NATURAL RESOURCES EVALUATION

ADDENDUM

Florida Department of Transportation
District One

SR 29 Immokalee
Project Development and Environment (PD&E) Study
from Oil Well Road to SR 82
Collier County, Florida

Financial Management Number: 417540-1-22-01
ETDM Number: 3752

September 2021

The environmental review, consultation, and other actions required by applicable federal environmental laws for the project are being, or have been, carried out by the Florida Department of Transportation (FDOT) pursuant to 23 U.S.C. § 327 and a Memorandum of Understanding dated December 14, 2016 and executed by the Federal Highway Administration (FHWA) and FDOT.

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1.0 INTRODUCTION

The Florida Department of Transportation (FDOT) District One is conducting a Project Development and Environment (PD&E) Study, in accordance with the National Environmental Policy Act (NEPA), to assess the need for capacity and traffic operational improvements along a section of SR 29 extending 15.6 miles from Oil Well Road (southern terminus) to SR 82 (northern terminus) in unincorporated Collier County, Florida. The project section of SR 29 specifically traverses the unincorporated community of Immokalee in eastern Collier County. The project proposes to widen existing two-lane undivided sections of SR 29 to four lanes, as well as add a new four-lane roadway bypassing the downtown area of Immokalee.

On July 20, 2018, the FDOT submitted a *Natural Resources Evaluation* (*NRE*) (July 2018) to the Florida Fish and Wildlife Conservation Commission (FWC), South Florida Water Management District (SFWMD), United States Army Corps of Engineers (USACE), and United States Fish and Wildlife Service (USFWS) for review and comment. The *NRE* was prepared to summarize the potential impacts associated with the two build alternatives (Central Alternative #1 Revised and Central Alternative #2) and the No Build Alternative to wetlands, federal and state protected species, and protected habitats, and to document the natural resources analysis performed to support decisions related to the evaluation of the alternatives. Measures considered to avoid, minimize, and mitigate for potential impacts were also discussed. The USFWS responded via email on August 3, 2018 (included in **Appendix A**), indicating that they would respond to all species determinations at the time of re-initiation of Section 7 consultation during the final design and permitting phase and they had no other comments on the project.

An *NRE Addendum* (August 2018) was prepared, under a separate cover, to address the FWC concern with the NRE in that the document did not specifically identify or discuss potential impacts of the project to the FWC-managed Immokalee Airport Conservation Easement and, consequently, impacts to habitat of the Florida scrub jay (*Aphelocoma coerulescens*) and gopher tortoise (*Gopherus polyphemus*). The FWC responded providing their agreement with the information in the addendum and the effects determinations in the *NRE* in a letter dated August 21, 2018.

A second *NRE Addendum* (August 2019), prepared under a separate cover, was prepared after the Public Hearing to address potential project impacts to the Florida scrub-jay and gopher tortoise resulting from the eastward shift of the Central Alternative #2 (Preferred Alternative) alignment through the Immokalee Airport Conservation Easement. The shift resulted in 5.49 acres of impact to suitable habitat for these species within the Upland Management Area (UMA). As a result, **Section 1.3.3 Conservation Lands** and **Section 2.3.1 Federally-Listed and State-Listed/Protected Wildlife Species**, were updated in the second *NRE Addendum* (August 2019), to reflect these changes. This addendum was submitted to agencies for review on August 9, 2019. The FWC concurred with the noted findings in a letter dated September 4, 2019.

The Preferred Alternative is Central Alternative #2, as previously discussed in the *NRE* (July 2018) **Section 1.1.2 Project Alternatives** and the second *NRE Addendum* (August 2019). The Preferred Alternative concept plans are included in **Appendix B** of this document.

The FDOT Office of Environmental Management (OEM), during their review of the final National Environmental Policy Act (NEPA) document [Environmental Assessment with Finding of No Significant Impact (EA/FONSI)], made the decision to initiate formal Endangered Species Act (ESA) Section 7 Consultation with the USFWS to address impacts resulting from the Preferred Alternative prior to the final design and permitting phase. This third *NRE Addendum* includes a summary of all species with prior/updated ***No Effect*** and ***May Affect, but is Not Likely to Adversely Affect*** **(MANLAA)** determinations and requests concurrence with these determinations, which is assumed to be included in the Biological Opinion (BO). This addendum also includes the Biological Assessment (BA), for species with a prior/updated ***May Affect, and is Likely to Adversely Affect (MALAA)*** determination.

As a note, there have been no changes in the project study area or alignment (referred to as the Preferred Alternative), soils data, or Florida Land Use, Cover and Forms Classification System (FLUCFCS) data, as documented in the *NRE* (July 2018). Additionally, there are no changes to the status of wetlands or wetland impacts, as documented in the *NRE* (July 2018).

As documented in the *NRE* (July 2018), Essential Fish Habitat (EFH) received a "No Involvement" determination from the NMFS during the ETDM review process. There is no change to this determination.

No designated critical habitat occurs within or adjacent to the proposed project study area; therefore, the project will not result in the destruction or adverse modification of any designated critical habitat.

It is assumed that the *NRE* (July 2018), previous NRE Addenda (August 2018 and August 2019), and updates contained within this third *NRE Addendum* support the BA.

2.0 FEDERAL PROTECTED SPECIES NO EFFECT AND MANLAA DETERMINATIONS

2.1 Introduction

Updated literature and database searches and field reviews (conducted on October 13-15 and 20-21, 2020) were completed for the Preferred Alternative for verification of prior observations and update the documentation of federal protected species presence.

In addition to the original data sources contained within the *NRE* (July 2018), the following data sources were reviewed as part of this evaluation:

- Audubon Florida EagleWatch Nest Map (https://cbop.audubon.org/conservation/about-eaglewatch-program);
- USFWS, Endangered and Threatened Wildlife and Plants, 50 CFR 17.11 and 17.12 - 2020;
- USFWS, Information for Planning and Consultation (IPaC) (https://ecos.fws.gov/ipac); and
- USFWS, Florida Wood Stork Colonies Core Foraging Areas map (https://www.fws.gov/northflorida/WoodStorks/WOST_Data/2019-WOST_FL_colonies_map_update_20190508.pdf).

2.2 Effect Determinations

Recommended effect determinations have been made based on a review of the involvement of the proposed improvements with federally protected species, their habitat, and proposed mitigation. The effect determinations, as a result of the Preferred Alternative, based on the FDOT findings and commitments to offset potential impacts, remain unchanged as documented in the *NRE* (July 2018) and the second *NRE Addendum* (August 2019). Effect determinations for the following federally listed species are described below.

No Effect (NE): Florida grasshopper sparrow, red-cockaded woodpecker, Florida prairie-clover, and Garber's spurge.

May Affect, but is Not Likely to Adversely Affect (MANLAA): American alligator, Audubon's crested caracara, Eastern black rail, wood stork; and snail kite.

In addition, the project will have no effect on the federally protected bald eagle.

The following sections include an effects determination for the Audubon's crested caracara, and the recently listed Eastern black rail that was not documented in the original *NRE* (July 2018); and updated data that confirms the previous effects determination for the wood stork.

Audubon's Crested Caracara (*Caracara cheriway*): The Audubon's crested caracara (caracara) is federally listed as threatened due to habitat degradation and loss, primarily from the expansion of residential developments and citrus groves throughout central peninsular Florida. This species often inhabits open country, such as dry prairie and pasturelands with scattered cabbage palms (*Sabal palmetto*), cabbage palm/live oak (*Quercus virginiana*) hammocks, and shallow ponds and sloughs, and requires cabbage palms or live oaks with low-growing surrounding vegetation for nesting.

The Preferred Alternative is located within the USFWS consultation area for the species. Suitable habitat is present within the vicinity of the proposed improvements and several caracaras were observed during field reviews. For these reasons, the caracara was assigned a 'high' probability to occur within the project study area.

The USFWS South Florida Ecological Services Office flow chart titled DRAFT *Standard Local Operating Procedures for Endangered Species: Audubon's Crested Caracara* (included in the April 20, 2004 DRAFT *Species Conservation Guidelines – South Florida*) was utilized to determine the effect of the Preferred Alternative on the species and if species surveys would be required (USFWS 2004). The path follows: Step 1 > Step 2 > Step 3 - Inside Consultation Area – **Yes**, Suitable Habitat - **Yes** > Step 4 – **Survey Habitat for Nests and Aggregations**.

Species surveys for the caracara were conducted from January through April 2021 in accordance with the *USFWS Crested Caracara Draft Survey Protocol – Additional Guidance (2016-2017 Breeding Season)* (USFWS 2016). An Audubon's Crested Caracara Survey Technical Report is included in **Appendix C**, and a summary of the findings are detailed in the subsequent sections.

Methodology

Current aerial imagery and SFWMD 2014/2016 FLUCFCS data was used to identify appropriate areas to survey for caracara nests. A 1,500-meter buffer around the Preferred Alternative was established to identify any potential nests that would have a primary 300-meter and/or secondary 1,500-meter protection zone that overlaps the project limits. This area is referred to as the caracara Action Area for the SR 29 PD&E study. A total of twelve (12) survey stations were established throughout the Action Area, which allowed for a field of view that included potential caracara nesting trees.

Results

While caracaras were observed at all 12 survey stations during field surveys, nesting activity was only observed at Station 1 and Station 10.

<u>Station 1</u>

Station 1 is located in the northernmost section of the project, outside of the Preferred Alternative. The survey station is on State Road 82 (SR 82) in the northern rights-of-way, approximately 0.03 miles west of SR 29. Caracaras were observed flying over this station from January 4 to March 12, 2021.

Potential nesting activity was first observed at Station 1 on January 4, 2021 and the location of the nest was documented in a cabbage palm tree on February 17, 2021. The last observations of caracaras in this nest occurred on May 4, 2021. The nest was rechecked two weeks later on May 19, 2021, and no caracaras were observed in the nest or in the vicinity, indicating that the immature caracaras had fledged from the nest.

Station 10

Station 10 is located in the southern portion of the project, within the footprint of the Preferred Alternative. Station 10 is located 1 mile north of the intersection of SR 29 and County Road 858 (CR 858)/Oil Well Road. Caracaras were observed flying over this station from January 4 to February 26, 2021.

Potential nesting activity was first observed at Station 10 on February 9, 2021 and the location of the nest was documented in a cabbage palm tree on March 9, 2021. One immature caracara was documented in the nest and the young bird no longer had downy feathers. The last observation of an immature caracara at this nest tree occurred on March 23, 2021. No caracaras were observed in the nest or in the vicinity of the nest on April 7, 2021 indicating the immature caracara had fledged from the nest.

Based on the field surveys two active caracara nests were documented within 1,500 meters of the project limits; one nest observed near Station 1 and a second nest observed near Station 10. The 300-meter primary protection zone buffer around the nest at Station 1 is outside of the Preferred Alternative footprint. However, the caracara nest documented near Station 10 is located approximately 85 meters (279 feet) west of the project limits and the Preferred Alternative impacts land uses within the 300-meter primary protection zone, as shown in **Figure 2-1**.

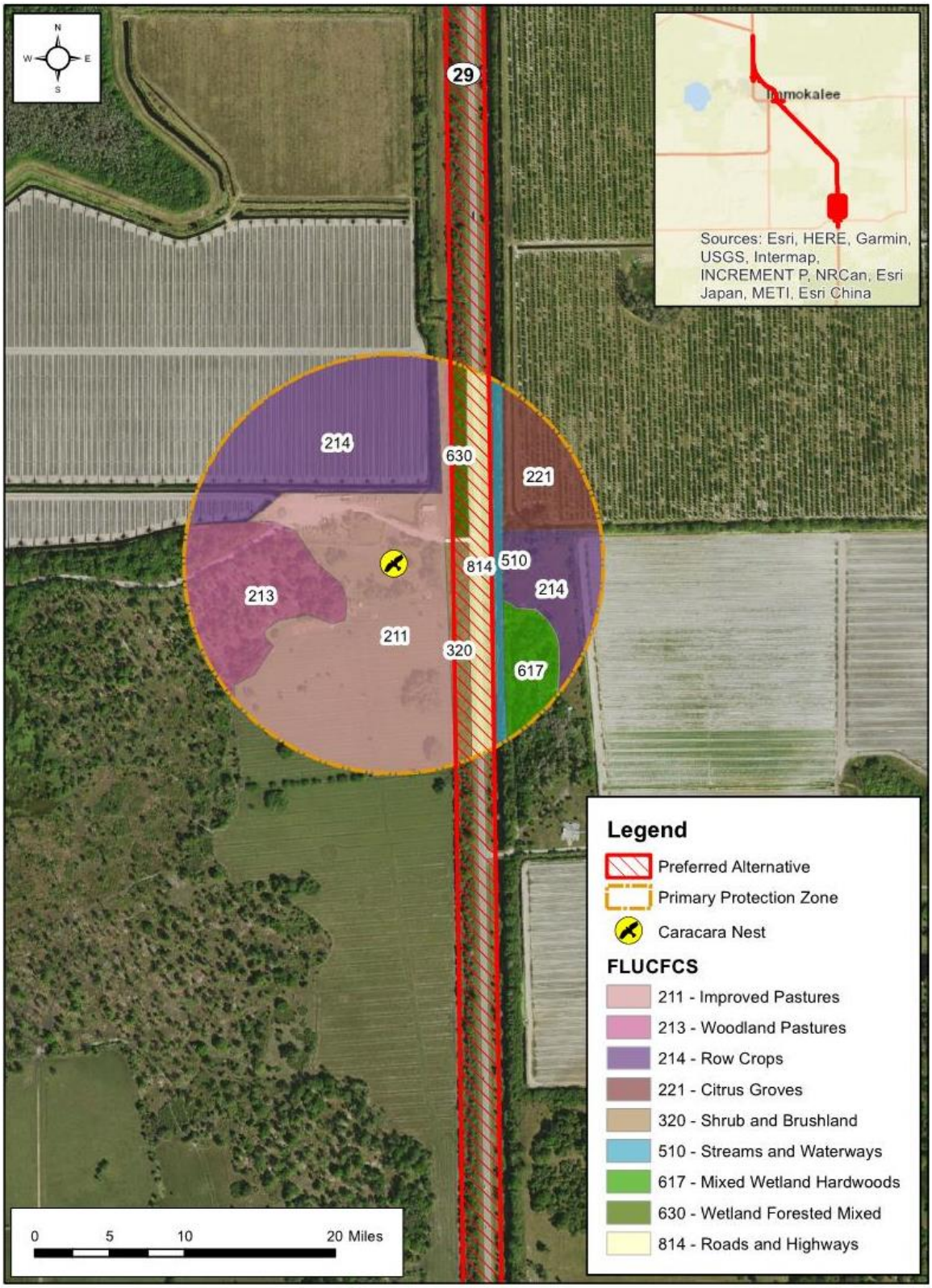
The primary zone is comprised of 69.85 acres. The proposed project footprint will result in 7.46 acres of impact to the nest's primary protection zone, of which, 2.98 acres are suitable caracara habitat. It is not anticipated that the nest tree will be directly affected by the roadway project, and only a small area of primary zone habitat will be converted to roadway use. Land use descriptions and acreages are provided in **Table 2-1**, and land uses within the primary zone are shown in **Figure 2-1**.

TABLE 2-1
AUDUBON'S CRESTED CARACARA PRIMARY PROTECTION ZONE IMPACT TABLE

FLUCFCS Classification[(1)]	Description	Primary Zone Impact (Acres)	Preferred Alternative Impact (Acres)
211	Improved Pasture	23.86	--
213	Woodland Pastures	8.58	--
214	Row Crops	19.45	--
221	Citrus Groves	4.80	--
320	Shrub and Brushland	2.65	1.65
510	Streams and Waterways	1.74	--
617	Mixed Wetland Hardwoods	2.94	--
630	Wetland Forested Mixed	1.33	1.33
814	Roads and Highways	4.50	4.48
Total Impacts - Audubon's Crested Caracara Suitable Habitat		***60.55***	***2.98***
	Total Impacts	**69.85**	**7.46**

(1) FDOT, FLUCFCS (Third edition), 1999.
(2) SFWMD 2014/2016 FLUCFCS
FLUCFCS – Denotes Audubon's crested caracara suitable habitat

FIGURE 2-1
AUDUBON'S CRESTED CARACARA PRIMARY PROTECTION ZONE IMPACT MAP



Utilizing the subject Flow Chart in the DRAFT *Standard Local Operating Procedures for Endangered Species Audubon's Crested Caracara,* the following path was followed through the key: Step 1 > Step 2 > Step 3 > Step 4 - Recommended Management Practices for Caracaras (Morrison 2001) by implementing Conservation Measures.

- The nest tree will not be directly affected by the roadway project and only a small area of primary zone habitat will be converted to roadway use. There are recommendations in place to reduce impacts to the crested caracara, and the primary zone of a caracara nest is particularly important to this species during nesting season, therefore, the following construction precautions may be implemented to reduce any potential impact to the nest: Land clearing activities for the project will be conducted outside of the caracara nesting season (December 1 through April 30) to the greatest extent practicable. Since caracara nesting season is from December 1 through April 30, clearing should be completed between May 1 and November 30.

- Should it be necessary to conduct land clearing activities within the nesting season (December 1 through April 30), the FDOT or their designated agent will survey suitable caracara nesting habitat to determine if an active caracara nest occurs within or adjacent to the project area. If an active nest is observed within 300 meters (985 feet) of the project area, land clearing within 300 meters (985 feet) of the nest will not occur until monitoring has determined the nest has either been abandoned, or chicks within the nest have fledged and left the nest site.

- The FDOT has agreed to provide a monetary donation, as specified by the USFWS, to the USFWS caracara fund, held by the Wildlife Foundation of Florida (WFF), to support measures that aid in the survival and recovery of the caracara (e.g. acquiring, managing, and protecting currently unprotected caracara habitat). Before construction can commence, the FDOT will provide the USFWS a receipt, letter, or email from the WFF verifying the contribution has been made, and b) the USFWS will provide an email or letter to the FDOT indicating that the letter has been received.

Because the project will only impact a small acreage of habitat within the primary zone, and land clearing activities are proposed to occur outside of the nesting season, it has been determined that the proposed project "**May Affect, but is Not Likely to Adversely Affect**" the Audubon's crested caracara.

Eastern Black Rail (*Laterallus jamaicensis jamaicensis*): In November 2020, the Eastern black rail was determined a threatened species under the ESA (85 Federal Register 63764). As such, it was not included in the *NRE* (July 2018). The Eastern black rail is a small black to gray bird that is 10-15 centimeters in height and exhibits bright red eyes. The nape of its neck is a chestnut color and it has small white spots on its feathers. This bird species utilizes saltwater and freshwater marshes with dense cover as its habitat. No Eastern black rails were observed during the field reviews. While some marginal habitat exists within the project study area, large areas of suitable

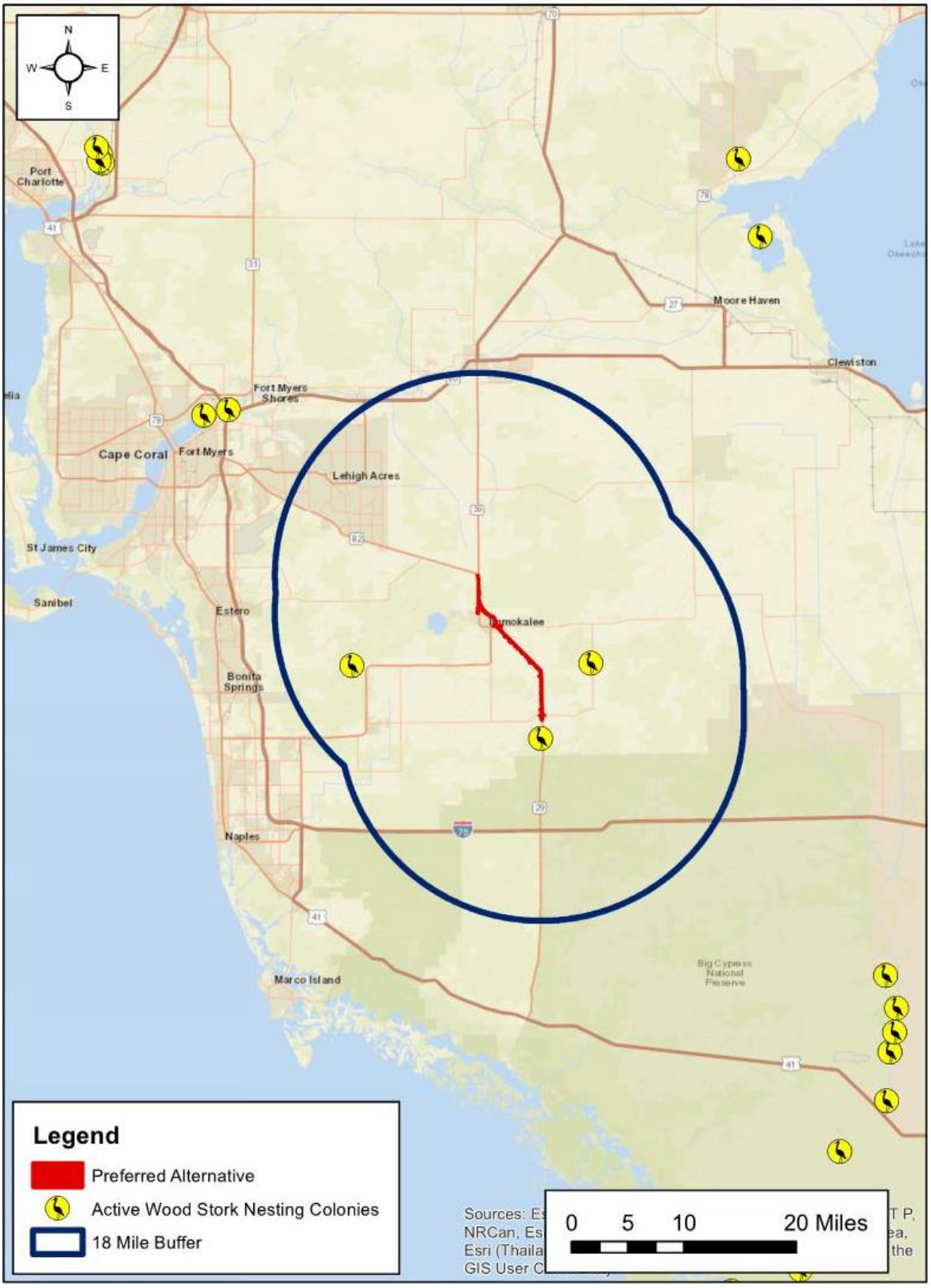
habitat will remain in the vicinity. For these reasons, the Eastern black rail was assigned a 'low' probability of occurrence.

The Preferred Alternative would result in unavoidable impacts to wetlands and OSWs that may provide suitable Eastern black rail foraging habitat. Any adverse wetland impacts will be fully mitigated pursuant to Section 373.4137, F.S. to satisfy all mitigation requirements of Part IV of Chapter 373, F.S. and 33 U.S.C. §1344 and prevent a net loss of functions and values to wetlands and surface waters that may provide suitable foraging habitat for this species. Based on the provision of compensatory mitigation to offset wetland and surface water habitat impacts, FDOT has determined that the Preferred Alternative "**May Affect, but is Not Likely to Adversely Affect**" the Eastern black rail.

Wood Stork (*Mycteria americana*): The wood stork is federally listed as threatened due to a sharp decline in breeding populations. This opportunistic wading bird utilizes various open hydric pine-cypress habitats, herbaceous marshes, and man-made wetlands and canals. A specialized method of feeding (commonly referred to as groping) limits its foraging ability to shallow waters with dense concentrations of small fish. Wood storks use freshwater and estuarine habitats for nesting, foraging, and roosting. They are typically colonial nesters and construct their nests in medium to tall trees located within wetlands or on islands.

In south Florida, the USFWS has defined an area with a radius of 18.6 miles (30 kilometers) from nesting wood stork colonies as the Core Foraging Area (CFA) for those colonies. The project study area falls within the CFA of three active nesting wood stork colonies (see **Figure 2-2** for wood stork CFA locations). As defined by the USFWS, wood stork suitable foraging habitat (SFH) includes wetlands and surface waters with relatively calm water, uncluttered by dense thickets of aquatic vegetation, that have permanent or seasonal water depths between 2 and 16 inches. Wood stork SFH is present within the Preferred Alternative, and wood storks were observed within the project study area during field reviews. Therefore, the wood stork was assigned a 'high' probability of occurrence within the project study area.

FIGURE 2-2
ACTIVE WOOD STORK COLONIES



Of the 29.74 acres of wetlands and other surface waters (OSW) within the Preferred Alternative proposed to be impacted by the project footprint, 19.67 acres of wetlands were determined to meet the qualifications of wood stork SFH, as defined by the USFWS in the *Habitat Management Guidelines for the Wood Stork in the Southeast Region* (USFWS 1990). Wetland and OSW habitats determined to be suitable habitat for wood storks included streams and waterways, reservoirs, cypress, and freshwater marshes (FLUCFCS 510, 534, 621, 641). Since greater than 5 acres of SFH would be impacted by the Preferred Alternative, a prey foraging analysis, pursuant to the USFWS *Wood Stork Foraging Habitat Assessment Methodology* (USFWS 2012), was completed. Total biomass lost for all wood stork SFH wetlands and other surface waters within the project area is 20.53 kilograms (summarized in **Table 2-2**). A detailed wood stork foraging habitat assessment is included as **Appendix D-2**.

TABLE 2-2
TOTAL WOOD STORK FORAGING BIOMASS LOST

Hydroperiod Class	Wetland Type	Acres	Biomass Loss
Class 2 (60-120 days inundated)	Linear Ditches	14.78	12.05 kg
Class 3 (120-180 days inundated)	Wetlands - Forested	0.56	0.97 kg
	Wetlands - Herbaceous	3.70	6.42 kg
Class 3 (120-180 days inundated)	Reservoirs less than 10 acres	0.63	1.09 kg
Total Short Hydroperiod Biomass Lost:			***20.53 kg***

Impacts to suitable wood stork foraging habitat will be replaced in-kind or mitigated through the purchase of wetland credits from a USFWS approved wetland mitigation bank, discussed in **Section 4.0**. All wetlands and other surface waters impacted by the proposed project have a hydroperiod class of Class 2 or Class 3, categorized as "short hydroperiod" wetlands. Compensation through the purchase of short hydroperiod wetland credits, to mitigate total biomass lost (20.53 kg) will be determined during the permitting phase of the project. The *Wood Stork Effect Determination Key (South Florida)* was utilized for this project (**Appendix D-1**). The path followed through the Key was A > B > C > E = NLAA. Based on this information, the Preferred Alternative "**May Affect, but is Not Likely to Adversely Affect**" the wood stork.

3.0 BIOLOGICAL ASSESSMENT

The following sections of this chapter include biological assessments for species with a prior and/or updated ***May affect, and is Likely to Adversely Affect (MALAA)*** determination, as described in the *NRE* (July 2018) or NRE Addenda (August 2018 and August 2019). The species include Eastern indigo snake, Florida scrub jay, Florida bonneted bat, and Florida panther.

3.1 Eastern Indigo Snake

The Eastern indigo snake (*Drymarchon corais couperi*) is listed as threatened by the USFWS due to extensive habitat loss and population declines. This species utilizes a variety of habitats including swamps, wet prairies, and pinelands and may also seek shelter in gopher tortoise burrows to escape hot or cold ambient temperatures within its range. While suitable habitat is present within the undeveloped upland and wetland habitats of the project study area, this species has not been documented within the Preferred Alternative. No Eastern indigo snakes were observed during field reviews, conducted on multiple occasions from April 2010 through October 2020; however, several gopher tortoise burrows were observed within the project study area. For these reasons, this species was assigned a 'moderate' probability of occurrence within the project study area. Due to the presence of large amounts of suitable habitat within the Preferred Alternative and recommended pond and floodplain compensation (FPC) sites, it was determined that, further analysis on the impacts of the proposed construction on the Eastern indigo snake is necessary.

The *Eastern Indigo Snake Programmatic Effect Determination Key (South Florida)* was used for this project (**Appendix E-2**). The path followed through the key was A > B > C = May Affect. This *NRE Addendum* serves as the Section 7 consultation with USFWS to address project involvement with the Eastern indigo snake.

3.1.1 Action Area

The Eastern indigo snake is known as a habitat generalist and is known to utilize every habitat type except for bodies of water (Layne and Steiner 1996). Throughout Peninsular Florida, the Eastern indigo snake may be found in almost all terrestrial habitats except in areas with high-density urban development.

The Preferred Alternative is comprised of the proposed roadway improvements. For the purposes of the effect analysis of the SR 29 PD&E study on the Eastern indigo snake, the Action Area has been designated as the entirety of the Preferred Alternative. The Eastern indigo snake Action Area is shown in **Figure 3-1**.

FIGURE 3-1
EASTERN INDIGO SNAKE ACTION AREA

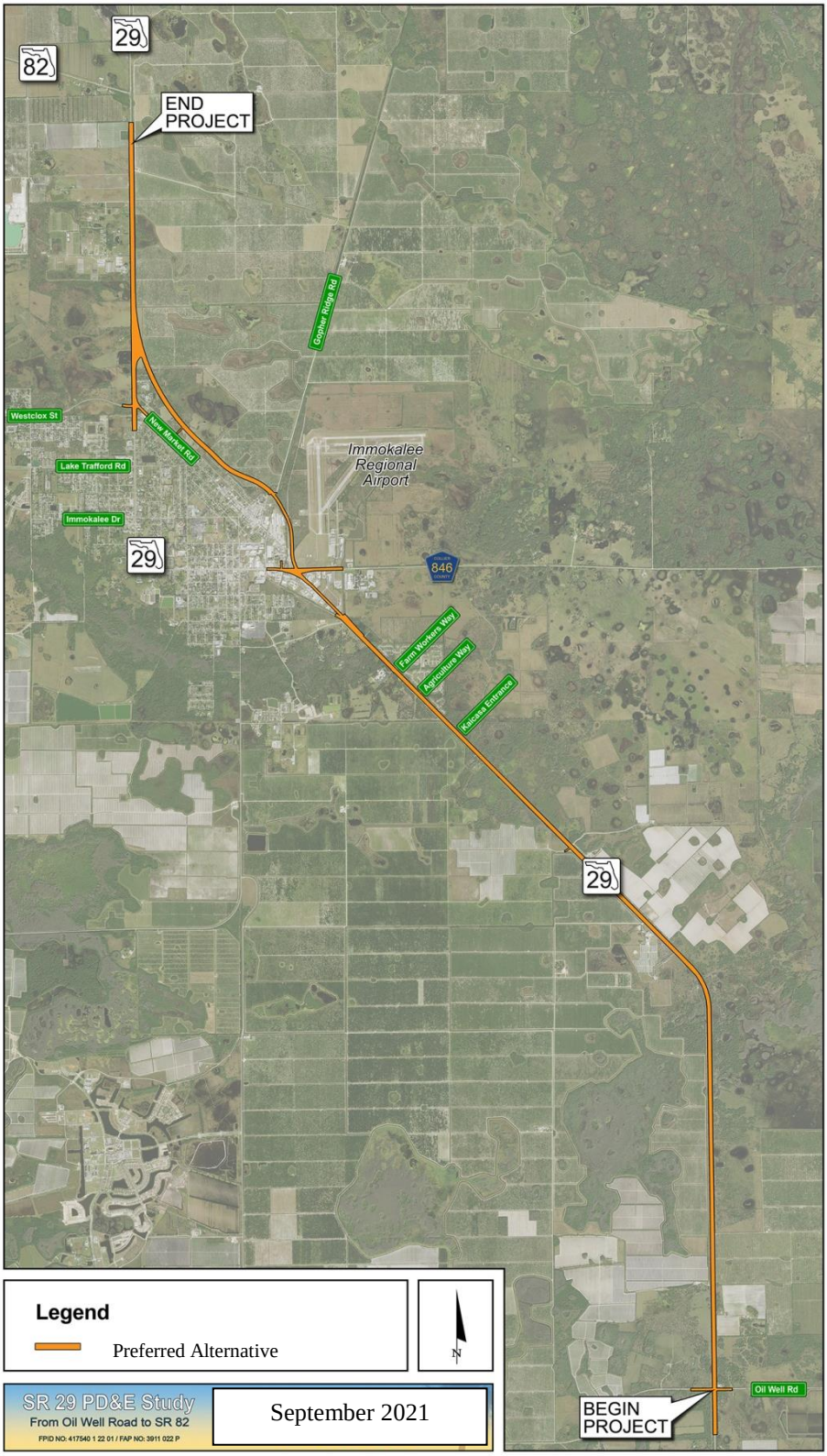


Table 3-1 presents land uses within the Action Area, of these land uses, agriculture (Florida Land Use Cover and Forms Classification System (FLUCFCS) 200, rangeland (FLUCFCS 300), upland forest (FLUCFCS 400), and freshwater wetlands (FLUCFCS 600) provide suitable habitat for the Eastern indigo snake.

TABLE 3-1
EXISTING LAND USE/VEGETATIVE COVER WITHIN THE EASTERN INDIGO SNAKE ACTION AREA

FLUCFCS Classification[1]		USFWS Classification[2]	Description	Preferred Alternative	
				Acres	Percent (%)
Uplands					
Urban Lands (100)	111	N/A	Residential, Low Density - Fixed Single Family Units	1.64	0.4
	121	N/A	Residential, Medium Density - Fixed Single Family Units	0.02	0.0
	140	N/A	Commercial and Services	0.89	0.2
	155	N/A	Other Light Industrial	3.55	0.9
	171	N/A	Educational Facilities	0.68	0.2
Agriculture (200)	211	N/A	Improved Pasture	27.78	7.3
	212	N/A	Unimproved Pasture	8.08	2.1
	213	N/A	Woodland Pasture	8.21	2.1
	221	N/A	Citrus Groves	18.76	4.9
Rangeland (300)	310	N/A	Herbaceous (Dry Prairie)	0.33	0.1
	320	N/A	Shrub and Brushland	42.27	11.1
	330	N/A	Mixed Rangeland	0.57	0.1
Upland Forest (400)	411	N/A	Pine Flatwoods	20.63	5.4
	434	N/A	Hardwood – Conifer Mixed	1.05	0.2
	437	N/A	Australian Pine	0.20	0.1
Transportation (800)	811	N/A	Airports	4.60	1.2
	814	N/A	Roads and Highways	213.03	55.7
	832	N/A	Electrical Power Transmission Lines	0.23	0.1
			Total Uplands	***352.52***	***92.1***
Wetlands and Other Surface Waters					
Other Surface Waters (500)	510	PUB2F	Streams and Waterways	14.78	3.9
	534	PSS1 / PUB2C	Reservoir less than 10 Acres	0.63	0.2
Freshwater Wetlands (600)	617	PFO1C	Mixed Wetland Hardwoods	1.95	0.5
	621	PFO2C	Cypress Swamp	0.56	0.2
	630	PFO1/2C	Wetland Forested Mixed	8.12	1.9
	641	PEM1C	Freshwater Marshes	3.70	1.2
			Total Wetlands/Other Surface Waters	***29.74***	***7.9***
			Total Impacts – Eastern Indigo Snake Suitable Habitat	***142.21***	***37.2***
			Total Land Use/Vegetative Cover	**382.26**	**100.0**

(1) FDOT, FLUCFCS (Third edition), 1999.
(2) USFWS, Classification of Wetlands and Deepwater Habitats of the United States (Cowardin, et al), 1979.

FLUCFCS – Denotes Eastern indigo snake suitable habitat

3.1.2 Status of the Species and Critical Habitat Range-Wide

3.1.2.1 Species Status

The Eastern indigo snake has been federally listed as Threatened under the Endangered Species Act (ESA) since 1978.

Law enforcement of prohibitions against unauthorized take has reduced pressure on the indigo snake, but has not eliminated it (Moler 1992). Because this snake has a large home range, it may be especially susceptible to habitat loss and fragmentation (Lawler 1977; Moler 1985a). Some estimates suggest that habitat losses of approximately 5% per year continue to occur (Lawler 1977). Increased human population growth also increases the possibility of increased snake mortality due to deaths from property owners and domestic pets. It is expected that the increasing trend toward altering natural areas for agricultural, residential, and commercial purposes will result in a large number of isolated groups which cannot support a sufficient number of individuals to ensure continued survival.

Recovery of the Eastern indigo snake requires protection and preservation of large expanses of unaltered habitat (USFWS 1999). However, relatively little is currently known about the minimum population size required to maintain and recover the species, though research and population modeling efforts are underway to address these issues.

Management activities being currently undertaken include prescribed burning to maintain optimum habitat quality, maintenance of a captive breeding colony, public outreach and education, and landowner cooperation to conserve snake populations on privately held lands.

No critical habitat has been designated for the Eastern indigo snake.

3.1.2.2 Species Description

Eastern indigo snakes are the longest native snakes in the U.S. and grow to lengths of 6.17 – 8.69 feet (Ashton and Ashton 1981; King and Krysko 2000). Eastern indigo snakes have a large, stout-body, and appear to be shiny black color. They are black ventrally, but chin, throat, and sides of head may be reddish or (rarely) white. Scales are typically smooth (no ridges), though adult males have keel on front half of some scales along back; anal scale undivided. Young similar to adults though often more reddish anteriorly and can measure 17 - 24 inches at hatching. When encountered, indigo snakes often hiss, flatten neck vertically (from side to side), and vibrate tail, but rarely bite.

3.1.2.3 Diet

The diet of the Eastern indigo snake reflects the species' large home range and movement between uplands, lowlands, and other landscapes in which it occurs. The Eastern indigo snake is an active forager (Stevenson et al. 2008, p. 341) seeking out its prey rather than sitting and waiting. As they lack venom and do not constrict, Eastern indigo snakes attack any vertebrate small enough to be overpowered and killed with their strong jaws. They have been observed to flush prey from cover, then give chase (Layne and Steiner 1996). They also occasionally climb trees or shrubs in search of prey.

Eastern indigo snakes are active and spend a great deal of time foraging and searching for mates. They are one of the few snake species that are active during the day and rest at night. A review of prey records indicates that the Eastern indigo snake consumes a wide variety of animals, including rodents, anurans, snakes and small turtles (Stevenson et al. 2010a), turtle eggs, gopher tortoises, small alligators, birds, and rodents. Juveniles consume primarily invertebrates (USFWS 1999; Layne and Steiner 1996; Steiner et al. 1983). In south Florida, Eastern indigo snakes have been documented to consume non-native species such as a walking catfish (*Clarius batrachus*) (Metcalf and Herman 2018, p.341) and a hatchling Burmese python (*Python bivittatus*) (Andreadis et al. 2018, pp.341-342). Nevertheless, more than half of the 47 different vertebrate prey species documented by Stevenson et al. (2010a, p.6) were snakes, including venomous snakes and other Eastern indigo snakes.

3.1.2.4 Habitat

The historic range of Eastern indigo snakes included the coastal plains of Georgia, Alabama, Mississippi, and possibly Southern South Carolina. Currently indigo snakes primarily range throughout Florida, including the Florida Keys, and into southern Georgia (Lazell 1989; Lawler 1977).

Currently, throughout Peninsular Florida, the Eastern indigo snake may be found in almost all terrestrial habitats except in areas with high-density urban development (Moler 1992, Enge et al. 2013). From the latitude of around Gainesville, Florida, south, they are less tied to longleaf pine sandhills and become more habitat generalists, although they still require below-ground shelter sites and commonly use gopher tortoise burrows and sandy xeric habitats when these are available (Layne and Steiner 1996, Enge et al. 2013, Bauder et al. 2016b). Eastern indigo snakes can be common in some hydric hammocks (Moler 1985a, Bauder et al. 2018). On the sandy central ridge (i.e., Lake Wales Ridge) of south Florida, Eastern indigo snakes may use gopher tortoise burrows more (62 percent) than other underground shelter (Layne and Steiner 1996). In extreme southern Florida, they are typically found in pine flatwoods, pine rocklands, tropical hardwood hammocks, and in most other undeveloped areas (Kuntz 1977, Enge et al. 2013). Below-ground shelter sites used in these areas include burrows of armadillos, hispid cotton rats (*Sigmodon hispidus*), and land crabs; burrows of unknown origin; natural ground holes; hollows at the base of trees or shrubs; ground litter; trash piles; and crevices of rock-lined ditch walls (Layne and Steiner 1996).

Eastern indigo snakes are also known to utilize human-altered habitats. In Florida, agricultural sites, such as sugar cane fields, improved pasture sites, citrus groves, and canal banks created in drained wetland areas are sometimes occupied by Eastern indigo snakes (Enge et al. 2013, O'Bryan 2017 p. 1, Bauder et al. 2018 p. 756).

3.1.2.5 Life History/Population Dynamics

In south-central Florida, limited information on the reproductive cycle suggests that Eastern indigo snake breeding extends from June to January, egg laying occurs from April to July, and hatching occurs from mid-summer to early fall (Layne and Steiner 1996). This breeding season, however, was extrapolated from just four observations and more in situ evidence is needed to better define the breeding season for the Eastern indigo snake. Based on the incubation period for 5 clutches in

captivity as reported by Moulis (1976), young hatch approximately 3 months after egg-laying and there is no evidence of parental care. Eastern indigo snakes in captivity take 3 to 4 years to reach sexual maturity (Speake et al. 1987). Female Eastern indigo snakes can store sperm and delay fertilization of eggs; there is a single record of a captive Eastern indigo snake laying five eggs (at least one of which was fertile) after being isolated for more than 4 years (Carson 1945). However, there have been several recent reports of parthogenetic (asexual) reproduction by virginal snakes. Hence, sperm storage may not have been involved in Carson's (1945) example (P. Moler, pers. comm., 1998). There is no information on the Eastern indigo snake lifespan in the wild, although one captive individual lived 25 years, 11 months (Shaw 1959).

Eastern indigo snakes range over large areas and use various habitats throughout the year, with most activity occurring in the summer and fall (Smith 1987; Moler 1985a). Adult males have larger home ranges than adult females and juveniles; their ranges average 554 ac, decreasing to 390 ac in the summer (Moler 1985b). In contrast, a gravid female may use from 3.5 to 106 ac (Smith 1987). In Florida, home ranges for females and males range from 5 to 371 ac and 4 to 805 ac, respectively (B. Smith, pers. comm., 2003). At Archbold Biological Station, average home range size for females was determined to be 46 ac (19 ha) and overlapping male home ranges to be 184 ac (74 ha) (Layne and Steiner 1996).

3.1.3 Effects of the Proposed Action

3.1.3.1 Factors to be Considered

Transportation projects may have a number of direct and indirect effects on the Eastern indigo snake and its habitat. Direct effects of this project may include: permanent loss of habitat, reduction in the geographic distribution of habitat for the species, and potential harassment by construction activities. Indirect effects may include: increased disturbance due to increased human activities and habitat degradation.

3.1.3.2 Analysis for Effects of the Proposed Action

For the purposes of this consultation, the Action Area includes all areas within the Preferred Alternative. Land use types, considered as Eastern indigo snake suitable habitat, that are represented within the Action Area include agriculture (FLUCFCS 200), rangeland (FLUCFCS 300), upland forests (FLUCFCS 400), and freshwater wetlands (FLUCFCS 600).

3.1.3.3 Avoidance and Minimization

The Preferred Alternative will result in unavoidable impacts to Eastern indigo snake habitat. Given that the project involves improvements to an existing roadway, opportunities to completely avoid indigo snake habitat are not available. Impacts have been avoided and minimized to the greatest extent possible. Transportation safety and design standards for the roadway improvements necessitate the impacts. Furthermore, the impacts are unavoidable due to the presence of natural habitat within the existing rights-of-way.

Best Management Practices (BMPs) will be utilized during construction of the project to minimize impacts. Erosion control measures will be installed and maintained in accordance with standard FDOT specifications and the erosion control plan found in the Roadway Construction Plans.

3.1.3.4 Conservation Measures

In order to conserve the species within the project area, BMPs will be implemented throughout the construction phase. Specified zones for construction workers and access routes and staging areas for equipment will be designated, to ensure no impacts outside the project footprint occur. The *Standard Protection Measures for the Eastern Indigo Snake* will be adhered to during construction to minimize the probability of any species impacts (**Appendix E-1**). If an indigo snake is encountered in the construction limits, work will stop immediately to allow the snake to vacate the area.

3.1.4 Effect Analysis

3.1.4.1 Direct Effects

Direct effects are those that are caused by the proposed action at the time of construction and are based upon habitat impacts and impacts on the species' ability to breed, forage, or take shelter. Potential direct effects include: the permanent loss of habitat and a reduction in the geographic distribution of habitat. Eastern indigo snakes may also be impacted by construction activities, which include the widening of the existing roadway and the installation of stormwater management facility (SMF) sites. The direct effects the SR 29 project may have on the Eastern indigo snake, within the Action Area, are discussed below.

3.1.4.1.1 Permanent Loss of Habitat

The Preferred Alternative is anticipated to impact 382.26 acres, of which, 142.21 acres have been deemed suitable habitat for the Eastern indigo snake. Land uses include agricultural lands (FLUCFCS 211, 212, 213, 221, and 243), rangeland (FLUCFCS 310, 320, and 330), upland forests (FLUCFCS 411, 434, and 437), and freshwater wetlands (FLUCFCS 617, 621, 630, and 641). **Table 3-2** presents suitable Eastern indigo snake habitat within the project study area.

TABLE 3-2
EASTERN INDIGO SNAKE SUITABLE HABITAT
WITHIN THE ACTION AREA

FLUCFCS Classification[1]		Description	Preferred Alternative Acres
Uplands			
Agriculture (200)	211	Improved Pasture	27.78
	212	Unimproved Pasture	8.08
	213	Woodland Pasture	8.21
	221	Citrus Groves	18.76
Rangeland (300)	310	Herbaceous (Dry Prairie)	0.33
	320	Shrub and Brushland	42.27
	330	Mixed Rangeland	0.57
Upland Forest (400)	411	Pine Flatwoods	20.63
	434	Hardwood – Conifer Mixed	1.05
	437	Australian Pine	0.20
		Total Uplands	***127.88***
Wetlands			
Freshwater Wetlands (600)	617	Mixed Wetland Hardwoods	1.95
	621	Cypress Swamp	0.56
	630	Wetland Forested Mixed	8.12
	641	Freshwater Marshes	3.70
		Total Wetlands	***14.33***
		Total	**142.21**

(1) FDOT, Florida Land Use, Cover, and Forms Classification System (FLUCFCS) (Third edition), 1999.

A loss of habitat will reduce the availability of suitable nesting, foraging, and breeding areas for indigo snakes. The loss of habitat has the potential to adversely affect the ability of individuals to forage for food, which has the potential to reduce the breeding success of the species. Therefore, the Preferred Alternative may have the potential to reduce the life span and survivability of the species.

Eastern indigo snakes are known to have expansive ranges. A 26-year study conducted by Layne and Steiner (1996) at Archbold Biological Station, Lake Placid, Florida, determined the average home range size for a female was 46 acres and that of a male was 184 acres. It is anticipated that up to 4 snakes (4 females) have the potential to occur within the 142.21 acres that will be directly impacted as a result of the Preferred Alternative. Additionally, up to 4 nests may be present during breeding season, and have the potential to be impacted.

3.1.4.1.2 Reduction in the Geographic Distribution of Habitat for the Species

Habitat impacts due to urbanization are increasing across the species range, particularly in Florida. In 1977, Lawler reported that the loss of natural habitat in Florida was increasing and Eastern indigo snake habitat was being lost at a rate of 5% per year. Zwick and Carr (2006, p.2) predicted that by 2060 nearly 3 million acres of natural habitat in Florida would be lost to urbanization. In a more recent study Carr and Zwick (2016) projected Florida's population to grow from about 18.8 million to approximately 33.7 million by 2070. The projected population growth is not evenly

distributed and may be accommodated by more compact pattern of development and increased protected lands (Carr and Zwick 2016). Generally, central Florida is projected to experience much greater growth and therefore have the greatest increase in developed lands while the Panhandle region is predicted to have the lowest rate of development with significant open space predicted to remain (Zwick and Carr 2006, Carr and Zwick 2016). Although Eastern indigo snakes may occupy areas of low density residential housing in the southern portions of its range in Florida, this also represents a potential negative influence to the species since there is increased likelihood of snakes being killed by humans and domestic pets (Breininger et al. 2012, p. 364). The effects of habitat destruction on the Eastern indigo snake are likely most substantial along the Florida coasts, in the Keys, and along the high ridges of central Florida, where human population growth is expected to continue to accelerate.

Roadway construction projects contribute to the permanent loss of habitat, therefore reducing the geographic distribution of habitat for the indigo snakes. As previously stated, Eastern indigo snakes may inhabit all types of land uses, except for open water. As the rate of construction and development projects continues to increase, the species distribution will decrease. Indigo snakes have adapted to such conditions by having large home ranges and the ability to travel long distances. Therefore, conservation efforts which implement the maintenance of extensive tracts of land with diverse, unfragmented habitat are essential to support viable Eastern indigo snake populations.

3.1.4.1.3 Construction

Habitat clearing, earth moving, and other construction activities can lead to direct injury or mortality from impacts due to equipment and/or hazardous materials. Heavy equipment may kill or injure snakes and/or bury snakes and their nests and eggs. Construction debris can also cause harm to individuals. Additionally, noise and vibration disturbance from construction equipment could adversely affect indigo snakes by causing the species to flee their refuge sites. The *Standard Protection Measures for the Eastern Indigo Snake* will be adhered to during construction to minimize the probability of direct harm to any individuals within the construction zone (**Appendix E-1**). If an indigo snake is encountered in the construction limits, work will stop immediately to allow the snake to vacate the area.

Eastern indigo snake commonly use gopher tortoise burrows for shelter. The Preferred Alternative will be surveyed in accordance with FWC *Gopher Tortoise Permitting Guidelines* for potential gopher tortoise utilization during the design and permitting phase of the project. If gopher tortoises or potentially occupied burrows are found within the project area, the FDOT will coordinate with the FWC and secure all permits needed to relocate the tortoises and, if necessary, any commensal species, including the Eastern indigo snake, found to be utilizing the burrows. This may serve to reduce potential impacts to individual Eastern indigo snakes.

3.1.4.2 Indirect Effects

Indirect effects are those effects that result from the proposed action and take place further out in time. Potential indirect effects that may result from the roadway improvements include increased disturbance due to human activities and habitat degradation.

3.1.4.2.1 Increased Disturbance Due to Human Activities

During construction, noise and vibration disturbance from construction equipment could adversely affect indigo snakes by causing the species to flee their refuge sites. As a result, individuals forced to flee their home territory could miss foraging and mating opportunities.

