in socioeconomic benefits. This alternative was not selected as the Preferred Alternative, falling short of the greater natural resource benefits provided in Alternative 6.

7.1.4 Alternative 6 – Preferred Alternative

Alternative 6 was selected as the Preferred Alternative due to its ability to facilitate the Applicants' project purpose by meeting goals and objectives of the development and habitat restoration features, economic feasibility, and infrastructure commitments, while achieving greater benefits to natural resources than the other alternatives. This alternative would eliminate 5.24 ac from previously proposed commercial development, moving that land into the western on-site preserve. Additional conservation measures were proposed under this alternative including a 50.96-ac. conservation mechanism on the adjacent UM Richmond Campus lands (Off-site Mitigation Area), an educational program and installation of bat boxes in the on-site preserves. Alternative 6 would provide benefits to pine rockland habitats and those species that depend upon them not limited to but including special status plant species. Alternative 6 facilitates conservation and restoration that would be expected to: 1) offset habitat losses from proposed development, and based on the functional habitat assessment, improve the habitat function of the property over the existing baseline conditions; 2) minimize impacts to listed species in the near term; and 3) assure perpetual habitat conservation management designed to provide long term benefits to the non-developed lands within the HCP Plan Area. **Table 12** provides a comparison of the four alternatives considered in detail.

Table 12. Alternative Environmental Consequence Comparison

Resources	Alternative 1 (No Action)	Alternative 4 (County Approved Zoning 2013)	Alternative 5 (Stepping Stones / Southern Corridor)	Alternative 6 (Preferred Alternative)
Description of Action	- ITP not required - No development - Restoration not authorized	- Site plan based on MDC approved NFC Permit #NFC2012-012	- Site plan based on MDC approved NFC Permit #NFC2012-013 with addition of 2.16 ac Southern Corridor and Stepping Stones throughout community	- Site plan based on MDC approved NFC Permit #NFC2012-013 with addition of 2.16 ac Southern Corridor, 5.45 ac additional preserve, and Stepping Stones throughout community - Additional conservation mechanism and management on 50.96 ac Off-site Mitigation Area
Development Limits	None	- 94.07 ac - 370,000 sq.ft. commercial - 900 residential units	- 91.8 ac - 370,000 sq.ft. commercial - 900 residential units	- 86.35 ac - 289,000 sq.ft. commercial - 900 residential units
Preserves and Restoration	None	- 43.36 acre preserve	- 46.09 ac on-site preserve -2.86 acre Stepping Stones	- 51.54 ac on-site preserve -3.88 acre Stepping Stones -50.96 ac Off-site Mitigation Area
Geology, Soils, &Topography	No effect	No effect: Any adverse impacts would be expected to be minimized through BMPs or mitigated through improved soil conditions w/in pine rocklands resulting from burning.	No effect: Any adverse impacts would be expected to be minimized through BMPs or mitigated through improved soil conditions w/in pine rocklands resulting from burning.	No effect: Any adverse impacts would be expected to be minimized through BMPs or mitigated through improved soil conditions w/in pine rocklands resulting from burning.

Resources	Alternative 1 (No Action)	Alternative 4 (County Approved Zoning 2013)	Alternative 5 (Stepping Stones / Southern Corridor)	Alternative 6 (Preferred Alternative)
Water Resources	Adverse effect: Polluted stormwater would remain untreated within the site.	Beneficial effect: stormwater management system would allow treatment prior to discharge into preserves and percolation into groundwater.	Beneficial effect: stormwater management system would allow treatment prior to discharge into on-site preserves and percolation into groundwater.	Beneficial effect: stormwater management system would allow treatment prior to discharge into on-site preserves and percolation into groundwater.
Air Quality	No effect	No significant adverse effect	No significant adverse effect	No significant adverse effect
Land Use/Zoning	No effect	No effect	No effect	No effect
Natural Forest Communities	Adverse effect: No direct impacts to NFC, indirect effect could include continued degradation of natural areas. Could result in loss of designated status when/if the site no longer meets the NFC standards.	Beneficial effect: Complies with MDC code. 39.64 ac pine rockland and 3.72 ac rockland hammock NFC preserved.	Beneficial effect: Complies with MDC code. 39.64 ac pine rockland and 3.72 ac rockland hammock NFC preserved.	Beneficial effect: Complies with MDC code. 39.64 ac pine rockland and 3.72 ac rockland hammock NFC preserved.
Vegetative Communities	No effect: no permanent removal of habitat. Adverse effect: in terms of continued degradation of functional value of pine rockland habitat if no management activities are implemented.	Adverse effect: Development and conservation activities would result in a net loss of - 4.02 HVU.	Adverse effect: Development and conservation activities would result in a net loss of - 0.64 HVU.	Adverse effect: development of 82.61 ac. Net Beneficial effect: functional value of habitat would increase + 3.10 HVU considering development and conservation activities. Additional benefits realized from Off-site Mitigation Area.