An increase in traffic volume throughout the corridor is anticipated with or without the SR 29 capacity improvement project. Roadway expansion in and of itself does not increase traffic. Major traffic travel routes in the vicinity of the project site include SR 82 to the northwest and Interstate 75 (I-75) to the south. In addition, this project is not anticipated to significantly alter land use, based on the Collier County future land use maps, which do not indicate notable land use changes based on the presence of public conservation land and productive agricultural lands in the project vicinity.

The widening of SR 29 will increase the total width of the roadway and it will allow more vehicles to occupy the roadway at one time. This increase in width will result in indigo snakes taking more time to cross the roadway. This may increase their chances of being struck by a vehicle, resulting in an increased risk of mortality or injury.

Life history traits such as the snake's diurnal nature, large body size and their large home range size, make indigo snakes more susceptible to being observed and deliberately killed. Educating the general public and maintenance personnel about Eastern indigo snakes may reduce future conflicts.

3.1.4.2.2 Habitat Degradation

Land clearing activities and vegetation removal are expected to take place within the Action Area. Degradation of habitat may be experienced along the edges of construction activities. Lands recently disturbed by construction, such as roadway rights-of-way and areas surrounding SMF sites, may be subjected to the influx of invasive plant species. Brazilian pepper is a common invasive species frequently observed in roadway rights-of-way and beyond.

Degraded habitat quality has the potential to impact population resiliency by inducing stress on individuals (e.g. reduced shelter and foraging habitat), impacting breeding and reproductive success, causing direct mortality and limiting connectivity and the ability to re-colonize areas after stochastic events (roadway construction). Therefore, extensive tracts of land with diverse, unfragmented habitat are important to support viable Eastern indigo snake populations (Diemer and Speake 1983, Breininger et al. 2004, Dodd and Barichivich 2007, Breininger et al. 2011, 2012, Hyslop et al. 2012). Lastly, degraded habitat quality can negatively impact the ability for long-distance movement and reduce genetic exchange among populations increasing the risk of extinction due to inbreeding and reduced capacity for evolutionary adaptation (Carlson et al. 2014, p. 523).

Eastern indigo snakes use a variety of habitats, and patterns of habitat use may shift seasonally. However, throughout its range, Eastern indigo snakes show a strong affinity for upland habitat types, especially longleaf pine habitats. Most of these upland habitat types depend on reoccurring periodic fire to maintain good quality. Natural fires are now often suppressed, and many habitats are degraded from inadequate fire management. The inability to meet prescribed fire goals is likely

to be influenced with expanding urbanization and climate change. The SR 29 project is within close proximity of residential communities, commercial services, and airports, which make habitat management practices by fire difficult.

Degradation of habitat can also lead to the introduction of exotic animal species such as greenhouse frogs (*Eleutherodactylus planirostris*), giant toads (*Bufo marinus*), Cuban tree frogs (*Osteopilus septentrionalis*), and brown anoles (*Anolis sagrei*), among others. Eastern indigo snakes may feed on small exotic animals.

3.1.4.3 Cumulative Effects

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the Action Area considered in this biological assessment. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to Section 7 of the ESA.

In order to identify potential future actions that are reasonably certain to occur, SFWMD Environmental Resource Permit (ERP) records were researched. Activities that would result in site grading or the conversion of natural habitat for site development would require an ERP. ERP records for the past five years (June 1, 2016 to July 19, 2021) were reviewed for the Township and Ranges in which the project is located (Township 46 South/Range 49 East, Township 47 South/Range 29 East, Township 47 South/Range 30 East, Township 48 South/Range 30 East). This is referred to as the cumulative effects evaluation area. This includes the Action Area for the Eastern indigo snake. SFWMD GIS Land Use data was reviewed for the cumulative effects evaluation area and 87,278 acres were determined to be suitable habitat (FLUCFCS 200, 300, 400, 600) for the Eastern indigo snake.

ERP Permits that have been applied for and issued satisfy the criterion of reasonably certain to occur. ERP permits are valid for 5 years. Permits older than 5 years have either been built (considered an existing condition) or have expired and are no longer reasonably certain to occur. Permits that include wetland impacts were eliminated because these projects would also require a Section 404 permit (a Federal action). These projects would require consultation as part of that Federal action and not considered in this analysis.

The search resulted in a total of 33 ERPs that have been issued by SFWMD within the defined area and timeline. Twelve (12) of the ERP permits include wetland impacts and were eliminated due to the requirement of a Section 404 permit (Federal action). Six (6) were eliminated because they had administrative modifications and/or are located within the footprint of another permit being evaluated. The remaining fifteen (15) ERPs were reviewed using SFWMD GIS Land Use data and six (6) of the permits were determined to include suitable habitat (FLUCFCS 200, 300, 400, 600) for the Eastern indigo snake totaling 744.51 acres. This total acreage has the potential for development and/or habitat loss. Including the 142.21 acres of suitable Eastern indigo snake habitat within the proposed SR 29 project, the potential for development and/or habitat loss totals 886.72 acres within the Township and Ranges in which the SR 29 project is located (see **Table 3-3**).

Of the 87,278 acres of suitable Eastern indigo snake habitat within the cumulative effects evaluation area, the 886.72 acres of potential development and/or habitat loss represent 1.1% of

the total area. This percentage of habitat loss is minor and will not jeopardize the continued existence of the Eastern indigo snake.

No interrelated or interdependent effects were identified for the proposed project.

TABLE 3-3
EASTERN INDIGO SNAKE CUMULATIVE EFFECTS ANALYSIS

Permit #	Application #	Approval Date	Project Name	Suitable Habitat
11-00034-S-02	161019-1	11/7/2016	Orange Grove	127.57
11-03058-P	170220-7	3/6/2017	Groverman Farms	317.10
11-00093-S	170424-5	5/10/2017	CCW 82 LLC	135.29
11-00091-S	170424-6	5/10/2017	CCW 82-Bethea Parcel	79.27
11-00024-S	171117-18	12/15/2017	IFAS Facilities and Planning	73.19
11-02911-P-02	180402-8	4/20/2018	Esperanza Place	12.09
			Total ERP impacts:	**744.51**
Proposed SR 29 Project:				
			State Road 29 Widening from Oil Well Rd to State Road 82	142.21
			Total:	**886.72**

3.1.4.4 Compensation

In order to offset potential impacts to indigo snake habitat as a result of the proposed project, FDOT will purchase required wetland and upland credits at a USFWS approved mitigation and/or conservation bank. Due to the fact that indigo snakes utilize all habitat types, these large tracts of preserved habitat, will offset proposed impacts to indigo snake habitat. Mitigation and conservation banks are discussed in **Section 4.0**.

The upland and wetland credits that will be purchased by FDOT to compensate for project impacts will exceed the 142.21 acres of affected suitable Eastern indigo snake habitat. The compensated habitat will be of higher quality, compared to areas impacted by the project footprint, since the lands at mitigation banks are well-maintained.

3.1.5 Conclusion

Direct take in the form of permanent loss of Eastern indigo snake habitat is anticipated. The Preferred Alternative will result in the permanent loss of 142.21 acres of Eastern indigo snake habitat. It is anticipated that up to 4 snakes (4 females) have the potential to occur within the 142.21 acres that will be directly impacted as a result of the Preferred Alternative based on Layne and Steiner's study (1996). Additionally, up to 4 nests may be present during breeding season and have the potential to be impacted.

The *Standard Protection Measures for the Eastern Indigo Snake* will be adhered to during construction to minimize the probability of any species impacts. If an indigo snake is encountered within the construction limits, work will stop immediately to allow the snake to vacate the area. Additional protection measures, such as the installation of silt fence barriers around suitable Eastern indigo habitat, may be implemented during the construction phase to minimize the

potential for indigo snakes entering the project area. These preventative measures will help reduce the chances of conflict with Eastern indigo snakes and the construction efforts.

Though the Preferred Alternative will result in a direct loss of habitat, vast amounts of suitable habitat remain in the vicinity of SR 29. The surrounding lands east and west of SR 29 include citrus groves, improved and unimproved pastures, and upland forests, among others. It is anticipated that the loss of habitat associated with these lands is negligible to the long-term survival of the Eastern indigo snake.

In order to offset potential impacts to indigo snake habitat as a result of the proposed project, FDOT will purchase required wetland and upland credits at a USFWS approved mitigation and/or conservation bank. Mitigation and conservation banks are discussed in **Section 4.0**.

It has been determined that the proposed project "**May Affect, and is Likely to Adversely Affect**" the Eastern indigo snake. However, with the proposed implementation of conservation measures and the acquisition of habitat mitigation, it is not likely to jeopardize the continued existence of the species.

3.2 Florida Scrub-Jay

The Florida scrub-jay (*Aphelocoma coerulescens*) is federally listed as threatened primarily due to habitat loss and degradation. This species is typically found in early successional stages of xeric oak communities that are frequently burned. Its preferred habitat consists of scrub oaks that are less than 10 feet tall with open sand and grass patches. Species Conservation Guidelines for the Florida Scrub-jay (USFWS 2004) defines three suitable habitat types:

Type I: any upland plant community in which percent cover of the substrate by scrub oak species is 15 percent or more.

Type II: any plant community, not meeting the definition of Type I habitat, in which one or more scrub oak species is represented.

Type III: any upland or seasonally dry wetland within 400 m (0.25 mi) of any area designated as Type I or II habitats.

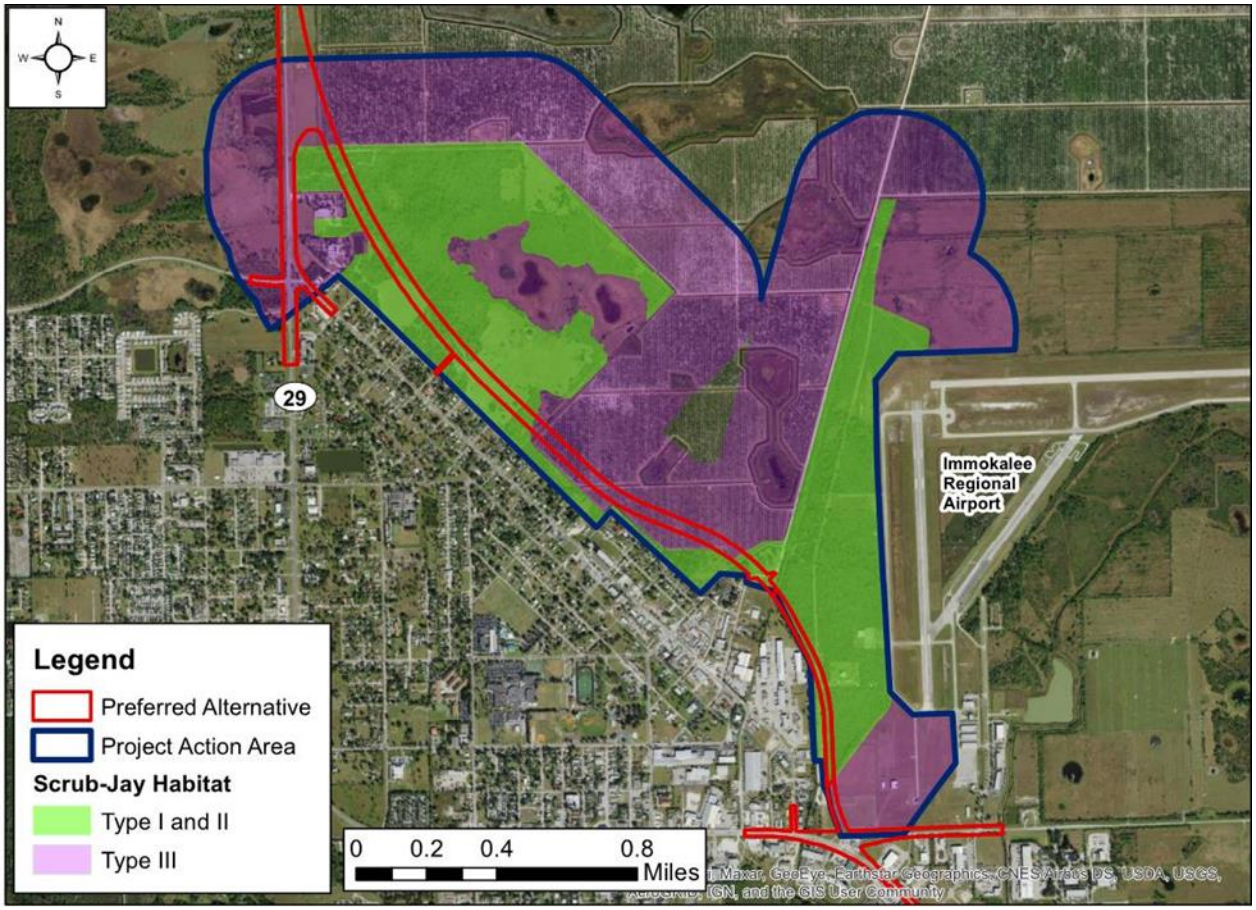
Due to proposed impacts to scrub-jay habitat and previous observations of scrub-jay within the project study area, potential involvement of the project with the Florida scrub-jay was determined to be high. This *NRE Addendum* serves as the Section 7 consultation with USFWS to address project involvement with the Florida scrub-jay.

3.2.1 Action Area

For the SR 29 PD&E study, the Action Area for the Florida scrub-jay has been designated as the areas that exhibit Type I, II, and III scrub-jay suitable habitat in and around the Preferred Alternative. Following 11 years of field observations and land use determinations, scientists deduced scrub habitat is present in the northern portion of the Preferred Alternative, specifically at the Immokalee Regional Airport and in the lands adjacent to the bypass corridor, east of the city of Immokalee. Scrub-jays have been documented in these areas dating back to the USFWS 1992-1993 statewide survey. Additionally, scientists have observed scrub-jays in these areas since the PD&E study began in October 2010. The scrub-jay Action Area for the SR 29 project is presented in **Figure 3-2**.

The bypass corridor intersects lands that include agriculture uses (FLUCFCS 211, 212, 213), shrub and brushland (FLUCFCS 320), and pine flatwoods (FLUCFCS 411). The Action Area for the Florida scrub-jay within this roadway improvement project includes a 600-foot buffer along the Preferred Alternative including lands associated with the Upland Management Area (UMA) at the Immokalee Regional Airport and properties located to the northwest of the airport and referred to as the Collier Property. These areas are discussed in detail below. Direct, indirect, and cumulative effects of the roadway project on the scrub-jay in these areas is discussed in detail in the subsequent sections of this chapter.

FIGURE 3-2
FLORIDA SCRUB-JAY ACTION AREA



UMA at the Immokalee Regional Airport

A portion of the new alignment traverses through the Immokalee Airport Conservation Easement, two parcels totaling 154.28 acres, located at the Immokalee Regional Airport. In 1998, the USFWS issued a Biological Opinion (BO) (USFWS Log No. 4-197-F-556) to the Federal Aviation Administration (FAA) that included a plan to manage and preserve a portion of the conservation easement, located along the western boundary and known as the Upland Management Area (UMA), for the benefit of the Florida scrub-jay. In 1999, the FWC issued an Incidental Take Permit (No. COL-36) for the development activities at the Immokalee Regional Airport. The permit required that gopher tortoises (*Gopherus polyphemus*) be relocated on site at the UMA, in order to minimize take. The UMA provides gopher tortoise habitat and serves as a relocation area for gopher tortoises excavated as a result of on-site development activities

The UMA site consists of a mixed shrub and brushland habitat with the canopy and midstory consisting of pine trees (*Pinus spp.*), cabbage palm (*Sabal palmetto*), Brazilian pepper (*Schinus terebinthifolia*), scrub oak (*Quercus spp.*), American beautyberry (*Callicarpa americana*), and caeserweed (*Urena lobata*). Groundcover includes a variety of grasses, herbs, and forbs, most of which were overgrown and not maintained. Muscadine grape vine (*Vitis rotundifolia*) carpets the midstory, covering tree and shrub species including cabbage palm and scrub oaks. A paved access

driveway runs north-south through the center of the UMA, leading to a stormwater facility in the southeast portion of the parcel. An additional unpaved access path, utilized for mowing and maintenance activities, is located to the west of the paved road. A stormwater canal (FLUCFCS 510) borders the western property boundary.

The majority of the conservation area has been historically classified as Type I and II suitable habitat; however, due to the increased presence of muscadine grape vine and other invasive species, this habitat is of poor quality to host scrub-jays. Discussions with airport personnel indicated that controlled burns have not been able to be utilized in this area. As a result, the area is maintained through a combination of chemical and mechanical controls. These activities have not successfully sustained the Type I and II scrub habitat.

Collier Property

The Collier Property consists of a mix of land uses including pine flatwoods and improved, unimproved, and woodland pasture. The pine flatwoods habitat included pine trees, Brazilian pepper, and scrub oak in the canopy and midstory, caeserweed, saw palmetto (*Serenoa repens*), and a variety of grasses, herbs, and forbs as groundcover. The agriculture parcels have scattered live oaks (*Quercus virginiana*) and Brazilian pepper. The pasture lands were open and had a variety of grasses herbs and forbs. The majority of this area is made of Type I and II scrub-jay habitat and appeared to be in suitable condition for the species.

3.2.2 Status of the Species and Critical Habitat Range-Wide

3.2.2.1 Species Status

Scrub-jays are in the order Passeriformes and the family Corvidae. They have been called a "superspecies complex" and described in four groups that differ in geographic distribution within the United States and Mexico: *A. californica*, from southwestern Washington through Baja California; *A. insularis*, on Santa Cruz in the Channel Islands, California; *A. woodhousii*, from southeastern Oregon and the Rocky Mountains and Great Plains to Oaxaca, Mexico; and *A. coerulescens* in peninsular Florida (American Ornithological Union [AOU] 1983).

Other jays of the same genus include the Mexican jay or gray-breasted jay (*A. ultramarina*) and the unicolored jay (*A. unicolor*) of Central America and southwest North America (Woolfenden and Fitzpatrick 1996b), respectively.

The Florida scrub-jay, originally named *Corvus coerulescens* by Bosc in 1795, was moved to the genus *Aphelocoma* in 1851. In 1858, Baird made *coerulescens* the type species for the genus, and it has been considered a subspecies (*A. c. coerulescens*) for the past several decades (AOU, 1957). It recently regained recognition as a full species (Florida scrub-jay, *Aphelocoma coerulescens*) from the AOU (AOU 1995) because of genetic, morphological, and behavioral differences from other members of this group: the western scrub-jay (*A. californica*) and the island scrub-jay (*A. insularis*). The group name is retained for species in this complex; however, it is now hyphenated to "scrub-jay" (AOU 1995).

No critical habitat has been designated for the Florida scrub-jay.

3.2.2.2 Species Description

Scrub-jays are about 10 to 12 inches long and weigh about 3 ounces. They are similar in size and shape to blue jays (*Cyanocitta cristata*) but differ significantly in coloration (Woolfenden and Fitzpatrick 1996a). Unlike the blue jay, the scrub-jay lacks a crest. It also lacks the conspicuous white-tipped wing and tail feathers, black barring, and bridle of the blue jay. The scrub-jay's head, nape, wings, and tail are pale blue, and its body is pale gray on its back and belly. Its throat and upper breast are lightly striped and bordered by a pale blue gray "bib" (Woolfenden and Fitzpatrick 1996a). Scrub-jay sexes are not distinguishable by plumage (Woolfenden and Fitzpatrick 1984), and males, on the average are only slightly larger than females (Woolfenden 1978). The sexes may be identified by a distinct "hiccup" call made only by females (Woolfenden and Fitzpatrick 1984, 1986). Scrub-jays that are less than about 5 months of age are easily distinguishable from adults; their plumage is smoky gray on the head and back, and they lack the blue crown and nape of adults. Molting occurs between early June and late November and peaks between mid-July and late September (Bancroft and Woolfenden 1982). During late summer and early fall when the first basic molt is nearly done, fledgling scrub-jays may be indistinguishable from adults in the field (Woolfenden and Fitzpatrick 1984).

3.2.2.3 Diet

Scrub-jays forage mostly on or near the ground, often along the edges of natural or man-made openings. They visually search for food by hopping or running along the ground beneath the scrub or by jumping from shrub to shrub. Insect larvae form most of the scrub-jay's diet throughout most of the year (Woolfenden and Fitzpatrick, 1984). Small vertebrates are eaten when encountered including frogs and toads, lizards, small snakes, small rodents, downy chicks of the bobwhite (*Colinus virginianus*), and fledgling common yellowthroat (*Geothlypis trichas*). In suburban areas, scrub-jays will accept supplemental foods once the scrub-jays have learned about them (Woolfenden and Fitzpatrick 1984).

Acorns are the principal plant food of the scrub-jay (Woolfenden and Fitzpatrick 1984; Fitzpatrick et al. 1991). From August to November each year, scrub-jays may harvest and cache 6,500 to 8,000 oak (*Quercus spp.)* acorns throughout their territory. Acorns are typically buried beneath the surface of bare sand patches in the scrub during fall, and retrieved and consumed year-round, though most are consumed in fall and winter (DeGange et al. 1989). Other small nuts, fruits, and seeds also are eaten (Woolfenden and Fitzpatrick 1984).

3.2.2.4 Reproduction

To become a breeder, a scrub-jay must find a territory and a mate. Evidence presented by Woolfenden and Fitzpatrick (1984) indicates that scrub-jays are monogamous. The pair retains ownership and sole breeding privileges in its particular territory year after year. Courtship, to form the pair, is lengthy and ritualized and involves posturing and vocalizations made by the male to the female (Woolfenden and Fitzpatrick 1996b). Age at first breeding in the scrub-jay varies from 1 to 7 years, although most individuals become breeders between 2 to 4 years of age (Fitzpatrick and Woolfenden 1988). Persistent breeding populations of scrub-jays exist only where there are scrub oaks in sufficient quantity and form to provide a winter acorn supply, cover from predators, and nest sites during the spring (Woolfenden and Fitzpatrick 1996b).

Scrub-jay nests are typically constructed in shrubby oaks, at a height of 1.6 to 8.2 feet (Woolfenden 1974). Sand live oak and scrub oak are the preferred shrubs on the Lake Wales Ridge (Woolfenden and Fitzpatrick 1996b), and myrtle oak is favored on the Atlantic Coastal Ridge (Toland 1991) and southern Gulf coast (Thaxton 1998). In suburban areas, scrub-jays nest in the same evergreen oak species as well as in introduced or exotic trees; however, they build their nests in a significantly higher position in these oaks than when in natural scrub habitat (Bowman et al. 1996). Scrub-jay nests are an open cup, about 7 to 8 inches outside diameter and 3 to 4 inches inside diameter. The outer basket is bulky and built of coarse twigs from oaks and other vegetation, and the inside is lined with tightly wound palmetto or cabbage palm fibers. There is no foreign material as may be present in a blue jay nest (Woolfenden and Fitzpatrick 1996b).

Nesting is synchronous, normally occurring from March 1 through June 30 (Woolfenden and Fitzpatrick 1984). In suburban habitats, nesting is consistently started earlier than in natural scrub habitat (Fleischer 1996), although the reason for this is unknown.

Clutch size ranges from one to five eggs but is typically three or four eggs (Woolfenden and Fitzpatrick 1990). Clutch size is generally larger in suburban habitats, and the birds try to rear more broods per year (Fleischer 1996). Eggs are incubated for 17 to 19 days (Woolfenden 1974), and fledging occurs 15 to 21 days after hatching (Woolfenden 1978). Only the breeding female incubates and broods eggs and nestlings (Woolfenden and Fitzpatrick 1984). Average production of young is two fledglings per pair, per year (Woolfenden and Fitzpatrick 1990; Fitzpatrick et al. 1991), and the presence of helpers improves fledging success (Woolfenden and Fitzpatrick 1990; Mumme 1992). Annual productivity must average at least two young fledged per pair for a population of scrub-jays to support long-term stability (Fitzpatrick et al. 1991).

Fledglings depend upon adults for food for about 10 weeks, during which time both breeders and helpers feed them (Woolfenden 1975; McGowan and Woolfenden 1990). Survival of scrub-jay fledglings to yearling age class averages about 35 percent in optimal scrub, while annual survival of both adult males and females averages around 80 percent (Fitzpatrick et al. unpublished data). Data from Archbold Biological Station suggests that survival and reproductive success of scrub-jays in sub-optimal habitat is lower (Woolfenden and Fitzpatrick 1991). This data helps explain why local populations inhabiting unburned, late successional habitats become extirpated. Similarly, data from Indian River County shows that mean annual productivity declines significantly in suburban areas where Toland (1991) reported that productivity averaged 2.2 young fledglings per pair in contiguous optimal scrub, 1.8 young fledglings per pair in fragmented moderately developed scrub, and 1.2 young fledglings per pair in fragmented suboptimal scrub. The longest observed lifespan of a scrub-jay is 15.5 years at Archbold Biological Station in Highlands County (Woolfenden and Fitzpatrick 1996b).

Scrub-jays are nonmigratory and permanently territorial. Juveniles stay in their natal (birth) territory for up to 6 years before dispersing to become breeders (Woolfenden and Fitzpatrick 1984, 1986). Once scrub-jays pair and become breeders, generally within two territories of their natal area, they stay on their breeding territory until death. In suitable habitat, fewer than 5 percent of scrub-jays disperse more than 5 miles (Fitzpatrick et al. unpublished data). All documented long-

distance dispersals have been in unsuitable habitat such as woodland, pasture, or suburban plantations. Scrub-jay dispersal behavior is affected by the intervening land uses. Protected scrub habitats will most effectively sustain scrub-jay populations if they are located within surrounding habitat types that can be used and traversed by scrub-jays. Brushy pastures, scrubby corridors along railway and road rights-of-way, and open burned flatwoods offer links for colonization among scrub-jay populations. Stith et al. (1996) stated that a dispersal distance of 5 miles is close to the biological maximum for scrub-jays.

3.2.2.5 Habitat

The scrub-jay has specific habitat needs. It is endemic to peninsular Florida's ancient dune ecosystems or scrubs, which occur on well drained to excessively well-drained sandy soils (Laessle 1958, 1968; Myers 1990; Fitzpatrick et al. unpublished data). This relict oak-dominated scrub, or xeric oak scrub, is essential habitat to the scrub-jay. This community type is adapted to nutrient-poor soils, periodic drought, and frequent fires (Abrahamson 1984).

Optimal scrub-jay habitat occurs as patches with the following attributes:

1. A 10 to 50 percent of the oak scrub made up of bare sand or sparse herbaceous vegetation;
2. Greater than 50 percent of the shrub layer made up of scrub oaks;
3. A mosaic of oak scrubs that occur in optimal height (4 to 6 feet) and shorter;
4. Less than 15 percent canopy cover; and
5. Greater than 984 feet from a forest (Breininger et al. 1998).

Much potential scrub-jay habitat occurs as patches of oak scrub within a matrix of little-used habitat of saw palmetto and herbaceous swale marshes (Breininger et al. 1991, 1995). These native matrix habitats supply prey for scrub-jays and habitat for other species of conservation concern. The flammability of native matrix habitats is important for spreading fires into oak scrub (Breininger et al. 1995, 2002). Degradation or replacement of native matrix habitats with habitat fragments and industrial areas attract predators of scrub-jays, such as fish crows, that are rare in most regularly burned native matrix habitats (Breininger and Schmalzer 1990; Woolfenden and Fitzpatrick 1991). Matrix habitats often develop into woodlands and forests when there is a disruption of fire regimes. These woodlands and forests, not suitable for scrub-jays, decrease the habitat suitability of nearby scrub, attract predators, and further disrupt fire patterns.

Many scrub-jays occur in habitat conditions where their long-term persistence is doubtful, although their persistence in these areas can occur for many years (Swain et al. 1995; Stith et al. 1996; Root 1998; Breininger et al. 2001). A primary cause for scrub-jay decline is poor demographic success associated with reductions in fire frequency (Woolfenden and Fitzpatrick 1984; Woolfenden and Fitzpatrick 1991; Schaub et al. 1992; Stith et al. 1996; Breininger et al. 1999). The reduction in fire frequency is associated with increases in shrub height, decreases in open space, increases in tree densities, and the replacement of scrub and marshes by forests (Duncan and Breininger 1998; Schmalzer and Boyle 1998; Duncan et al. 1999). These habitat trajectories result in declines in habitat use and demographic success (Woolfenden and 10 Fitzpatrick 1984; Woolfenden and Fitzpatrick 1991). As a result, mean family size declines, and

eventually the number of breeding pairs can decline by 50 percent every 5 to 10 years (Woolfenden and Fitzpatrick 1991; Breininger et al. 1999; Breininger et al. 2001).

3.2.2.6 Life History/Population Dynamics

Scrub-jays have a social structure that involves cooperative breeding, a trait that the other North American species of scrub-jays do not show (Woolfenden and Fitzpatrick 1984, 1990). Scrub-jays live in families ranging from two birds (a single mated pair) to extended families of eight adults (Woolfenden and Fitzpatrick, 1984) and one to four juveniles. Fledgling scrub-jays stay with the breeding pair in their natal territory as "helpers," forming a closely-knit, cooperative family group. Pre-breeding numbers are generally reduced to either a pair, with no helpers, or families of three or four individuals (a pair plus one or two helpers) (Woolfenden and Fitzpatrick, 1996a).

Scrub-jays have a well-developed intra-familial dominance hierarchy with breeder males most dominant, followed by helper males, breeder females, and, finally, female helpers (Woolfenden and Fitzpatrick 1977, 1984). Helpers take part in sentinel duties (Woolfenden and Fitzpatrick 1984; McGowan and Woolfenden, 1989), territorial defense (Woolfenden and Fitzpatrick 1984), predator-mobbing, and the feeding of both nestlings (Stallcup and Woolfenden 1978) and fledglings (Woolfenden and Fitzpatrick 1984; McGowan and Woolfenden 1990). The well-developed sentinel system involves having one individual occupying an exposed perch watching for predators or territory intruders. When a predator is seen, the sentinel scrub-jay gives a distinctive warning call (McGowan and Woolfenden 1989, 1990), and all family members seek cover in dense shrub vegetation (Fitzpatrick et al. 1991).

Scrub-jay pairs occupy year-round, multi-purpose territories (Woolfenden and Fitzpatrick 1978, 1984; Fitzpatrick et al. 1991). Territory size averages 22 to 25 acres (Woolfenden and Fitzpatrick 1990; Fitzpatrick et al. 1991), with a minimum size of about 12 acres (Woolfenden and Fitzpatrick 1984; Fitzpatrick et al. 1991). The availability of territories is a limiting factor for scrub-jay populations (Woolfenden and Fitzpatrick, 1984). Because of this limitation, non-breeding adult males may stay at the natal territory as helpers for up to 6 years, waiting for either a mate or territory to become available (Woolfenden and Fitzpatrick 1984). Scrub-jays may become breeders in several ways:

1. By replacing a lost breeder on a non-natal territory (Woolfenden and Fitzpatrick 1984);
2. Through "territorial budding," where a helper male becomes a breeder in a segment of its natal territory (Woolfenden and Fitzpatrick 1978);
3. By inheriting a natal territory following the death of a breeder;
4. By establishing a new territory between existing territories (Woolfenden and Fitzpatrick 1984); or
5. Through "adoption" of an unrelated helper by a neighboring family followed by resident mate replacement (Woolfenden and Fitzpatrick 1984). Territories also can be created by restoring habitat through effective habitat management efforts in areas that are overgrown (Thaxton and Hingtgen 1994).

3.2.3 Effects of the Proposed Action

3.2.3.1 Factors to be Considered

Road-widening and new alignment projects may have a number of direct and indirect effects on the Florida scrub-jay and scrub-jay habitat. Direct effects of this project include permanent loss and fragmentation of habitat; reduction in the geographic distribution of habitat for the species; and potential harassment by construction activities. Indirect effects may include increased disturbance to scrub-jay in the project vicinity due to increased human activities; habitat degradation due to lack of habitat management (fire); and a barrier to dispersal of young.

3.2.3.2 Analysis for Effects of the Proposed Action

The study area has been reviewed on multiple occasions within the last 11 years. It was determined, through field reviews, desktop research, and historical data that the UMA at the Immokalee Regional Airport and the Collier Property exhibit suitable habitat for the Florida scrub-jay.

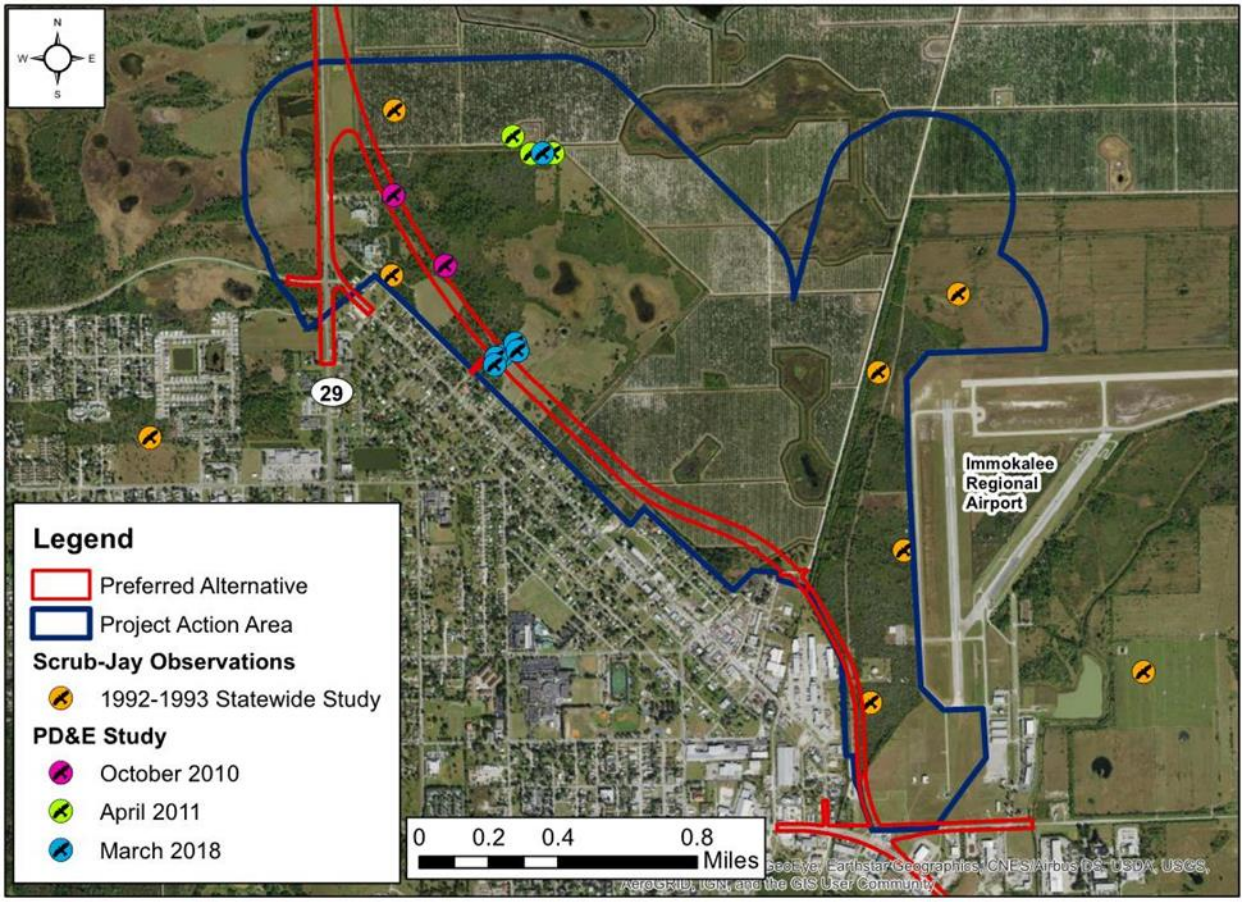
3.2.3.2.1 Scrub-jay Surveys Prior to October 2020

In 1992-1993, the USFWS conducted a statewide study to estimate the population of scrub-jays and the number of breeding pairs (Fitzpatrick 1994). In 1992-1993, scrub-jays were observed at the Immokalee Regional Airport and in the western portion of the Collier Property parcel. For the SR 29 PD&E Study, field biologists have conducted scrub-jay surveys during site reviews in October 2010, April 2011, and March 2018. Scrub-jays were documented in multiple locations throughout the Collier Property since 2018. Historic observations of scrub-jays within the Action Area are depicted in **Figure 3-3**.

3.2.3.2.2 Current Scrub-Jay Surveys – October 2020

Scrub-jay surveys were performed in October 2020 following the re-initiation of Section 7 consultation for the USFWS. Surveys were conducted along the construction limits of the Preferred Alternative, specifically at the UMA at the Immokalee Regional Airport and Collier Property. The objective of the 2020 surveys was to confirm the presence or absence of scrub-jays, determine resident family size, and approximate the resident scrub-jay family home territory within the direct impacts of the Preferred Alternative.

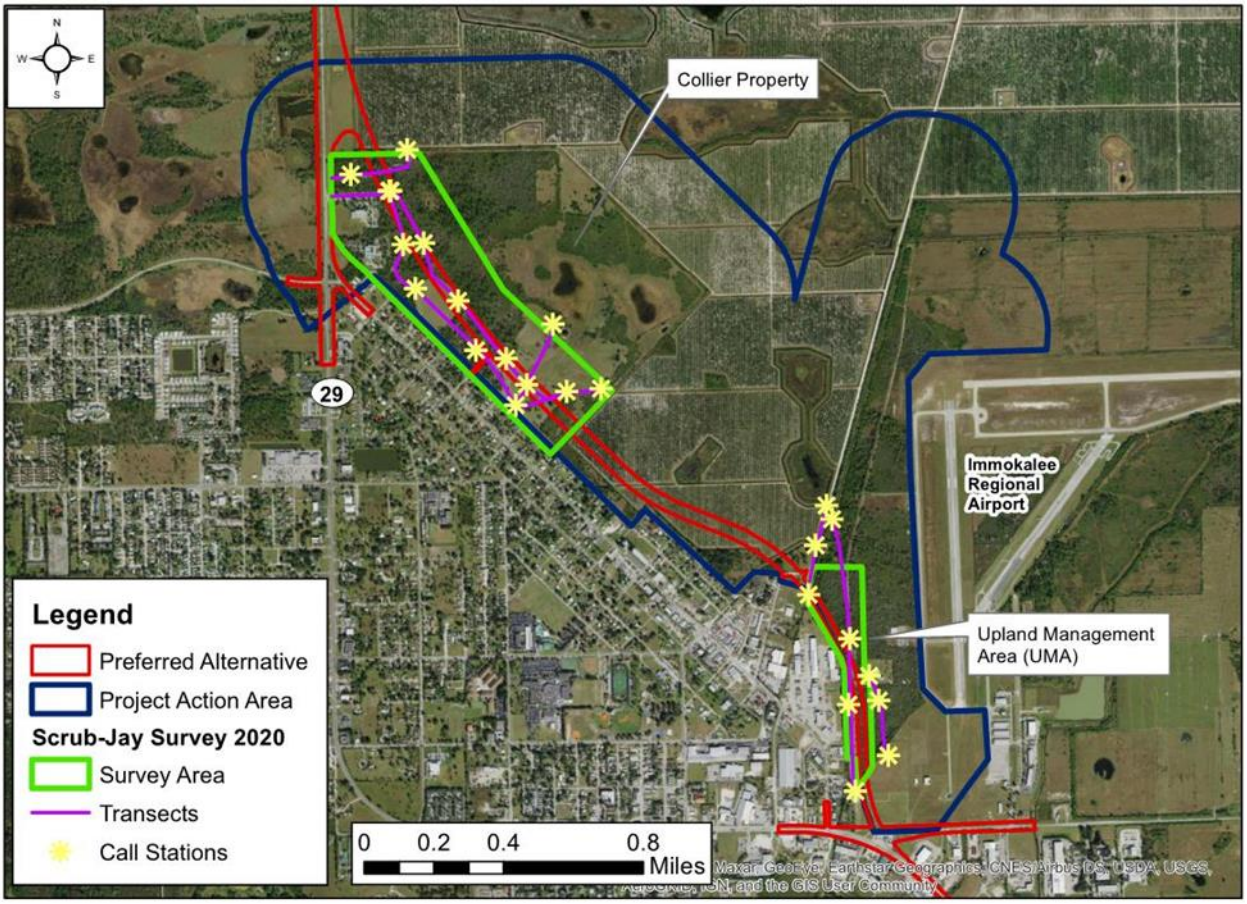
FIGURE 3-3
FLORIDA SCRUB-JAY OBSERVATIONS – PRIOR TO 2020



Methodology

As stated above, the October 2020 scrub-jay survey was focused on determining family size and territorial boundaries within the direct impacts of the proposed roadway. The USFWS *Scrub-jay Survey Guidelines (Updated 08/24/2007)* document was referenced prior to conducting surveys. Surveys were performed for a total of five days at each site (UMA at the Immokalee Regional Airport and Collier Property) either just after sunrise and/or in the late afternoon. Resident family size, home range boundaries, flight direction, and behavior was noted where scrub-jays were present. **Figure 3-4** presents the survey area, including transect lines and call station locations. Field notes from the surveys are provided in **Appendix F**.

FIGURE 3-4
FLORIDA SCRUB-JAY SURVEY METHODOLOGY



Results

The proposed footprint of the Preferred Alternative would directly impact a total of 86.47 acres of suitable scrub-jay habitat (34.53 acres of Type I and II and 51.94 acres of Type III habitat). Of this acreage, 24.20 acres of Type I and II scrub habitat at the Collier Property will be impacted and 10.41 acres of Type I and II scrub habitat at the Upland Management Area (UMA) at the Immokalee Regional Airport will be impacted.

<u>UMA at the Immokalee Regional Airport</u>

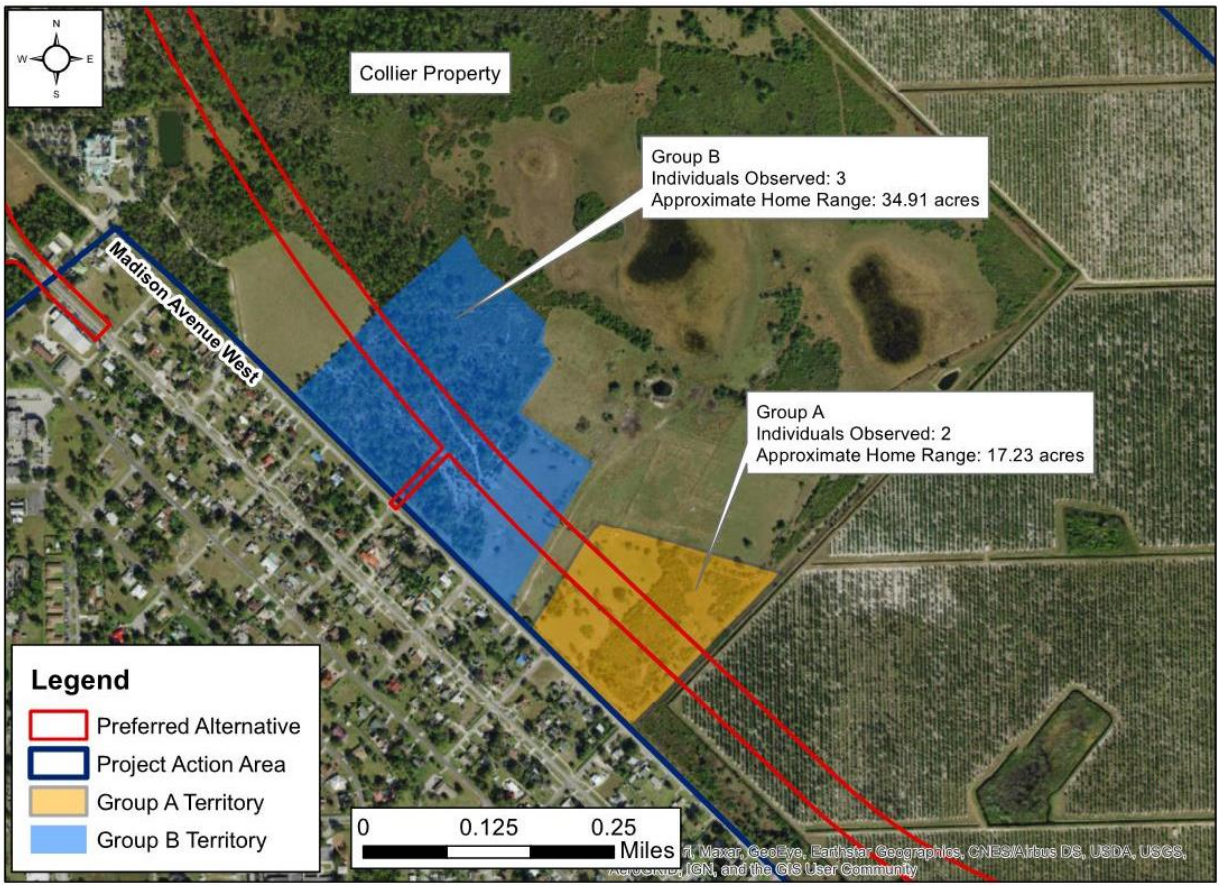
No scrub-jays were observed at the UMA at the Immokalee Regional Airport during the entirety of the five-day survey or during any of the prior survey activities associated with this PD&E study. The time of day varied each day between just after sunrise and late afternoon. Current site conditions did not appear to be optimal habitat for the species. Discussions with airport personnel indicated that controlled burns have not been able to be utilized in this area. The UMA is maintained through a combination of chemical and mechanical controls. Habitat maintenance constraints, especially the restriction of prescribed burns, at the UMA have resulted in the rapid growth of muscadine vine and invasive species throughout the site. These activities have not successfully sustained the Type I and II scrub habitat.

Collier Property

A total of two resident families (identified as Group A with two individuals and Group B with three individuals) were observed at the Collier Property during the October 2020 surveys. The presence of at least two individuals of each family, at least once a day, throughout the entirety of the five-day survey was confirmed.

Resident family, identified as Group A, is comprised of two individuals. The home range territory of Group A is located in the shrub and brushland habitat in the southeastern portion of the property, east of the central pasture. The approximate territory of Group A is 17.23 acres. Resident family, identified as Group B, is comprised of three individuals. The home range territory of Group B is located in the pine flatwoods habitat to the west of the central pasture. The home range of Group B may include lands to the north, outside of the construction footprint. The approximate territory of Group B was estimated to be 34.91 acres. A Scrub-Jay Territory Map is included as **Figure 3-5**. A Scrub-Jay Survey Report is included in **Appendix F**. The survey report includes detailed survey information with figures and daily survey logs.

FIGURE 3-5
FLORIDA SCRUB-JAY TERRITORY MAP – OCTOBER 2020



3.2.3.3 Avoidance and Minimization

The Preferred Alternative will result in unavoidable impacts to scrub-jay habitat. As the project involves improvements that bypass downtown Immokalee and transect through undeveloped lands, potential conflicts with protected species may occur. Impacts have been avoided and minimized to the greatest extent possible. Transportation safety and design requirements for the roadway improvements necessitate the impacts.

Best Management Practices (BMPs) will be implemented during project construction to minimize impacts. Erosion control measures will be installed and maintained in accordance with standard FDOT specifications, and the erosion control plan found in the Roadway Construction Plans.

3.2.3.4 Conservation Measures

In order to conserve the species within the Action Area, BMPs will be implemented during the construction phase. Efforts will include limiting disturbance outside the project footprint. Since Type I, II, and III scrub habitat will remain to the north and south rights-of-way of the Preferred Alternative along the bypass corridor, minimizing secondary impacts to these areas is essential. Specified work zone access routes and staging areas for equipment will be designated to minimize impacts to the surrounding scrub-jay habitat. In addition, construction workers should avoid entering scrub habitat in the vicinity, as to not disturb the jays that may be nesting in the area. These preventative measures will help reduce the chances of conflict with scrub-jays during the construction efforts.

To minimize risks to scrub-jays during the breeding season, clearing of occupied scrub habitat will not occur during the scrub-jay nesting season (March 1 to June 30) to avoid the destruction of nests with eggs, hatchlings, and/or juveniles and the female breeder.

3.2.4 Effect Analysis

3.2.4.1 Direct Effects

Direct effects are those that are caused by the proposed action at the time of construction and are based upon habitat impacts and impacts on the species' ability to breed, feed, or take shelter. Potential direct effects include: the permanent loss and fragmentation of scrub-jay habitat and a reduction in the geographic distribution of its habitat. Scrub-jays may also be impacted by construction activities, which include the installation of a new roadway alignment and associated features. The direct effects the SR 29 project could have on the Florida scrub-jay, within the Action Area, are discussed below.

3.2.4.1.1 Permanent Loss and Fragmentation of Habitat

Roadway improvements will result in the permanent loss of Type I, II, and III scrub-jay habitat, and potential harm to individual scrub-jays within the Action Area, in the form of injury or mortality. A loss of habitat will reduce the availability of suitable shelter and nesting areas for scrub-jays and will adversely affect the ability of individuals to forage for food, reducing the breeding success of each family, and ultimately reducing the life span and survivability of the individuals of each group and their offspring.

Permanent loss of habitat not only reduces the amount of suitable scrub habitat but may cause the remaining habitat to become fragmented. As scrub habitat is altered or lost, the remaining habitat is cut into smaller, potentially isolated pieces, separated from other areas of suitable habitat by large distances. As fragmentation continues, scrub-jays are unable to travel between the patches of suitable habitat. Small populations are at risk of disappearing because of a lack of connectivity. As such, fragmentation increases the probability of genetic isolation, which is likely to increase extinction probability of isolated scrub-jay populations (Fitzpatrick et al. 1991; Woolfenden and Fitzpatrick 1991; Stith et al. 1996; Thaxton and Hingtgen 1996). Thaxton, Hingtgen, and Breininger stated: dispersal distances of scrub-jays in fragmented habitat are further than in optimal unfragmented habitats, and demographic success is poor.

Scrub-jay surveys, conducted for the SR 29 PD&E Study, confirmed the presence of two resident families within the Action Area, and located in the Collier Property. Permanent loss and fragmentation of habitat of both scrub-jay resident families' home range territories is anticipated within the footprint and in the vicinity of the Preferred Alternative.