Resources	Alternative 1 (No Action)	Alternative 4 (County Approved Zoning 2013)	Alternative 5 (Stepping Stones / Southern Corridor)	Alternative 6 (Preferred Alternative)
Wildlife and Protected Species	No significant adverse effect: Existing Federal, State, and local protections would restrict future development without appropriate permits. Lack of habitat management would result in continued decline of habitat quality, which would be likely to have adverse effects to species.	Adverse effect: Development and conservation activities would result in a net loss of - 4.02 HVU. Decline in habitat quality would be expected to adversely affect species. Critical habitat: Loss of 46.84 ac of CH for the BSHB and leafwing and 60.64 ac of CH for Carter's small- flowered flax and Florida brickell bush. Preservation and management of 43.36 ac of CH for all 4 species.	Adverse effect: Development and conservation activities would result in a net loss of - 0.64 HVU. Decline in habitat quality would be expected to adversely affect species. Critical habitat: Loss of 45.36 ac of CH for the BSHB and leafwing and 55.78 ac of CH for Carter's small- flowered flax and Florida brickell bush. Preservation and management 44.84 ac of CH for the butterflies and 48.22 ac of CH for the plants	Adverse effect: development of 82.61 ac, take of species would be expected to occur. Net Beneficial effect: Development and conservation activities would result in a net loss of + 3.10 HVU. Improved habitat quality would be expected to support more robust populations of species. Improved management on Off-site Mitigation Area would increase the availability of improved habitat in Richmond Area. Critical habitat: Loss of 39.47 ac of CH for the BSHB and leafwing and 52.85 ac of CH for Carter's small-flowered flax and Florida brickell bush. Preservation and management of 50.73 ac of CH for the butterflies and 51.15 ac of CH for the plants.
Invasive Species	Adverse effect: Invasive species would be expected to continue to expand and increase without additional management actions.	Beneficial effect: Invasive species would be removed and managed in perpetuity within on-site preserves.	Beneficial effect: Invasive species would be removed and managed in perpetuity within on-site preserves.	Beneficial effect: Invasive species would be removed and managed in perpetuity within on-site preserves and Off-site Mitigation Area.

Resources	Alternative 1 (No Action)	Alternative 4 (County Approved Zoning 2013)	Alternative 5 (Stepping Stones / Southern Corridor)	Alternative 6 (Preferred Alternative)
Cultural Resources	No effect	No adverse effect on eligible or listed resources under the National Register of Historic Places.	No adverse effect on eligible or listed resources under the National Register of Historic Places.	No adverse effect on eligible or listed resources under the National Register of Historic Places.
Socioeconomic	No effect	Beneficial effect: Alleviate anticipated housing deficiency; 780 temporary and 740 permanent jobs created; $115 million into economy from construction; $170 million placed on MDC tax roll - $1,647,000 municipal and $1,354,000 Public School District ad valorem taxes; $85,000 to Children's Trust.	Beneficial effect: Alleviate anticipated housing deficiency; 780 temporary and 740 permanent jobs created; $115 million into economy from construction; $170 million placed on MDC tax roll - $1,647,000 municipal and $1,354,000 Public School District ad valorem taxes; $85,000 to Children's Trust.	Beneficial effect: Alleviate anticipated housing deficiency; 780 temporary and 575 permanent jobs created; $90 million into economy from construction; $132 million placed on MDC tax roll - $1,288,000 municipal and $1,058,000 Public School District ad valorem taxes; $66,000 to Children's Trust.
Utilities (Water Supply, Wastewater, Solid Waste)	No effect	No effect: Pump station 0678 would be replaced by Applicants; MDC has capacity to provide service.	No effect: Pump station 0678 would be replaced by Applicants; MDC has capacity to provide service.	No effect: Pump station 0678 would be replaced by Applicants; MDC has capacity to provide service.
Human Health and Safety	Adverse effect: Lack of habitat management could continue to promote wildfires at the prevailing rate and magnitude.	Beneficial effect: Reduction in wildfires from habitat management Additional sworn officers would maintain LOS and police work station established on- site would mitigate additional demand from development.	Beneficial effect: Reduction in wildfires from habitat management Additional sworn officers would maintain LOS and police work station established on- site would mitigate additional demand from development.	Beneficial effect: Reduction in wildfires from habitat management Additional sworn officers would maintain LOS and police work station established on- site would mitigate additional demand from development.

Resources	Alternative 1 (No Action)	Alternative 4 (County Approved Zoning 2013)	Alternative 5 (Stepping Stones / Southern Corridor)	Alternative 6 (Preferred Alternative)
Schools	No effect:	Beneficial effect: 4-acre school site donated to MDC Public School District $1,354,000 ad valorem tax to MDC Public School District. $85,000 to Children's Trust.	Beneficial effect: 4-acre school site donated to MDC Public School District $1,354,000 ad valorem tax to MDC Public School District. $85,000 to Children's Trust.	Beneficial effect: 4-acre school site donated to MDC Public School District $1,058,000 ad valorem tax to MDC Public School District. $66,000 to Children's Trust.
Transportation	No effect.	Beneficial effect: Improvements would alleviate current transportation issues.	Beneficial effect: Improvements would alleviate current transportation issues.	Beneficial effect: Improvements would alleviate current transportation issues.
Parks and Recreation	No effect	No effect: MDC surplus of parks would meet the additional 5.42 ac required from development.	No effect: MDC surplus of parks would meet the additional 5.42 ac required from development.	No effect: MDC surplus of parks would meet the additional 5.42 ac required from development.
Scenic Value	No significant adverse effect: Potential deteriorating scenic value due to increasing invasive species and remaining abandoned buildings.	Beneficial effect: Removal of invasive species in preserves and demolition of abandoned building.	Beneficial effect: Removal of invasive species in on-site preserves and demolition of abandoned building.	Beneficial effect: Removal of invasive species in on-site preserves and demolition of abandoned building.
Noise	No effect	No significant adverse effect	No significant adverse effect	No significant adverse effect

BMP Best management practices
BSHB Bartram's scrub-hairstreak butterfly
CH Critical habitat
HVU Habitat value units
ITP Incidental take permit
Leafwing Florida leafwing butterfly
LOS Level of service
NFC Natural forest community
MDC Miami-Dade County

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