The home range of the first family unit, Group A, is 17.23 acres in size. The proposed project footprint will bisect this home territory and will directly impact 3.93 acres. The remaining two segments of the home range will consist of a 6.19-acre parcel and a 7.11-acre parcel (total 13.30 acres), located south and north of the proposed project, respectively (see **Figure 3-5**). Due to the size of the family (two individuals), and the fragmentation and quality of the remaining habitat, it is not anticipated that the remainder of the group's home range will be adequate to sustain the family unit. As a result, it is anticipated that the entirety of the home range will be lost as a result of construction of the SR 29 project. Additionally, the loss of these territories also reduces reproductive potential of the scrub jays. It can be assumed that one of the individuals in Group A is a female. As discussed in **Section 3.2.2.4**, female scrub-jays become sexually mature at 2 years of age, and live for a total of 12 years, she would reproduce for approximately 10 years. In suburban areas, the average brood is 1.2 eggs per clutch, and the survival rate of fledglings is 35%. Therefore, the female of Group A may have a total of 12 young in her life with only 4 individuals surviving. The proposed roadway improvements have the potential to impact the survivability of the individuals of Group A and their potential offspring.

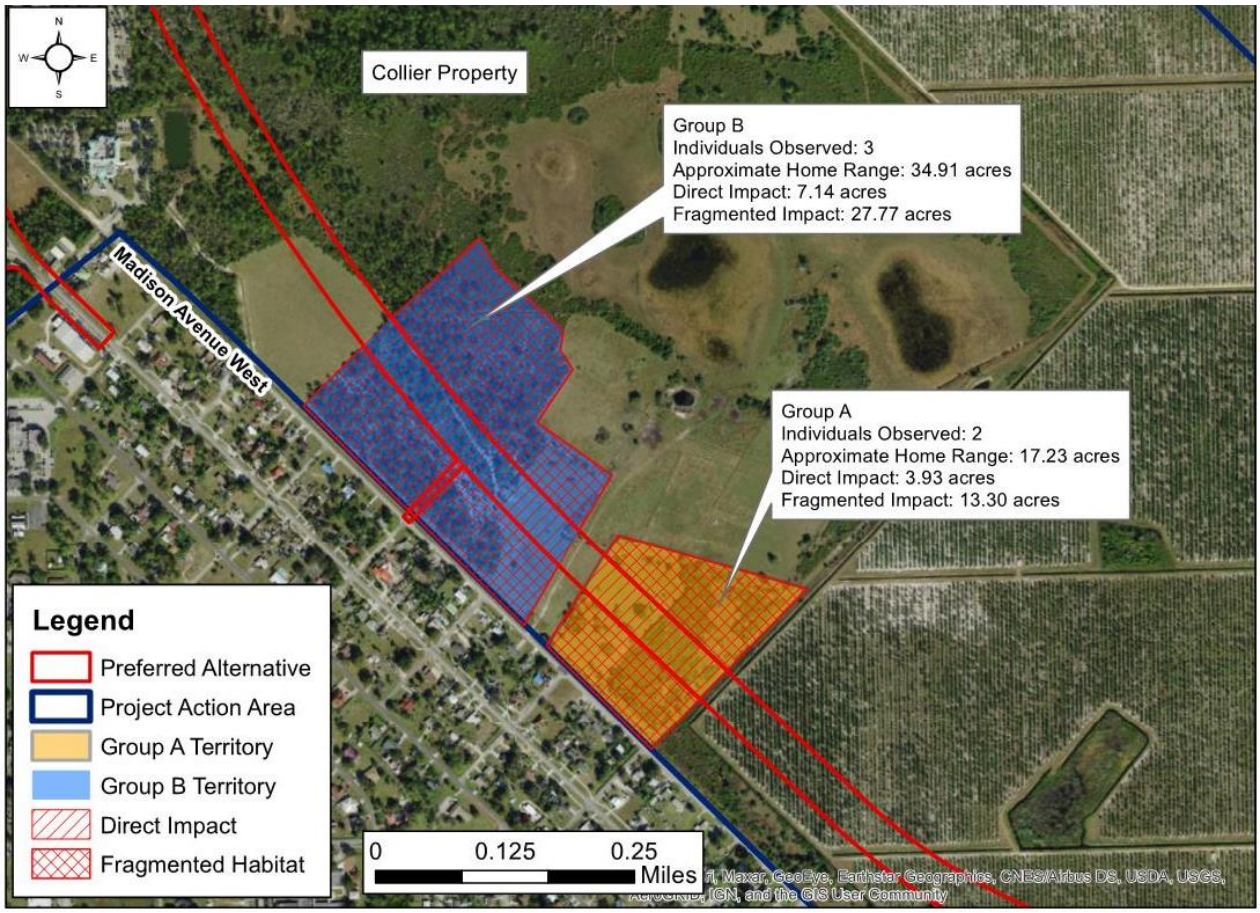
The home range of the second family unit, Group B, is 34.91 acres in size. The proposed project will bisect this home territory and will directly impact 7.14 acres. The remaining two segments of home range will consist of a 12.66-acre parcel and a 15.11-acre parcel (total 27.77 acres), located south and north of the proposed project, respectively (see **Figure 3-5**). Due to the size of the family (three individuals), and the fragmentation and quality of the remaining habitat, it is not anticipated that the remainder of the group's home range will be adequate to sustain the family unit. As a result, it is anticipated that the entirety of the home range will be lost as a result of construction of the proposed project. Pertaining to the discussions above regarding the survivability of the scrub-jays and their potential offspring, Group B has the potential to have at least one female scrub-jay in the family unit. Therefore, the female of Group B may have a total of 12 young in her life with only 4 individuals surviving. The proposed roadway improvements have the potential to impact

the survivability of the individuals of Group B and their potential offspring. Anticipated impacts to scrub habitat and individual groups are presented in **Table 3-4** and **Figure 3-6**.

TABLE 3-4
SCRUB HABITAT AND INDIVIDUAL IMPACT TABLE

Impact Type	Group A		Group B	
	Acres	Individuals	Acres	Individuals
Direct	3.93	2	7.14	3
Fragmented	13.30	--	27.77	--
Total	**17.23**	**2**	**34.91**	**3**
Potential Offspring Lost	**--**	**4**	**--**	**4**
Total Scrub Habitat and Scrub-Jay Impact for the SR 29 project:			**52.14 acres / 5 individuals / 8 potential offspring**	

FIGURE 3-6
FLORIDA SCRUB-JAY HABITAT IMPACTED BY THE PREFERRED ALTERNATIVE



While the proposed project will result in 10.41 acres of direct impacts to suitable scrub habitat at the UMA at the Immokalee Regional Airport, no take of scrub-jays is anticipated, due to the

absence of the species in this area. Based on field reviews, this habitat is overgrown with muscadine grape vine carpets and other nuisance vegetation, due to the lack of prescribed burns. No scrub-jays have been documented in this area since the USFWS 1992-1993 Statewide Survey. Type I and II habitat to the north of the new alignment will be unaffected by roadway construction.

3.2.4.1.2 Reduction in the Geographic Distribution of Habitat for the Species

Roadway construction projects contribute to the permanent loss and fragmentation of habitat. Florida scrub occurs sporadically on well-drained sandy ridges on the Georgia Fall Line and within the Florida peninsula from Kingsley Lake, Clay County south to Immokalee, Collier County (Myers 1990, Wharton 1978). Most interior Florida scrubs are associated with north-south tending ridges that were formed by wind and wave action during periods of higher sea level. Within the South Florida Ecosystem, interior Florida scrub occurs on the Lake Wales, Winter Haven, Lake Henry, Lakeland, and Bombing Range ridges (White 1970) in Polk, Osceola, and Highlands counties; on lesser ridges within the Osceola Plain and Eastern Valley in Osceola, Okeechobee, Indian River, St. Lucie, and Martin counties; and scattered on small rises in Hardee, DeSoto, Glades, Hendry, and Collier counties.

Natural scrub communities in Florida have been reduced over the years due to increased development and lack of management of existing habitat. According to the 2017 American Community Survey (ACS) provided by the US Census Bureau, approximately 566,476 people moved to the state of Florida within the 2019 year (Kerns and Locklear 2019). Traffic trends for the project area, per the FDOT Telemetered Traffic Monitoring Site states that SR 29, has an Annual Average Daily Traffic (AADT) value of 18,495. AADT is the total volume of vehicle traffic of a highway or road for a year divided by 365 days. With the vast amount of people and businesses coming to Florida each year, development will continue to expand. The Florida scrub-jay is endemic to scrub habitat as discussed in **Section 3.2.2.5**. As suitable habitat is lost and fragmented, the geographic distribution of scrub-jays becomes reduced. Resident families of scrub-jays, such as the families observed on the Collier Property, are forced to evacuate their home territories and recolonize new areas. With limited scrub habitat available, this task becomes a challenge, especially due to the fact that scrub-jay dispersal distances from their established home range are minimal (5 miles). Therefore, reduction in the geographic distribution of habitat coincides with the reduction in the geographic distribution of the Florida scrub-jay.

3.2.4.1.3 Construction

The construction efforts involved with the Preferred Alternative have the potential to reduce the life span and/or survivability of the individuals, and their potential offspring, of the resident families at the Collier Property. The construction efforts may result in death, or injury that leads to mortality, to resident families and/or individual scrub-jays observed during 2020 surveys.

The new alignment traverses directly through two resident scrub-jay family territories. Florida scrub-jays are territorial and use a sentinel system to detect predators. Increased foot traffic could cause scrub-jays to neglect their sentinel positions, which could result in an increased risk of injury or death from predation. Woolfenden (1973) suggested that scrub-jay nests may be robbed by predators when all adults are away from the nest, and Schaub et al. (1992) found that scrub-jay

nests experienced increased predation when non-breeding adult helpers were absent. To minimize these risks, clearing of occupied scrub habitat should not occur during the scrub-jay nesting season (March 1 to June 30) to avoid the destruction of nests with eggs, hatchlings, and/or juveniles and the female breeder. Increased foot traffic could also cause Florida scrub-jays to miss foraging and breeding opportunities.

Noise associated with land clearing and construction efforts could disturb scrub-jays where it exceeds ambient noise. Additionally, visual disturbance from personnel during the construction activities could disturb the scrub-jays. These disturbances may result in affected individuals leaving refugia and becoming more vulnerable to predation.

Scrub-jays may react to the construction activities by temporarily avoiding the Action Area and migrating to suitable scrub habitat to the north. Resident scrub-jays were observed in these areas in field surveys in April 2011 and March 2018. If those resident families remain in lands to the north, dispersing scrub-jays will have decreased success of claiming a new home territory. Stith et al. (1996) found a dispersal distance of 5 miles is close to the biological maximum for scrub-jays. Though Type III scrub habitat remains to the north of the Preferred Alternative rights-of-way, this habitat is of lower quality and may decrease the survivability of the individuals.

An additional adverse effect from construction includes the increase in human activity. An increase of trash, which could attract scrub-jay predators, such as raccoons and feral cats, has the potential to occur. Best Management Practices (BMPs) including using closed trash receptacles and educating the construction crews to avoid harassing and/or feeding the wildlife may be implemented to minimize effects of construction to the scrub-jay.

3.2.4.2 Indirect Effects

Indirect effects are those effects that result from the proposed action and take place further out in time. There are three potential indirect effects that may result from the roadway improvements, including increased disturbance due to human activities, habitat degradation, and barrier to dispersal.

3.2.4.2.1 Increased Disturbance Due to Human Activities

Human interference with natural fire regimes has continued to play a major part in the decline of the scrub-jay and today may exceed habitat loss as the single most important limiting factor (Woolfenden and Fitzpatrick 1991; Woolfenden and Fitzpatrick 1996a; Fitzpatrick et al. 1994). Lightning strikes cause all naturally-occurring fires in south Florida scrub habitat (Abrahamson 1984; Hofstetter 1984; Woolfenden and Fitzpatrick 1990). Fire has been noted to be important in maintenance of scrub habitat for decades (Nash 1895; Harper 1927; Webber 1935; Davis 1943; Laessle 1968; Abrahamson et al. 1984). Human efforts to prevent and control natural fires have allowed the scrub to become too dense and tall to support populations of scrub-jays, resulting in the decline of local populations of scrub-jays throughout the state (Fernald 1989; Fitzpatrick et al. 1994, Percival et al. 1995; Stith et al. 1996; Thaxton and Hingtgen 1996; Woolfenden and Fitzpatrick 1990; Woolfenden and Fitzpatrick 1996a; Toland 1999). Woolfenden and Fitzpatrick (1996a) cautioned, however, that fire applied too often to scrub habitat also can result in local extirpations. Data from Archbold Biological Station show that fire-return intervals varying

between 8 and 15 years are optimal for long-term maintenance of productive scrub-jay populations in central Florida (Woolfenden and Fitzpatrick 1996b). These intervals also correspond with those yielding healthy populations of listed scrub plants (Menges and Kohfeldt 1995; Menges and Hawkes 1998).

The implementation of natural or prescribed burns to the remaining scrub habitat within and surrounding the Action Area is not a probable land management technique. The new roadway, residential homes, commercial businesses, and the Immokalee Regional Airport are all within too close of a proximity to the UMA and Collier Property and surrounding scrub lands. The lack of fire will ultimately degrade the surrounding scrub habitat within the Action Area and beyond.

The addition of a new roadway presents a new threat to scrub-jays. Scrub-jays often forage along roadsides and other openings in scrub habitat, therefore increasing the likelihood that one would be struck by a vehicle and killed. A medium density residential community is present to the south of the Collier Property, on Madison Avenue West. This road experiences light vehicle and pedestrian traffic. Mumme et al. (2000) found that scrub-jays living adjacent to roads acclimated or "learned" about the road within two years, and the likelihood of mortality for breeding birds decreased. Though the scrub-jays at the Collier Property have inhabited an area with a road nearby for many years, the Preferred Alternative will introduce a 4-lane highly travelled artery through the center of their habitat. This new roadway will be utilized by large freight trucks and is expected to have exponentially greater vehicle traffic than the resident scrub-jay families have experienced in the past. The construction activities may cause scrub-jays to temporarily leave their established habitat; however, if they return, threats from vehicles may be encountered.

Increased human activity in the Action Area provides an additional danger to scrub-jays. Disturbance from increased human presence within the Action Area may also result in missed foraging and mating opportunities. Birds may be temporarily displaced from foraging, resting, singing, or incubating eggs by this activity. The disturbance may be temporary due to the scrub-jay habituation to humans in the Action Area.

Scrub-jays are curious creatures and may become familiar with humans. Humans may provide the scrub-jays with a supplemental food source. The presence of additional food may allow scrub-jays to persist in fragmented habitats, but recruitment in these populations has a lower success rate than those in native habitats. Though human feeding may postpone local displacement of scrub-jays, long-term survival cannot be ensured in the absence of protecting native oak scrub habitat necessary for nesting. Humans may also introduce domestic dogs and cats (domestic and feral), which may become predators to scrub-jays. Overall, Fitzpatrick et al (1991) noted individual encounters between humans and scrub-jays are likely to result in increased mortality rates of both juvenile and adult birds.

3.2.4.2.2 Habitat Degradation

Scrub habitat that will not be maintained and managed with the use of prescribed burns is subject to degradation. Degradation of habitat may also be experienced along the edges of construction activities. Lands recently disturbed by construction, such as roadway rights-of-way, may be subjected to the influx of invasive plant species. Brazilian pepper is a common invasive species

frequently observed in roadway rights-of-way and beyond. Degradation of habitat can also lead to the introduction of exotic animal species such as greenhouse frogs (*Eleutherodactylus planirostris*), giant toads (*Bufo marinus*), Cuban tree frogs (*Osteopilus septentrionalis*), brown anoles (*Anolis sagrei*), among others. These exotic species may become scrub-jay predators or competitors. In some areas, native scrub has been replaced by exotic vegetation and scrub-jays are known to use shrubs that are structurally similar to native scrub oaks as nesting sites. Scrub-jays may occasionally feed on small exotic animals.

3.2.4.2.3 Barrier to Dispersal

Large roadway systems act as wildlife barriers to a vast range of wildlife. The Florida scrub-jay is no exception. As previously discussed, scrub-jays are nonmigratory and permanently territorial, and their average home territory size is approximately 22-25 acres, with a minimum size of 12 acres. Once scrub-jays pair and become breeders, they stay on their breeding territory until death. In suitable habitat, fewer than 5 percent of scrub-jays disperse more than 5 miles (Fitzpatrick et al. unpublished data). Stith et al. (1996) stated that a dispersal distance of 5 miles is close to the biological maximum for scrub-jays. If a roadway project results in the permanent loss or fragmentation of scrub-jay habitat, with remaining scrub areas in proximity that are blocked by interstates and/or large residential and commercial developments, dispersed birds will have difficulty finding and colonizing a new territory. This anticipated stress on the individuals will reduce the success of breeding, ultimately decreasing survivability. In the event the individuals establish a new territory, this population may be isolated from other scrub-jays, including potential breeders, which increases the probability of inbreeding and genetic isolation. Increased extinction probability of isolated scrub-jay populations may be anticipated.

3.2.4.3 Cumulative Effects

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the Action Area considered in this biological assessment. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to Section 7 of the ESA.

In order to identify potential future actions that are reasonably certain to occur, SFWMD Environmental Resource Permit (ERP) records were researched. Activities that would result in site grading or the conversion of natural habitat for site development would require an ERP. ERP records for the past five years (June 1, 2016 to July 19, 2021) were reviewed for the Township and Ranges in which the project is located (Township 46 South/Range 49 East, Township 47 South/Range 29 East, Township 47 South/Range 30 East, Township 48 South/Range 30 East). This is referred to as the cumulative effects evaluation area. This includes the Action Area for the Florida scrub-jay. SFWMD GIS Land Use data was reviewed for the cumulative effects evaluation area and 5,867 acres were determined to be suitable habitat (FLUCFCS 300 and 400) for the Florida scrub-jay.

ERP Permits that have been applied for and issued satisfy the criterion of reasonably certain to occur. ERP permits are valid for 5 years. Permits older than 5 years have either been built (considered an existing condition) or have expired and are no longer reasonably certain to occur. Permits that include wetland impacts were eliminated because these projects would also require a

Section 404 permit (a Federal action). These projects would require consultation as part of that Federal action and not considered in this analysis.

The search resulted in a total of 33 ERPs that have been issued by SFWMD within the defined area and timeline. Twelve (12) of the ERP permits include wetland impacts and were eliminated due to the requirement of a Section 404 permit (Federal action). Six (6) were eliminated because they had administrative modifications and/or are located within the footprint of another permit being evaluated. The remaining fifteen (15) ERPs were reviewed using SFWMD GIS Land Use data and three (3) were determined to include suitable habitat (FLUCFCS 300 and 400) for the Florida scrub-jay totaling 7.50 acres. This total acreage has the potential for development and/or habitat loss. Including the 87.46 acres of Florida scrub-jay habitat within the proposed SR 29 project, the potential for development and/or habitat loss totals 94.96 acres within the Township and Ranges in which the SR 29 project is located, represented in **Table 3-5**.

Of the 5,867 acres of suitable Florida scrub-jay habitat within the cumulative effects evaluation area, the 94.96 acres of potential development and/or habitat loss represent 1.6% of the total area. This percentage of habitat loss is minor and will not jeopardize the existence of the Florida scrub-jay.

No interrelated or interdependent effects were identified for the proposed project.

TABLE 3-5
FLORIDA SCRUB-JAY CUMULATIVE EFFECTS ANALYSIS

Permit #	Application #	Approval Date	Project Name	Suitable Habitat
11-00093-S	170424-5	5/10/2017	CCW 82 LLC	0.11
11-02336-P	170831-6	3/1/2018	Town Of Ave Maria	0.18
11-02911-P-02	180402-8	4/20/2018	Esperanza Place	7.21
			Total ERP impacts:	**7.50**
Proposed SR 29 Project:				
State Road 29 Widening from Oil Well Rd to State Road 82				87.46
			Total:	**94.96**

3.2.4.4 Compensation

The USFWS recommends conservation and management of two acres of occupied habitat for every one acre of occupied habitat affected. (USFWS 1999) A total of 52.14 acres of scrub habitat requires mitigation for the SR 29 proposed improvements. FDOT commits to acquiring 104.28 acres of scrub-jay habitat from a USFWS approved scrub-jay mitigation bank, identified in **Section 4.0**. This purchase will offset the potential impacts to the Florida scrub-jay as a species and offset the loss of scrub habitat as a result of this project. An Incidental Take Permit will be required for the potential harm in the form of injury/mortality for the five scrub-jays observed within the Action Area.

3.2.5 Conclusion

Two resident families of scrub-jays– five individuals total - inhabiting the Collier Property (Group A: two individuals and Group B: three individuals) and the associated scrub habitat will be directly

and/or indirectly impacted by the Preferred Alternative. Land clearing and construction activities present a major threat to the individuals and may result in mortality and/or injury that leads to mortality. Disturbance from noise and human presence may lead to the scrub-jays fleeing their home ranges and potentially abandoning a nest. This action leaves the scrub-jays vulnerable and at risk to predation, further decreasing their chances of survival. With the addition of the roadway, increased human disturbance and degradation of scrub habitat is anticipated. With increased area development, maintaining suitable scrub through the implementation of burn management, will not be possible.

Direct take in the form of permanent loss and fragmentation of habitat is to be anticipated within the Action Area. The Preferred Alternative will directly impact and fragment a total of 52.14 acres of scrub habitat. FDOT commits to acquiring 104.28 acres of scrub-jay habitat (to account for a 2:1 compensation ratio), from a USFWS approved scrub habitat bank. This purchase will offset the potential impacts to the Florida scrub-jay and offset the loss of scrub habitat as a result of this project. An Incidental Take Permit will be required for the potential harm in the form of injury/mortality for the five scrub-jays observed within the Action Area. Additionally, to minimize risks to scrub-jays during the breeding season, clearing of occupied scrub habitat will not occur during the scrub-jay nesting season (March 1 to June 30) to avoid the destruction of nests with eggs, hatchlings, and/or juveniles and the female breeder.

It has been determined that the proposed project "**May Affect, and is Likely to Adversely Affect**" the Florida scrub-jay. However, taking into consideration the status of the species in the project area; direct, indirect, and cumulative effects of the proposed action; and, the conservation and mitigation actions proposed to offset these impacts, it is not likely to jeopardize the continued existence of the species.

3.3 Florida Bonneted Bat

The Florida bonneted bat (*Eumops floridanus*) is federally listed as endangered due to declining populations from habitat loss and degradation. The Florida bonneted bat has historically been documented in a variety of habitat types including mangroves, earth midden hammocks, pine rocklands, wet prairies, tropical hardwoods, hardwood hammocks, pine flatwoods, lakes, cypress hammocks, scrubby flatwoods, and wetland scrub habitats as well as man-made and altered areas (such as residential and urban areas, canals, and developed park lands).

The U.S Fish and Wildlife Service (USFWS) Florida bonneted bat Consultation Area (CA) overlaps the entire project area, and suitable habitat for the Florida bonneted bat occurs within the Preferred Alternative; therefore, there is the potential for habitat of this species to be impacted.

In accordance with the *Consultation Key for the Florida Bonneted Bat* (October 22, 2019), since the project is located within the Florida Bonneted Bat Consultation Area, potential roosting habitat exists within the project area, and the project size is greater than 5 acres, Full Acoustic/Roost Surveys are required. Surveys were conducted in accordance with the USFWS Florida Bonneted Bat Consultation Guidelines (USFWS 2019). This *NRE Addendum* serves as the Section 7 consultation with USFWS to address project involvement and effect on the Florida bonneted bat.

3.3.1 Action Area

The Preferred Alternative is comprised of the proposed roadway improvements. For the purposes of the effect analysis of the SR 29 PD&E study on the Florida bonneted, the Action Area has been designated as the entirety of the Preferred Alternative. The Florida bonneted bat Action Area is shown in **Figure 3-7**.

Table 3-6 shows land uses within the Preferred Alternative, of these land uses urban lands (Florida Land Use Cover and Forms Classification System (FLUCFCS 100)), agriculture (FLUCFCS 200), rangeland (FLUCFCS 300), upland forest (FLUCFCS 400), other surface waters (FLUCFCS 500), and freshwater wetlands (FLUCFCS 600) codes provide suitable foraging and/or roosting habitat for the Florida bonneted bat.

FIGURE 3-7
FLORIDA BONNETED BAT ACTION AREA

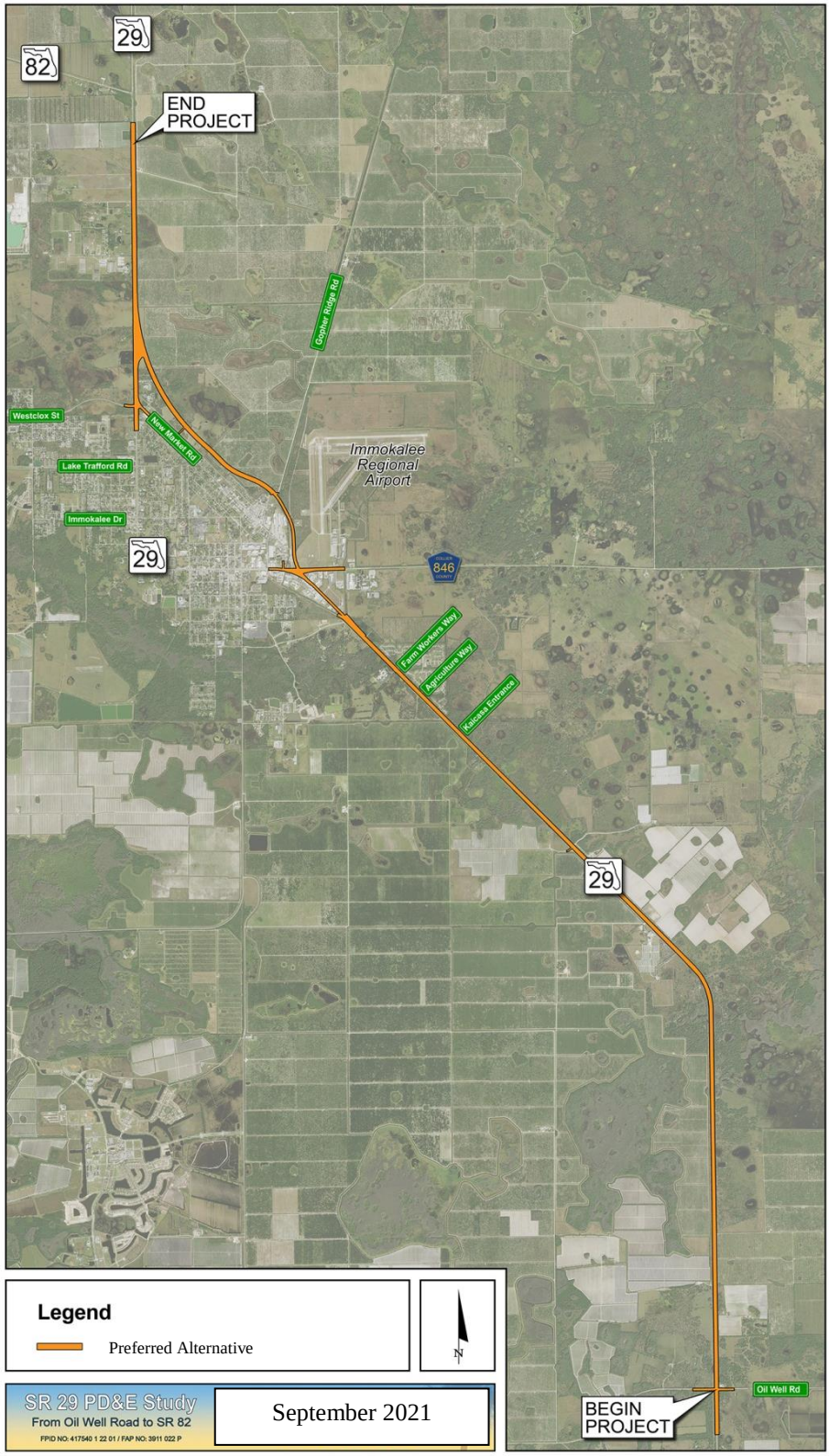


TABLE 3-6
EXISTING LAND USE/VEGETATIVE COVER WITHIN THE FLORIDA BONNETED BAT ACTION AREA

FLUCFCS Classification[1]		USFWS Classification[2]	Description	Preferred Alternative	
				Acres	Percent (%)
Uplands					
Urban Lands (100)	111	N/A	Residential, Low Density - Fixed Single Family Units	1.64	0.4
	121	N/A	Residential, Medium Density - Fixed Single Family Units	0.02	0.0
	140	N/A	Commercial and Services	0.89	0.2
	155	N/A	Other Light Industrial	3.55	0.9
	171	N/A	Educational Facilities	0.68	0.2
Agriculture (200)	211	N/A	Improved Pasture	27.78	7.3
	212	N/A	Unimproved Pasture	8.08	2.1
	213	N/A	Woodland Pasture	8.21	2.1
	221	N/A	Citrus Groves	18.76	4.9
Rangeland (300)	310	N/A	Herbaceous (Dry Prairie)	0.33	0.1
	320	N/A	Shrub and Brushland	42.27	11.1
	330	N/A	Mixed Rangeland	0.57	0.1
Upland Forest (400)	411	N/A	Pine Flatwoods	20.63	5.4
	434	N/A	Hardwood – Conifer Mixed	1.05	0.2
	437	N/A	Australian Pine	0.20	0.1
Transportation (800)	811	N/A	Airports	4.60	1.2
	814	N/A	Roads and Highways	213.03	55.7
	832	N/A	Electrical Power Transmission Lines	0.23	0.1
			Total Uplands	***352.52***	***92.1***
Wetlands and Other Surface Waters					
Other Surface Waters (500)	510	PUB2F	Streams and Waterways	14.78	3.9
	534	PSS1 / PUB2C	Reservoir less than 10 Acres	0.63	0.2
Freshwater Wetlands (600)	617	PFO1C	Mixed Wetland Hardwoods	1.95	0.5
	621	PFO2C	Cypress Swamp	0.56	0.2
	630	PFO1/2C	Wetland Forested Mixed	8.12	1.9
	641	PEM1C	Freshwater Marshes	3.70	1.2
			Total Wetlands/Other Surface Waters	***29.74***	***7.9***
			Total Land Use/Vegetative Cover	**382.26**	**100.0**

(1) FDOT, FLUCFCS (Third edition), 1999.
(2) USFWS, Classification of Wetlands and Deepwater Habitats of the United States (Cowardin, et al), 1979.

FLUCFCS – Denotes Florida bonneted bat suitable habitat

3.3.2 Status of the Species and Critical Habitat Range-Wide

3.3.2.1 Species Status

The U.S. Fish and Wildlife Service (USFWS) proposed to list the Florida bonneted bat under the Endangered Species Act of 1973, as amended in 1998 (Act) (87 Stat. 884; 16 U.S.C. 1531 et seq.), on October 4, 2012 (USFWS 2012). The final determination to federally list the Florida

bonneted bat as endangered was published on October 2, 2013 and became effective November 1, 2013 (USFWS 2013).

No Critical Habitat has been designated for this species; however, USFWS has proposed critical habitat. The Proposed Rule to designate critical habitat for the Florida bonneted bat was published in the Federal Register on June 10, 2020 (USFWS 2020). The SR 29 project study area does not fall within the proposed critical habitat; however, the limits of the proposed critical habitat is approximately 0.6 miles south and east of the Preferred Alternative, as shown in **Figure 3-8**.

3.3.2.2 Species Description

The Florida bonneted bat has a body length of between 84 to 108 millimeters (mm) (approximately 3.75 inches) with a wingspan of 490 to 530 mm (approximately 20 inches), making it the largest species of bat in Florida. Its fur color can range from a dark grey to reddish brown and a distinguishing characteristic of the Florida bonneted bat is its large, rounded ears which are joined at the midline of the forehead. There is no significant difference in size or appearance between males and females. Florida bonneted bat echolocations have a minimum frequency of 10-18 kilohertz (kHz) and a maximum frequency of 16-22 kHz.

The Florida bonneted bat's morphological characteristics make it capable of and generally adapted for low cost, swift, long distance travel from roost site to foraging areas (Norberg and Rayner 1987; Gillies 2012; Ober 2012). Data from a satellite tagged Florida bonneted bat indicated that individuals foraged several miles (24 miles maximum) from their roosts and cover long distances in one night (56 miles maximum) (Ober 2016; Webb 2018a-b).

3.3.2.3 Diet

The Florida bonneted bat is active year-round and does not have periods of hibernation or torpor; consequently, the species is likely dependent upon a constant and sufficient food supply to maintain its high metabolism. Based upon limited information, Florida bonneted bats feed on flying insects of the following orders: Coleoptera (beetles), Diptera (true flies), Hemiptera (true bugs), and Lepidoptera (moths) (Belwood 1981; Belwood 1992; FBC 2005; Marks 2013). Foraging in open spaces, these bats use echolocation to detect prey at relatively long range, roughly 10 to 16 feet (ft) (Belwood 1992). Individuals leave roosts to forage after dark, seldom occur below 33 ft in the air, and produce loud, audible calls when flying (Belwood 1992; Best et al. 1997; Marks and Marks 2008a).

FIGURE 3-8
FLORIDA BONNETED BAT PROPOSED CRITICAL HABITAT

3.3.2.4 Reproduction

The maternity season for most bat species in Florida occurs from mid-April through mid-August (Marks and Marks 2008a). The Florida bonneted bat is a subtropical species, and limited data suggest the species may be polyestrous (having more than one period of estrous in a year) (Timm and Genoways 2004; FBC 2005; Ober et al. 2017b). The full extent of the maternity season is not well understood but is a time of particular sensitivity with increased energy demands for females who leave young in roosts while making multiple foraging excursions to support lactation (Kurta et al. 1989; Kurta et al. 1990; Kunz et al. 1995; Marks and Marks 2008a; Ober 2014c). Preliminary data suggest a prolonged maternity season, as some pregnant and postlactating females were observed in late August (Ober 2014b; Myers, 2014a–c). Reduced insect populations in urban areas may make it difficult for females to raise offspring successfully to maturity (Kurta et al. 1990; Kurta and Teramino 1992). Disturbance to summer maternity colonies of bats is extremely detrimental (Harvey et al. 1999). In general, maternity colonies of bats do not tolerate disturbance, especially when flightless newborns are present (Harvey et al. 1999). Newborns or immature bats may be dropped or abandoned by adults if disturbed (Harvey et al. 1999).

The Florida bonneted bat has low fecundity; litter size is one (FBC 2005; Timm and Arroyo-Cabrales 2008). Assuming a lifespan of 10 to 20 years for bats of this size (Wilkinson and South 2002), the average generation time is estimated to be 5 to 10 years (Gore et al. 2010). The species is not migratory, but there appears be seasonal shifts in roosting and foraging sites (Timm and Genoways 2004; Ridgely 2018).

3.3.2.5 Habitat

Habitat for the Florida bonneted bat consists primarily of foraging areas and roosting sites, which appear varied, with the species occurring in forested, suburban, and urban areas (Timm and Arroyo-Cabrales 2008). Echolocation calls have been recorded in a wide array of habitat types: pine flatwoods, pine rocklands, cypress, hardwood hammocks, scrubby flatwoods, mixed shrubs, mangroves, wetlands, swamps, rivers, lakes, ponds, canals, developed park lands, groves, tropical gardens, crop-based agriculture, disturbed nonnative areas, rural lands, residential areas, and urban landscapes. Open, fresh water and wetlands appear to be prime foraging areas for bats (Marks and Marks 2008b). During dry seasons, bats become more dependent on remaining ponds, streams, and wetland areas for foraging purposes (Marks and Marks 2008b).

The presence of roosting habitat is critical for day roosts, protection from predators, and the rearing of young (Marks and Marks 2008c). For most bats, the availability of suitable roosts is an important, limiting factor (Humphrey 1975). Roosting habitat for the Florida bonneted bat can be any habitat with tall, mature dead or live trees, tree snags, and trees with cavities, hollows, deformities, decay, crevices, or loose bark.

At present, only 19 natural roost sites are known, and information on historical sites is scarce. Based upon limited information, the species roosts singly or in colonies consisting of a male and several (potentially over 50) females, in live trees and snags of pines, cypress, and palms (Belwood 1992; Arwood 2015; Ober et al. 2018). Florida bonneted bats will also use artificial structures, such as bat houses, utility poles, and buildings. In general, Florida bonneted bat roosts use areas

with sufficient open space for obstacle-free emergence, which can occur in canopy gaps or edges, or above the canopy.

3.3.2.6 Life History/Population Dynamics

Endemic to Florida, the Florida bonneted bat has one of the most restricted distributions of any species of bat in the New World (Belwood 1992; Timm and Genoways 2004). Although numerous acoustical surveys for the Florida bonneted bat have been conducted in the past decade by various parties, the best scientific information indicates that the species exists only within a very restricted range, confined to south and south-central Florida. The core range currently appears to consist of habitat within Charlotte, Lee, Collier, Monroe, and Miami-Dade Counties. Recent data also indicate use of portions of Okeechobee, Polk, DeSoto, Hendry, and Broward Counties and possible use of areas within Glades and Highlands Counties. Surveys and research are ongoing to evaluate the current extent of the species range.

The Florida bonneted bat was considered common in the Miami-Coral Gables area because of regular collection of specimens from 1951 to 1965 (Robson 1989; Belwood 1992). Unpublished data from a survey of 100 pest control companies in 1982 on the southeastern coast of Florida showed that requests to remove "nuisance" bats from this area all but ceased beginning in the 1960s (Belwood 1992), indicating a sharp decline in bats in general. Timm and Genoways (2004) found only three records of Florida bonneted bats in the greater Miami area after 1965. No new evidence of this species was found from 1979 until 1988 when a pregnant female was observed in Coral Gables (Robson 1989).

Timm and Genoways (2004) surmised the Florida bonneted bat may have been uncommon for several decades, based upon the work of previous researchers (Barbour 1945, as edited in Timm and Genoways 2004; Jennings 1958; Layne 1974), who noted the scarcity of bats in southern Florida. Owre (1978) observed fewer than a dozen individuals in roughly 25 years and noted few mammologists had success in finding the species. A status survey conducted in 1989, encompassing 25 sites within natural areas within a nine county area, found no new evidence of this species (Robson 1989).

Results of the 2006-2007 range-wide survey suggested that the Florida bonneted bat is a rare species with limited range and low abundance (Marks and Marks 2008a). Based upon results of both the range-wide study and survey of select public lands, the species was found at 12 locations (Marks and Marks 2008b), but the number and status of the species at each location are unknown. Based upon the small number of locations where calls were recorded, the low numbers of calls recorded at each location, and the fact that the species forms small colonies, Marks and Marks (2008a) stated that it is possible that the entire population of Florida bonneted bats may number less than a few hundred individuals. As part of their evaluation of listing criteria for the species, Gore et al. (2010) found the extent of occurrence appears to have declined on the east coast, but trends on the west coast could not be inferred due to limited information.

Actual population size is not known, and no population viability analyses are available (FWC 2011a; 2013; Bohn 2012). Few roosts are known, and roost switching can occur, making precise counts difficult to obtain. However, current population size is thought to be less than that needed

for optimum viability (Timm and Arroyo-Cabrales 2008; Bohn 2012), possibly in the hundreds or less than 1,000 individuals (Marks and Marks 2008a; Marks and Marks 2012; FWC 2011b; FWC 2019).

3.3.3 Effects of the Proposed Action

3.3.3.1 Factors to be Considered

Transportation projects may have a number of direct and indirect adverse effects on bonneted bats and their habitat. Direct effects may include: the permanent loss of habitat, fragmentation of habitat, and impacts from construction activities. Indirect effects may include: an increased disturbance due to increased human activities and habitat degradation.

3.3.3.2 Analysis for Effects of the Proposed Action

For the purposes of this consultation, the Action Area includes all areas within the Preferred Alternative. Land use types, considered as bonneted bat suitable habitat, and are represented within the Action Area, include urban lands (FLUCFCS 100), agriculture (FLUCFCS 200), rangeland (FLUCFCS 300), upland forest (FLUCFCS 400), other surface waters (FLUCFCS 500), and freshwater wetlands (FLUCFCS 600).

The Action Area is located within the USFWS Consultation Area for the Florida bonneted bat, but does not fall within the South Florida Urban Bat Area, as depicted in the *USFWS South Florida Ecological Services Office - Florida Bonneted Bat Consultation Guidelines* (USFWS 2019). It was confirmed through comprehensive literature and GIS analysis that the project does not fall within the USFWS proposed Critical Habitat as shown in **Figure 3-8**.

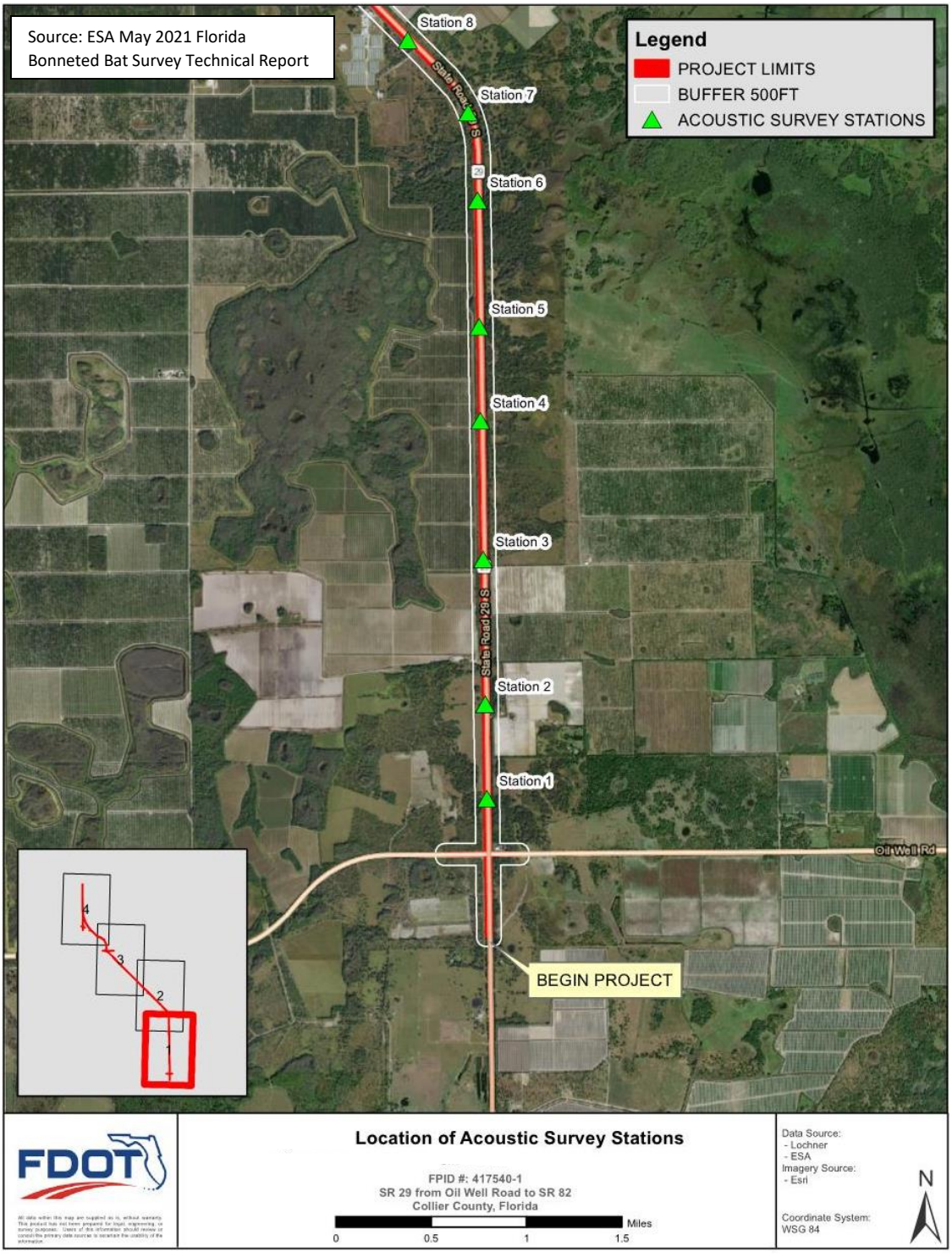
3.3.3.2.1 Florida Bonneted Bat Surveys – March - May 2021

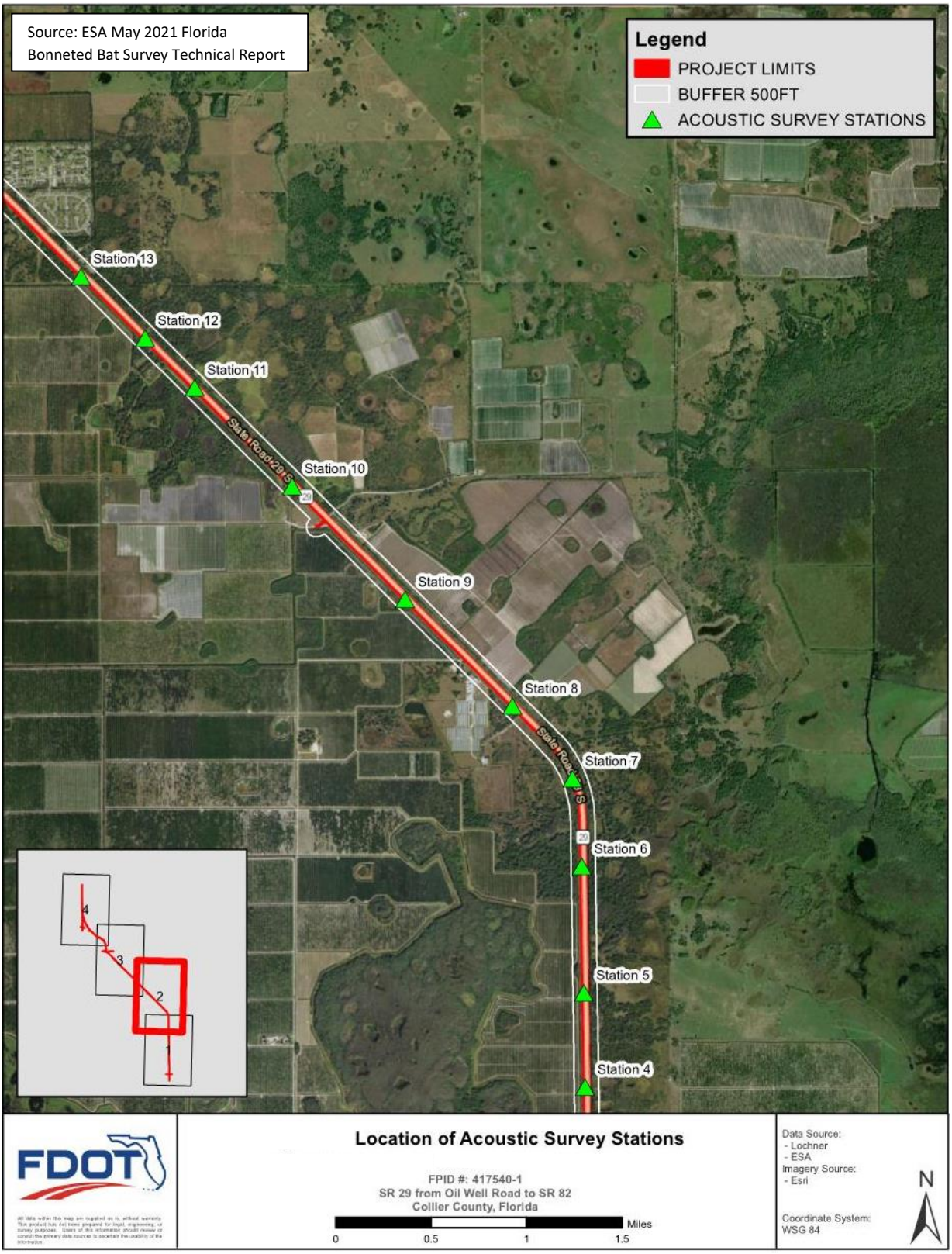
In accordance with the October 2019 *USFWS South Florida Ecological Services Office - Florida Bonneted Bat Consultation Guidelines* (USFWS 2019), for linear projects that contain potential bonneted bat roosting and foraging habitat and that are also greater than five acres in size, acoustic surveys were required for the SR 29 PD&E study. Florida bonneted bat acoustic surveys were conducted from March through May 2021, and a technical report detailing the surveys are provided in **Appendix G-1**.

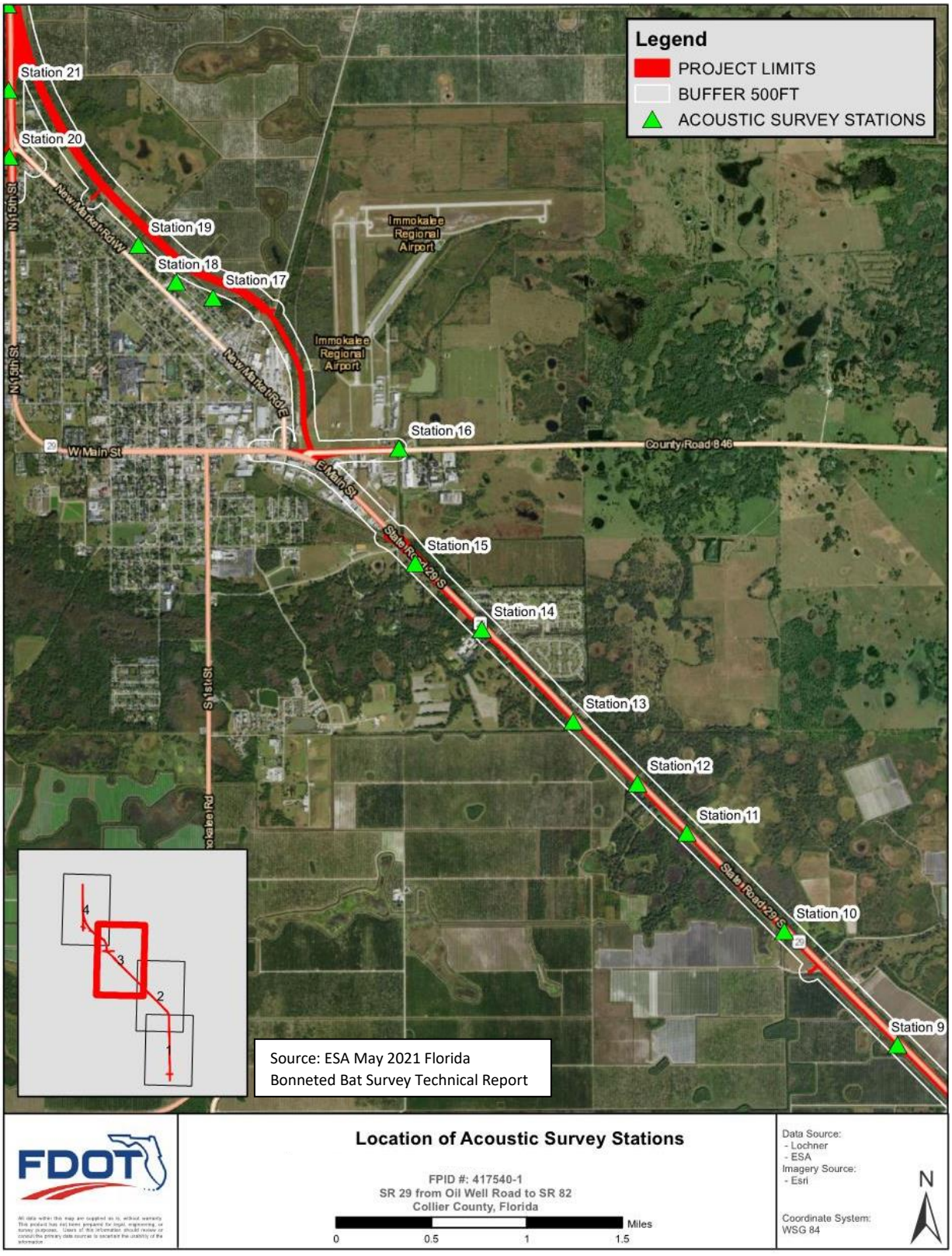
Methodology

For the SR 29 project, a total of twenty-five (25) acoustic survey stations were established based on the minimum requirements of one station per 0.60 miles for linear projects. Survey station locations are shown in **Figure 3-9**. Each acoustic survey station was placed in an area that could be used as a potential flight path for the Florida bonneted bat and where nearby habitat contained mature forested areas and an open water source to maximize chances of detecting foraging bats and potential roosting areas. At each survey station, a Wildlife Acoustics Song Meter SM4BAT Full Spectrum (FS) detector was deployed and was set to record 15-second file lengths, with a two-second trigger window, and each detector automatically began collecting data continuously from 30 minutes before sunset to 30 minutes after sunrise. For each detector, an omnidirectional Wildlife Acoustic SMM-U2 External Ultrasonic Microphone placed on a 9-foot high pole was

FIGURE 3-9
FLORIDA BONNETED BAT ACOUSTIC SURVEY STATION LOCATIONS




Source: ESA May 2021 Florida Bonneted Bat Survey Technical Report
Legend
PROJECT LIMITS
BUFFER 500FT
ACOUSTIC SURVEY STATIONS
Station 13
Station 12
Station 11
State Road 29 S
Station 10
Station 9
Station 8
State Road 29 S
Station 7
Station 6
Station 5
Station 4
4
3
2
1
FDOT
Location of Acoustic Survey Stations
FPID #: 417540-1
SR 29 from Oil Well Road to SR 82
Collier County, Florida
0
0.5
1
1.5
Miles
Data Source:
- Lochner
- ESA
Imagery Source:
- Esri
Coordinate System:
WSG 84
N


Legend
PROJECT LIMITS
BUFFER 500FT
ACOUSTIC SURVEY STATIONS
Station 21
Station 20
Station 19
Station 18
Station 17
Station 16
Station 15
Station 14
Station 13
Station 12
Station 11
Station 10
Station 9
N 15th St
New Market Rd W
New Market Rd E
Immokalee Regional Airport
W Main St
E Main St
County Road 846
State Road 29 S
S 1st St
Source: ESA May 2021 Florida Bonneted Bat Survey Technical Report
Location of Acoustic Survey Stations
FPID #: 417540-1
SR 29 from Oil Well Road to SR 82
Collier County, Florida
Miles
0
0.5
1
1.5
Data Source:
- Lochner
- ESA
Imagery Source:
- Esri
Coordinate System:
WSG 84
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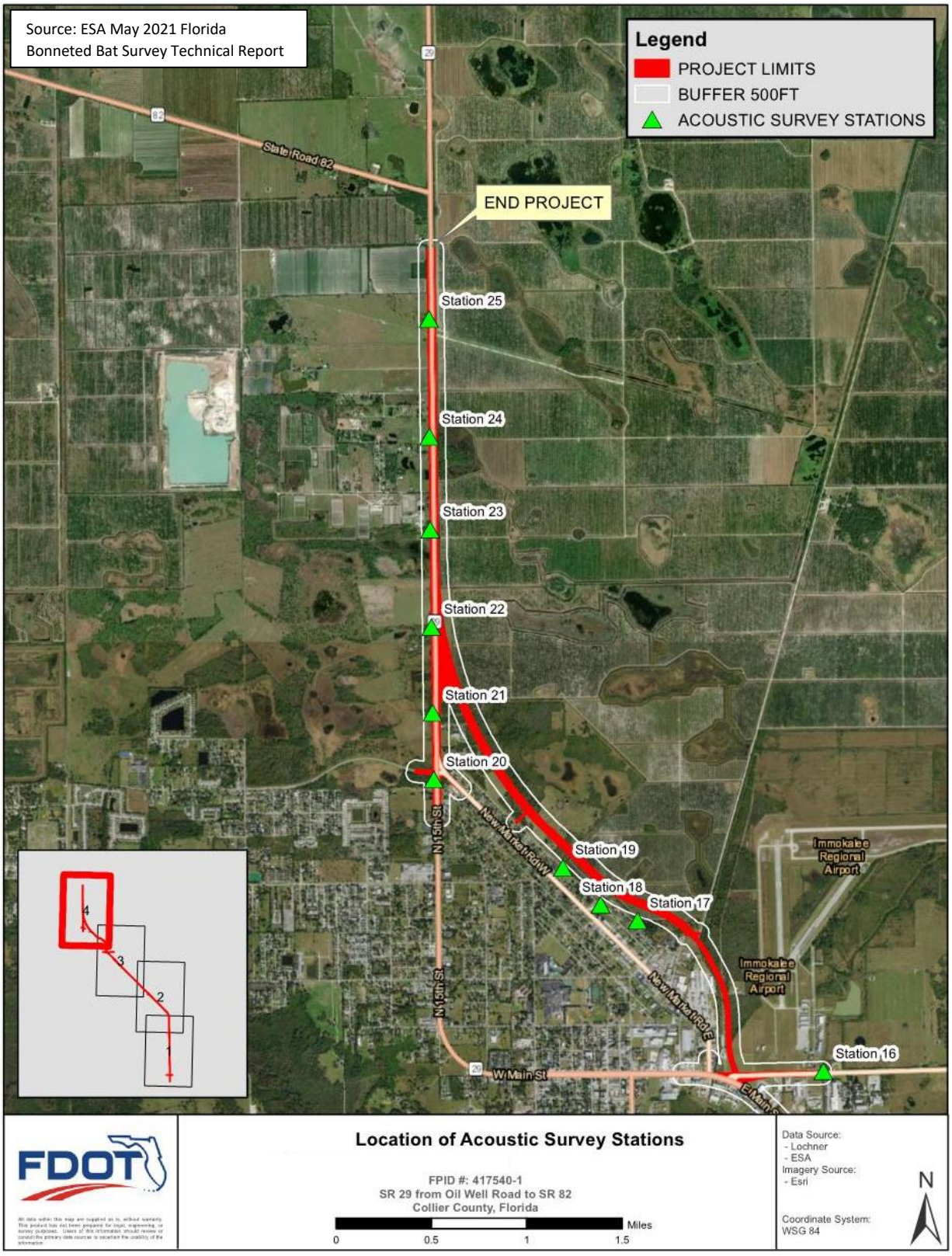

Source: ESA May 2021 Florida Bonneted Bat Survey Technical Report
Legend
PROJECT LIMITS
BUFFER 500FT
ACOUSTIC SURVEY STATIONS
State Road 82
END PROJECT
Station 25
Station 24
Station 23
Station 22
Station 21
Station 20
Station 19
Station 18
Station 17
Station 16
N 15th St
New Market Rd W
New Market Rd E
Immokalee Regional Airport
W Main St
E Main St
Location of Acoustic Survey Stations
FPID #: 417540-1
SR 29 from Oil Well Road to SR 82
Collier County, Florida
Miles
0
0.5
1
1.5
Data Source:
- Lochner
- ESA
Imagery Source:
- Esri
Coordinate System:
WSG 84
N

utilized. The microphone was not placed beneath tree canopies or overhead power lines and was situated away from echo-producing surfaces including open water.

Per the *USFWS South Florida Ecological Services Office Florida Bonneted Bat Consultation Guidelines* (October 2019), the following weather conditions need to be met each night during the first five hours of acoustic surveys:

- Temperature at or above 65 degrees Fahrenheit;
- Precipitation cannot exceed 30 minutes in length; and
- Wind speeds cannot be greater than 9 miles per hour.

The Wildlife Acoustics Song Meter SM4BAT Full Spectrum detector records bat echolocations as Waveform Audio (WAV) files. A single WAV file is made up of a series of pulses which is considered a single bat pass. The WAV files recorded at each survey station were analyzed using Wildlife Acoustics Kaleidoscope Pro version 5.4.1. The auto-identification parameters utilized via Kaleidoscope Pro include Bats of North America (Version 5.4.0), region Florida, and the sensitivity setting utilized was zero balanced (neutral). The species to be selected in the auto identification classifier included: big brown bat (*Eptesicus fuscus*), Florida bonneted bat, Eastern red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), northern yellow bat (*Lasiurus intermedius*), Seminole bat (*Lasiurus seminolus*), southeastern myotis (*Myotis austroriparius*), evening bat (*Nycticeius humeralis*), tri-colored bat (*Perimyotis subflavus*), and Brazilian free-tailed bat (*Tadarida brasiliensis*).

The bat acoustic data was retrieved, saved, analyzed, and interpreted using Kaleidoscope Pro. All echolocations auto identified by Kaleidoscope Pro as being created by a Florida bonneted bat were visually reviewed and manually verified by experienced biologists. The parameters used to manually verify a sequence of echolocations as coming from a Florida bonneted bat included the following:

- Whether the characteristic frequency of echolocations fell within the documented range for the Florida bonneted bat;
- Whether there are eight or more echolocations where the time between echolocations remained consistent across the sequence of echolocations;
- Whether the minimum frequency remained consistent across the sequence of echolocations;
- Whether the slope and bandwidth remained consistent from echolocation to echolocation; and
- Whether there was good signal to noise ratio as evidenced by a crisp, clean oscillogram.

If a series of echolocations only meet some of these requirements, and they were within the characteristic frequency of the Florida bonneted bat, these echolocations were classified as potentially coming from a Florida bonneted bat. All WAV files between 8 kHz and 20 kHz not assigned an auto identification and classified by Kaleidoscope Pro as "No ID" were manually

reviewed to determine if they were misclassified and could contain Florida bonneted bat echolocations.

Results

A total of 205,605 Waveform Audio (WAV) files were recorded during acoustic surveys for the Action Area. Of those, 510 WAV files from 22 acoustic survey stations (Stations 1 – 12, 14 – 21, and 23 – 24) were auto identified by Kaleidoscope Pro as containing Florida bonneted bat echolocations. Biologists manually verified each of the 510 WAV files, and a total of 37 WAV files contained echolocations from the Florida bonneted bat. No Florida bonneted bat echolocations were recorded during acoustic surveys that met the USFWS criteria to confirm the presence of high bonneted bat activity or roosting likely within the Action Area. One WAV file contained Florida bonneted bat echolocations that met the USFWS definition of roosting likely. However, this one WAV file was recorded when the weather conditions did not meet the USFWS criteria (wind speeds greater than 9 miles per hour) for conducting Florida bonneted bat acoustic surveys. Therefore, this WAV file was not considered when the Consultation Key was used to make an effect determination for the species. Detailed results of the acoustic bat surveys are included in the Florida Bonneted Bat Survey Technical Report, provided as **Appendix G-1**.

3.3.3.3 Avoidance and Minimization

The Preferred Alternative will result in unavoidable impacts to bat habitat. Given that the project involves improvements to an existing roadway, opportunities to completely avoid bonneted bat habitat were not available. Impacts have been avoided and minimized to the greatest extent possible. A large north-south canal to the east of SR 29, will not be impacted by the proposed project. This habitat provides optimal foraging habitat for the bonneted bat. Transportation safety and design requirements for the roadway improvements necessitate project impacts.

Best Management Practices (BMPs) will be utilized during the project construction phases to minimize impacts. Erosion control measures will be installed and maintained in accordance with standard FDOT specifications and the erosion control plan found in the Roadway Construction Plans.

3.3.3.4 Conservation Measures

Conservation measures are identified in the USFWS Florida Bonneted Bat Consultation Key. The FDOT will implement the following during the construction phase include:

1. Land clearing activities for the project will be conducted outside of the breeding season (January 1 – April 15) to the greatest extent practicable. Since bonneted bat breeding season is from January 1 through April 15, clearing should be completed between April 16 and December 31. If potential roost trees or structures need to be removed, a biologist familiar with bats and their ecology should check cavities for bats within 30 days prior to removal of trees, snags, or structures. If evidence of use by any bat species is observed, discontinue removal efforts in that area and coordinate with the USFWS on how to proceed.

2. When using heavy equipment, establish a 250-foot (76-meter) buffer around known or suspected roosts to limit disturbance to roosting bats.

7. Avoid or limit widespread application of insecticides (e.g., mosquito control, agricultural pest control) in areas where Florida bonneted bats are known or expected to forage or roost. Within the project footprint, this includes the rights-of-way.

11. Avoid and minimize the use of artificial lighting, retain natural light conditions, and install wildlife friendly lighting (i.e., downward facing and lowest lumens possible) along the Preferred Alternative, wherever possible. Avoid permanent night-time lighting to the greatest extent practicable.

3.3.4 Effects Analysis

3.3.4.1 Direct Effects

Direct effects are those that are caused by the proposed action at the time of construction and are based upon habitat impacts and impacts on the species' ability to breed, feed, or take shelter. Potential direct effects include permanent loss of habitat, fragmentation of habitat, and injury or mortality due to construction. The direct effects the SR 29 project could have on the bonneted bat, within the Action Area, are discussed below.

3.3.4.1.1 Permanent Loss of Habitat

The SR 29 project will result in the loss of 164.40 acres of habitat that may provide foraging and potential roosting opportunities for the bonneted bat, as shown in **Table 3-7**. Of that 164.40 acres, 14.33 acres of wetlands and 15.41 acres of open water land uses, which are categorized as land uses that exhibit the best foraging conditions for the bonneted bat, will be directly impacted.

TABLE 3-7
FLORIDA BONNETED BAT SUITABLE HABITAT
WITHIN THE ACTION AREA

FLUCFCS Classification[(1)]		Description	Preferred Alternative Acres
Uplands			
Urban Lands (100)	111	Residential, Low Density- Fixed Single Family Units	1.64
	121	Residential, Medium Density- Fixed Single Family Units	0.02
	140	Commercial and Services	0.89
	155	Other Light Industrial	3.55
	171	Educational Facilities	0.68
Agriculture (200)	211	Improved Pasture	27.78
	212	Unimproved Pasture	8.08
	213	Woodland Pasture	8.21
	221	Citrus Groves	18.76
Rangeland (300)	310	Herbaceous (Dry Prairie)	0.33
	320	Shrub and Brushland	42.27
	330	Mixed Rangeland	0.57
Upland Forest (400)	411	Pine Flatwoods	20.63
	434	Hardwood – Conifer Mixed	1.05
	437	Australian Pine	0.20
		Total Uplands	***134.66***
Wetlands and Other Surface Waters			
Other Surface Waters (500)	510	Streams and Waterways	14.78
	534	Reservoir less than 10 Acres	0.63
Freshwater Wetlands (600)	617	Mixed Wetland Hardwoods	1.95
	621	Cypress Swamp	0.56
	630	Wetland Forested Mixed	8.12
	641	Freshwater Marshes	3.70
	643	Wet Prairies	14.78
		Total Wetlands/Other Surface Waters	***29.74***
		Total	**164.40**

(1) FDOT, Florida Land Use, Cover, and Forms Classification System (FLUCFCS) (Third edition), 1999.

3.3.4.1.2 Fragmentation of Habitat

Permanent loss of habitat not only reduces the amount of suitable habitat, but it may cause the remaining habitat to become fragmented. As habitat is altered or lost, the remaining habitat is cut into smaller pieces, separated from other areas of suitable habitat by large distances. As fragmentation continues, sustainable forage within these small areas is reduced which may require higher expenditures of energy for feeding activities. Longer foraging dispersals may reduce the overall fitness of individuals. Lower fitness may decrease reproductive success and survivorship of young. Habitat fragmentation could also result in insufficient food resources resulting in territory abandonment.

3.3.4.1.3 Construction

Land clearing activities associated with the roadway widening have the potential to kill or injure bonneted bats. Construction efforts are most likely to occur during the day, while bats are roosting and less alert, making them vulnerable. Noise produced by heavy machinery could disturb bonneted bats where it exceeds ambient noise, forcing them to flee their roost sites.

3.3.4.2 Indirect Effects

Indirect effects are those effects that result from the proposed action and take place further out in time. Indirect effects that may result from the roadway improvements include increased disturbance due to human activities and habitat degradation.

3.3.4.2.1 Increased Disturbance Due to Human Activities

During construction, noise and vibration disturbance from construction equipment could adversely affect bonneted bats by causing the individuals to flee their refuge sites. Harvey et al. (1999) indicated disturbance to summer maternity colonies of bats is extremely detrimental. In general, maternity colonies of bats do not tolerate disturbance, especially when flightless newborns are present. Newborns or immature bats may be dropped or abandoned by adults if disturbed (Harvey et al. 1999). Disturbance to maternity colonies of the Florida bonneted bat may be particularly damaging because of this species' low fecundity and low abundance. The net effect of the physical disturbance, including sustained sources of noise, may be a localized reduction of survival or productivity, avoidance of otherwise suitable habitat, and or reduction of breeding and or foraging frequency. These effects are expected to occur rarely and are not expected to produce substantial changes in species distribution and abundance. However, some small level of temporary adverse effect is expected. Temporary adverse effects on individuals can include increased levels of stress hormones, increased recesses during incubation (i.e., may increase detection by predators and predation risk), or disturbance/flushing of young. If these risks are realized, individual fitness is reduced and may have population level effects if disturbance is over a broad enough spatial or temporal scale. Limited information is available on Florida bonneted bat territory size and foraging ranges, nightly and seasonal movements, dispersal capabilities, and dietary requirements, and locations of key roost sites are not known.

3.3.4.2.2 Habitat Degradation

Land clearing activities and vegetation removal are expected to take place within the Action Area. This disturbance may result in loss or temporary change in habitat conditions for the bonneted bat. Sources of the disturbance include use of heavy equipment, as well as practices that involve manipulation of vegetation. An indirect effect following land clearing activities include a short-term degradation of habitat conditions and the potential to create opportunities for invasive vegetation to colonize disturbed sites. These changes may decrease prey availability.

3.3.4.3 Cumulative Effects

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

In order to identify potential future actions that are reasonably certain to occur, SFWMD Environmental Resource Permit (ERP) records were researched. Activities that would result in site grading or the conversion of natural habitat for site development would require an ERP. ERP records for the past five years (June 1, 2016 to July 19, 2021) were reviewed for the Township and Ranges in which the project is located (Township 46 South/Range 49 East, Township 47 South/Range 29 East, Township 47 South/Range 30 East, Township 48 South/Range 30 East). This is referred to as the cumulative effects evaluation area. This includes the Action Area for the Florida bonneted bat. SFWMD GIS Land Use data was reviewed for the cumulative effects evaluation area and 92,064 acres were determined to be suitable habitat (FLUCFCS 100, 200, 300, 400, 500, 600, 700) for the Florida bonneted bat.

ERP Permits that have been applied for and issued satisfy the criterion of reasonably certain to occur. ERP permits are valid for 5 years. Permits older than 5 years have either been built (considered an existing condition) or have expired and are no longer reasonably certain to occur. Permits that include wetland impacts were eliminated because these projects would also require a Section 404 permit (a Federal action). These projects would require consultation as part of that Federal action and not considered in this analysis.

The search resulted in a total of 33 ERPs that have been issued by SFWMD within the defined area and timeline. Twelve (12) of the ERP permits include wetland impacts and were eliminated due to the requirement of a Section 404 permit (Federal action). Six (6) were eliminated because they had administrative modifications and/or are located within the footprint of another permit being evaluated. The remaining fifteen (15) ERPs were reviewed using SFWMD GIS Land Use data and all 15 were determined to contain suitable habitat (FLUCFCS 100, 200, 300, 400, 500, 600, and 700) for the Florida bonneted bat totaling 795.30 acres. This total acreage has the potential for development and/or habitat loss. Including the 164.40 acres of suitable Florida bonneted bat habitat within the proposed SR 29 project, the potential for development and/or habitat loss totals 959.70 acres within the Township and Ranges in which the SR 29 project is located, represented in **Table 3-8**.

Of the 92,064 acres of suitable Florida bonneted bat habitat within the cumulative effects evaluation area, the 959.70 acres of potential development and/or habitat loss represent 1.0% of the total area. This percentage of habitat loss is minor and will not jeopardize the existence of the Florida bonneted bat.

No interrelated or interdependent effects were identified for the proposed project.

TABLE 3-8
FLORIDA BONNETED BAT CUMULATIVE EFFECTS ANALYSIS

Permit #	Application #	Approval Date	Project Name	Suitable Habitat
11-00034-S-02	161019-1	11/7/2016	Orange Grove	127.57
11-02336-P	170201-6	2/24/2017	Ave Maria University Mother Teresa Building	3.00
11-03058-P	170220-7	3/6/2017	Groverman Farms	317.10
11-00093-S	170424-5	5/10/2017	CCW 82 LLC	135.29
11-00091-S	170424-6	5/10/2017	CCW 82-Bethea Parcel	68.71
11-02336-P	170713-4	8/4/2017	Ave Maria University Football Field	3.95
11-02336-P	170831-6	3/1/2018	Town Of Ave Maria	10.55
11-02336-P	171107-4	3/8/2018	Ave Maria University Batting Cages	0.10
11-00024-S	171117-18	12/15/2017	IFAS Facilities and Planning	78.68
11-02911-P-02	180402-8	4/20/2018	Esperanza Place	8.02
11-00465-S	180509-2	5/23/2018	L.C.E.C. Immokalee Warehouse	5.05
11-00465-S-04	180806-8	8/27/2018	L.C.E.C. Immokalee Warehouse	5.06
11-02336-P	180926-3	10/24/2018	Ave Maria University Softball Field Batting Cages	0.03
11-03748-P	181003-14	3/8/2019	Our Lady Of Guadalupe	8.93
11-00731-S	181018-4	11/9/2018	Immokalee Middle School	23.27
			Total ERP impacts:	**795.30**
Proposed SR 29 Project:				
State Road 29 Widening from Oil Well Rd to State Road 82				164.40
			Total:	**959.70**

3.3.4.4 Compensation

In order to offset potential impacts to Florida bonneted bat foraging habitat as a result of the proposed project, FDOT will purchase required wetland and upland credits at a USFWS approved mitigation and/or conservation bank. The purchase of high-quality habitat will provide foraging habitat for bonneted bats. Mitigation and conservation banks are discussed in **Section 4.0**.

The upland and wetland credits that will be purchased by FDOT to compensate for project impacts will exceed the 164.40 acres of affected suitable bonneted bat habitat. The compensated habitat will be of higher quality, compared to areas impacted by the project footprint, since the lands at mitigation banks are well-maintained.

3.3.5 Conclusion

Direct take in the form of permanent loss of Florida bonneted bat suitable foraging habitat is anticipated. The Preferred Alternative will result in the permanent loss of 164.40 acres of bonneted bat habitat.

The results of the acoustic surveys determined that Florida bonneted bat roosting activity is not present within the Action Area. In addition, no roosts have been identified. The presence of Florida bonneted bat echolocations confirms that the species utilizes habitat within the project area for foraging. However, the results of the survey did not determine that there was high activity. The calls were not recorded when bonneted bats would be emerging from a roost, which may indicate

that the home roost is likely off-site and far enough away that bats using the roost are unlikely to be disturbed by on-site construction. Large areas of bonneted bat suitable foraging habitat will remain in the vicinity of the Action Area. Conservation measures will be implemented by FDOT during project construction to minimize impacts to bonneted bats.

Conservation measures include:

1. Land clearing activities for the project will be conducted outside of the breeding season (January 1 – April 15) to the greatest extent practicable. Since bonneted bat breeding season is from January 1 through April 15, clearing should be completed between April 16 and December 31. If potential roost trees or structures need to be removed, a biologist familiar with bats and their ecology should check cavities for bats within 30 days prior to removal of trees, snags, or structures. If evidence of use by any bat species is observed, discontinue removal efforts in that area and coordinate with the USFWS on how to proceed.

2. When using heavy equipment, establish a 250-foot (76-meter) buffer around known or suspected roosts to limit disturbance to roosting bats.

7. Avoid or limit widespread application of insecticides (e.g., mosquito control, agricultural pest control) in areas where Florida bonneted bats are known or expected to forage or roost. Within the project footprint, this includes the rights-of-way.

11. Avoid and minimize the use of artificial lighting, retain natural light conditions, and install wildlife friendly lighting (i.e., downward facing and lowest lumens possible) along the Preferred Alternative, wherever possible. Avoid permanent night-time lighting to the greatest extent practicable.

In order to offset potential impacts to Florida bonneted bat foraging habitat as a result of the proposed project, FDOT will purchase required wetland and upland credits at a USFWS approved mitigation and/or conservation bank.

Following the acoustic surveys, the *USFWS Florida Bonneted Bat Consultation Key* was used to establish the effect determination for the proposed SR 29 project. The following sections of the key were applicable (1a, 2a, 3b, 6a, 7b, 10b, 12a); resulting in an effect determination of **Likely to Adversely Affect (LAA$^+$ Further)**, see **Appendix G-2** for the effects determination key. This determination requires further consultation with USFWS.. However, based upon the results of the acoustic survey discussed in the first paragraph above along with implementation of the conservation measures by FDOT during project construction to minimize impacts to bonneted bats, the determination could change to **May Affect, but is Not Likely to Adversely Affect** (**MANLAA**) (pending concurrence from USFWS).

3.4 Florida Panther

The Florida panther (*Puma concolor coryi*), is federally listed as endangered by the USFWS, primarily due to habitat fragmentation and loss. The panther is particularly sensitive to habitat fragmentation because of its extensive spatial requirements (Harris 1984). Increasing human population has resulted in increasing impacts on native habitat and flora and fauna. Direct effects of roadway construction to panthers include permanent loss of habitat, while indirect effects include potential road mortality, habitat fragmentation, loss of prey habitat, and intra-specific aggression.

The *Florida Panther Effect Determination Key* was used for this project (**Appendix H-1**). The path followed through the key was A > C = May Affect, consultation with USFWS is requested. This *NRE Addendum* serves as the Section 7 consultation with USFWS to address project involvement with the Florida panther.

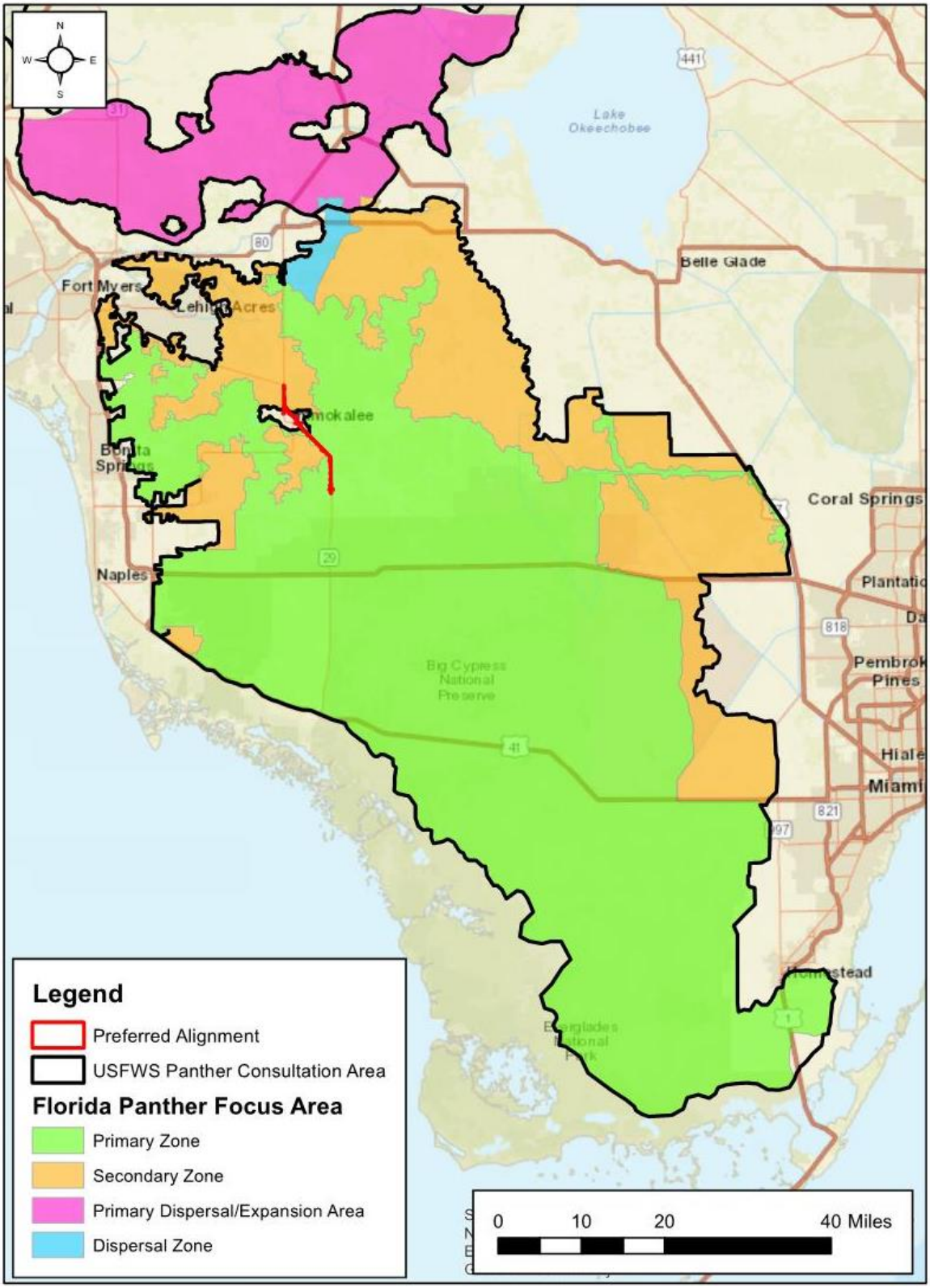
3.4.1 USFWS Panther Consultation Area

The USFWS developed the Panther Focus Area, which represents regions of South Florida containing suitable panther habitat in which development could adversely affect the panther. The Panther Focus Area covers portions of Charlotte, Glades, Hendry, Lee, Collier, Palm Beach, Broward, Miami-Dade, and Monroe Counties, as well as the southern portion of Highlands County. The Panther Focus Area includes the Primary Zone, Secondary Zone, Dispersal Zone, and Primary Dispersal/Expansion Area. The Panther Consultation Area consists of the Panther Focus Area. Urban and coastal areas are excluded from the Panther Focus Area due to limited availability of suitable panther habitat. A USFWS Panther Consultation Area Map is depicted as **Figure 3-10**.

South of the Caloosahatchee River, the Panther Focus Area is divided into Primary, Secondary, and Dispersal Zones. North of the Caloosahatchee River, the Panther Focus Area consists of the Primary Dispersal/Expansion Area only. Each zone is further described below.

- Primary Zone: consists of lands currently occupied by the Florida panther which support the only known wild breeding population of this species.
- Secondary Zone: is comprised of lands that are positioned contiguously with the Primary Zone which are used to a lesser extent by panthers, but still may be occupied.
- Dispersal Zone: a corridor between the Panther Focus Area south of the Caloosahatchee River and the Panther Focus Area north of the Caloosahatchee River that may facilitate future panther expansion north of the Caloosahatchee River (Kautz et al. 2006).
- Primary Dispersal/Expansion Area: lands identified by Thatcher et al. (2006) as potential panther habitat and which have the shortest habitat connection to the Panther Focus Area in south Florida. No reproduction has been known to occur in this region.

FIGURE 3-10
USFWS FLORIDA PANTHER CONSULTATION AREA



3.4.2 Action Area

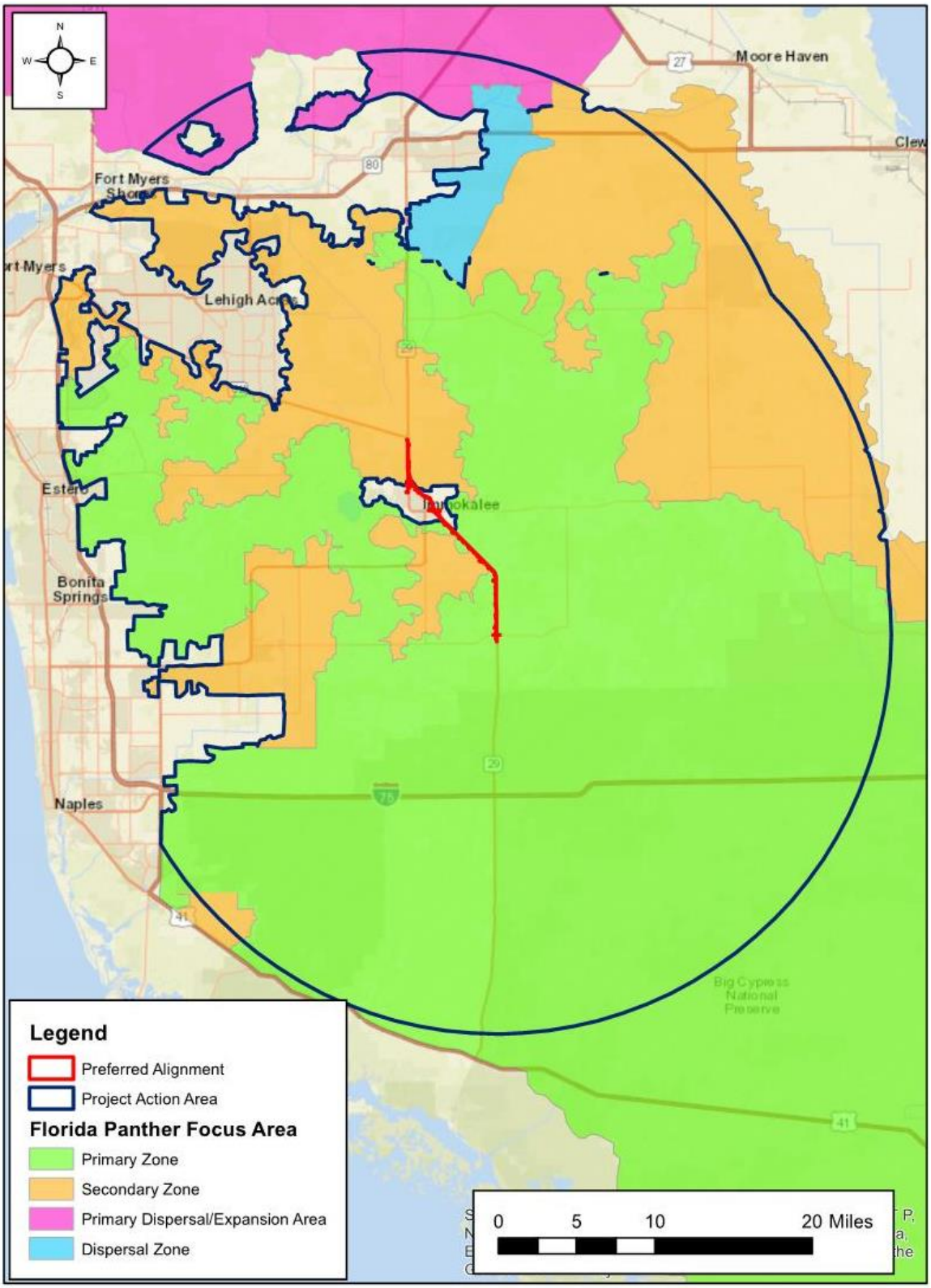
In order to determine how the roadway improvements will directly and indirectly impact the Florida panther, an Action Area was defined as Panther Focus Area within a 25-mile buffer around the Preferred Alternative. The size of the Action Area for this consultation is consistent with action areas defined in recent biological opinions for the panther, and it encompasses the wide-ranging movements of subadult panthers and the large home territories of adult panthers.

Maehr et al. (1990b) monitored five solitary panthers continuously for 130-hour periods seasonally from 1986 to 1989, rarely observing measurable shifts in location during the day, but nocturnal shifts in location exceeding 20.0 kilometers (km) (12.4 miles) were not unusual. Maehr et al. (2002) in a later report documents a "mean maximum dispersal distance" of 68.1 km (42.3 miles) for subadult males and 20.3 km (12.6 miles) for subadult females. In the same report, Maehr et al. (2002) documents a "mean dispersal distance" of 37.3 km (23.1 miles) for subadult males. Comiskey et al. (2002) documents a "mean dispersal distance" for subadult male panthers as an average distance of 40.1 km (24.9 miles) from their natal range, which is similar to the dispersal distance referenced by Maehr et al. (2002).

Therefore, for both direct and indirect effects, the Action Area is defined as Panther Focus Area within a 25-mile radius of the SR 29 PD&E Study, which is slightly greater than the mean dispersal distance for subadult males. This action area does not include urban lands (the highly developed portions of Immokalee, Lehigh Acres, and LaBelle) and lands outside the Service's panther consultation area, west of I-75. This Action Area includes areas anticipated to sustain direct and indirect effects, such as roadways experiencing increased traffic, areas with increased human disturbance (project area and periphery of project), and areas in which habitat fragmentation and intraspecific aggression may be felt.

The Action Area for this Biological Assessment includes lands in Glades, Hendry, Lee, Charlotte, and Collier counties. The direct and indirect effects of the proposed roadway improvements on the Florida panther within the entire Action Area, as well as on a more localized scale (5-mile buffer around the Preferred Alternative) will be discussed in depth in subsequent chapters. The Action Area is represented in **Figure 3-11**.

FIGURE 3-11
FLORIDA PANTHER ACTION AREA



3.4.3 Status of the Species and Critical Habitat Range-Wide

3.4.3.1 Species Status

The Florida panther was once found throughout the southeastern United States (Young and Goldman 1946). Excessive hunting of this species led to its decline throughout Florida. To prevent potential extinction of the species, the Florida panther was designated a game animal in 1950 and panthers could only be hunted during a specific period (Onorato et al. 2010). Continued population decline resulted in the Florida panther being listed as a federally endangered species in 1967 (Federal Register 1967).

The current breeding portion of the Florida panther population is found within the Big Cypress/Everglades physiographic region south of the Caloosahatchee River, principally in Collier, Hendry, and Miami-Dade counties (USFWS 1999).

Sightings of Florida panthers north of the Caloosahatchee River have occasionally occurred. The panthers documented outside of the breeding area are considered to be male panthers dispersing from habitat south of the Caloosahatchee River that is occupied by resident panthers.

No critical habitat has been designated for the Florida panther.

3.4.3.2 Species Description

Florida panthers can measure six feet or more in length (Williams 1978). Adult male panthers range from 24 to 28 inches in height (Roelke 1990) and weigh between 100 and 160 pounds (FWC 2013). Adult female panthers are smaller in size and weigh between 70 and 100 pounds (FWC 2013). Both males and females are light brown in color and have a pale grey coloring on the lower chest, stomach, and inner legs (Busch 1996). Panther kittens have spots which fade as the animal matures (USFWS 2008).

Due to the reduced population size, inbreeding has resulted in some Florida panthers sporting physical characteristics such as a cowlick and or kinked tail (Wilkins et al. 1997). In addition, white flecking may be found on the head, neck, and shoulders possibly due to tick bites (Wilkins et al. 1997).

3.4.3.3 Diet

Florida panthers feed on a variety of prey including the Florida white-tailed deer, wild pig, raccoons (Maehr 1992), nine-banded armadillos, marsh rabbits (Maehr et al. 1990), and alligators (Dalrymple and Bass 1996). Panthers also prey on domestic animals including house cats (Onorato et al. 2010), goats, and pigs (FWC 2010b).

3.4.3.4 Reproduction

Florida panther litters are not seasonal and reproduction can occur at any time of the year (National Park Service 2009). The majority of breeding occurs from December to March (Shindle et al. 2003). Male Florida panthers are polygynous, mating with several females. Female panthers are polyestrous and can return to estrus if they lose a litter or do not become pregnant after mating (Seidensticker et al. 1973). The gestation period is between 90 and 96 days (Maehr 1992).

Florida panther dens are typically found in areas containing extremely dense understory (Benson et al. 2008). Panther dens have been documented in saw palmetto thickets (Maehr et al. 1989, Benson et al. 2008) and areas containing dense shrubs or vines (Benson et al. 2008).

Mean litter size for female panthers can vary based on a variety of factors. Between 2009 and 2010, the FWC handled 26 Florida panther kittens, 17 males and 9 females. The mean litter size for the dens was 2.6 kittens (FWC 2010a). Florida panther kittens can remain with their mother for approximately 12 to 18 months before dispersing (Maehr 1992). Survival for Florida panther kittens has been previously estimated, but the methodology and results of previous studies have been questioned (Beier et al. 2006). It was not until recently that a rigorous study of kitten survival was conducted. Hostetler et al. (2010) utilized multiple sources of data (from 1982 through 2008) and analyzed the data in a live-recapture dead-recovery model. Their study determined an annual kitten survival probability of approximately 0.323. There was no difference in survival rates between male and female panther kittens.

3.4.3.5 Habitat

Florida panthers utilize a wide variety of habitats including pine flatwoods, cabbage palm forests, cypress swamps, live oak forests, sawgrass marshes, and agricultural lands (Maehr 1992). Previous research regarding panther habitat usage has been questioned because the majority of data collected was during the daytime (Beier et al. 2006). A current research priority for the Florida panther is determining resource selection based upon both nocturnal and diurnal locations from panthers equipped with GPS radio-collars (Onorato et al. 2010).

3.4.3.6 Population Trends

Previous estimates of the Florida panther population have been as low as 20 to 30 panthers (Nowak and McBride 1974). Over time, there has been a trend showing an increasing panther population (FWC 2010c). A population estimate has shown the Florida panther population to be between 100 and 160 adults (FWC 2010c). Several methods were used to count Florida panthers including utilizing physical evidence such as tracks (McBride et al. 2008) and utilizing age estimates from live captured panthers and dead panthers (FWC 2010).

Due to the panther's elusive nature, low population size, large home range, and similarity in morphology, it is difficult to utilize capture-mark-recapture methods to estimate the Florida panther population. DNA hair snares have not been effective in capturing hair samples from Florida panthers (FWC 2010). Also, trail cameras have not proven effective in capturing Florida panthers due to the inability to consistently identify physical characteristics that would distinguish individual panthers (Shindle et al. 2007). Telemetry and mortality data are used to document known panther occurrences and provide estimates of home range boundaries, known or modeled panther travel corridors, and ranges of panthers in southwest Florida. Habitat utilization by non-radio marked panthers is unknown. Panther telemetry data and trends within the Action Area and within a 5-mile buffer of the Preferred Alternative will be discussed in depth in **Section 3.4.4.2.1**.

3.4.3.7 Recovery

Major threats to the Florida panther are habitat loss, degradation, and fragmentation. Recovery objectives for the Florida panther include maintaining the Florida panther and its habitat in south

Florida, expanding the current panther population into south-central Florida, and reintroducing at least two viable panther populations into habitats in central Florida that were previously part of the panther's historic range (USFWS 2008).

The Florida panther will be considered for reclassification by the USFWS when two criteria are met: 1) two viable populations of at least 240 adults and subadults for each population are established and 2) these populations are maintained for a minimum of twelve years. Also, sufficient habitat to support these populations will need to be protected (USFWS 2008).

3.4.3.8 Land Conservation Trends

Within the 25-mile Action Area for the SR 29 project, conservation lands total 642,740.27 acres, of which 559,409.79 acres are located within the Primary Zone, 64,882.22 acres within the Secondary Zone, 8,576.52 acres within the Dispersal Zone, and 9,871.74 acres within the Primary Dispersal/Expansion Area. These acreages are summarized in **Table 3-9**.

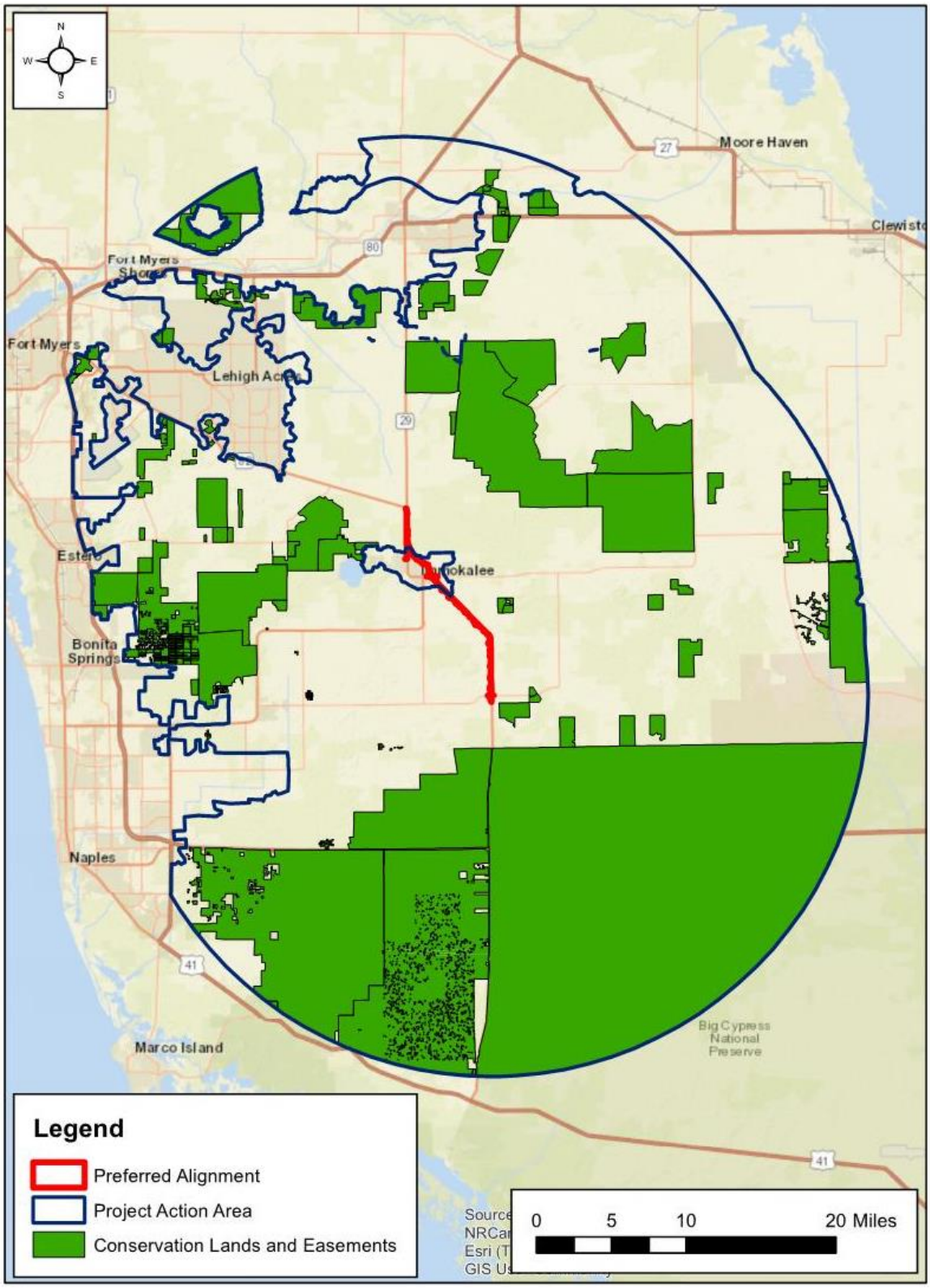
TABLE 3-9
CONSERVATION LANDS WITHIN THE ACTION AREA

Panther Zone	Acres of Land	Acres of Conservation Lands	Percentage (%) of Land Under Conservation
Primary	963,658	559,410	58.1%
Secondary	434,015	64,882	14.9%
Dispersal	27,882	8,577	30.8%
Primary Dispersal/Expansion Area	37,286	9,872	26.5%
Totals	**1,462,841**	**642,741**	**43.9%**

Source: Florida Panther Focus Area, 2007. U.S. Fish and Wildlife Service. Florida Geographic Data Library (FGDL), https://www.fgdl.org/metadataexplorer/explorer.jsp

The 1,509,154-acre Everglades National Park (ENP) was established in 1947, more than two decades before the Florida panther was listed as endangered. The 720,566-acre Big Cypress National Preserve (BCNP) was established in 1974, just one year after passage of the Endangered Species Act (ESA). A total of 271,868.66 acres of the BCNP are located within the project Action Area (AA). Additional state and federal acquisitions since the establishment of ENP and BCNP include: Fakahatchee Strand Preserve State Park (65,448.48 acres in the AA), Florida Panther National Wildlife Refuge (NWR) (26,355.37 acres in the AA), Picayune Strand State Forest (71,343.09 acres in the AA), Collier-Seminole State Park (127.79 acres within the AA), Okaloacoochee Slough State Forest (32,350.89 acres within the AA), and Corkscrew Regional Ecosystem Watershed (CREW) (28,674.32 acres in the AA). **Figure 3-12** shows the conservation lands located within the project Action Area. (Florida Managed Areas, 2020, FGDL)

FIGURE 3-12
CONSERVATION LANDS WITHIN THE ACTION AREA



3.4.3.9 Panther Habitat Assessment

In 2003, the USFWS developed a Panther Habitat Assessment methodology and refugia design to help guide the agency in evaluating permit applications for projects that could affect panther habitat. This methodology provides a way to assess the level of impacts to panthers expected from a given project, and to evaluate the effect of any proposed compensation offered by the project applicant. Prior to the development of this methodology, the USFWS (from March 1984 through August 2003) concluded consultation on 43 projects involving the panther and habitat preservation. The older data records originate from repeated USFWS Biological Opinions for the Florida panther; the most recent data records through May 2020 are sourced from the USFWS South Florida Ecological Services Field Office Biological Opinion website.

The USFWS South Florida Ecological Services Field Office Biological Opinion website has documents dating from June 2000 to May 2020. In summary, 47 development projects in Collier County, impacting a total of 22,124 acres of suitable panther habitat, were reviewed by the USFWS. As a result, compensation in the form of 76,484 acres of preservation lands and 46, 292 PHUs were purchased to compensate the impacts. The project-affected lands were primarily agricultural fields consisting of row crops, citrus groves, and natural lands with varying degrees of exotic vegetation. The preservation lands were generally native habitat lands or disturbed lands that included restoration components. Restoration components included exotic species removal, fire management, wetland hydrology improvement, improved forest management practices, and full habitat restoration from agriculture uses to native habitats.

3.4.3.9.1 Habitat Assessment, Base Ratio, and Primary Equivalent Factors

Kautz et al. (2006), through their habitat evaluation of lands important to the Florida panther, identified three sets of lands (Primary Zone, Secondary Zone, and Dispersal Zone), and documented the relative importance of these lands to the Florida panther. These lands are referred to as panther core lands and include the majority of the home ranges of the current Florida panther population. In its effort to evaluate habitat needs for the Florida panther, the USFWS expanded the panther boundaries to include those lands south of the Caloosahatchee River where additional telemetry points were historically recorded. These additional lands are referred to as the Other Zone. These lands (core lands and Other Zone lands) together are referred to by the USFWS as the Panther Core Area. The Other Zone lands, and lands within the Secondary Zone, provide less landscape benefit to the Florida panther than the Primary and Dispersal Zones, but are important as a component of the USFWS' goal to preserve sufficient lands to support a population.

Land uses within the Preferred Alternative were evaluated individually and scored based on their utilization value to the Florida panther and its prey. Utilization of habitat by white-tailed deer, feral hogs, and other panther prey species is influenced by the quality of the habitat and level of human activity within and adjacent to the habitat. Habitats with poor quality vegetation for foraging and the presence of nuisance exotics can reduce the overall value.

An assessment to determine appropriate mitigation for unavoidable impacts to panther habitat was conducted. The purpose of this assessment is to ensure that adequate compensation will occur to prevent any significant reductions in the likelihood of survival and recovery of the species due to

habitat loss. The effects from the proposed roadway to the Florida panther were evaluated through a habitat assessment methodology that incorporates many of the habitat importance values referenced in Kautz et al. (2006) and FWC (in review). The USFWS analysis evaluates habitats and assigns them a score from 0 to 10, with low scores reflecting low habitat value to the Florida panther. The habitat suitability scores, as developed by the USFWS, incorporate a direct calculation per acre, with a base ratio multiplier of 1.98 to compensate for other unavoidable project effects to the Florida panther.

The USFWS developed a base ratio that aims to provide protection to the sufficient acreage of Primary Zone equivalent land for a population of 90 panthers. The available Primary Zone equivalent land was estimated at 3,276,563 acres. At the time, the USFWS estimated that 2,073,865 acres of Primary Zone equivalent land of non-urban lands were preserved. The remaining non-urban at-risk private lands were estimated at 1,202,698 acres of Primary Zone equivalent land. To meet the protected and managed lands goal for a population of 90 panthers, an additional 799,205 acres of Primary Zone equivalent land was estimated to be needed. The base ratio was calculated by multiplying the at-risk acres in each panther zone by their equivalent value. Based on recent correspondence between FDOT and USFWS, a base ratio of 1.98 is to be used.

To account for the lower landscape importance of panther zones excluding the Primary Zone, the USFWS assigned land in the Other Zone a value of 0.33 and land in the Secondary Zone a value of 0.69 to convert these lands to Primary Zone value, i.e., Primary Zone Equivalents. Dispersal Zone land is considered equivalent to Primary Zone land and has a 1.00 value. These equivalent values, 0.33 and 0.69, for Other and Secondary Zones, respectively, and 1.00 for Dispersal Zone, are important components in the USFWS's assessment of compensation needs for a project in the panther consultation area and habitat assessment methodology.

3.4.4 Effects of the Proposed Action

3.4.4.1 Factors to be Considered

Transportation projects may have a number of direct and indirect adverse effects on the Florida panther and its habitat. Direct effects, which are primarily habitat based, may include: the permanent loss and fragmentation of panther habitat; the permanent loss and fragmentation of habitat that supports panther prey; the loss of available habitat for foraging, breeding, and dispersing panthers; and a reduction in the geographic distribution of the species. Indirect effects to the Florida panther may include: an increased risk of roadway mortality to panthers traversing the area due to increased vehicular traffic; increased disturbance to panthers in the project vicinity due to increased human activities; a reduction in panther prey; a reduction in value of panther habitat adjacent to the project due to habitat fragmentation; and a potential increase in intraspecific aggression between panthers due to reduction of the geographic distribution of habitat for the panther.

3.4.4.2 Analysis for Effects of the Proposed Action

As previously stated, for the purposes of this consultation, the Action Area includes lands within the Panther Focus Area within a 25-mile radius of the project area. The Action Area is a subset of the current geographic range of the panther and includes those lands that the USFWS believes may

experience direct and indirect effects from the proposed development. Therefore, for both direct and indirect effects, the Action Area is defined as all Panther Focus Area lands within a 25-mile radius of the Preferred Alternative.

3.4.4.2.1 Telemetry and Mortality Data Assessment

To evaluate Florida panther utilization of habitats within the Action Area, panther telemetry and mortality GIS data was analyzed. It should be noted that telemetry and mortality data only document known panther occurrences; habitat utilization by non-radio marked panthers is unknown. The GIS telemetry and mortality data examined can provide a rough estimates of home range boundaries, known or modeled panther travel corridors, and range of panthers in southwest Florida. Impacts and trends of roadways on the Florida panther can be closely analyzed by using telemetry and mortality data.

Telemetry data, obtained from the FWC and BCNP, includes recorded GPS data points of collared Florida panthers from 1981 to 2020. Telemetry data within the Action Area is presented in **Appendix H-2**. The telemetry data is organized by panther identification number and includes the number of telemetry points for the specific panther and the first and last dates of recorded telemetry data. It is not clear of the significance of the last telemetry date recorded, a radio collar may have been lost or this date may mark the end of the panther's life.

Mortality data, obtained from the FWC, includes panther mortalities from 1979 to 2020. Mortality data within the Action Area is presented in **Appendix H-3**. Information included in the panther mortality table are panther identification number, sex, approximate age, and date and location of the fatality. The mortality table also includes approximate distances of panther deaths in relation to the Preferred Alternative.

Telemetry data identifies 78,185 documented occurrences a total of 265 different collared Florida panthers within the Action Area since 1981. A total of 386 panther fatalities have been reported within the Action Area since 1979. Of those fatalities, 232 resulted from vehicular collisions, 18 were determined to be caused by disease, and 78 were determined to be from intraspecific aggression. A total of 58 panthers died from unknown causes. Maps depicting telemetry and mortality data within the Action Area are included as **Figure 3-13** and **Figure 3-14**, respectively.

FIGURE 3-13
FLORIDA PANTHER TELEMETRY DATA WITHIN THE ACTION AREA

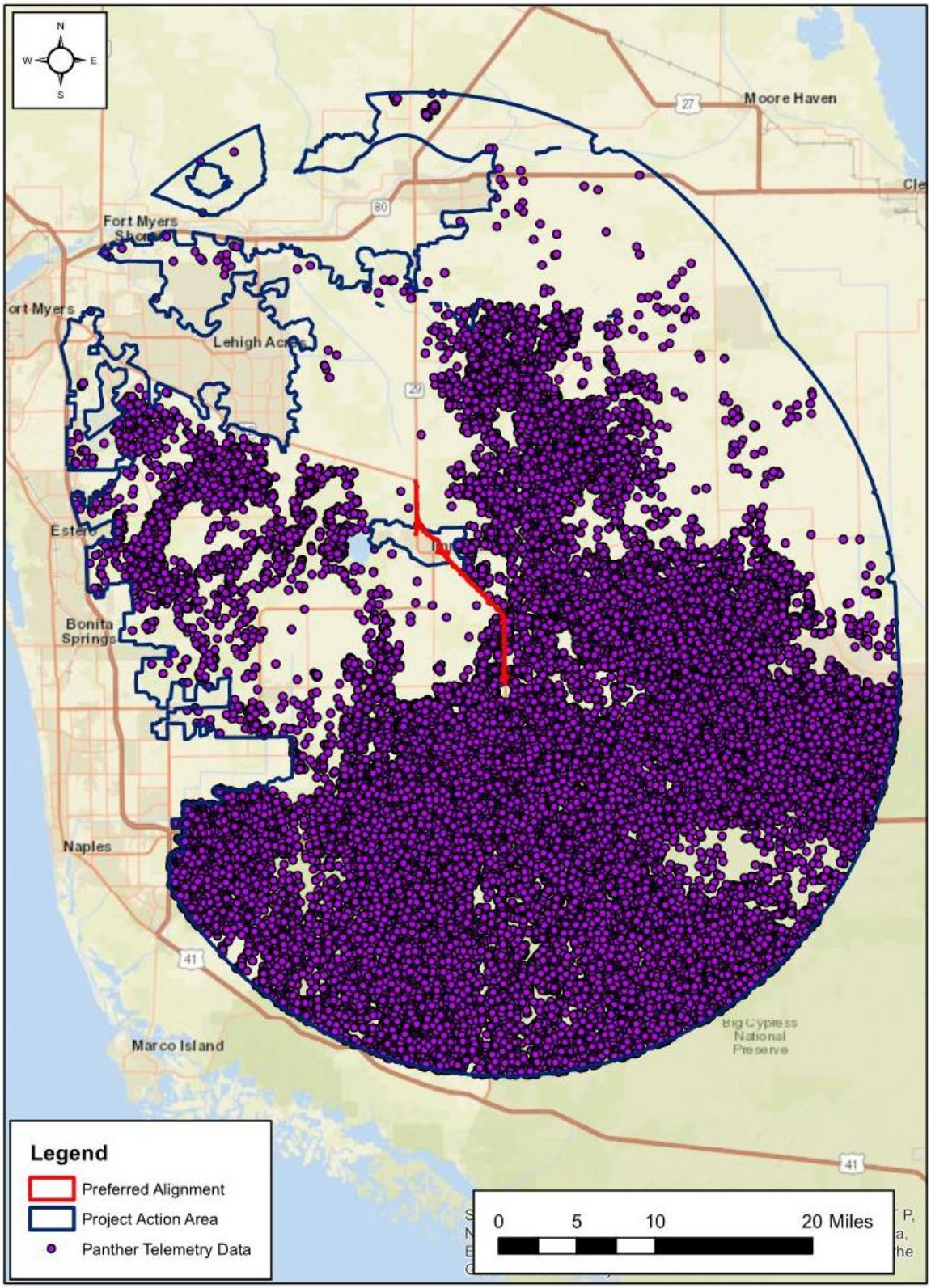
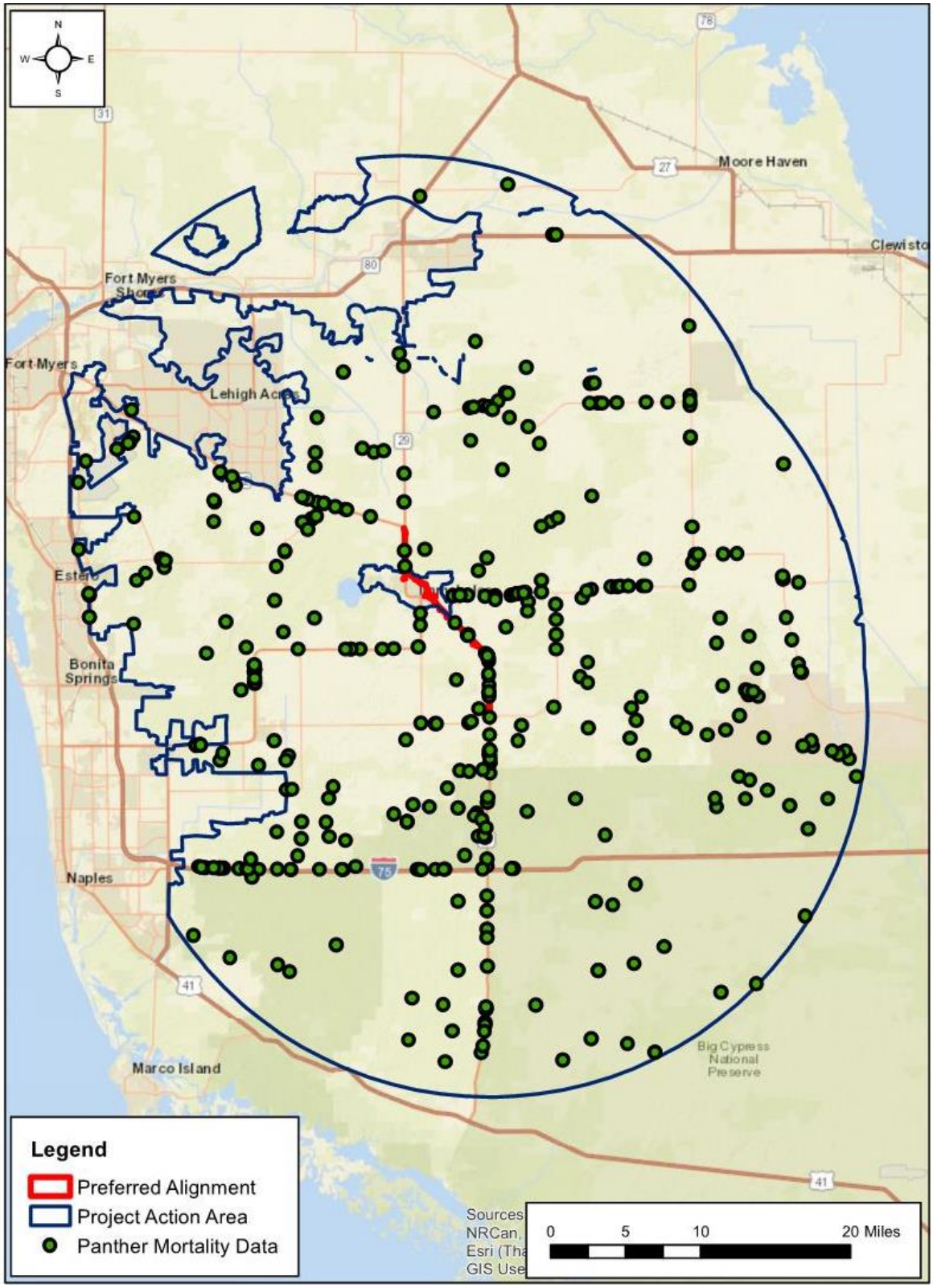


FIGURE 3-14
FLORIDA PANTHER MORTALITY DATA WITHIN THE ACTION AREA

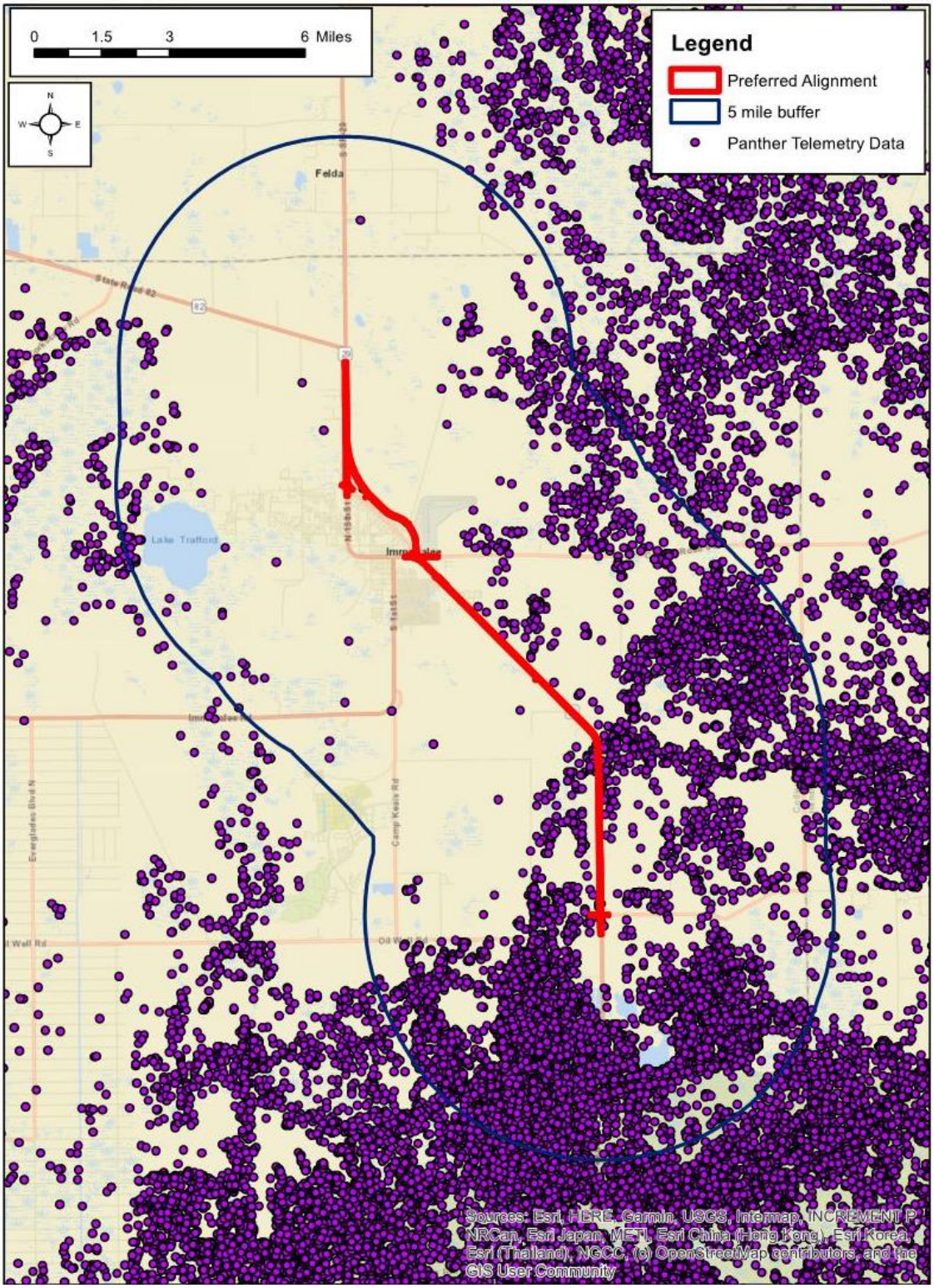


An additional analysis of telemetry and mortality data within five miles of the Preferred Alternative was also conducted. A five-mile buffer was used to focus on panthers that have home ranges or have at some point traveled in close proximity to the study area and the SR 29 roadway. By looking on a more localized scale from the study area, effects of the proposed roadway improvements on these populations can be determined.

Telemetry data trends in the northern limits of the project (north of downtown Immokalee) show few panther occurrences. Panther occurrences in this area are predominantly present in the Primary Zones, at a distance greater than one mile, with some within five miles, to the east and west of SR 29. There are few instances where panthers have traveled into the Secondary Zone within this area. No telemetry data points are present in the Other Zone, which comprises the developed areas within and adjacent to downtown Immokalee. Telemetry data points from south of downtown Immokalee to the curve just south of Owl Hammock are present in the Primary Zone, east of SR 29. Panthers Primary Zone to the east of SR 29 do not appear to cross the roadway to Secondary Zone areas to the west. SR 29 acts as a barrier to panther movement along this approximate four mile stretch of roadway. From the location of the Owl Hammock curve to the southernmost limits of the project, the roadway travels directly to the south for a distance of approximately four miles. The greatest density of telemetry data is observed at this location. Florida panthers appear to be utilizing the surrounding lands as home territories and travel corridors. The telemetry data also suggests that panthers are frequently crossing SR 29 at the Owl Hammock curve. Just north of Oil Well Road (the southernmost limits of the Preferred Alternative) is an additional location where panthers appear to be crossing SR 29, to access lands to the east and west.

As previously stated, a total of 78,185 documented occurrences for 265 panthers were recorded within the 25-mile Action Area. Within five miles of the Preferred Alternative, a total of 9,603 occurrences for 89 panthers were documented. These panthers most likely have home territories within the proximity of SR 29 and will be most affected by the direct and indirect effects associated with the proposed roadway improvements. Telemetry data within five miles of the Preferred Alternative is included in tabular form in **Appendix H-4**. Panther telemetry data within five miles of the study area is included as **Figure 3-15**.

FIGURE 3-15
FLORIDA PANTHER TELEMETRY DATA WITHIN FIVE MILES
OF THE PREFERRED ALTERNATIVE



As the telemetry data would suggest, the southernmost four mile stretch of SR 29, especially at the high frequency travel corridor at the Owl Hammock curve, has the greatest number of panther mortalities due to vehicle collision within the Preferred Alternative. Panthers appear to be crossing SR 29, most likely during dark hours, at a location with a dangerous curve and possible blind spot conditions for drivers. Mortality and/or injury that leads to death is the common result of panther-vehicle collisions.

Mortality data within five miles of the SR 29 study area, depicts 83 panther fatalities reported since 1979. Of those fatalities, 69 resulted from vehicular collisions, two were caused by disease, and ten were determined to be caused by intraspecific aggression. In addition, two panther deaths resulted from unknown causes. Within one mile of the Preferred Alternative, 24 of the 83 panther deaths were caused by vehicular collision, most occurring along the SR 29 corridor, specifically just south of the Owl Hammock curve. Mortality data within five miles of the Preferred Alternative is included as **Appendix H-5**. **Figure 3-16** represents mortality data within five miles of the Action Area.

Beyond the southern limits of the project, two conservation areas exist: the Florida Panther National Wildlife Refuge and Big Cypress National Preserve. These areas provide vast amounts of habitat for the panthers. These areas experience the highest frequency of panther telemetry data, outside of the project study area. As male panthers reach maturity, they most likely migrate through the conservation lands to lands to the north, in order to find a new home territory. Closer research of telemetry data suggests these trends. As these panthers travel outside of the conservation lands, they may be exposed to dangers associated with roadways and human activity.

3.4.4.2.2 Least-Cost Pathways Discussion

Least-cost pathways (LCPs), created by Swanson et al. (2008), are known or modeled travel corridors most likely used by panthers to move between six major panther use areas in Florida. The major use areas are: Corkscrew Regional Ecosystem Watershed (CREW), Florida Panther National Wildlife Refuge (NWR), Okaloacoochee Slough State Forest, Big Cypress National Preserve (BCNP) north of I-75, BCNP south of I-75, and Everglades National Park (ENP) (Swanson et al. 2008).

The SR 29 project study area intersects one LCP, referred to as the OKSLOUGH to FPNWR pathway. The OKSLOUGH to FPNWR pathway travels from Okaloacoochee Slough State Forest to the Florida Panther NWR), which crosses SR 29 at the Owl Hammock curve. The OKSLOUGH to FPNWR pathway is depicted in **Figure 3-17**.

3.4.4.2.3 Habitat Methodology Assessment Application

The SR 29 PD&E study is located south of the Caloosahatchee River in northern Collier County. The Preferred Alternative intersects USFWS Florida panther Primary, Secondary, and Other Zones. Existing land use within the Preferred Alternative currently consists of roads and highways, shrub and brushland, pine flatwoods, hardwood conifer mixed, improved, unimproved, and woodland pastures, wetland forested mixed, mixed wetland hardwoods, streams and waterways, freshwater marshes, and citrus groves.

FIGURE 3-16
FLORIDA PANTHER MORTALITY DATA WITHIN FIVE MILES OF THE PREFERRED ALTERNATIVE

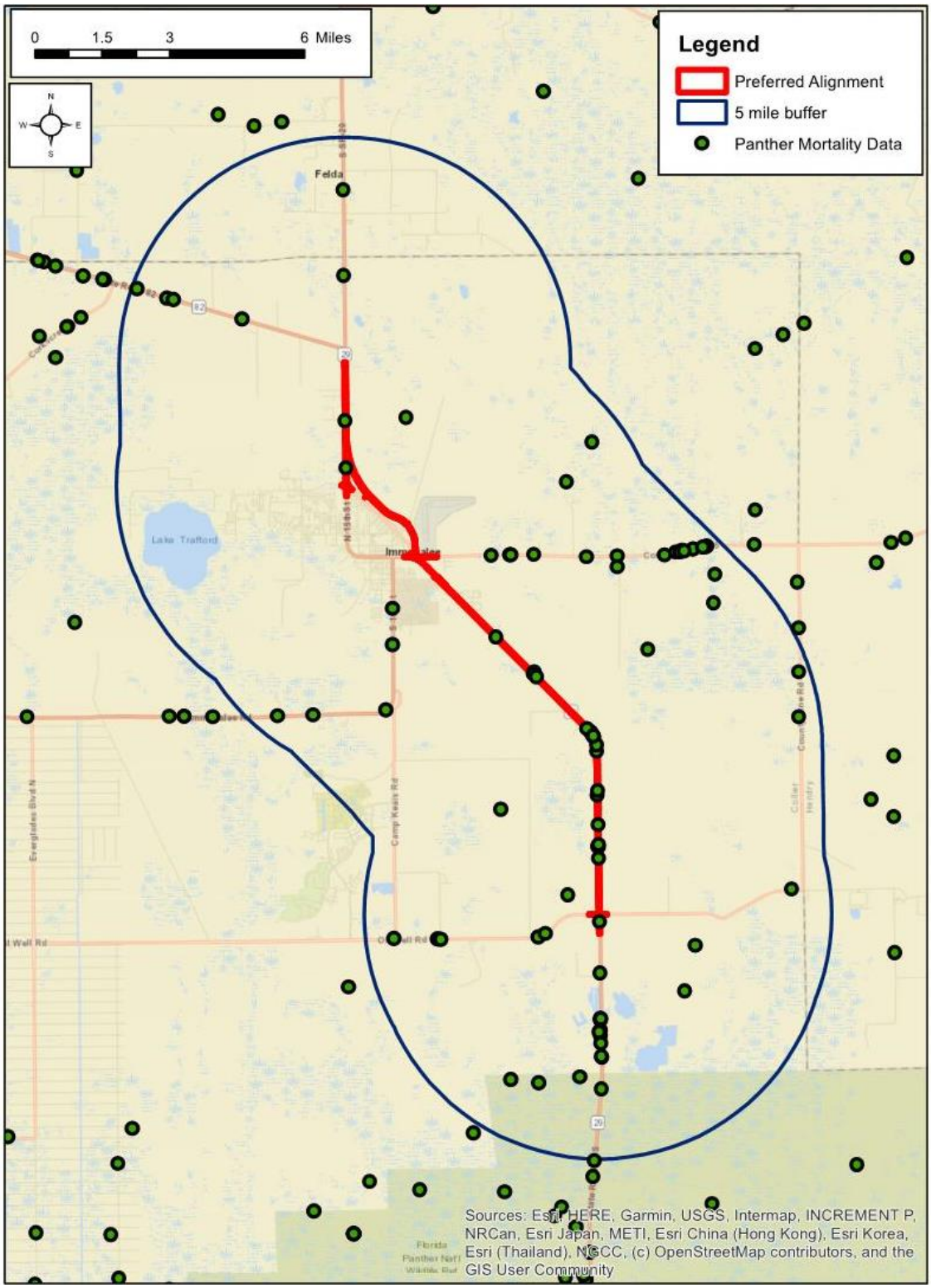
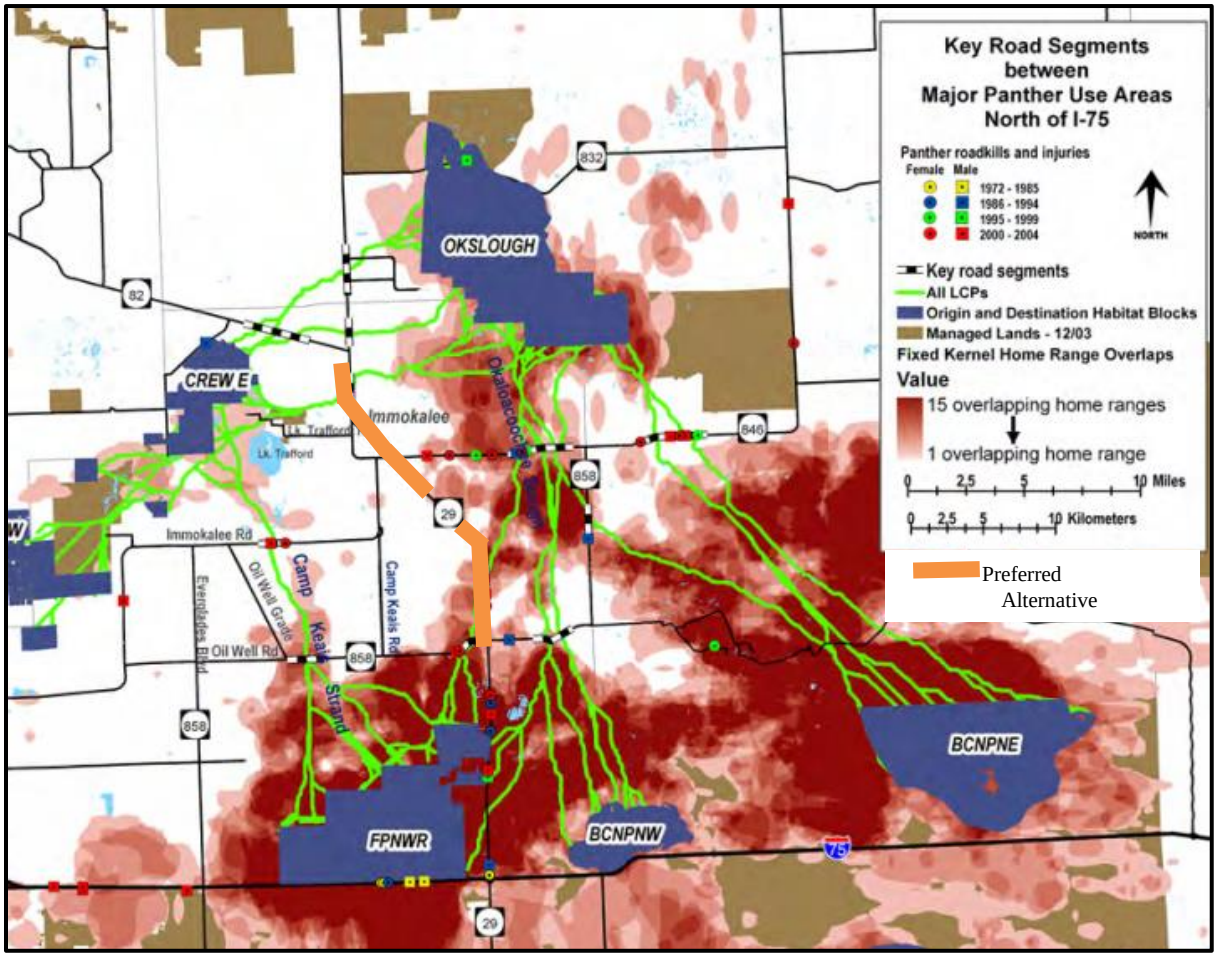


FIGURE 3-17
FLORIDA PANTHER LEAST-COST PATHWAYS LOCATED NEAR THE PREFERRED ALTERNATIVE



Source: Swanson, K., D. Land, R. Kautz, and R. Kawula. 2008. Use of least-cost pathways to identify key road segments for Florida panther conservation. Fish and Wildlife Research Institute Technical Report TR-13. ii + 44 p.

The USFWS Panther Compensation Calculator was used to determine the compensation required for impacts occurring in the Primary and Secondary Zones. The application of the habitat assessment methodology, including the landscape multiplier, base ratio, Panther Habitat Unit (PHU) determinations, and compensation requirements are presented below for the Preferred Alternative.

The project footprint consists of 382.26 acres of proposed roadway improvement. Of this acreage, 269.88 acres are located within Florida panther habitat zones (192.25 acres in the Primary Zone and 77.63 acres in the Secondary Zone). In accordance with the Panther Habitat Assessment Methodology, most developed rural and highly urbanized areas and open water bodies in an urban setting are not suitable panther habitat and are assigned a habitat value of zero (USFWS 2012). In total, there are 86.29 acres of suitable panther habitat within the Preferred Alternative (62.03 acres in the panther Primary Zone and 24.26 acres in the panther Secondary Zone).

As summarized in **Table 3-10**, the 62.03 acres of suitable panther habitat within the Primary Zone provides a value of 851.45 PHUs and the 24.26 acres of suitable panther habitat located within the Secondary Zone provides a value of 175.41 PHUs, for a total of 1,026.85 units. Compensation will be provided by the purchase of 1,027 PHUs from a USFWS approved wetland mitigation bank and/or panther habitat mitigation bank. A detailed PHU Assessment Summary for the SR 29 PD&E project is provided in **Appendix H-6**.

The Florida Panther Conservation Bank, Florida Panther Conservation Bank II, Panther Passage Conservation Bank, and Panther Island Mitigation Bank (Expansion) service the project area and have PHU credit availability. Additionally, Big Cypress Mitigation Bank (Phases I-V) offers palustrine wetland credits with a PHU component attached. The Florida Panther Conservation Bank, Panther Island Mitigation Bank (Expansion), and Big Cypress Mitigation Bank (Phases I-V) are located within the Primary Panther Zone (additional PHU credits would be required if mitigating in Secondary or Dispersal Zones).

Critical habitat has not been designated for the Florida panther; therefore, none will be affected.

3.4.4.3 Avoidance and Minimization

The Preferred Alternative will result in unavoidable impacts to panther habitat. Given that the project involves improvements to an existing roadway, opportunities to completely avoid panther habitat were not available. Impacts have been avoided and minimized to the greatest extent possible. Transportation safety and design standards for the roadway improvements necessitate the impacts. Furthermore, the impacts are unavoidable due to the presence of natural habitat within the existing rights-of-way.

Best Management Practices (BMP's) will be utilized during the design and construction phases to minimize impacts. Erosion control measures will be installed and maintained in accordance with standard FDOT specifications and the erosion control plan found in the Roadway Construction Plans.

TABLE 3-10
PHU SUMMARY TABLE

Panther Zone	Impact Type	Land Cover (FLUCFCS)	Acres	PHUs Required
Primary	Corridor	200 - Agriculture	3.59	38.24
Primary	Corridor	300 - Rangeland	33.61	366.57
Primary	Corridor	400 - Upland Forests	12.79	238.01
Primary	Corridor	600 - Wetlands	12.04	208.63
Total Suitable Panther Habitat Primary Zone			**62.03**	**851.45**
Secondary	Corridor	200 - Agriculture	19.76	139.60
Secondary	Corridor	300 - Rangeland	1.86	13.98
Secondary	Corridor	400 - Upland Forests	0.85	10.87
Secondary	Corridor	600 - Wetlands	1.56	10.02
Secondary	Corridor	832 -Electrical power transmission lines	0.23	0.94
Total Suitable Panther Habitat Secondary Zone			**24.26**	**175.41**
Total Suitable Panther Habitat within the Preferred Alternative			**86.29**	
Total Mitigation (PHUs)				**1,026.85**

3.4.4.4 Conservation Measures

The Florida Panther Recovery Plan (USFWS 2008) outlines a number of actions required to maintain, restore, and increase the Florida panther population and habitat in south Florida. Recovery Action 1.1.1.2.3 states that panther habitat loss, degradation, or fragmentation should be avoided for federally funded or authorized projects or actions. If impacts to panther habitat cannot be avoided then equivalent habitat protection and restoration should compensate for both the quantity of habitat lost and the functional value of habitat lost.

Based on coordination and comments received from USFWS and FWC, the FDOT proposes the installation of a wildlife crossing with associated directional fencing, south of the Owl Hammock curve along SR 29. As discussed in **Section 3.4.4.2.2**, this area aligns with a panther least-cost pathway (LCP), referred to as the OKSLOUGH to FPNWR pathway, which travels from the Florida Panther NWR to the Okaloacoochee Slough State Forest. The LCP and telemetry and mortality data support the design of this wildlife crossing at the Owl Hammock curve along SR 29. With the addition of a wildlife crossing and directional fencing, panthers will be directed into a single-entry, funneled path, to cross under SR 29. A wildlife crossing will provide panthers and their prey a safe access route to lands to the east and west of SR 29. The perimeter fencing will deter panther exposure to the roadway, which will ultimately result in fewer instances of panther-vehicle conflicts, thus decreasing the amount of panther mortalities due to vehicle collisions. Jump out locations may be added to allow wildlife that unintentionally enter the roadway to escape. A detailed design of the wildlife crossing and associated features will be developed during the design and permitting phase of the proposed project.

The *FDOT Wildlife Crossing Guidelines* (2018) was used to determine the appropriateness of the wildlife crossing at the Owl Hammock curve along SR 29. The SR 29 project meets all the

approved criteria for the installation of a wildlife crossing with the exception of the lands adjacent to the proposed crossing are privately owned. Most of the SR 29 corridor is surrounded by privately owned lands. Potential issues with adjacent private land ownership may include legal access restrictions to property owners and the potential for these lands to be developed in the future. FDOT does not have reasonable assurance that these lands will not be developed in the foreseeable future. As previously discussed, the location of the wildlife crossing is associated with a panther mortality hot spot and FDOT is committed to the installation of this feature, in order to offset impacts to panther habitat.

3.4.5 Effect Analysis

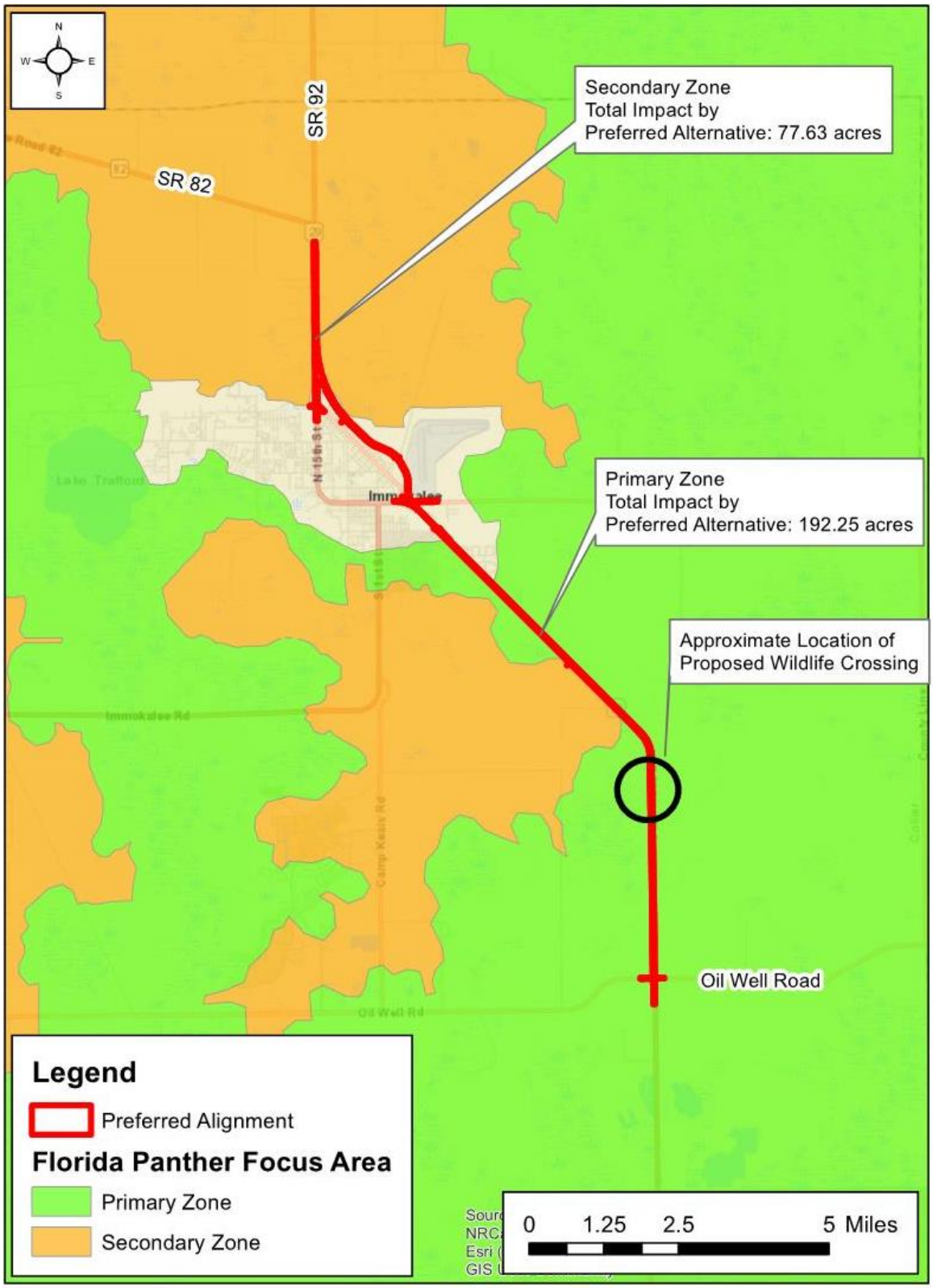
3.4.5.1 Direct Effects

Direct effects are those that are caused by the proposed action at the time of construction and are primarily based upon habitat impacts. Potential direct effects include: the permanent loss of panther (and panther prey) habitat; a reduction in the geographic distribution of habitat for the Florida panther, and a reduction in panther prey. Panthers may also be impacted by construction activities. The direct effects of the Preferred Alternative on the Florida panther, within the Action Area, are discussed below.

3.4.5.1.1 Permanent Loss of Habitat

Within the Action Area, the Preferred Alternative footprint will directly impact 382.26 acres, of which 192.25 acres are located within the panther Primary Zone and 77.63 acres are located within the panther Secondary Zone, as depicted in **Figure 3-18**.

FIGURE 3-18
FLORIDA PANTHER ZONE IMPACTS BY THE PREFERRED ALTERNATIVE



Using the Panther Habitat Methodology Assessment Application, as described in **Section 3.4.4.2.3**, as guidance, it was determined that of the 269.88 total impact acres, 86.29 acres have been classified as suitable habitat available to panthers and their prey (this acreage excludes water and urban land, as per the methodology). A total loss of 62.03 acres of suitable panther habitat within the panther's Primary Zone will result in the loss 851.45 PHU equivalents and the total loss of 24.26 acres of suitable habitat located within the Secondary Zone will result in the loss of 175.41 PHU equivalents; these impacts are summarized in **Table 3-11**.

TABLE 3-11
PANTHER ZONE IMPACT TABLE

Zone	Acres of Land	Acres of Suitable Habitat	PHUs
Primary	192.25	62.03	851.45
Secondary	77.63	24.26	175.41
Other	113.38	--	--
Totals	**382.26**	**86.29**	**1,026.85**

Areas within the Preferred Alternative will be converted to additional travel lanes. The quality of the habitat to be impacted is generally poor, as it is adjacent to the existing roadway corridor and is either actively utilized for agricultural purposes or contains low-density residential areas. It is anticipated that the loss of habitat associated with these lands is negligible to the long-term management of the Florida panther.

3.4.5.1.2 Reduction in the Geographic Distribution of Habitat for the Species

The 25-mile Action Area encompasses approximately: 1,466,616 acres of habitat within the USFWS Panther Focus Area; 963,682 acres within the Primary Zone (42.0 percent of the overall Primary Zone); 433,993 acres within the Secondary Zone (53.4 percent of the overall Secondary Zone); 27,882 acres within the Dispersal Zone (100 percent of the overall Dispersal Zone); and 41,059 acres within the Primary Dispersal/Expansion Area (8.5 percent of the overall Primary Dispersal/Expansion Area). The loss of panther habitat due to the Preferred Alternative represents a 0.01 percent reduction in the spatial extent of habitats available to the Florida panther within the Action Area.

3.4.5.1.3 Reduction in Panther Prey

Florida panthers feed on a variety of prey including white-tailed deer, feral hogs, raccoons, armadillos, and rabbits. The majority of panther prey, when comparing the percentage of prey biomass in the diet, is composed of white-tailed deer and feral hogs. Increased development in an area has the potential to adversely affect panther prey due to loss or fragmentation of habitat, increased vehicular traffic, and roadway mortality.

The proposed widening of SR 29 is expected to impact panther prey. There may be a potential increase in panther prey mortality due to vehicle conflict from increased traffic and increased roadway width. The potential increase in traffic is expected to occur along SR 29 with or without

the proposed project. However, greater prey mortality may be expected due to the additional lanes requiring crossing.

Due to projected population and employment growth both along the corridor and in Collier County, traffic volumes on SR 29 from Oil Well Road to SR 82 are expected to increase. According to data extracted from the SR 29 Design Traffic Technical Memorandum prepared for this project, the population along the corridor was estimated to be 350,202 in 2016 and is expected to increase to 442,000 in year 2030 and to 516,000 in year 2045.

3.4.5.1.4 Construction

The timing of construction for the SR 29 project, relative to sensitive periods of the panther's lifecycle, is unknown. However, land clearing associated with the construction activities will be undertaken in phases over several years or more. The quality and quantity of the habitat foraging base for prey species is relatively low immediately adjacent to the roadway. Therefore, it is anticipated that panther use of the property is limited and the construction will not result in direct panther mortality.

3.4.5.2 Indirect Effects

Indirect effects are those effects that result from the proposed action and take place further out in time. There are four potential indirect effects that may result from the proposed action. These include: an increased risk of roadway mortality to panthers due to increased vehicular traffic in the project area; increased disturbance to panthers in the project vicinity due to human activities; reduction in panther prey; reduction in the value of panther habitat in areas adjacent to the project; and a potential increase in intraspecific aggression between panthers due to a reduction in the geographic distribution of habitat for the Florida panther.

3.4.5.2.1 Increased Risk of Roadway Mortality

Evaluating a potential increase in Florida panther roadway mortality requires considering the location of the project in relation to surrounding natural habitats, preserved lands, and wildlife corridors that may be utilized by panthers. The current utilization and value of the surrounding lands to Florida panthers and their prey need to be considered, along with the potential decrease in utilization and value due to proposed project. In addition, current traffic patterns of surrounding roadways and the projected increase in vehicular traffic due to the anticipated development in the area must be considered.

Section 3.4.4.2.3 describes the habitats adjacent to the project corridor. Based on a review of panther telemetry data (**Figures 3-13** and **3-15**), the project corridor, especially the southernmost section at the Owl Hammock bend, is a high traffic area for Florida panther crossing. Two large conservation areas, Big Cypress National Preserve and the Florida Panther NWR, both managed by the US Department of the Interior and the USFWS, are located approximately three miles from the southernmost limits of the project study area. The project is approximately 10 miles from the Dispersal Zone which contains areas that would allow for dispersal of Florida panthers and an expansion of the panther population north of the Caloosahatchee River.

A high increase in traffic volume throughout the corridor is anticipated with or without the SR 29 capacity improvement project. Roadway expansion in and of itself does not increase traffic, as would a new roadway corridor. Major traffic travel routes in the vicinity of the project site include SR 82 to the northwest and Interstate 75 (I-75) to the south. In addition, this project is not anticipated to increase accessibility to adjacent properties or significantly alter land use, based on the Collier County future land use maps, which do not indicate notable land use changes based on the presence of public conservation land in the project vicinity.

A review of Florida panther vehicular mortality and injury data, provided by the USFWS, indicates collisions with motor vehicles have occurred in the Action Area, and 23 collisions resulting in panther mortality have occurred within one mile of the proposed project. This amount is higher than fatality instances documented in the biological assessment of the SR 29 PD&E Study from north of SR 82 to south of CR 80A.

The documented panther-vehicle collisions (**Figures 3-14** and **3-16**) occur primarily in the southernmost portion of the project area (as suggested by the telemetry data). Although the project proposes to add two travel lanes to the SR 29 roadway, the roadway profile itself is not anticipated to inhibit panther crossing. However, panthers and other wildlife will require additional time to cross a 4-lane roadway as compared to a 2-lane facility, thus potentially increasing likelihood of vehicle conflicts.

3.4.5.2.2 Increased Disturbance Due to Human Activities and Reduction in Panther Prey

Potential increases in disturbance to the Florida panther and panther prey were evaluated. A significant portion of the existing habitat within the proposed project site consists of existing paved roadway, agricultural lands, citrus groves, shrub and brushland, pine flatwoods, and mixed forested wetlands, that provide marginal quality habitat to the Florida panther and panther prey species. Moreover, the existing SR 29 roadway already provides significant disturbance to wildlife from heavy vehicle use. Future land use maps for Collier County does not depict significant land use changes along this segment of SR 29, and the roadway is not expected to increase access to adjacent properties. Panthers and panther prey primarily use the habitats in the southernmost portion of the project area. Telemetry data depicts the high traffic corridor at the Owl Hammock bend. Project construction in this high frequency panther area may result in an increase in panther/human interactions and prey disturbance.

The rural characterization of the project area and associated land uses are not expected to change substantially as a result of the proposed improvements to SR 29. Similarly, access to adjacent properties is not expected to change substantially from the existing roadway design. A review of the Collier County 2025 future land use maps reveals that no significant land use changes are predicted; land use in the project area is designated as agricultural/rural mixed use in the Collier County 2012-2025 Future Land Use Map (Collier County Growth Management Division, 2014). A review of the Hendry County 2040 future land use maps indicates predominantly agricultural, with some residential, public land, and conservation easement land use along the length of the project limits (Hendry County Planning and Zoning Department, 2013).

One existing conservation area is located within one mile of the project limits. The JB Ranch Conservation Easement is located 0.55 miles east of the southernmost limits of the SR 29 project study area. This land is managed by the Florida Department of Agriculture and Consumer Services (FDACS) and the Florida Forest Service. This land has a total of 1,617 acres and provides habitat for the Florida panther and other federal and state listed species. The proposed project will not require any rights-of-way from this existing area; therefore, the JB Ranch Conservation Easement will not be affected.

Other existing conservation lands are located within the vicinity of the project, but do not lie within one mile of SR 29. These consist of the Okaloacoochee Slough WMA and State Forest, managed primarily by the FWC and offering public recreation opportunities include hunting, fishing, camping, hiking, and biking. The BCNP and the Florida Panther NWR, both managed by the US Department of the Interior and the USFWS, are located to the south of the southernmost project limits.

3.4.5.2.3 Habitat Fragmentation

Habitat fragmentation is defined as "the breaking up of a habitat into unconnected patches interspersed with other habitat which may not be inhabitable by species occupying the habitat that was broken up. The breaking up is usually by human action, as for example the clearing of forest or grassland for agriculture, residential development, or overland electrical lines" (Mac et al 1998). Habitat fragmentation and loss from road construction, urban development, and agricultural land conversions can affect the dispersal ability of panthers and decrease the large areas of forested habitat preferred by this species.

The project area is located in the northern section of Collier County, south of the Caloosahatchee River in the Primary and Secondary Zones of the Panther Focus Area. The proposed improvements involve the expansion of an existing roadway (SR 29). Because the existing footprint of roadway will be expanded, new fragmentation of habitat is not expected to result from this project.

3.4.5.2.4 Intraspecific Aggression

Within the 25-mile Action Area, intraspecific aggression was the cause of 78 deaths out of a total of 386 panther mortalities since 1979. The closest documented mortality by intraspecific aggression occurred approximately 1.3 miles northeast of the project study area in year 2011.

The SR 29 project study area is located within the OKSLOUGH to FPNWR LCP created by Swanson et al. (2008), as discussed in **Section 3.4.4.2.2**. The OKSLOUGH to FPNWR panther pathway travels from the Florida Panther NWR to the Okaloacoochee Slough State Forest, which crosses SR 29 at the Owl Hammock curve. The proposed wildlife crossing and the OKSLOUGH to FPNWR LCP occur at the same location along SR 29, which as the telemetry data would suggest, is also where the highest frequency of panther telemetry data is observed along the Preferred Alternative. The installation a wildlife crossing south of the Owl Hammock curve is anticipated to minimize panther-vehicle collisions, by providing panthers a protected corridor to cross SR 29. Rather than panthers crossing SR 29 at multiple locations, there will now only be one designated route across the highway. With the addition of the wildlife crossing and associated perimeter fencing, the panthers will be herded into the same crossing point. Increased intraspecific

aggression among adult and subadult male panthers may be a potential indirect effect of the proposed wildlife crossing.

It is unknown how drastic an increase in mortalities due to intraspecific aggression will be. Within five miles of the project corridor, there have been four reported cases of panther mortality due to intraspecific aggression in the vicinity of the OKSLOUGH to FPNWR LCP, the most recent was documented in 1997. Though many panthers utilize the OKSLOUGH to FPNWR LCP, intraspecific aggression does not appear to be a prevalent cause of panther mortality.

3.4.5.3 Cumulative Effects

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the Action Area considered in this biological assessment. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to Section 7 of the ESA.

In order to identify potential future actions that are reasonably certain to occur within the large Action Area, information of development orders within each county was sought. This information could include Sector plans, Developments of Regional Impact (DRI), Planned Unit Developments (PUD), and rezoning applications within the Action Area.

An analysis of DRI projects was completed utilizing 2021 data titled *Developments of Regional Impact in the State of Florida - 2021 Quarter 2* from the FGDL database. Within the Action Area there were 24 approved or pending DRIs. No new lands within the Action Area have been included in any DRIs since 2010.

Collier County

Collier County provided a Master PUD List, updated May 2021. Information in the PUD Master List included approval date, estimated build out date, acreage, and conservation acreage. Only PUDs within the Action Area were identified. All projects that had an estimated build out date prior to 2021 were eliminated in the analysis. Thirty (30) projects, totaling 3,707.71 acres of future development in Collier County were within the Action Area (**Table 3-12**). Of that acreage, 456.91 acres included lands for conservation. Land use make up of these PUDs could not be evaluated to exclude already developed areas and wetlands (which would require a separate Federal review if developed). Therefore, for purposes of this cumulative effects analysis, the worst case scenario is assumed that all of this acreage is available for development.

TABLE 3-12
PLANNED UNIT DEVELOPMENTS WITHIN COLLIER COUNTY

Name	Date Approved	Estimated Buildout	Project Acres	Conservation Acres
Courthouse Shadows/Collier	1/28/1992	2021	20.35	--
New Hope Ministries	1/29/2008	2021	39.89	5.73
Price Street & 41	12/13/2016	2021	6.50	--
Vincent Acres	9/27/2016	2021	16.80	--
Westclox 29	2/23/2016	2021	9.50	--
Addie's Corner	4/12/2011	2022	23.33	3.45
Cleary	11/14/2017	--	8.99	1.07
Logan/Immokalee	12/12/2017	2022	18.60	1.99
Mac	9/27/2005	--	10.76	1.30
Resource Recovery Business Park	1/10/2017	2022	344.30	171.20
951 Villas	7/10/2018	--	37.5	7.30
Esperanza Place	6/10/2008	2023	31.60	0.31
I-75/Alligator Alley	2/13/2007	2023	40.80	14.00
Rushton Pointe	4/24/2018	2023	38.10	2.81
Russell Square	10/23/2018	2023	32.90	3.47
Baumgarten	6/11/2019	2024	55.66	0.00
Vanderbilt Commons	12/12/2017	2024	14.49	0.17
Kase	2/25/2020	--	7.58	0.16
Naples Senior Center	12/8/2020	--	13.60	2.70
Temple Shalom	11/10/2020	2025	13.50	1.00
Ventana Pointe	7/14/2020	2025	37.62	9.63
Bembridge Ems Complex	9/13/2005	--	39.82	0.12
Abaco Club	4/12/2016	4/12/2021	15.9	--
Tollgate (DRI-83-2) PUD-83-18(1)	2/11/1992	8/1/2021	100.23	--
Emmanuel Evangelical Lutheran Church	6/28/2011	10/12/2022	21.72	6.52
R. Roberts Estate	1/21/1992	1/28/2024	42.90	4.10
Germain Immokalee	10/13/2020	10/13/2025	8.97	1.35
Parklands (DRI-84-4c) (DRI-03-02)	9/9/2003	1/22/2026	635.20	155.40
Grey Oaks (DRI-89-1)	6/27/2000	8/8/2026	1,601.00	60.66
City Gate (DRI 88-2)	12/22/1988	10/26/2035	419.60	2.47
		Total:	**3,707.71**	**456.91**

Charlotte County

No development information was able to be obtained from Charlotte County. Within the Action Area, Charlotte County makes up a total of 5,395.34 acres (0.33% of Action Area). According to SFWMD FLUCFCS data, 3,788.10 acres are comprised of natural, non-wetland lands (FLUCFCS 200, 300, 400) that could be developed without Federal review. Therefore, for purposes of this cumulative effects analysis, the worst case scenario is assumed that all of this acreage is available for development.

Glades County

The Glades County Zoning Department provided a log of rezoning projects from 1975 to present. Rezoning projects within the Action Area were identified. Rezoning is a typical precursor to land development. It was assumed rezoning applications with dates prior to 2011 have been developed and were eliminated from the evaluation. A total of 430.12 acres have been rezoned lands in Glades County (**Table 3-13**). Land use make up of these rezoning areas could not be evaluated to exclude already developed areas and wetlands (which would require a separate Federal review if developed). Therefore, for purposes of this cumulative effects analysis, the worst case scenario is assumed that all of this acreage is available for development.

TABLE 3-13
REZONING APPLICATIONS WITHIN GLADES COUNTY

Name	Date Approved	Project Acres
Glades Tree & Sod LLC	6/14/2011	321.12
Stanley & Patricia Wegscheid	9/13/2011	48.00
Jenness Allen	1/10/2012	18.19
T. Duke LLC	5/9/2017	38.20
RFYC, LLC	6/13/2017	4.61
	Total:	**430.12**

Hendry County

No development information was able to be obtained from Hendry County. Through a review of the 2021 Hendry County Comprehensive Plan, three (3) sector and/or master plans were identified within the Action Area. According to SFWMD FLUCFCS data, 49,775.01 acres within these sector and master plans are comprised of natural, non-wetland lands (FLUCFCS 200, 300, 400) that could be developed without Federal review (**Table 3-14**). For purposes of this cumulative effects analysis, the worst case scenario is assumed that all of this acreage is available for development.

TABLE 3-14
SECTOR AND MASTER PLANS WITHIN HENDRY COUNTY

Name	Project Acres
Rodina	23,931.85
Southwest Hendry	18,635.77
Felda	7,207.39
Total (FLUCFCS 200, 300, 400):	**49,775.01**

Lee County

Lee County provided PUD data and a GIS shapefile. It was assumed that PUDs with application dates prior to 2011 have been completed and were eliminated from the evaluation. Since a shapefile was provided, the PUD data was evaluated using GIS land use data (SFWMD 2016 FLUCFCS). Investigation was performed to determine if areas within the proposed PUDs have already been developed (FLUCFCS 100, 700 and 800) or were wetlands (FLUCFCS 500 and 600) and would require a separate Federal review if developed. According to the analysis, 6,062.73 acres of natural,

non-wetland lands (FLUCFCS 200, 300, 400) within thirteen (13) PUDs were identified within the Lee County Action Area (**Table 3-15**). Therefore, for purposes of this cumulative effects analysis, the worst case scenario is assumed that all of this acreage is available for development.

TABLE 3-15
PLANNED UNIT DEVELOPMENTS WITHIN LEE COUNTY

Name	Date Approved	Project Acres
Corkscrew Shores	2012	61.21
Cemex, Alico Rd Quarry PH3C	2014	1.86
Corkscrew Farms	2015	814.27
Wildblue	2015	795.99
Oak View RPD	2017	13.57
Troyer Brothers	2019	981.46
The Treeline 28 Commerce Park	--	28.91
Florida Gulf Coast Technology	--	507.68
Youngquist Trade Center MPD	--	155.60
Babcock Mixed Use Planned Development	--	297.46
Verdana Village	--	1,829.77
Timber Creek	--	574.95
Gateway DRI and PUD Amendment	--	
Total (FLUCFCS 200, 300, 400):		**6,062.73**

A summary of the lands within the Action Area with development reasonably certain to occur, including the proposed project is provided in **Table 3-16**. Of the 1,466,616 acres of land located within the cumulative effects evaluation area, 64,145.93 acres have a reasonable certain potential for development and/or habitat loss, representing 4.4% of the total Action Area. This percentage of habitat loss is minor and will not jeopardize the existence of the Florida panther.

No interrelated or interdependent effects were identified for the proposed project.

TABLE 3-16
POTENTIAL DEVELOPMENT IMPACTS WITHIN THE ACTION AREA

County	Acreage
Collier	3,707.71
Charlotte	3,788.10
Glades	430.12
Hendry	49,775.01
Lee	6,062.73
State Road 29 Widening from Oil Well Rd to State Road 82	382.26
Total:	**64,145.93**
% of Action Area	**4.4%**

3.4.5.4 Compensation

The Florida Panther Recovery Plan (USFWS 2008) outlines a number of actions required to maintain, restore, and increase the Florida panther population and habitat in south Florida. Recovery Action 1.1.1.2.3 states that panther habitat loss, degradation, or fragmentation should be avoided for federally funded or authorized projects or actions. If impacts to panther habitat cannot be avoided, then equivalent habitat protection and restoration should compensate for both the quantity of habitat lost and the functional value of habitat lost.

The FDOT will provide compensation for impacted Primary and Secondary Zone panther habitat by purchasing panther habitat from a USFWS approved mitigation bank equivalent to 1,027 PHUs. A PHU Summary Table is included as **Appendix H-6**. The use of PHU credits as compensation is consistent with the USFWS's panther conservation strategy to locate, preserve, and restore sets of lands containing sufficient area, access, and appropriate cover types to ensure the long-term survival of the Florida panther south of the Caloosahatchee River.

In addition, the FDOT commits to the installation of a wildlife crossing under SR 29 south of Owl Hammock. A wildlife crossing at this location is supported by the telemetry and mortality data and panther least-cost pathways (LCP), discussed in **Section 3.4.4.2.1** and **Section 3.4.4.2.2**. Detailed design of the wildlife crossing and associated features will take place during the design and permitting phase of the project.

3.4.6 Conclusion

In summary, direct take in the form of mortality or injury of the Florida panther due to the proposed project is not expected. Factors including the status of the species, remaining habitat, recovery objectives, and cumulative effects were considered in order to determine the effect of the proposed SR 29 project on the Florida panther. In order to offset the impacts to panther habitat, resulting from project construction, mitigation through the purchase of 1,027 Panther Habitat Units (PHUs) at a USFWS approved panther habitat bank will be undertaken by FDOT.

Additionally, the FDOT commits to incorporate a wildlife crossing feature at the Owl Hammock curve in an effort to conserve the species. With the installation of a wildlife crossing and directional fencing, the panthers will be directed into a single-entry, funneled path, to cross under SR 29. The addition of a wildlife crossing may help offset panther mortality. Decreased panther exposure to the roadway will ultimately result in fewer instances of a panther-vehicle conflict, thus decreasing the amount of panther mortalities due to vehicle collisions. Though habitat fragmentation is not anticipated with the roadway improvements, a wildlife crossing would provide a safe connection between lands east and west of SR 29 and will relieve the effects of a large roadway system acting as a wildlife deterrent. Detailed design of the wildlife crossing and associated features will be developed during the design and permitting phase of the proposed project.

It has been determined that the proposed project "**May Affect, and is Likely to Adversely Affect**" the Florida panther. However, with the proposed implementation of conservation measures and the acquisition of habitat mitigation, it is not likely to jeopardize the continued existence of the species.

4.0 CONCLUSION

Thirteen (13) federally protected plant and animal species that occur within Collier County and have the potential to occur within the study area. Based on the analyses documented in this report, effect determinations were made concerning the proposed action's impacts on these species. These effect determinations are summarized in **Table 4-1**.

TABLE 4-1
FEDERAL PROTECTED SPECIES EFFECT DETERMINATIONS

Species	Common Name	Federal Status	Effect Determination
Plants			
Chamaesyce garberi	Garber's spurge	E	No Effect
Dalia carthagenesis floridana	Florida prairie-clover	E	No Effect
Reptiles			
Alligator mississippiensis	American alligator	T(S/A)	May Affect, but is Not Likely to Adversely Affect
Drymarchon corais couperi	Eastern indigo snake	T	May Affect, and is Likely to Adversely Affect
Birds			
Ammodramus savannarum floridanus	Florida grasshopper sparrow	E	No Effect
Aphelocoma coerulescens	Florida scrub-jay	T	May Affect, and is Likely to Adversely Affect
Caracara cheriway	Audubon's crested caracara	T	May Affect, but is Not Likely to Adversely Affect
Laterallus jamaicensis jamaicensis	Eastern black rail	T	May Affect, but is Not Likely to Adversely Affect
Mycteria americana	Wood stork	T	May Affect, but is Not Likely to Adversely Affect
Picoides borealis	Red-cockaded woodpecker	E	No Effect
Rostrhamus sociabilis plumbeus	Snail kite	E	May Affect, but is Not Likely to Adversely Affect
Mammals			
Eumops floridanus	Florida bonneted bat	E	May Affect, and is Likely to Adversely Affect
Puma concolor coryi	Florida panther	E	May Affect, and is Likely to Adversely Affect

F = Federally Listed / E = Endangered / T = Threatened / T(S/A) = Threatened due to similar appearance

Required compensation in the form of credit purchase at USFWS approved mitigation and/or conservation banks for impacts to suitable habitat for the Florida scrub-jay, wood stork, and Florida panther will be completed by the FDOT. This acquisition of high-quality upland and wetland credits will also mitigate habitat loss for the Eastern indigo snake, Audubon's crested caracara, and Florida bonneted bat. Additionally, compensation in the form of a monetary donation, as specified by the USFWS, to the Wildlife Foundation of Florida (WFF), to support measures that aid in the survival and recovery of the Audubon's crested caracara, will further mitigate for loss of caracara suitable habitat by the proposed project. **Table 4-2** lists conservation and/or mitigation banks that currently have available credits to satisfy the project mitigation

requirements. It should be noted that credit acquisition will be completed during the design and permitting phase of the project, and credit availability is subject to change.

TABLE 4-2
CONSERVATION/MITIGATION BANKS WITH CREDIT AVAILABILITY

Species	Common Name	Mitigation Requirements	Conservation/Mitigation Banks
Reptiles			
Drymarchon corais couperi	Eastern indigo snake	--	Florida Panther Conservation Bank II (Phase I-III), Corkscrew Regional Mitigation Bank, Panther Island Mitigation Bank (Expansion), Panther Passage Conservation Bank
Birds			
Aphelocoma coerulescens	Florida scrub-jay	104.21 acres scrub habitat	Tippen Bay Conservation Bank
Caracara cheriway	Audubon's crested caracara	Monetary donation to WFF	Florida Panther Conservation Bank II (Phase I-III), Corkscrew Regional Mitigation Bank, Panther Island Mitigation Bank (Expansion), Panther Passage Conservation Bank
Mycteria americana	Wood stork	9.21 wetland functional units / 20.58 kg biomass loss	Florida Panther Conservation Bank II (Phase I), Corkscrew Regional Mitigation Bank, Panther Island Mitigation Bank (Expansion)
Mammals			
Eumops floridanus	Florida bonneted bat	--	Florida Panther Conservation Bank II (Phase I-III), Corkscrew Regional Mitigation Bank, Panther Island Mitigation Bank (Expansion), Panther Passage Conservation Bank
Puma concolor coryi	Florida panther	1,027 PHUs	Florida Panther Conservation Bank II (Phase I-III), Panther Passage Conservation Bank

4.1 Proposed Conservation Measures

- Wetland impacts resulting from construction of this project will be mitigated pursuant to Section 373.4137, F.S. to satisfy all mitigation requirements of Part IV of Chapter 373, F.S. and 33 U.S.C. §1344. Compensatory mitigation for this project will be completed through the use of mitigation banks and any other mitigation options that satisfy state and federal requirements.

Audubon's Crested Caracara

- Impacts to suitable habitat for the federally listed Audubon's crested caracara will be offset through a monetary donation to the USFWS caracara fund, held by the Wildlife Foundation of Florida (WFF) to support measures that aid in the survival and recovery of the caracara (e.g., acquiring, managing, and protecting currently unprotected caracara habitat). Before construction can commence; a) the FDOT will provide the USFWS a receipt, letter, or email from the WFF verifying the contribution has been made, and b) the USFWS will provide an email or letter to the FDOT indicating that the letter has been received.

- Land clearing activities for the project will be conducted outside of the Audubon's crested caracara nesting season (December 1 through April 30) to the greatest extent practicable. Since caracara nesting season is from December 1 through April 30, clearing should be completed between May 1 and November 30. Should it be necessary to conduct land clearing activities within the nesting season, the FDOT or their designated agent will survey suitable caracara nesting habitat to determine if an active caracara nest occurs within or adjacent to the project area. If an active nest is observed within 300 meters (985 feet) of the project area, land clearing within 300 meters (985 feet) of the nest will not occur until monitoring has determined the nest has either been abandoned, or chicks within the nest have fledged and left the nest site.

Wood Stork

- Impacts to suitable foraging habitat for the federally listed wood stork will be mitigated through the purchase of credits from a USFWS-approved mitigation bank pursuant to Section 373.4137, F.S. or as otherwise agreed to by the FDOT and the USFWS.

Eastern Indigo Snake

- The USFWS Standard Protection Measures for the Eastern Indigo Snake will be utilized during construction.

Florida Scrub-Jay

- Impacts to suitable habitat for the federally listed Florida scrub-jay will be offset through the purchase of scrub habitat equivalent to a 2:1 compensation ratio of acreage impacted by the project, from a USFWS-approved scrub habitat bank.
- To minimize risks to Florida scrub-jays during the breeding season, clearing of occupied scrub habitat will not occur during the scrub-jay nesting season (March 1 to June 30) to avoid the destruction of nests with eggs, hatchlings, and/or juveniles and the female breeder.

Florida Bonneted Bat

- Land clearing activities for the project will be conducted outside of the Florida bonneted bat breeding season (January 1 – April 15) to the greatest extent practicable. Since bonneted bat breeding season is from January 1 through April 15, clearing should be completed between April 16 and December 31. If potential roost trees or structures need to be removed, a biologist familiar with bats and their ecology should cavities which may be used by bats will be checked within 30 days prior to removal of trees, snags, or structures. If evidence of use by any bat species is observed, removal efforts in that area will be discontinued and coordinate with the USFWS on how to proceed will be undertaken.
- When heavy equipment is used, a 250-foot (76-meter) buffer around known or suspected roosts will be established to limit disturbance to roosting Florida bonneted bats.

- Widespread application of insecticides (e.g., mosquito control, agricultural pest control) in areas where Florida bonneted bats are known or expected to forage or roost will be avoided or limited. Within the project footprint, this includes the rights-of-way.
- As a measure to conserve the Florida bonneted bat, the use of artificial lighting will be avoided or minimized. To the extent possible, natural light conditions will be retained, and wildlife friendly lighting (i.e., downward facing and lowest lumens possible) along the Preferred Alternative will be installed wherever possible. In addition, permanent night-time lighting will be avoided to the greatest extent practicable.

Florida Panther

- Impacts to suitable habitat for the federally listed Florida panther will be offset through the purchase of Panther Habitat Unit (PHU) credits, from a USFWS-approved conservation bank.
- A wildlife crossing will be incorporated into the proposed roadway design, as a measure to conserve the Florida panther and other wildlife species. Currently, FDOT anticipates a crossing near the Owl Hammock curve based upon prior coordination with the USFWS. Details of this crossing will be developed as part of Section 7 consultation with USFWS during the design and permitting phase of the project.

5.0 LITERATURE CITED

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APPENDICES

Appendix A
USFWS Correspondence

From:	Brooks, Lauren
To:	Gwen Pipkin; Richey, Tobi; kconnor@hwlochner.com
Cc:	Bizerra, Marlon; Howell, Bill; Peate, Martin; kwarren@rkk.com; Gregory, Ron; Scott, Vickie
Subject:	RE: SR 29 Immokalee
Date:	Tuesday, March 20, 2018 10:14:29 AM

Excellent! Thanks, Gwen!

Tobi and Kevin – Please see email below from Gwen regarding John Wrublik's concurrence on the species surveys and the NRE pertaining to SR 29 Immokalee. Thanks!

Lauren M. Brooks, AICP
Project Manager & Senior Transportation Planner, Surface Transportation
D 1-813-636-2162 C 1-813-313-9913
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From: Pipkin, Gwen G [mailto:Gwen.Pipkin@dot.state.fl.us]
Sent: Tuesday, March 20, 2018 10:11 AM
To: Bizerra, Marlon; Howell, Bill; Peate, Martin; Brooks, Lauren; kwarren@rkk.com
Subject: FW: SR 29 Immokalee
Importance: High

We have concurrence from John Wrublik (see below) on our plan to do some species surveys as part of design. We will do the NRE as usual and get concurrence on the species we can do now, and include commitments to do during design for the rest. Please forward as needed.

Gwen G. Pipkin
Environmental Manager
Office - 863.519.2375
Cell - 863-280-5850
gwen.pipkin@dot.state.fl.us

From: Wrublik, John [mailto:john_wrublik@fws.gov]
Sent: Tuesday, March 20, 2018 8:26 AM
To: Pipkin, Gwen G <Gwen.Pipkin@dot.state.fl.us>
Subject: Re: SR 29 Immokalee

Gwen,

The proposal that the listed species surveys indicated for this project be conducted during the design phase
of the project is acceptable to the Service. I don't have any further comments at this time.

John

John M. Wrublik
U.S. Fish and Wildlife Service
1339 20th Street
Vero Beach, Florida 32960
Office: (772) 469-4282
Fax: (772) 562-4288
email: John_Wrublik@fws.gov

On Tue, Mar 20, 2018 at 7:30 AM, Pipkin, Gwen G <Gwen.Pipkin@dot.state.fl.us> wrote:

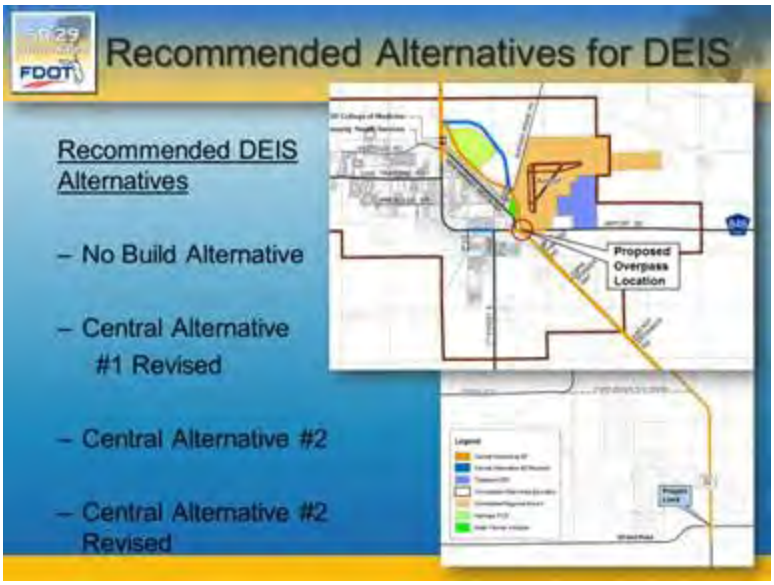
> Hi John,
>
> We spoke a while back about completing some of our species surveys during design for this project. I followed up I with an email (see attached). I would like to know if you have had a chance to review that, and if we could get a response back?
>
> I am also including the following additional information for your use.
>
> - Panther: This is the major wildlife issue south of Immokalee, especially considering the number of panther vehicle strikes. A wildlife crossing at Owl Hammock curve is needed. PHUs for lost habitat will also need to be calculated as part of the PD&E.
> - Crested caracara: No nests currently known in PD&E study area; surveys will be required during design for those segments that are not right in town.
> - Scrub jay: An updated survey will be required during design for the new alignment segment northwest of the airport (a colony is known to exist in this area). There is no suitable habitat south of Immokalee.
> - Wood stork: Suitable foraging habitat is present in all segments and at least three colonies are within 18.6 miles. A foraging habitat assessment should be completed during design.
>
> Thanks, John, I look forward to your response!
>
> Gwen G. Pipkin
> Environmental Manager
> Office - 863.519.2375
> Cell - 863-280-5850
> gwen.pipkin@dot.state.fl.us
>
> ---------- Forwarded message ----------
> From: "Pipkin, Gwen G" <Gwen.Pipkin@dot.state.fl.us>
> To: "John Wrublik (john_wrublik@fws.gov)" <john_wrublik@fws.gov>
> Cc:

Bcc:
Date: Thu, 8 Mar 2018 17:36:41 +0000
Subject: 417540-1 - SR 29 from Oil Well Rd to SR 82, Immokalee
John,

We spoke last week about the method FDOT would like to use to accomplish the species surveys for this project, and I was going to send you an email with more information so you could reply back. My apologies for taking so long!

Due to time constraints on the project, and the sensitivity of the species issues in the area, we feel it would be more appropriate to complete the NRE with commitments to do the formal surveys and coordination during the design phase, when the plans are more detailed. The species we feel would be best to complete later are snail kite, scrub jay, caracara, bonneted bat, and panther. The forthcoming NRE will address the rest of the species, and contain the commitments for completing the rest during design.

Also, just to update you, we are planning to move forward with only two build alternatives and the no-build alternative. We are in the process of officially eliminating Central Alternative #2 Revised, shown in blue below.



Thanks,

Gwen G. Pipkin
Environmental Manager
Office - 863.519.2375
Cell - 863-280-5850
gwen.pipkin@dot.state.fl.us

From: John Wrublik
To: Bennett, Jonathon
Subject: Re: [EXTERNAL] 417540-1-22-01 NRE Transmittal
Date: Friday, August 03, 2018 9:05:31 AM

John M. Wrublik
U.S. Fish and Wildlife Service
1339 20th Street
Vero Beach, Florida 32960
Office: (772) 469-4282
Fax: (772) 562-4288
email: John_Wrublik@fws.gov

Jonathon,

Yes I have downloaded the documents for the SR 29 project. I thought that I had sent you a response to your email, letter, and NRE dated July 20, 2018, but I can not locate in my records so maybe I neglected to send it. Anyway, her is the response I thought I had sent to you. You indicated in your letter that the FDOT intends to re-initiate consultation with the Service regarding the project's adverse effects to the Florida panther and the Florida scrub-jay during the project's design and permitting phase. In order to avoid unnecessary duplication of effort and better manage my workload, I will respond to determinations for all listed species (i.e., panther, scrub-jay, and all species that you made a MANLAA determination in your July 20th, 2018 letter) at the time of re-initation of consultation for this project (i.e., during the final design and permitting phase). I have no other comments on the project at this time.

Sincerely,

John Wrublik

On Thu, Aug 2, 2018 at 1:16 PM Bennett, Jonathon <Jonathon.Bennett@dot.state.fl.us> wrote:

> Good afternoon,
>
> The email below was sent Friday July 20th, 2018, it is for a review of the SR 29 from Oil Well Rd to SR 82 Collier County Natural Resource Evaluation Report (NRE). The link will expire on Friday August 3rd, please let me know if you need me to resend the link for your availability to download and review the NRE. If you have already retrieved this file, please disregard this email.
>
> Thank you,
>
> **Jonathon A. Bennett**
>
> Environmental Project Manager
>
> Florida Department of Transportation District One
>
> 801 North Broadway Avenue
>
> Bartow, Florida 33830
>
> Office – (863) 519-2495
>
> Main – (863) 519-2300

Jonathon.Bennett@dot.state.fl.us

From: jonathon.bennett@dot.state.fl.us <Jonathon.Bennett@dot.state.fl.us>
Sent: Friday, July 20, 2018 4:42 PM
To: xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
Cc: Pipkin, Gwen G <Gwen.Pipkin@dot.state.fl.us>; Cross, Vivianne <Vivianne.Cross@dot.state.fl.us>; Bizerra, Marlon <Marlon.Bizerra@dot.state.fl.us>; Marshall, Jennifer <Jennifer.Marshall@dot.state.fl.us>; Howell, William G. <bhowell@hwlochner.com>; tobi.richey@aecom.com; lauren.brooks@aecom.com; Kevin Connor <kconnor@hwlochner.com>
Subject: 417540-1-22-01 NRE Trasmittal

You have received 2 secure files from Jonathon.Bennett@dot.state.fl.us.

Use the secure links below to download.

Good afternoon,

Please find attached the transmittal letter along with the Natural Resources Evaluation (NRE) prepared for SR 29 Immokalee. The Florida Department of Transportation (FDOT) is conducting a Project Development and Environment (PD&E) Study to evaluate improvements to the SR 29 from Oil Well Road to SR 82 Collier County, Florida. The total project length is approximately 15.6 miles. The attached NRE assesses potential effects of the proposed roadway improvements on state and federal listed species and their respective habitats along with wetlands and other surface waters. This NRE also presents conceptual mitigation alternatives, as appropriate, for unavoidable wetland impacts. The FDOT appreciates your involvement with this project and respectfully requests your review comments or written letter of concurrence with the findings presented in the NRE within 30 days.

The NRE is being distributed to other federal and state resource agencies for their review and comment. If you have any questions or would like a hard copy of the document, please contact me at (863) 519-2495 or jonathon.bennett@dot.state.fl.us.
Thank you!

Jonathon A. Bennett
Environmental Project Manager
Florida Department of Transportation District One
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Bartow, Florida 33830
Office – (863) 519-2495
Main – (863) 519-2300
Jonathon.Bennett@dot.state.fl.us

Secure File Downloads:

Available until: **03 August 2018**

Click links to download:

2018-07-20 SR 29 Immokalee NRE July 2018 with appendices.pdf

62.05 MB

417540-1 NRE Transmittal_xxx.pdf

127.30 KB

Thank you for sharing files securely.

FW: 417540-1 - SR 29, Oil Well Rd to SR 82 - Species Coordination

Pipkin, Gwen G <Gwen.Pipkin@dot.state.fl.us>

Thu 6/25/2020 5:29 PM

To: Kirby, Marjorie <Marjorie.Kirby@dot.state.fl.us>; Cornwell, Katasha <Katasha.Cornwell@dot.state.fl.us>; Garrett, Harrison <Harrison.Garrett@dot.state.fl.us>; Marino, Matthew <Matthew.Marino@dot.state.fl.us>; Marshall, Jennifer <Jennifer.Marshall@dot.state.fl.us>; Kimberly Warren <kwarren@rkk.com>

Hello all!

This email is to document our discussion on Wednesday June 24, 2020 regarding the completion of the species effort for the above referenced PD&E project .

- The original document was a draft ESBA dated Oct 2012. The draft ESBA was sent to the agencies in Nov 2012, but no FWS concurrence was obtained at that time for any of the species. After the new NRE format came out, the ESBA was updated into an NRE in 2018.
- Two subsequent NRE Addendums have been prepared, August 2018 and August 2019.
- In order to initiate formal Section 7 Consultation we will prepare a third NRE addendum which will include the BA in order to get a BO from FWS.
- The new addendum will focus on the species, but will also contain a brief introduction which includes an update on the status of wetlands for which there are not changes, and for EFH, which got a "No Involvement" from NMFS during the ETDM screen. (In light of the DOE, do we need to discuss EFH at all?)
- The addendum will request concurrence on all of the "no effect" (Florida grasshopper sparrow, red-cockaded woodpecker, Florida prairie-clover, Garber's spurge) and "MANLAA" species (*American alligator, Eastern indigo snake, Florida bonneted bat, wood stork, Audubon's crested caracara, and snail kite).* The bonneted bat and caracara information will be updated with the surveys that will be completed and will provide information to support the determinations for those species to close consultation and get a concurrence.
- Required work and species surveys for the 4 species (Florida Scrub Jay, Florida Panther, Caracara, and Florida Bonneted Bat) will be done between now and April, 2021.
- The addendum will be sent to OEM for review and to initiate formal consultation with FWS for the "may affect, likely adversely affect" determinations, at a minimum the Florida panther and the Florida scrub jay.
- Once a BO is obtained, we will resume work on the EA/FONSI and submit for approval.

Thanks, and let me know if you have any questions!

Gwen G. Pipkin, CPM
District Environmental Manager
Office - 863.519.2375
Cell - 863-280-5850
gwen.pipkin@dot.state.fl.us

From: Kimberly Warren <kwarren@rkk.com>
Sent: Thursday, June 25, 2020 3:54 PM
To: Pipkin, Gwen G <Gwen.Pipkin@dot.state.fl.us>
Subject: Re: 417540-1 - SR 29, Oil Well Rd to SR 82 - Species Coordination

Gwen,

Well, I have been a couple of calls regarding SR 29 South and continued computer issues, thus the delay. Looks good to me. I made a couple of revisions, reduced the 2nd bullet to one sentence and addressed the scrub jay. I did not include the scrub jay in the MANLAA species because the determination is a "may affect, likely to adversely affect" along with the panther at this time.
☺

KIMBERLY WARREN
Manager Transportation
PD&E Development & Technical Delivery

402 S. Kentucky Avenue, Suite 400
Lakeland, FL 33801
863.333.4572 D | 863.528.9685 C | 863.682.4081 P
www.rkk.com
Responsive People | Creative Solutions

From: Pipkin, Gwen G <Gwen.Pipkin@dot.state.fl.us>
Sent: Thursday, June 25, 2020 2:06 PM
To: Kimberly Warren <kwarren@rkk.com>
Subject: FW: 417540-1 - SR 29, Oil Well Rd to SR 82 - Species Coordination

Kim,

This is where I am with your revisions. I simplified most of it without losing any info. However, I am having issues with the second bullet. It's too long and complicated and distracts from the point of the email. The more I think about it, I don't think we need to discuss it at all right now since it doesn't lend anything to the discussion at hand. We can always provide more detail later.

In bullet 5 you didn't include scrub jay in the MANLAA species list, so I added in green. Is there a reason we shouldn't list it there?

Also, I added a question for them on EFH.

Let me know what you think ASAP, I want to get this to them today. Thanks!

****

This email is to document our discussion on Wednesday June 24, 2020 regarding the completion of the species effort for the above referenced PD&E project .

- The original document was a draft ESBA dated Oct 2012. The draft ESBA was sent to the agencies in Nov 2012, but no FWS concurrence was obtained at that time for any of the species. After the new NRE format came out, the ESBA was updated into an NRE in 2018.
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- Once a BO is obtained, we will resume work on the EA/FONSI and submit for approval.

Gwen G. Pipkin, CPM
District Environmental Manager
Office - 863.519.2375
Cell - 863-280-5850
gwen.pipkin@dot.state.fl.us

Re: [EXTERNAL] 417540-1 - SR 29, Oil Well Rd to SR 82 - NRE

Wrublik, John <john_wrublik@fws.gov>

Wed 7/15/2020 8:52 AM

To: Pipkin, Gwen G <Gwen.Pipkin@dot.state.fl.us>
Cc: Marshall, Jennifer <Jennifer.Marshall@dot.state.fl.us>; Kimberly Warren <kwarren@rkk.com>; Howell, William G. <bhowell@hwlochner.com>

Gwen, yes the summary and methodology provided seems acceptable.

John

John M. Wrublik
U.S. Fish and Wildlife Service
1339 20th Street
Vero Beach, Florida 32960
Office: (772) 469-4282
Fax: (772) 562-4288
email: John_Wrublik@fws.gov

From: Pipkin, Gwen G <Gwen.Pipkin@dot.state.fl.us>
Sent: Wednesday, July 15, 2020 8:48 AM
To: Wrublik, John <john_wrublik@fws.gov>
Cc: Marshall, Jennifer <Jennifer.Marshall@dot.state.fl.us>; Kimberly Warren <kwarren@rkk.com>; Howell, William G. <bhowell@hwlochner.com>
Subject: [EXTERNAL] 417540-1 - SR 29, Oil Well Rd to SR 82 - NRE

Hi John,

I am sending you a summary of our June 30th conversation regarding how we were going to finalize our species work for this piece of SR 29. Please let me know if you are OK with this summary and our planned methodology.

The purpose of the meeting was discussed. OEM is asking that we go ahead and complete Formal Section 7 Consultation at this time in order to close and receive a Biological Opinion before the project continues into Design. We discussed the ESBA of October 2012, which included the panther and the scrub jay. We did not receive FWS concurrence at that time. After the new NRE format came out, the ESBA was updated into an NRE which included all species.

Kim Warren explained that we are planning to move forward with Amendment #3 to the NRE. The NRE and the two subsequent amendments have been reviewed previously by the FWS and other agencies. With the original NRE, FWS indicated that response to determinations for all listed species (which

included the panther, scrub jay and all species with a MANLAA determination) would be made at that time of re-initiation of consultation final design and permitting.

It is our plan to include the BA as part of NRE Addendum #3. This addendum will address determinations for all species. We are proposing three sections. The first section will be an introduction, which will provide a brief history and then discuss that a) there are no changes to the status of wetland impacts and b) that EFH received a "No Involvement" response from NMFS during ETDM. The second section will address all species with prior no effect and MANLAA determinations and request concurrence with these determinations and/or updated determinations, which we are assuming would be provided within the BO. The third section and remainder of the document will be the BA, which will address the Florida panther and Florida scrub jay, at a minimum. Additional species may be included in the BA based upon reviews to update data and field reconnaissance. Species specific surveys will be completed for the Florida scrub jay, Audubon's crested caracara, and Florida bonneted bat. For the Florida panther, additional telemetry data along with other data will be collected to update the prior information included in the NRE.

Jennifer Marshall discussed the reasoning behind the request from OEM to complete the formal Section 7 during the PD&E. Since the document is an Environmental Assessment (EA), they feel that we should have the consultation completed during PD&E so that all determinations are completed and the identified mitigation can be included in the documentation for subsequent phases of the project.

John Wrublik expressed his agreement with our plan to move forward. We anticipate the submittal of NRE Addendum #3 to occur in June or July of 2021. It was also indicated that once we have an outline for the document, we can provide it for review and input from John.

Thanks!!

Gwen G. Pipkin, CPM
District Environmental Manager
Office - 863.519.2375
Cell - 863-280-5850
gwen.pipkin@dot.state.fl.us

Appendix B
Preferred Alternative Concept Plans

N

0 50 200

Feet

Barron Collier

POTENTIAL POND 1

Existing RW

29

Match Line

Existing RW

Sunniland Family Partnership, LTD

Sunniland Family Partnership, LTD

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Parcels
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- Potential Contamination (Low)
- Potential Contamination (Medium or High)

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Preferred Alternative

Sheet No. 1

N

0 50 200
Feet

POTENTIAL POND 3

POTENTIAL POND 4

Barron Collier

CDC Land Investments

Oil Well Rd

BEGIN SR 29 PD&E STUDY

Existing RW

Match Line

Match Line

29

Sunniland Family Partnership, LTD

Existing RW

Sunniland Country Store

2

Robert Thomas

Sunniland Family Partnership, LTD

Oil Well Rd

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2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

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Sheet No. 2

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2016 Aerial Photography - Source: Collier County

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Sheet No. 3

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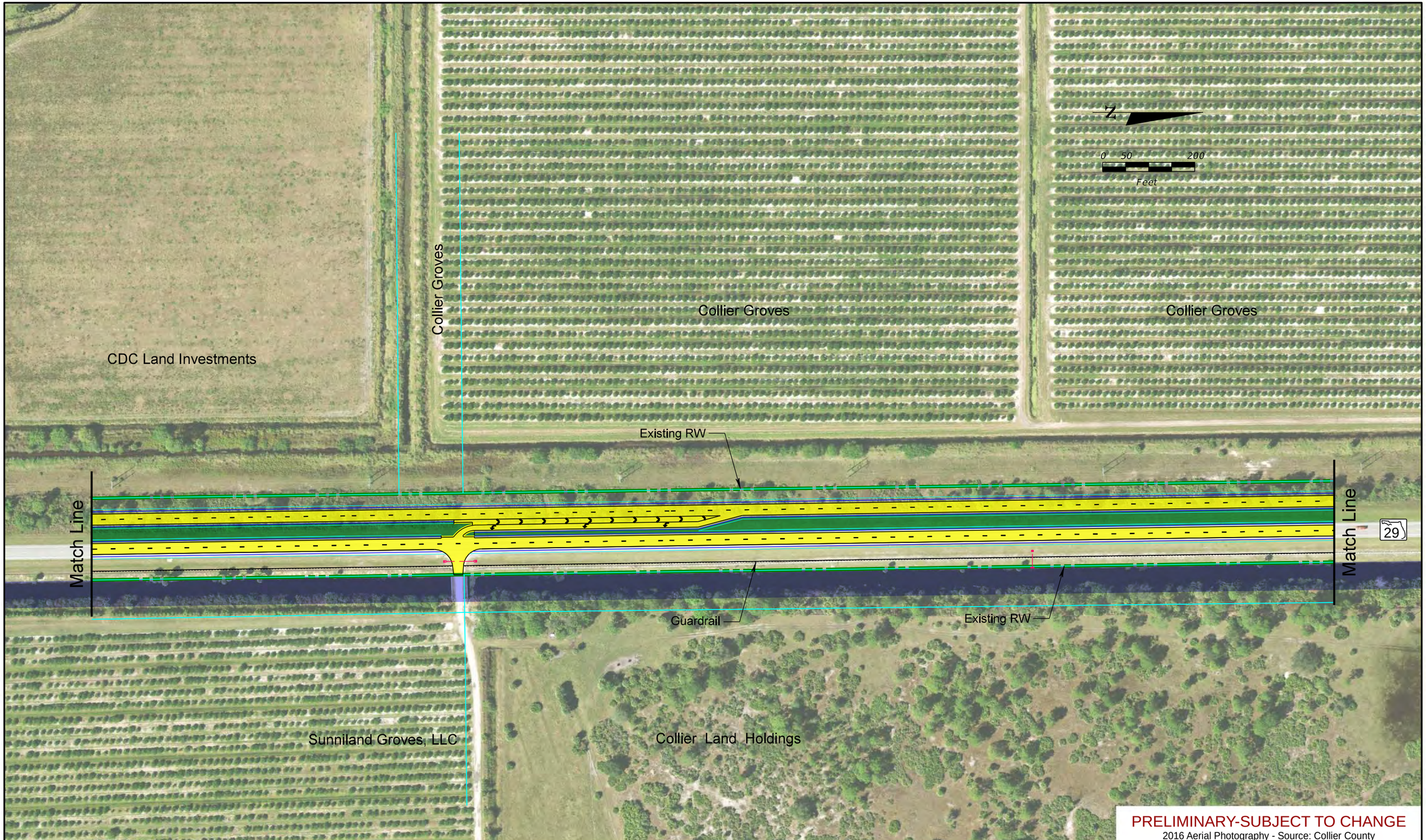
Sheet No. 4



PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

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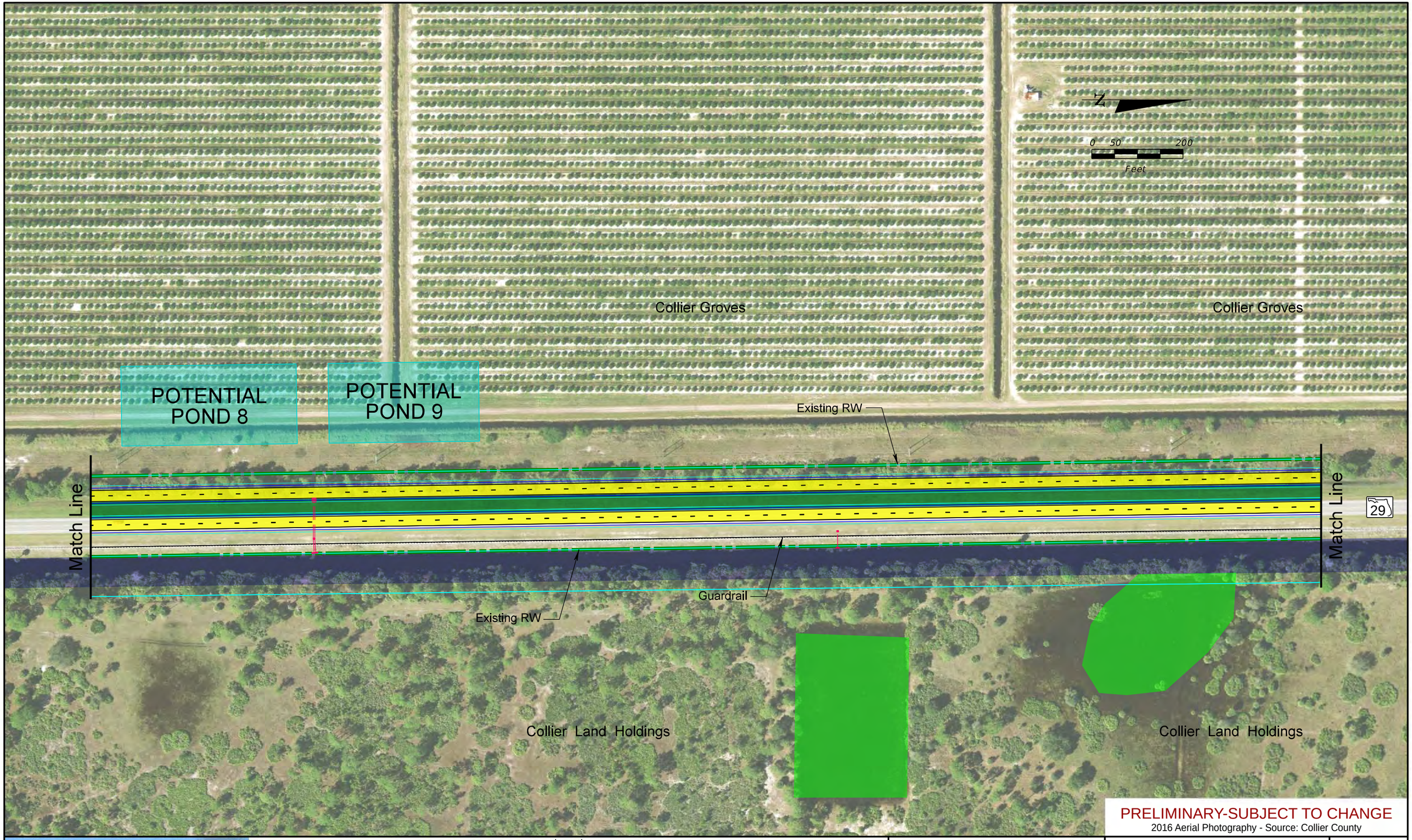
Sheet No. 5



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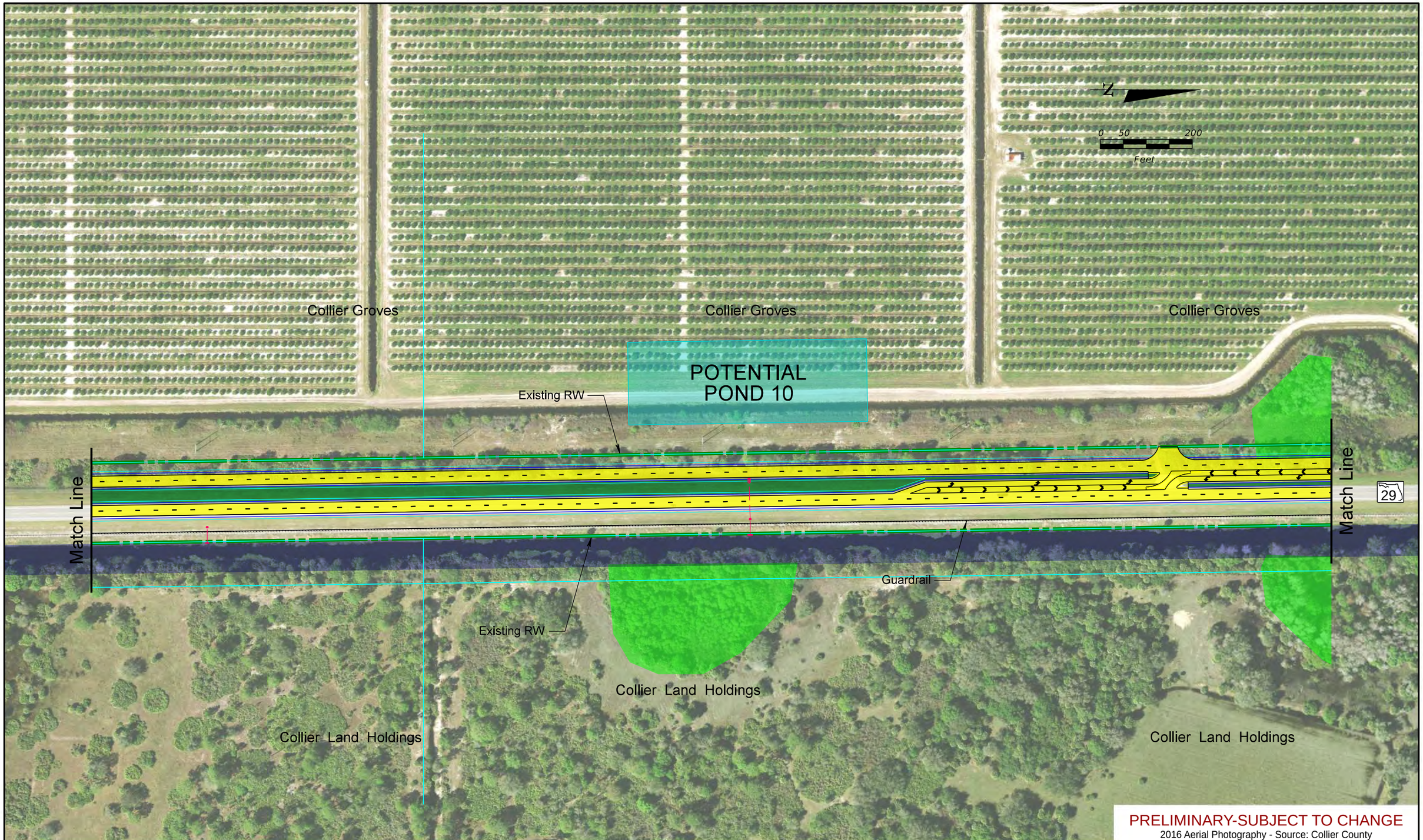
Sheet No. 6



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2016 Aerial Photography - Source: Collier County

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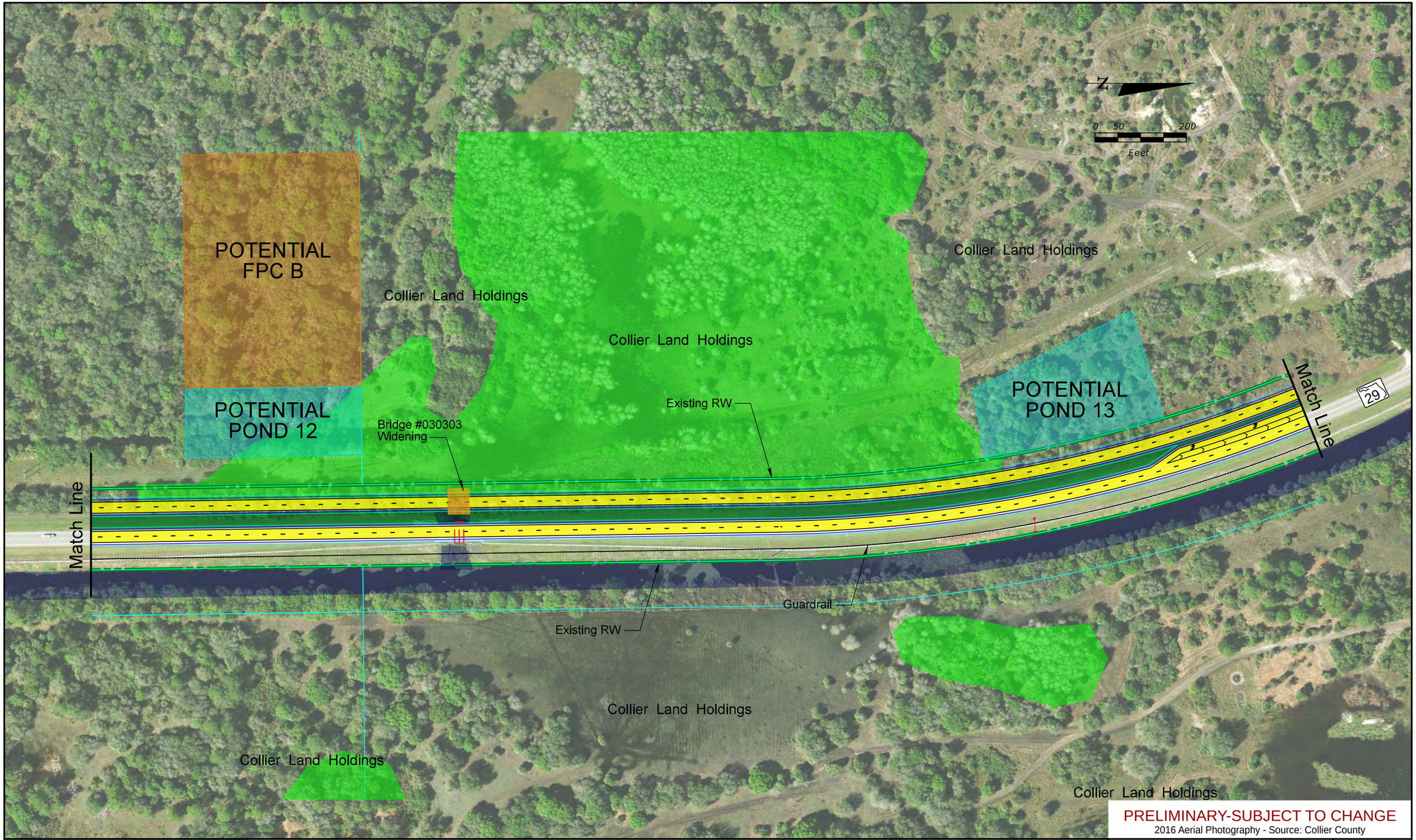

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2016 Aerial Photography - Source: Collier County

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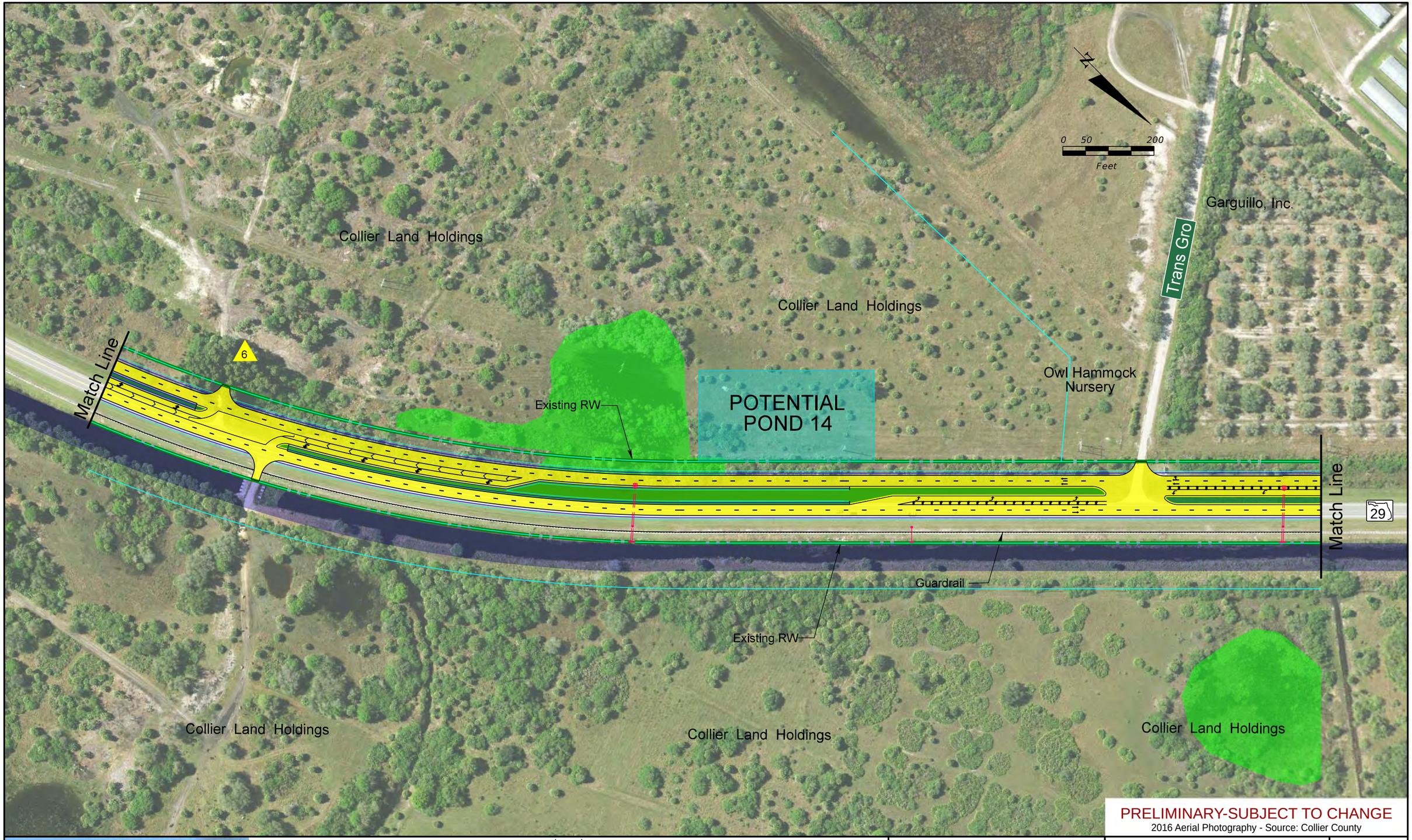

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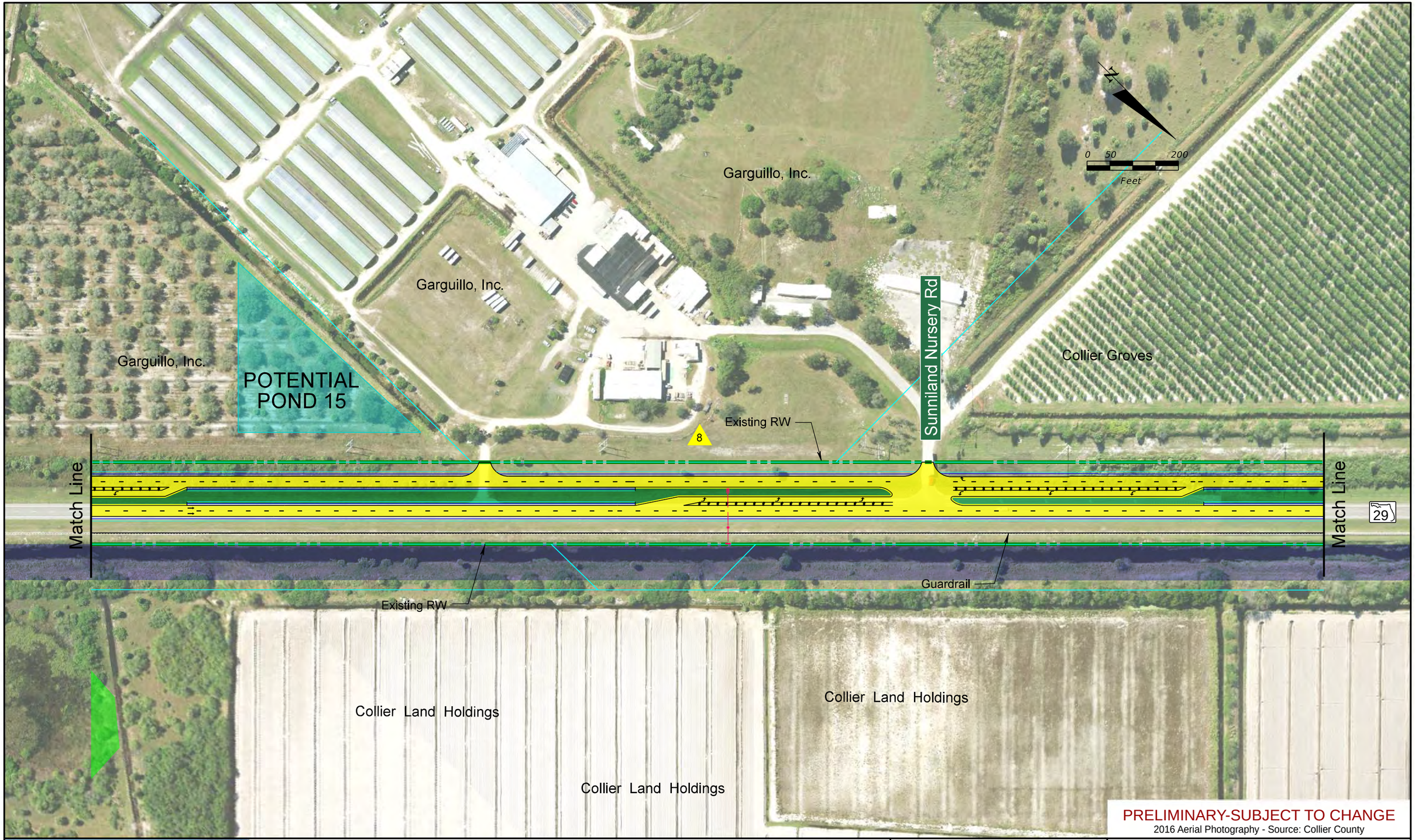

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Sheet No. 11

SR 29 PD&E Study

From Oil Well Road to SR 82

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Preferred Alternative

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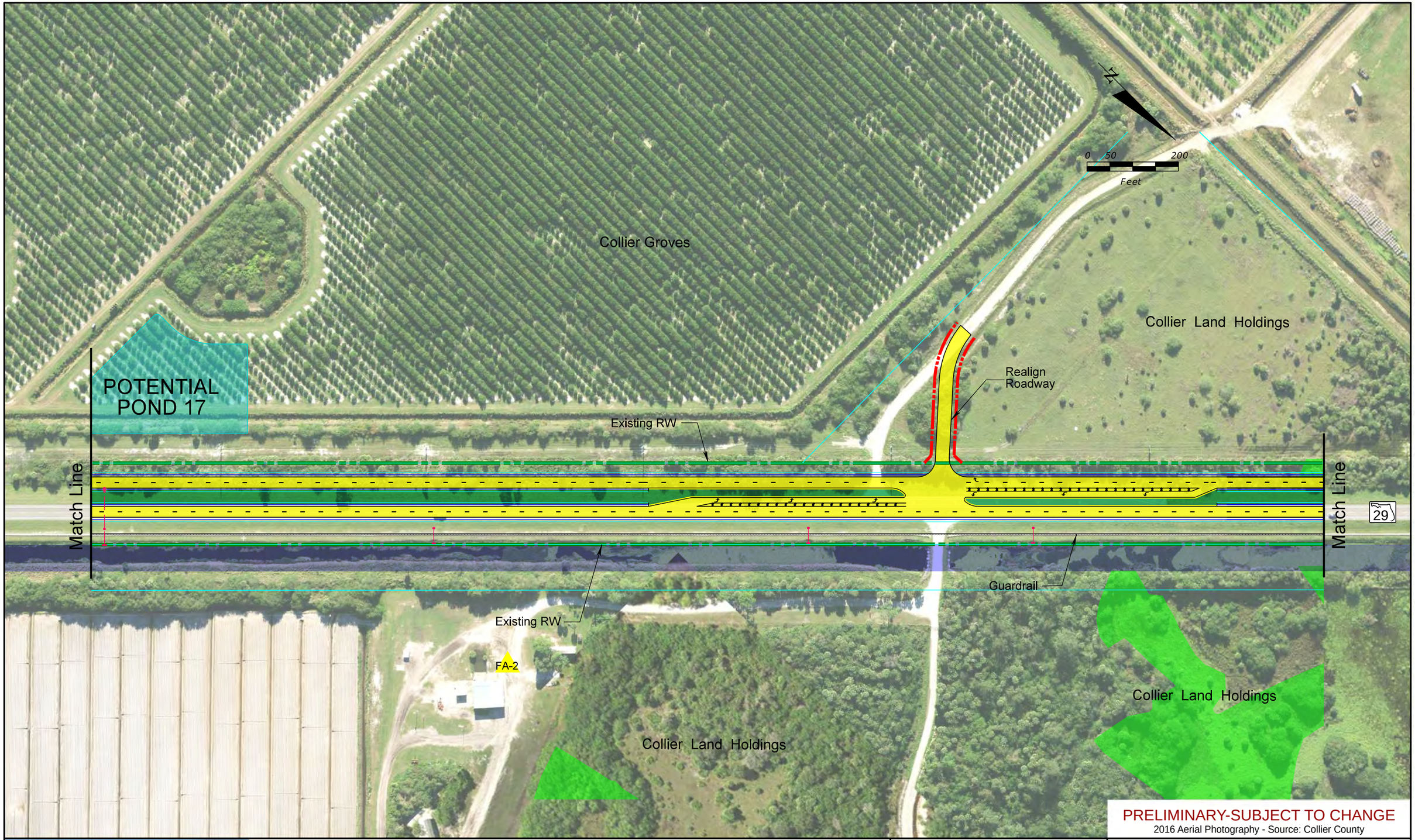

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Sheet No. 13

PRELIMINARY-SUBJECT TO CHANGE

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- Potential Contamination (Low)
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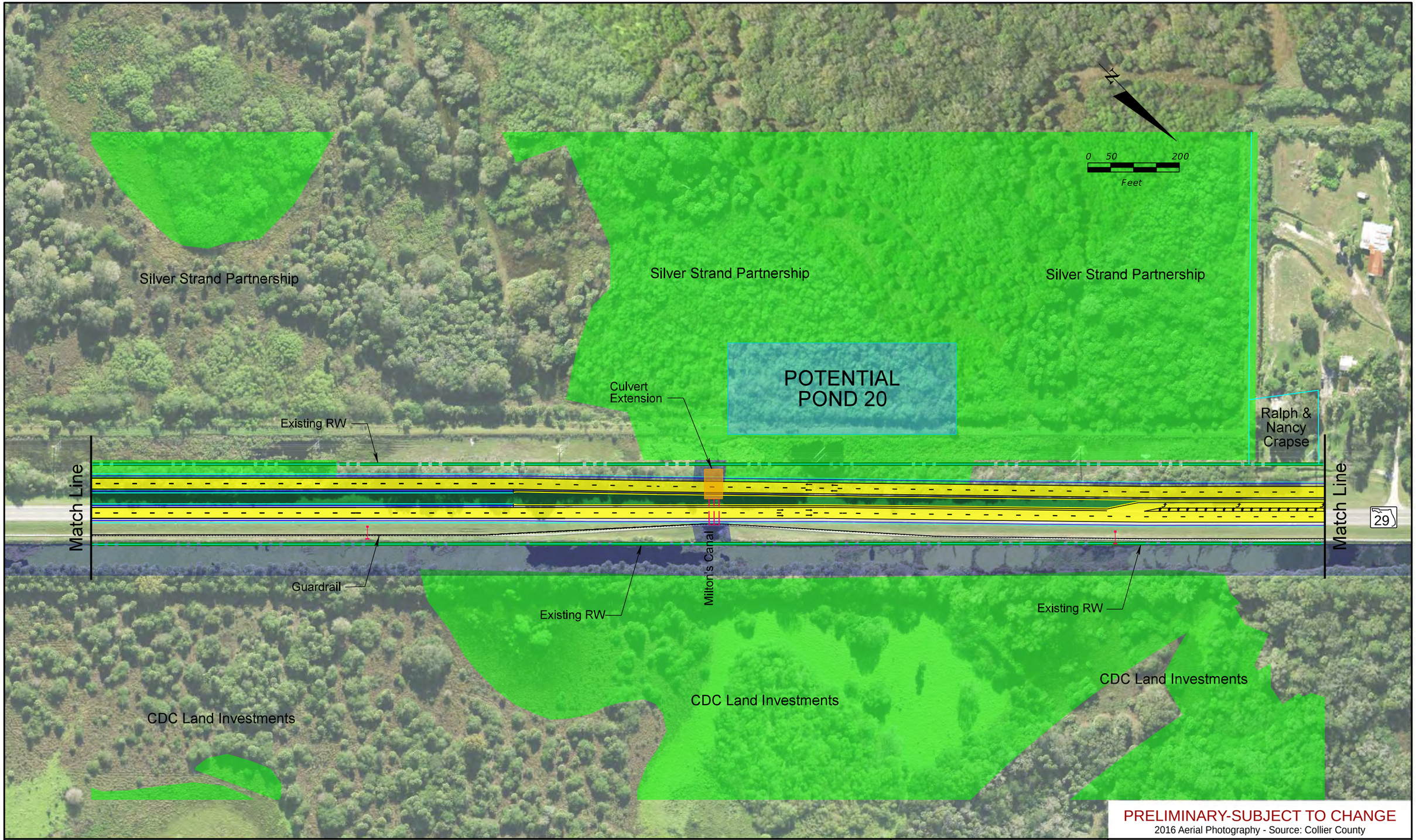

PRELIMINARY-SUBJECT TO CHANGE

2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

From Oil Well Road to SR 82

FPID NO: 417540 1 22 01 / FAP NO: 3911 022P

Legend

- Existing Right-of-Way
- Parcels
- Proposed Right-of-Way
- Water/Canal
- Seminole Land
- Wetland
- Potential Pond
- Potential Flood Plain Compensation
- Traffic Signal
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Sheet No. 15

Otis & Anita Crapse

Carroll McSwain

Joy Mullins

POTENTIAL POND 21

Silver Strand Partnership

Silver Strand Partnership

0 50 200
Feet

Existing RW

Match Line

Match Line

29

Guardrail

Existing RW

Future Entrance to Kaicasa (Habitat for Humanity)

CDC Land Investments

Habitat for Humanity

Habitat for Humanity

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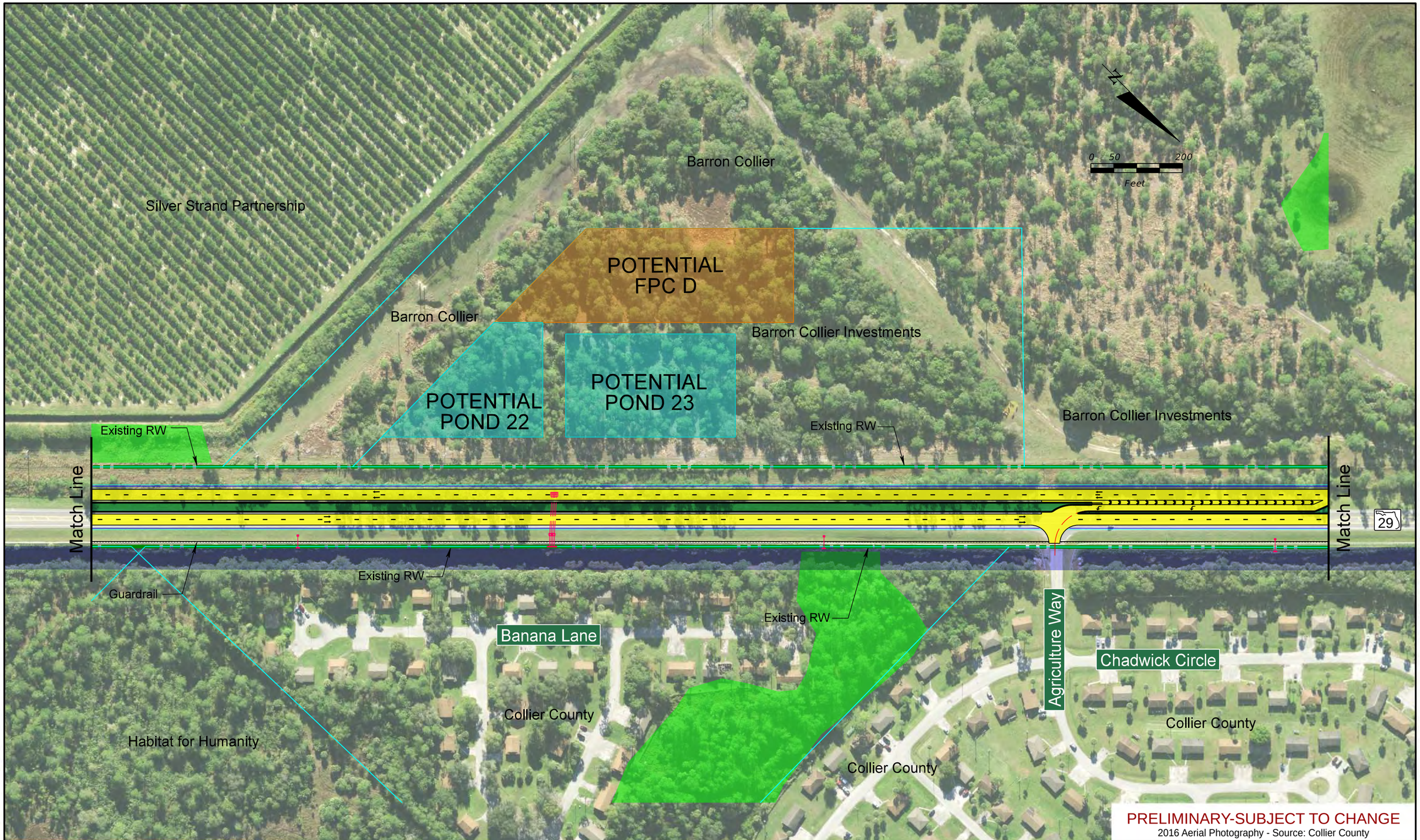

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Barron Collier Investments

Village Oaks Elementary

Barron Collier Investments

POTENTIAL POND 24

POTENTIAL POND 25

0 50 200

Feet

Existing RW

Proposed RW

Proposed 10' Shared Use Path

Match Line

Match Line

29

Existing RW

Replacement Pedestrian Overpass #039001

Existing Sidewalk

Farm Workers Way

6' Sidewalk

Collier County

Collier County

Elm Hammock Circle

Collier County

Collier County

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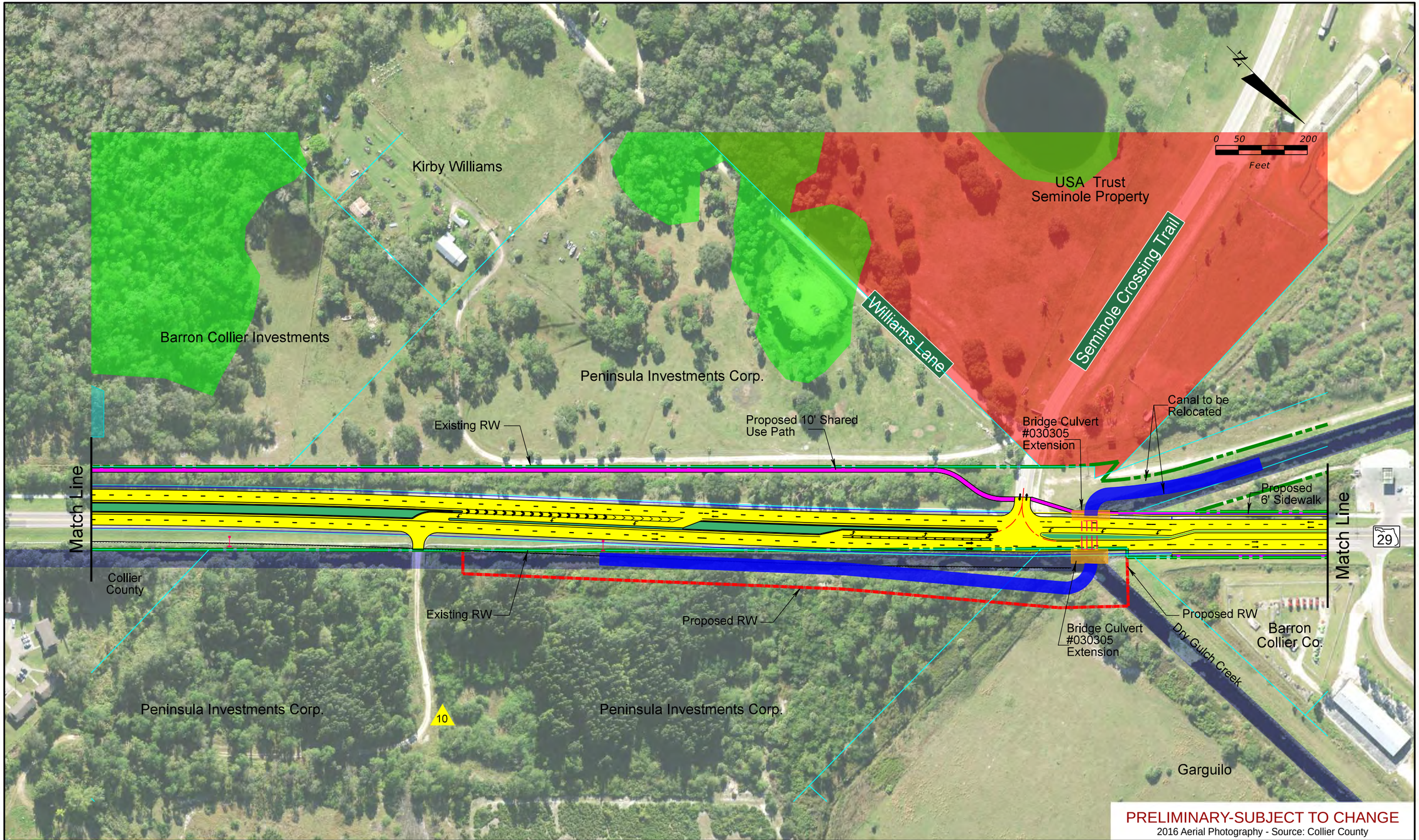

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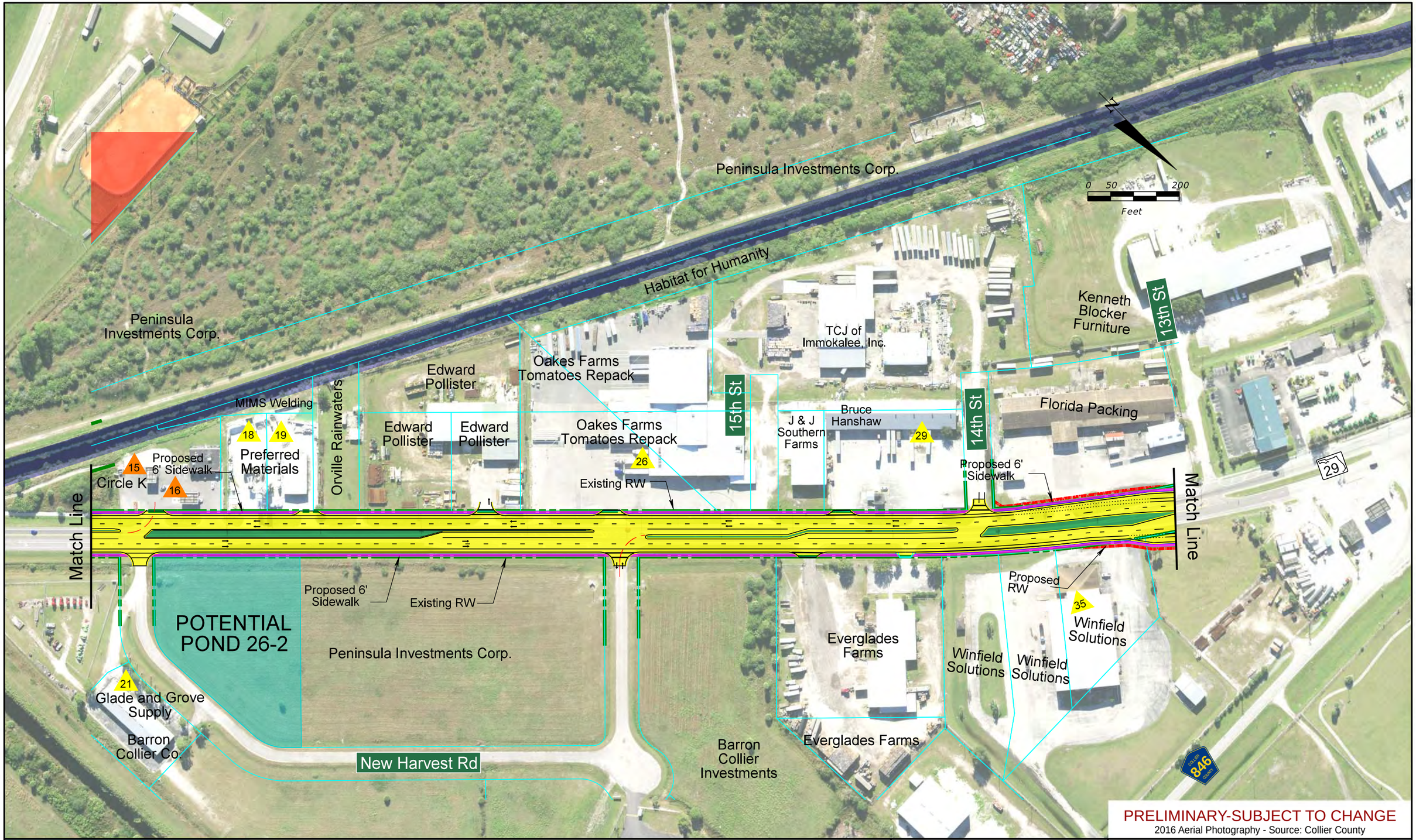

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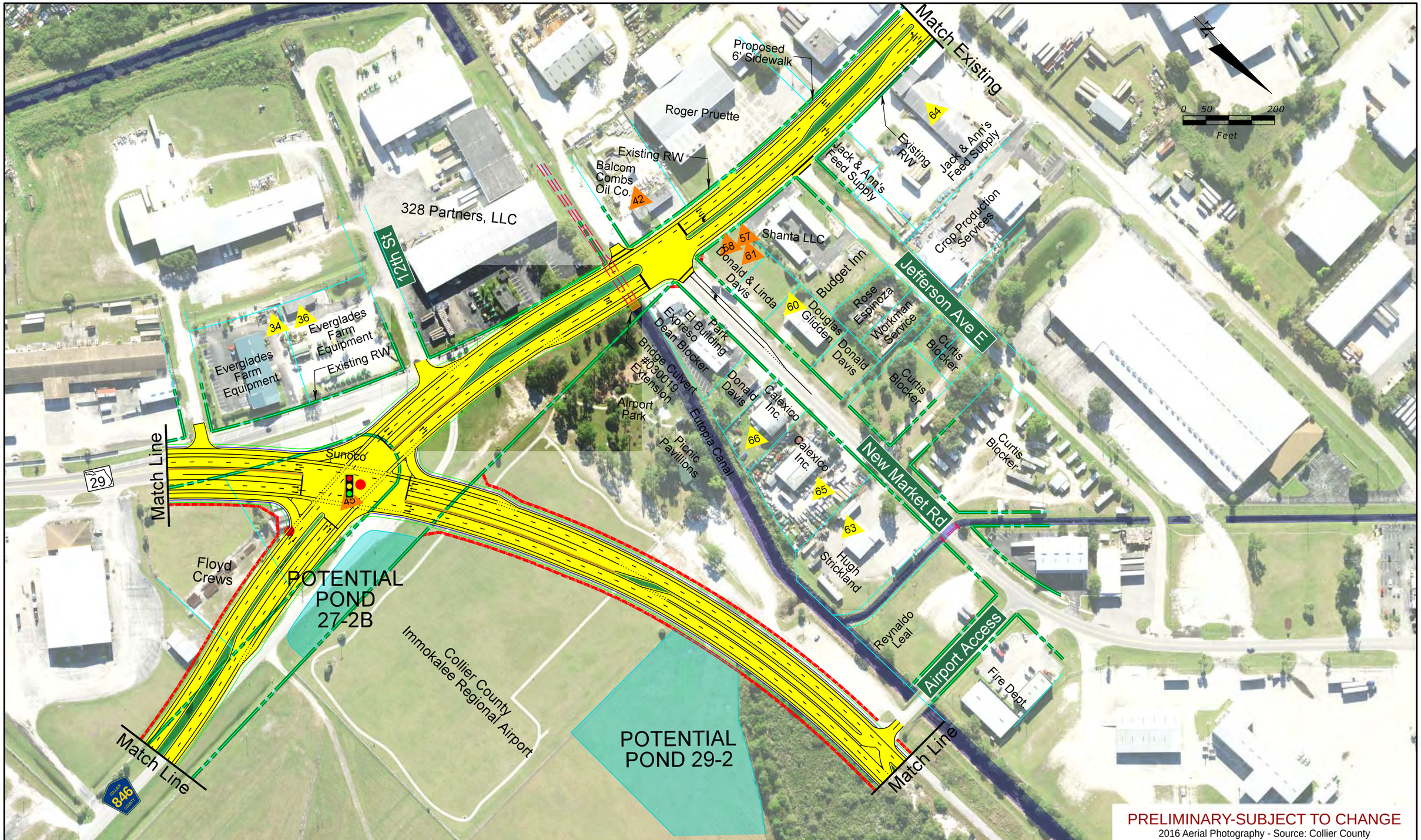

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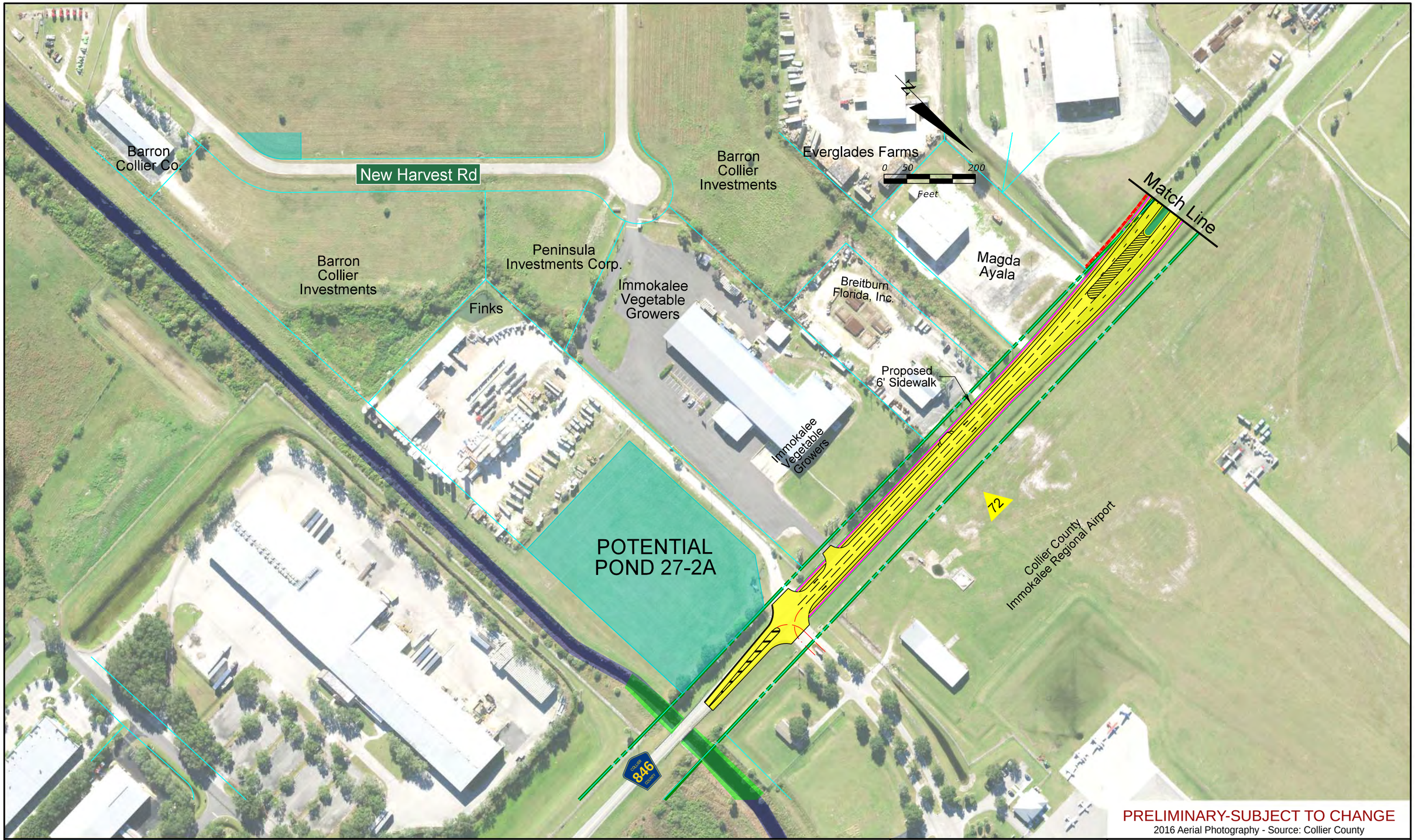

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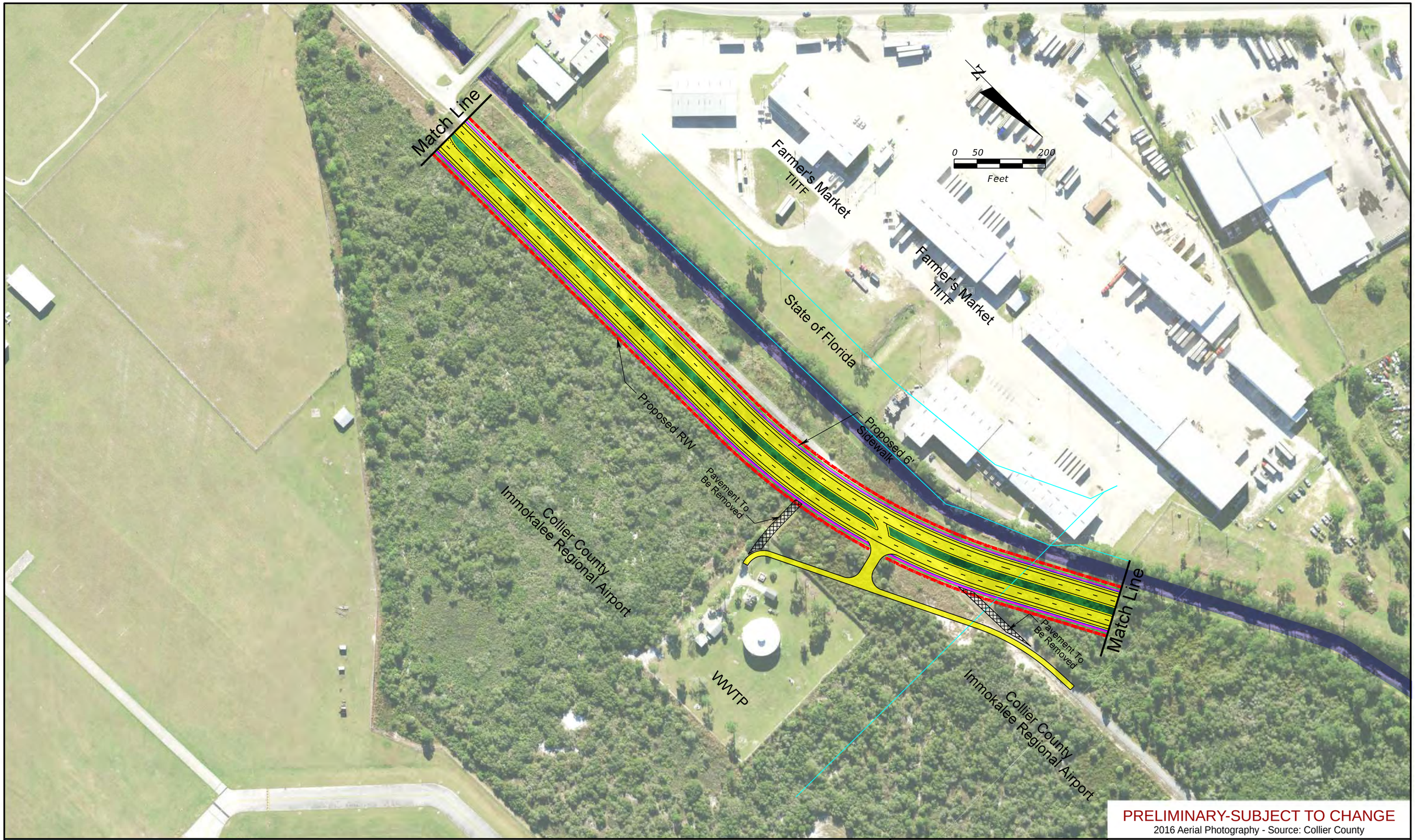

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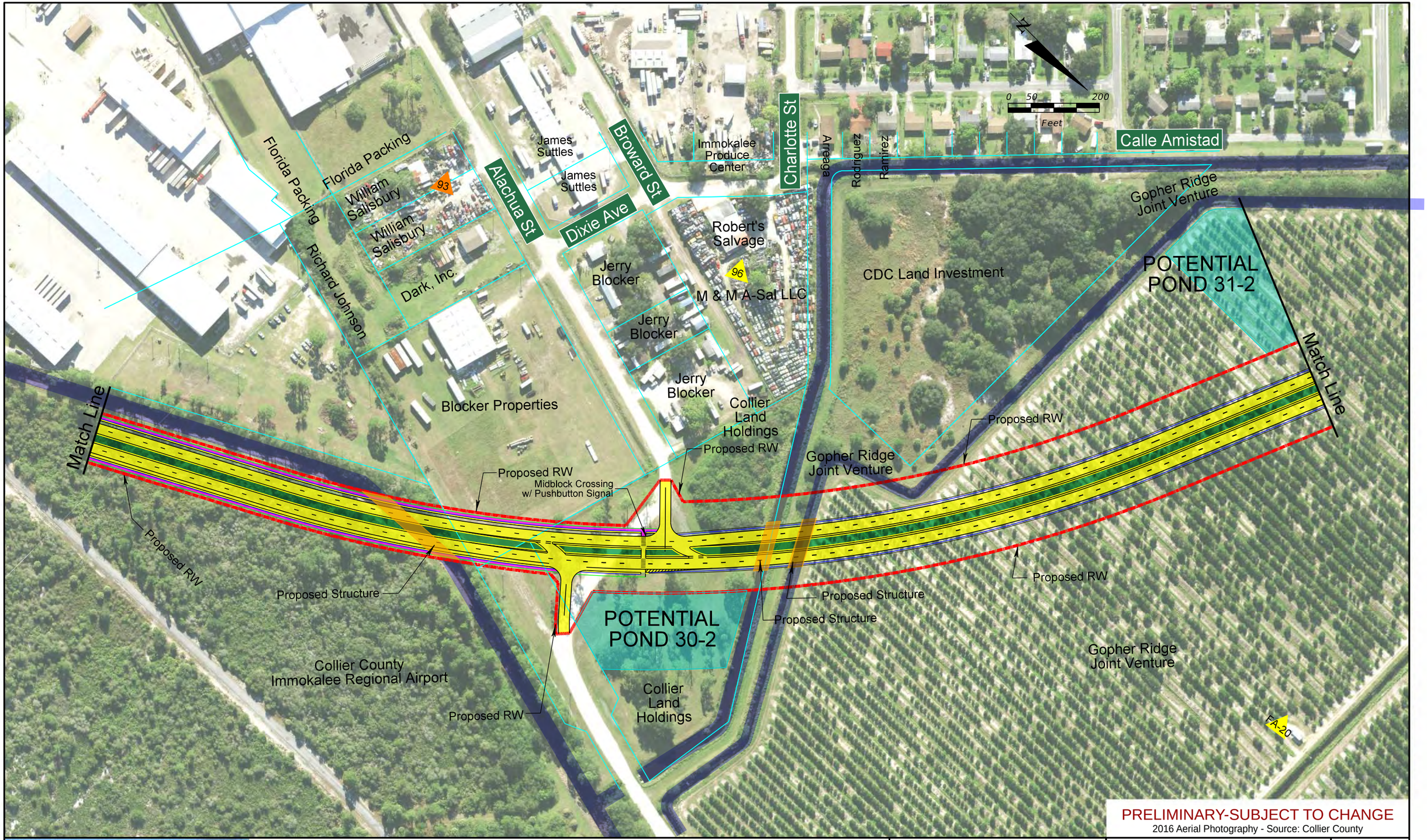

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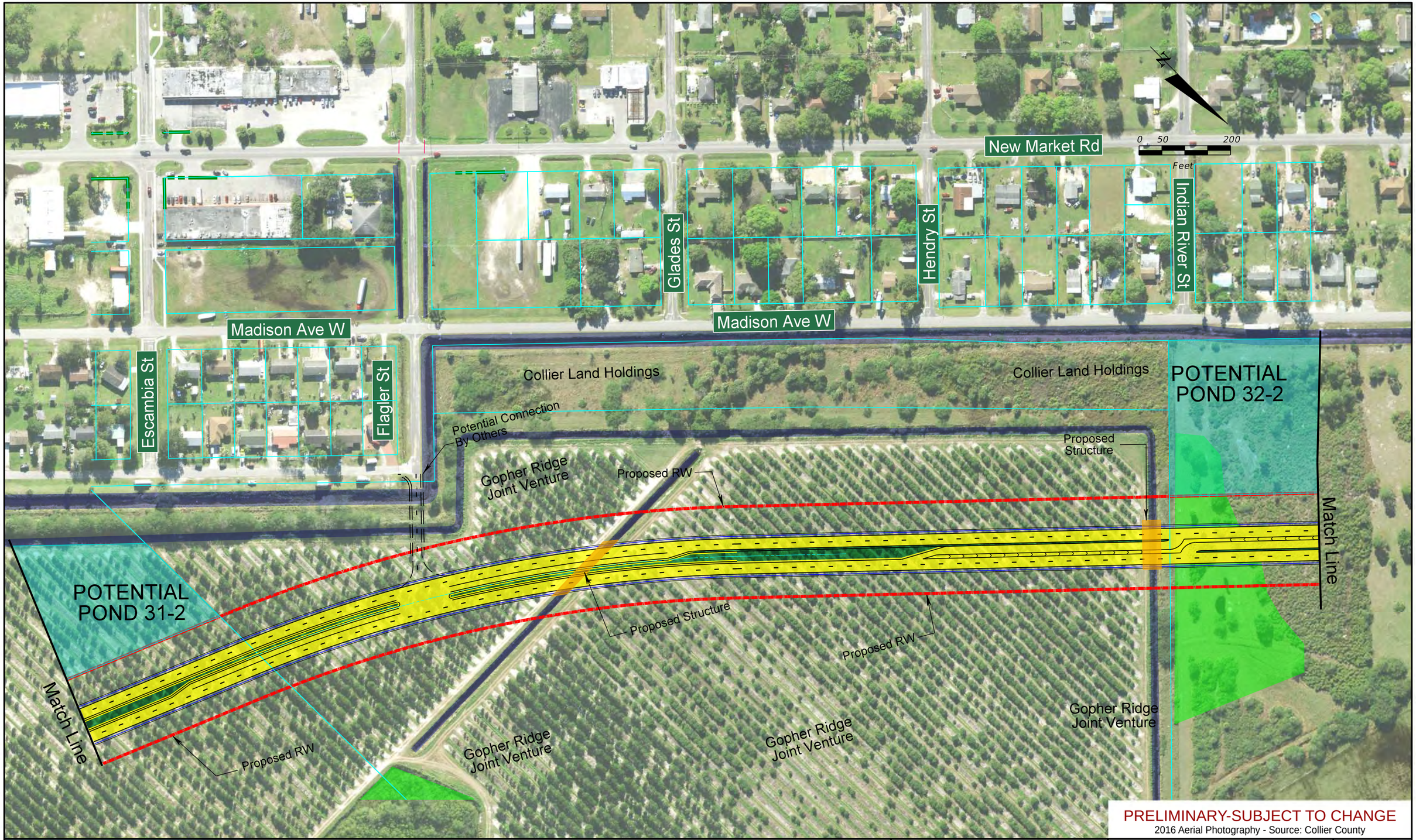

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Sheet No. 26

CDC Land Investments
Heritage

Proposed RW

Match Line

CDC Land Investments
Heritage

Potential Connection
By Others

Heritage Blvd

Community Health Care, Inc.

N

0 50 200
Feet

SR 29

Proposed RW

CDC Land Investments
Heritage

Proposed RW

CDC Land Investments
Heritage

Match Line

Gopher Ridge
Joint Venture

PRELIMINARY-SUBJECT TO CHANGE
2016 Aerial Photography - Source: Collier County

SR 29 PD&E Study

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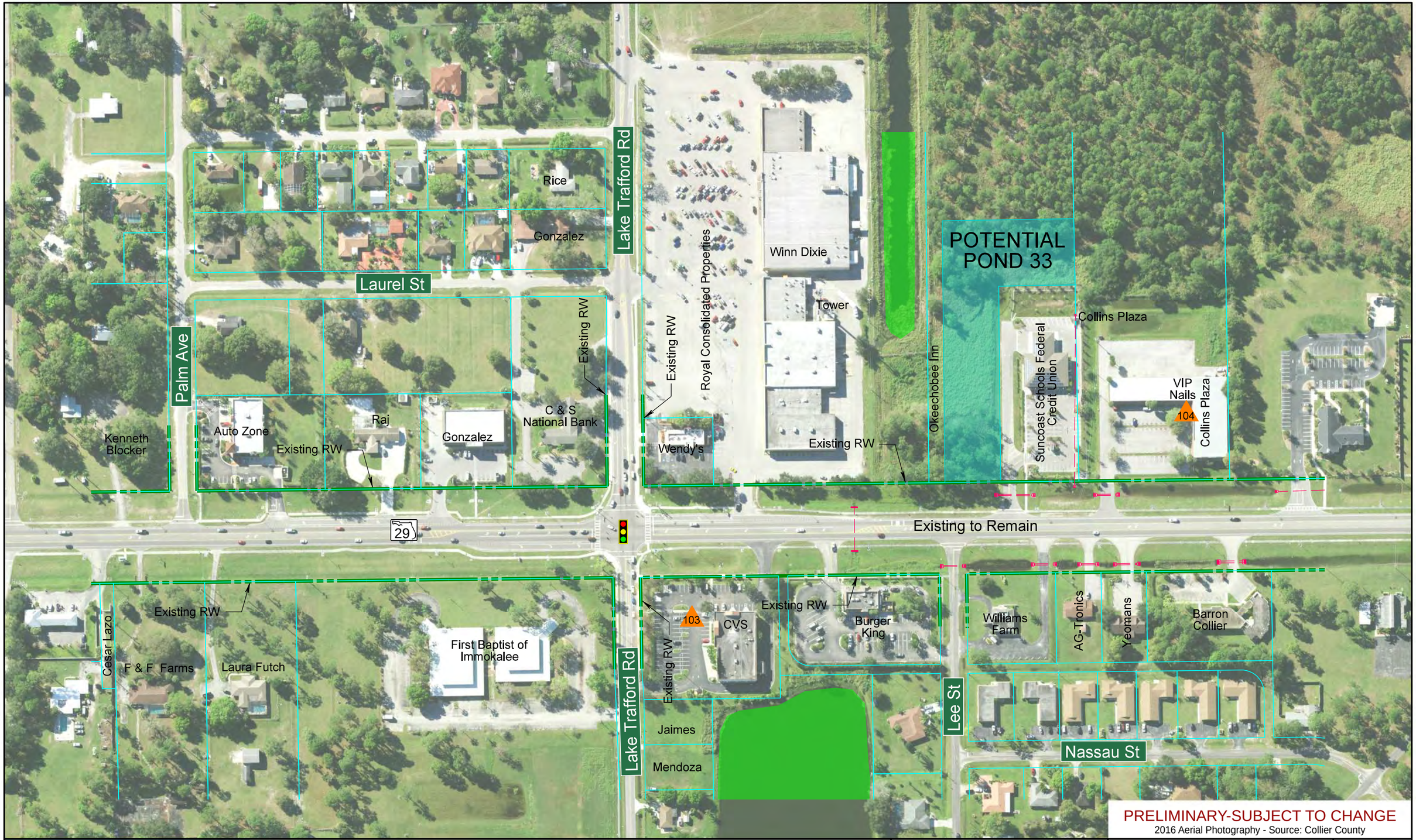

SR 29 PD&E Study

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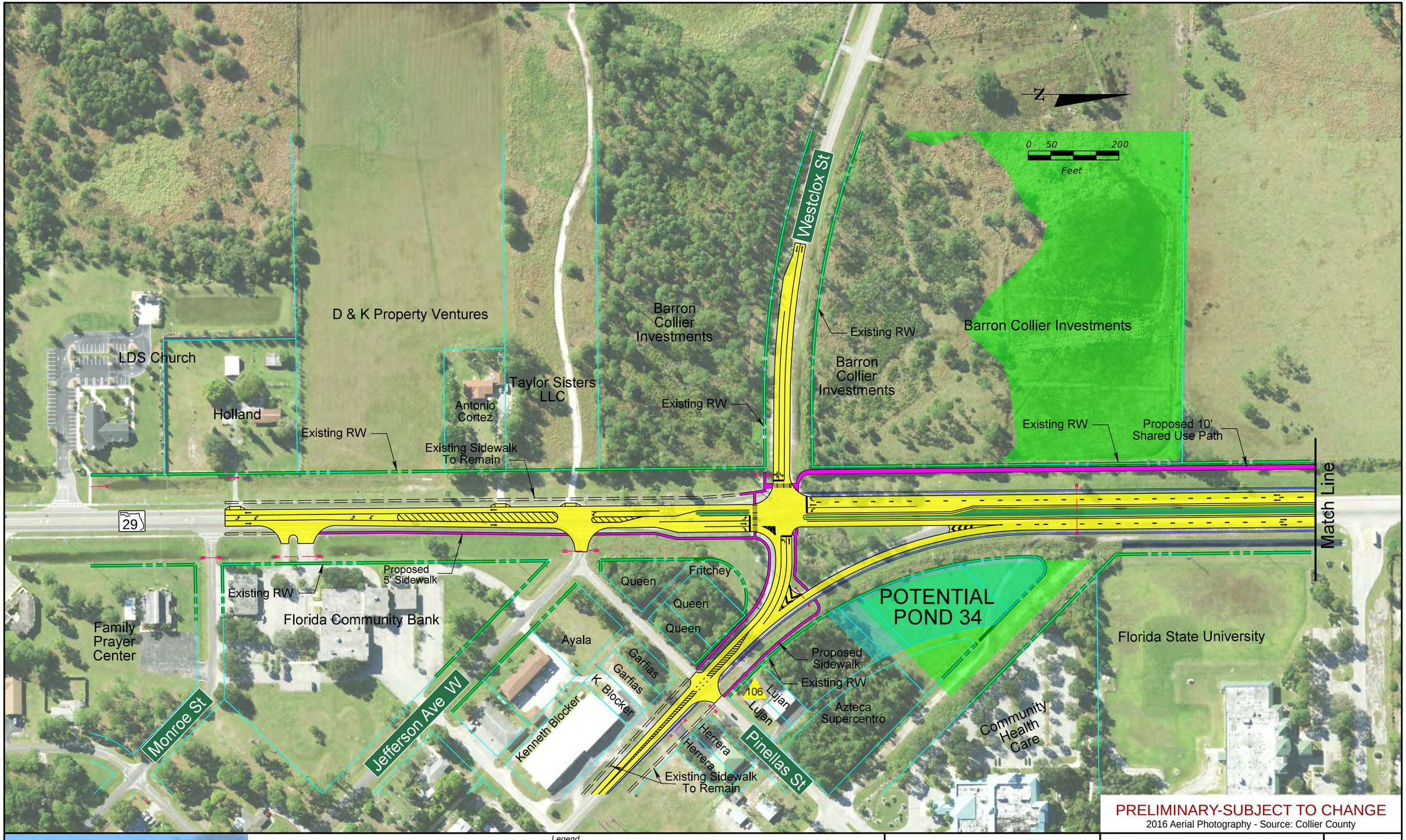

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Sheet No. 29

N

0 50 200
Feet

Barron Collier Investments

Everett Loukonen

Everett Loukonen

Existing RW

Proposed 10'
Shared Use Path

Match Line

29

Existing RW

Proposed RW

Collier
Land Holdings

POTENTIAL
POND 35

POTENTIAL
POND 36

Existing RW

Match Line

Proposed RW

Heritage Blvd

mmunity Health Care, Inc.

CDC Land Investments

Match Line

Gopher Ridge Joint Venture

PRELIMINARY-SUBJECT TO CHANGE
2016 Aerial Photography - Source: Collier County

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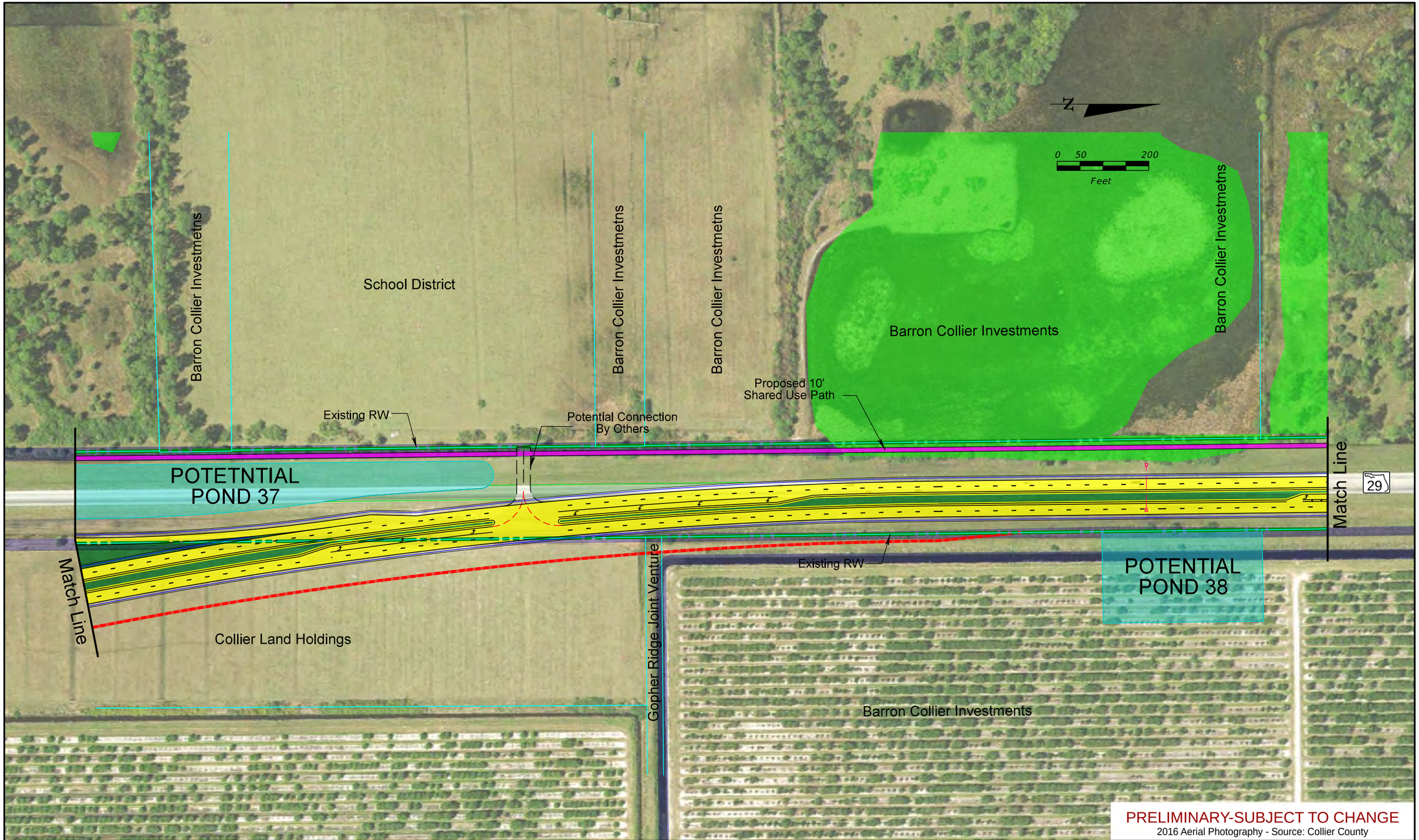

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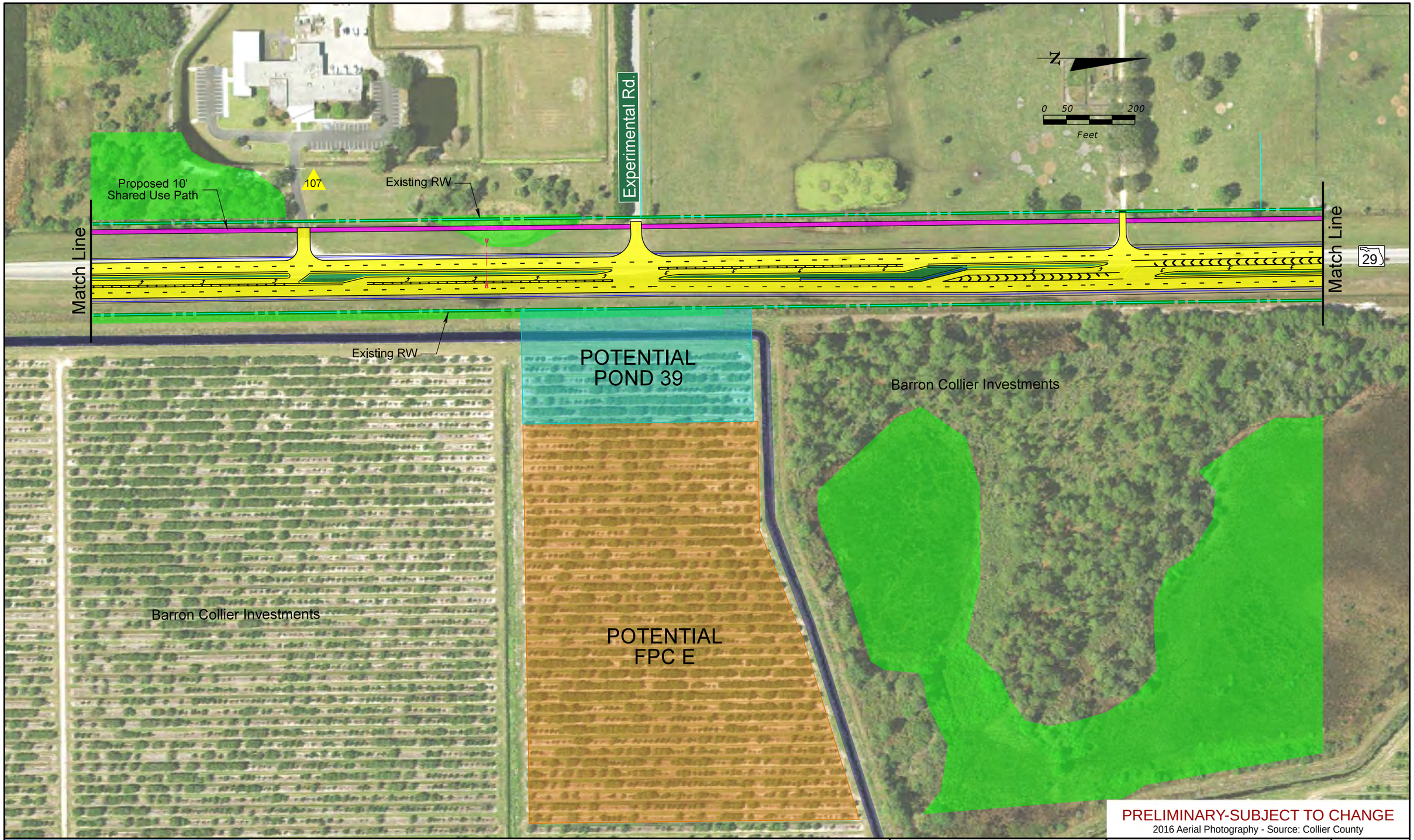

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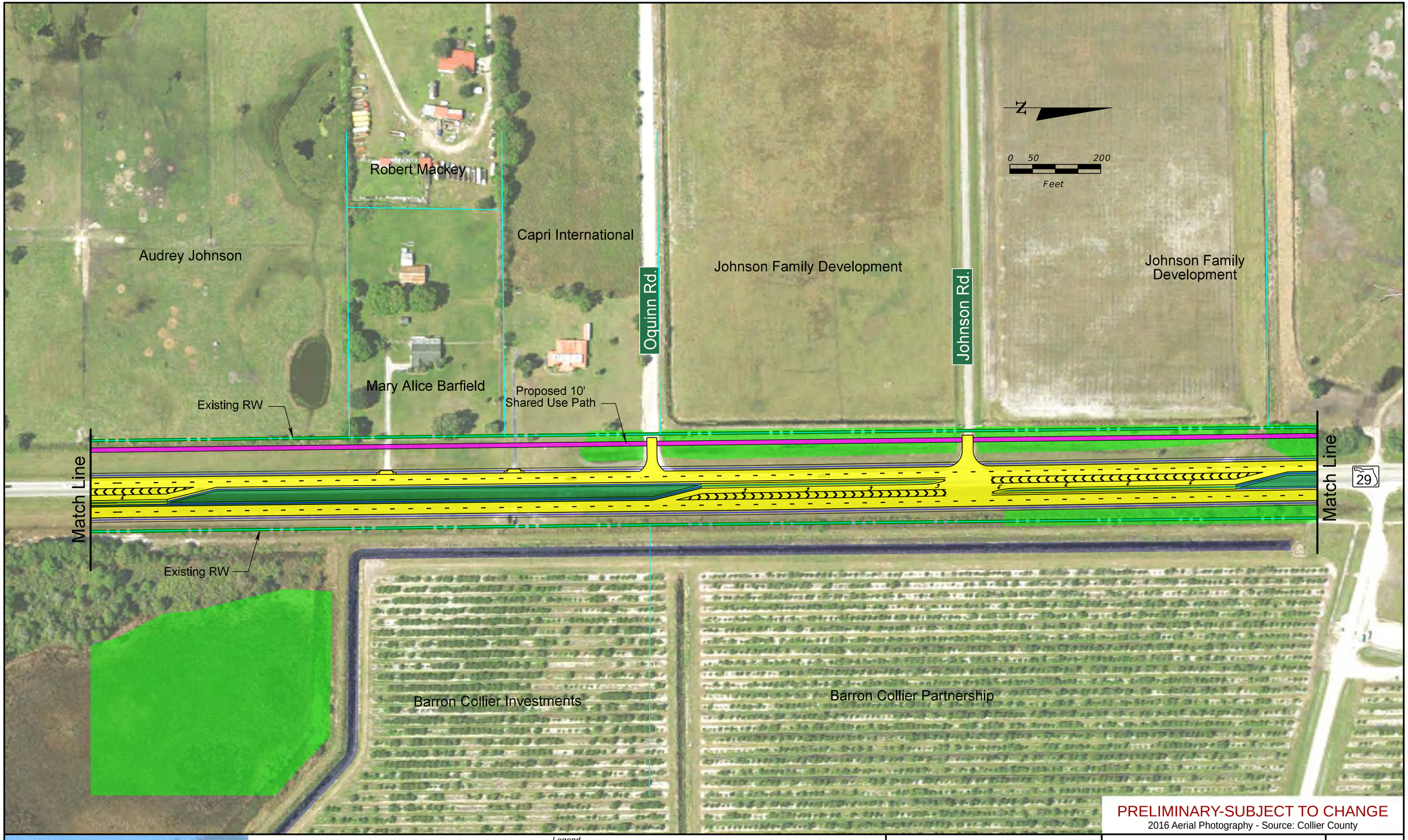

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Sheet No. 33

E & B Miller Family

Virginia Ayala

Virginia Ayala

N

0 50 200

Feet

END IMPROVEMENTS

Tie to Future Improvements By Others

Proposed 10' Shared Use Path

Existing RW

Match Line

Match Line

29

Existing RW

POTENTIAL POND 40

108

Barron Collier Partnership

Barron Collier Partnership

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2016 Aerial Photography - Source: Collier County

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Sheet No. 35

Appendix C
Audubon's Crested Caracara Survey Technical Report

DRAFT

SR 29 FROM OIL WELL ROAD TO SR 82

FPID No. 417540-1
Audubon's Crested Caracara Survey Technical Report

Prepared for
FDOT District One

May 2021

Prepared by
ESA

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- Field Survey Methodology 4

Results **4**

Conclusions **5**

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Figure 2 Land Use Within 1,500-Meter Secondary Buffer Zone Map
Figure 3 Crested Caracara Survey Stations and Observation Blocks Map
Figure 4 Crested Caracara Nest Tree Locations and Flight Paths Map
Figure 5 300 Meter Buffer (Primary Zone) of Nest Tree

Appendices

A. 2016 USFWS Crested Caracara Draft Survey Protocol – Additional Guidance (2016-2017 Breeding Season)
B. USFWS Caracara Survey Forms (updated 12/9/2016)
C. Summary of Caracara Survey Data
D. Representative Field of View at Survey Stations

SR 29 FROM OIL WELL ROAD TO SR 82

Audubon's Crested Caracara

Introduction

This report summarizes the methods and results of a 2021 species-specific Audubon's crested caracara (*Polyborus plancus audubonii*) survey conducted for the proposed improvements to State Road (SR) 29 from Oil Well Road to SR 82 in Collier County, Florida (**Figure 1**). The U.S Fish and Wildlife Service (USFWS) Audubon's crested caracara Consultation Area (CA) overlaps the entire project limits; therefore, there is the potential for habitat of this species to be impacted. This survey was conducted in accordance with the 2016 USFWS Crested Caracara Draft Survey Protocol – Additional Guidance (2016-2017 Breeding Season).

Species Information

Species and Habitat Description

The Audubon's crested caracara is a large, boldly patterned raptor with a crest, naked face, heavy bill, elongated neck, and long legs. It has a body length of about 50-60 centimeters (cm) (20-24 inches) and a wingspan of about 124 cm (50 inches). The adult is blackish-brown on the crown, upper abdomen, rump, wings, and thighs. The lower part of the head, throat, upper breast, lower abdomen, and undertail coverts are white or cream. The lower breast has blackish barring with a buff background color. The back is also heavily barred with black and white. The tail is white with 11 to 14 narrow dark crossbars and a broad terminal band; there are conspicuous white patches in the outer part of the wing in flight. The bill is bluish-gray which contrasts with the bright yellow facial skin, which turns reddish-orange when flushed with blood. The legs and feet are deep yellow. Juveniles have a similar color pattern but are brownish and buff with the breast and upper back streaked instead of barred. In addition, facial skin of juveniles is pinkish in color and the legs are gray.

Caracaras inhabit open xeric to mesic habitats. Its preferred habitat is native dry or wet prairie with associated marshes, cabbage palm (*Sabal palmetto*), and cabbage palm-live oak (*Quercus virginiana*) hammocks. Native prairie habitats have been greatly reduced in Florida via residential and commercial development and conversion to improved pasture, consequently, caracaras frequently utilize unimproved and improved pastures. Adult caracaras maintain and defend large territories, usually with their mates. Breeding activity can occur between September and June with the primary season being November through April. Suitable nest trees are an important component of caracara habitat. Cabbage palms are most frequently utilized followed by live oaks,

cypress (*Taxodium* spp.), and occasionally Australian pine (*Casuarina* spp.) and black gum (*Nyssa sylvatica*). Caracaras usually construct their nests 12 to 50 feet above the ground and they consist primarily of woven vines trampled to form a depression (Humphrey and Morrison 1997). Caracara pairs sometimes have two or three alternate nest trees that may be used in different years or for a second nesting effort within the same year. All nest trees are typically situated in the same general vicinity, usually within 0.3 miles of each other.

Caracaras forage extensively on the ground with a foraging range average of 3,000 acres and a radius of approximately one mile. Caracaras are opportunistic feeders with a diet consisting of carrion as well as a wide variety of live invertebrate and vertebrate prey. This species also closely follows agricultural equipment to capitalize on prey that may be exposed during agricultural activities. Agricultural drainage ditches, cattle ponds, roadside ditches, and other shallow water features also provide good feeding areas for caracaras (Morrison 2001). Within native habitats, caracaras regularly scavenge in recently burned areas and forage along the margins of wetlands within dry prairie communities.

Status

The Audubon's crested caracara is listed as a federally designated threatened species by the USFWS and is protected by both the Endangered Species Act (ESA), as amended (16 U.S.C. 1531 et seq.) and the Migratory Bird Treaty Act. No Critical Habitat has been designated for this species.

The decline of the caracara in Florida is primarily due to habitat loss. In particular, the optimal habitat for caracaras, dry prairie, has been largely destroyed or modified for agriculture and residential/commercial development. Additionally, previous regulatory mechanisms did not adequately prevent the destruction or modification of the caracara's habitat, located mainly on private land. Both of these factors led to the federal listing of the species.

In order to reduce the potential for nest abandonment and loss of eggs and small chicks from human disturbance, the USFWS recommends that primary and secondary protection zones be placed around nest trees (2004 USFWS). The primary zone encompasses a 360-degree area extending 300 meters (985 feet) outward from the nest tree. Morrison (2001) found that the adult caracaras are most sensitive to human disturbance during incubation or early nesting stages if the source of disturbance is within 300 meters from the nest tree. Year-round restrictions in the primary zone typically include activities such as alteration to pasture, wetlands, nest trees, and other vegetation, as well as construction of buildings, roads, power lines or canals, changes in land management activities, and chemical applications that are harmful to wildlife. Nesting season limitations within the primary zone include normal agricultural activities (only until nestlings fledge), human entry, and low flyovers by aircraft.

A 360-degree secondary zone is recommended as a foraging protection zone and extends 1,500 meters (4,920 feet) outward from the nest tree. Conservation measures for this zone include maintaining pasture, grassland, and wetlands (including ditches and canals) that are necessary for caracara foraging habitat. Conversion of pasture and wetland habitats in this zone to row crops,

sugarcane, citrus groves, pine plantations or hardwood forest may adversely affect caracaras. The use of chemicals toxic to wildlife including pesticides, fertilizers, or herbicides should be limited as they may impact the food supply available for caracaras. Normal ranching and agricultural operations (including sod farming), hiking, bird watching, fishing, camping, picnicking, hunting, and recreational off-road vehicle use are allowed within the secondary zone.

Existing Environmental Characteristics

Natural/biological features and land use within the survey boundary were initially reviewed using the 2014/2016 Florida Land Use, Cover and Forms Classification System (FLUCFCS) Geographic Information System (GIS) data layer available from the South Florida Water Management District (SFWMD). A 1,500-meter secondary zone buffer of the project limits, which comprises the project action area for this species, was created. Citrus Groves (FLUCFCS 2210, ~ 23%) is the predominant land use, followed by Improved Pastures (FLUCFCS 2110, ~ 17%). The remaining land use / land cover categories with significant coverage in the 1,500-meter buffer include: Woodland Pastures (FLUCFCS 2130, ~ 8%), Row Crops (FLUCFCS 2140, ~ 7%), Freshwater Marshes / Graminoid Prairie - Marsh (FLUCFCS 6410, ~ 6%), Unimproved Pastures (FLUCFCS 2120, ~ 6%), Cypress (FLUCFCS 6210, ~ 3%), and Mixed Wetland Hardwoods (FLUCFCS 6170, ~ 3%). These categories total 73% of the land use/land cover within a 1,500-meter buffer of the project limits. **Figure 2** depicts the land uses within the 1,500-meter buffer. Lands surrounding the project limits are impacted due to agricultural activities such as growing row crops, cattle grazing, and citrus farming.

Methodology

Preliminary Data Collection

A comprehensive literature and GIS database search was conducted for the project action area (1,500-meter buffer of the project boundary) to determine if the Audubon's crested caracara was previously documented within the project limits and if suitable habitat was available. The literature and database search included standard references such as the Rare and Endangered Biota of Florida Series, Florida Geographic Data Library (FGDL) GIS databases, as well as the Florida Fish and Wildlife Conservation Commission (FWC) and USFWS lists of protected species and their GIS databases.

Based on this preliminary protected species effort, caracara findings include the following:

- The project falls within the USFWS Audubon's crested caracara CA;
- No critical habitat has been designated for the caracara; and
- Suitable foraging and nesting habitat was identified within the project limits and outside the project limits.

Field Survey Methodology

Project biologists examined current aerial imagery and also the 2014/2016 SFWMD FLUCFCS data to identify appropriate areas to survey for caracara nests. A 1,500-meter buffer of the project area was used to identify any potential nests that would have a primary 300-meter and/or secondary 1,500-meter protection zone that overlaps with the project limits. Potential survey stations were identified and a field review was conducted to verify the suitability of the survey stations.

Twelve (12) survey stations were established which allowed for a field of view that included potential caracara nesting trees. Determination of survey stations was based upon potential available nesting habitat, area of visibility, and suitable foraging habitat. Caracara foraging and nest tree surveys were conducted bi-weekly from January 4, 2021 through April 30, 2021, and each survey event included field surveys in the morning per the 2016 USFWS Crested Caracara Draft Survey Protocol – Additional Guidance (2016-2017 Breeding Season) (**Appendix A**). Foraging and nest tree surveys began 15 minutes before sunrise and lasted three hours. For each survey event, a team of one or two field biologists monitored a predetermined survey station. Typically, each person worked individually and routinely, assessing the project area to the greatest extent possible and monitoring areas that had suitable nesting and/or foraging habitat in the vicinity. Survey efforts were focused in open and woodland pastures which provided the best foraging habitat for the species, contained potential nest trees, and provided the best visibility for the survey area. Survey stations and observation blocks are presented in **Figure 3**. Once a caracara nest tree was identified, a productivity survey was then initiated following the USFWS guidelines.

USFWS Caracara Survey Forms were used to record survey observations and all survey forms are provided in **Appendix B**. Information recorded on the forms includes names of observers, current weather, number of caracaras observed, their age class, crested caracara activity, and incidental wildlife species observed.

Results

Potential foraging habitat for the species was identified throughout the project landscape. Pastureland, citrus groves, lightly wooded areas, and roadways (which provide roadkill) offer foraging opportunities for caracaras and are all are present within the project area. Potential nesting habitat for the species was also identified within the project area; specifically, pastureland and rural residential land containing cabbage palms. Within the SR 29 right-of-way (ROW), potential nesting habitat was observed which consists of cabbage palms and slash pines (*Pinus elliottii*). All caracara observations were recorded and the results are presented in **Figure 4.** A summary of the crested caracara survey data is documented in **Appendix C**. Photos documenting the representative field of view at each survey station are in **Appendix D**. Crested caracara observer experience is documented in **Table 1** shown below.

Table 1. Crested Caracara Observer Experience.

Name	Primary or Secondary Observer	Total Hours of Experience	Number of Caracara Nests Previously Found
Robert Mrykalo	Primary	383	3
Tori Kuba	Primary	124	2
Christine Sciarrino	Primary	250	1
Brad Young	Primary	75	0
Troy Craig	Secondary	40	0
Brendon Quinton	Primary	82	1
Sandy Scheda	Primary	250	5
Zackary Yawn	Secondary	48	0
Craig Stout	Primary	203	3

Crested caracaras were observed at all 12 survey stations during field surveys, but nesting activity was only observed at Station 1 and Station 10 (**Figure 4**). Potential nesting activity was first observed at Station 1 on January 4, 2021 and the location of the nest was documented on February 17, 2021 in a cabbage palm. Two immature caracaras with downy feathers were documented in this nest late in the survey season, and in accordance with USFWS survey guidance requirements, biologists continued to visit the nest every two weeks to verify that the immature caracaras had fledged. The last observations of caracaras in this nest occurred on May 4, 2021. The nest was rechecked two weeks later on May 19, 2021, and no caracaras were observed in the nest or in the vicinity, indicating that the immature caracaras had fledged from the nest.

Potential nesting activity was first observed at Station 10 on February 9, 2021 and the location of the nest was documented on March 9, 2021 in a cabbage palm tree. One immature caracara was documented in the nest and the young bird no longer had downy feathers. The last observation of an immature caracara at this nest tree occurred on March 23, 2021. No caracaras were observed in the nest or in the vicinity of the nest on April 7, 2021 indicating the immature caracara had fledged from the nest.

Conclusions

Based on the field surveys two active crested caracara nests were documented within 1,500 meters of the project limits; one nest observed near Station 1 and a second nest observed near Station 10 (**Figure 5**). For the caracara nest documented near Station 1, the 300-meter primary zone of this nest is outside of the project limits, but this nest is located within 1,500 meters of the project limits. For the caracara nest documented near Station 10 the nest is located approximately

85 meters (279 feet) west of the project limits and the primary zone for this nest overlaps the project limits.

Approximately 7.46 acres of the SR 29 project footprint is located within the primary protection zone for the caracara nest located near 300-meter Station 10 and the land use within this acreage is categorized as Upland Shrub and Brushland (FLUCFCS 3200).

The nest tree will not be directly affected by the roadway project and only a small area of primary zone habitat will be converted to roadway use. There are recommendations in place to reduce impacts to the crested caracara, and the primary zone of a caracara nest is particularly important to this species during nesting season, therefore, the following construction precautions may be implemented to reduce any potential impact to the nest:

- Land clearing activities for the project will be conducted outside of the caracara nesting season (December 1 through April 30) to the greatest extent practicable. Since caracara nesting season is from December 1 through April 30, clearing should be completed between May 1 and November 30.

- Should it be necessary to conduct land clearing activities within the nesting season (December 1 through April 30), the applicant or their designated agent will survey suitable caracara nesting habitat within the project site to determine if an active caracara nest occurs within or adjacent to (i.e., within viewing distance) the project site. If an active nest is observed on or near the project site (i.e., within 300 meters), land clearing within 300 meters (985 feet) of the nest will not occur until monitoring has determined the nest has either been abandoned, or chicks within the nest have fledged and left the nest site.

Because the project will only impact a small acreage of habitat within the primary zone, and land clearing activities are proposed to occur outside of the caracara nesting season, it's anticipated that this project "may affect, but not likely to adversely affect" the Audubon's crested caracara.

References

Humphrey, S.R., and J. L. Morrison. 1997. Habitat Associations, Reproduction, and Foraging Ecology of Audubon's Crested Caracaras in South-Central Florida. Final Report. Florida Game and Freshwater Fish Commission (Florida Fish and Wildlife Conservation Commission) Nongame Program Project No. NG91-007 (August 8, 1997).

Morrison, J. L. 2001. Recommended Management Practices and Survey Protocols for Audubon's Crested Caracara (*Polyborus plancus audubonii*) in Florida. Technical Report No. 18. Florida Fish and Wildlife Conservation Commission, Tallahassee, FL.

U.S. Fish and Wildlife Service. 2004. Species Conservation Guidelines South Florida. Audubon's Crested Caracara.

U.S. Fish and Wildlife Service. 2016. USFWS Crested Caracara Draft Survey Protocol – Additional Guidance (2016-2017 Breeding Season).

Figures

Figure 1 Project Location Map
Figure 2 Land Use Within 1,500-Meter Secondary Buffer Zone Map
Figure 3 Crested Caracara Survey Stations and Observation Blocks Map
Figure 4 Crested Caracara Nest Tree Locations and Flight Paths Map
Figure 5 300-Meter Buffer (Primary Zone) of Nest Trees

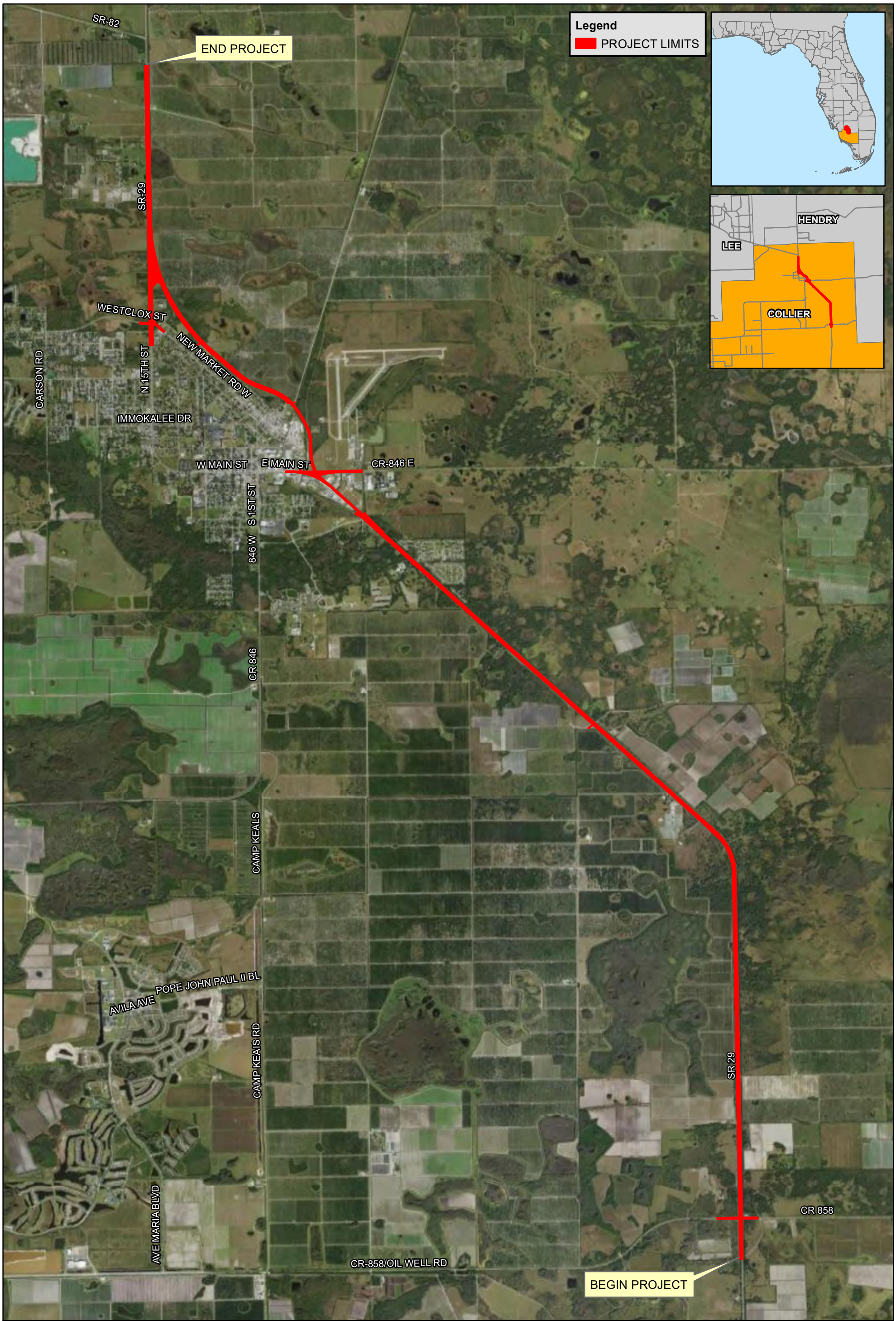

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Figure 1 - Project Location Map

FPID #: 417540-1
SR 29 from Oil Well Road to SR 82
Collier County, Florida

0 4,000 8,000 12,000 Feet

Data Source:
- Lochner
- ESA

Imagery Source:
- Esri

Coordinate System:
WGS 84

N

END PROJECT

Legend

- PROJECT LIMITS
- 1500M BUFFER PROJECT LIMITS
- LAND USE / LAND COVER

CODE, DESCRIPTION

- 1110, Fixed Single Family Units
- 1120, Mobile Home Units
- 1130, Mixed Units Fixed and Mobile Home Units
- 1210, Fixed Single Family Units
- 1220, Mobile Home Units
- 1230, Mixed Units Fixed and Mobile Home Units
- 1290, Medium Density Under Construction
- 1320, Mobile Home Units
- 1330, Multiple Dwelling Units Low Rise
- 1350, Mixed Units Fixed and Mobile Home Units
- 1400, Commercial and Services
- 1410, Retail Sales and Services (not used in map)
- 1420, Wholesale Sales & Services
- 1480, Cemeteries
- 1550, Other Light Industry
- 1700, Institutional
- 1710, Educational Facilities
- 1860, Community Recreation Facilities
- 2110, Improved Pastures
- 2120, Unimproved Pastures
- 2140, Row Crops
- 2160, Mixed Crops
- 2210, Citrus Groves
- 2230, Other Groves
- 2430, Ornamentals
- 2510, Horse Farms
- 2610, Fallow Cropland
- 3100, Herbaceous (Dry Prairie)
- 3200, Upland Shrub and Brushland
- 3210, Palmetto Prairies
- 3300, Mixed Rangeland
- 4110, Pine Flatwoods
- 4200, Upland Hardwood Forests
- 4220, Brazilian Pepper
- 4240, Melaleuca
- 4280, Cabbage Palm
- 4340, Upland Mixed Coniferous / Hardwood
- 5120, Channelized Waterways Canals
- 5300, Reservoirs
- 6170, Mixed Wetland Hardwoods
- 6180, Cabbage Palm Wetland
- 6190, Exotic Wetland Hardwoods
- 6200, Wetland Coniferous Forests
- 6210, Cypress
- 6250, Wet Pinelands Hydric Pine
- 6300, Wetland Forested Mixed
- 6410, Freshwater Marshes / Graminoid Prairie - Marsh
- 6430, Wet Prairie
- 6440, Emergent Aquatic Vegetation
- 8110, Airports
- 8200, Communications
- 8330, Water Supply Plants - Including Pumping Stations
- 8340, Sewage Treatment

State Road 29
New Market Rd W
New Market Rd E
N 1st St
S 1st St
W Main St
Immokalee Regional Airport
County Road 846
Immokalee Rd

Figure 2 - Land Use Within 1,500-Meter Buffer Secondary Zone Map

Sheet 1 of 2

FPID #: 417540-1
SR 29 from Oil Well Road to SR 82
Collier County, Florida

0 4,000 8,000 12,000 Feet

Data Source:
- SFWMD
- Lochner
- ESA

Imagery Source:
- Esri

Coordinate System:
WGS 84

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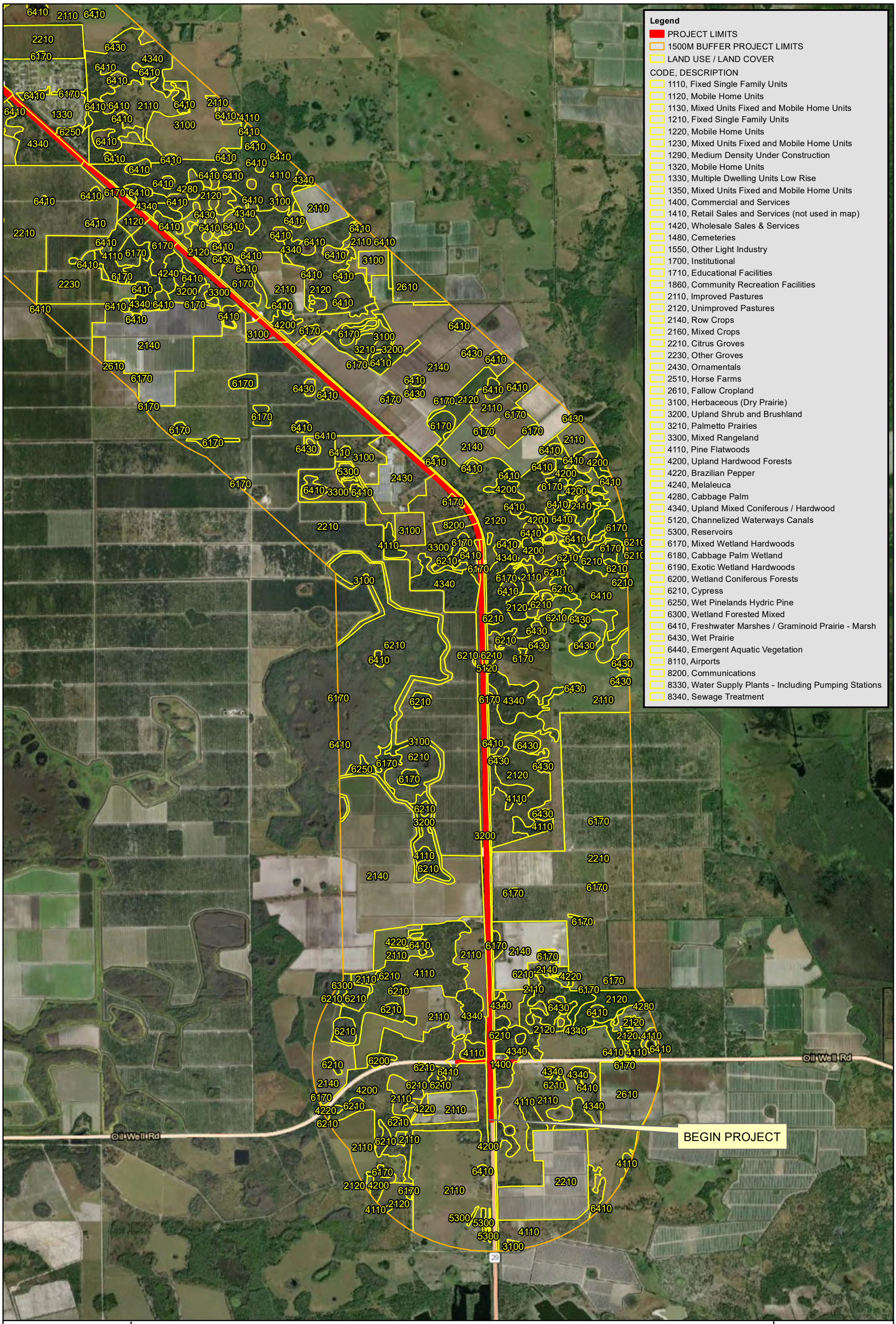

Figure 2 - Land Use Within 1,500-Meter Buffer Secondary Zone Map

Sheet 2 of 2

FPID #: 417540-1
SR 29 from Oil Well Road to SR 82
Collier County, Florida

Feet
0 4,000 8,000 12,000

Data Source:
- SFWMD
- Lochner
- ESA

Imagery Source:
- Esri

Coordinate System:
WGS 84

N

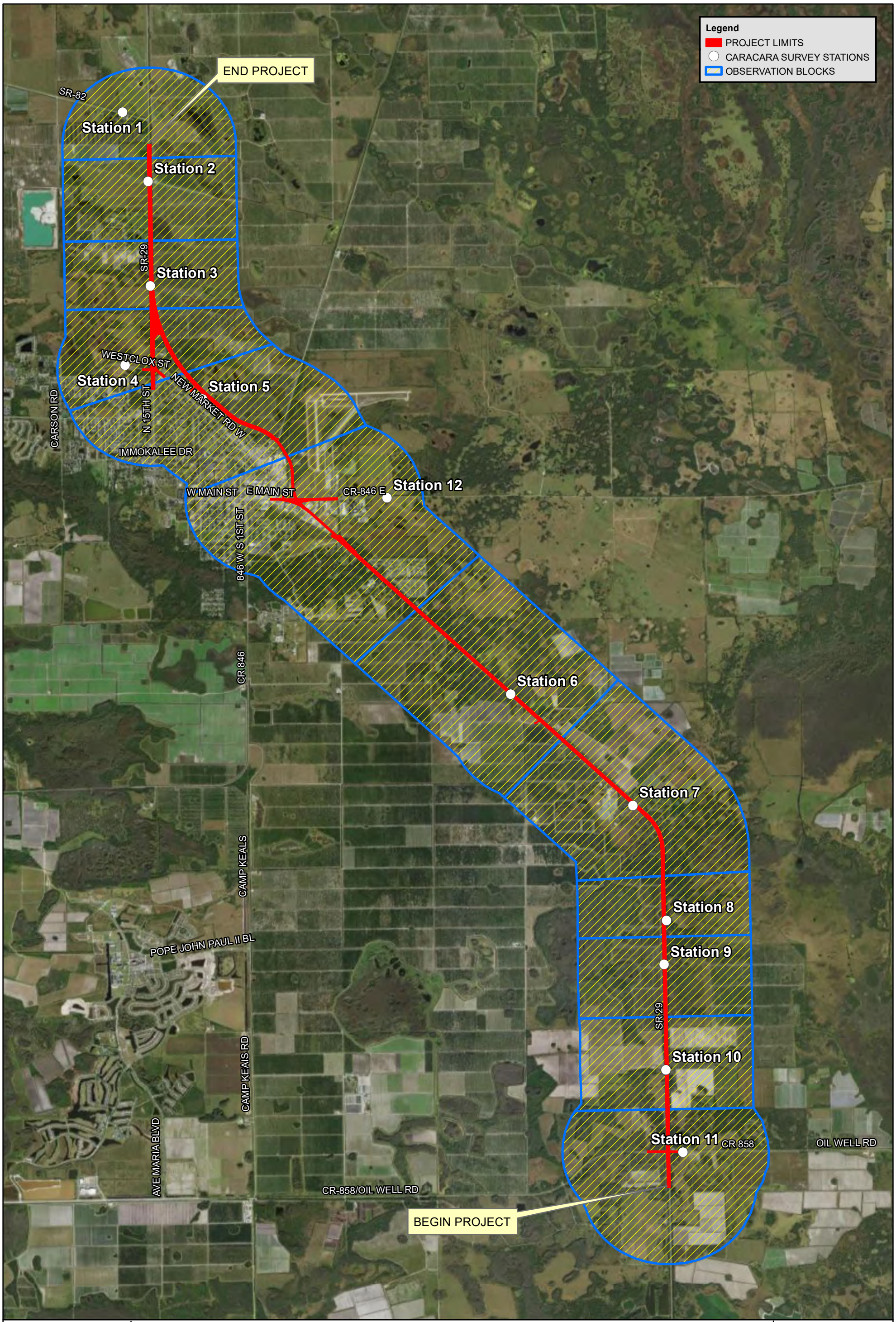

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Figure 3 - Crested Caracara Survey Stations and Observation Blocks Map

FPID #: 417540-1
SR 29 from Oil Well Road to SR 82
Collier County, Florida

0 4,000 8,000 12,000 Feet

Data Source:
- SFWMD
- Lochner
- ESA

Imagery Source:
- Esri

Coordinate System:
WGS 84

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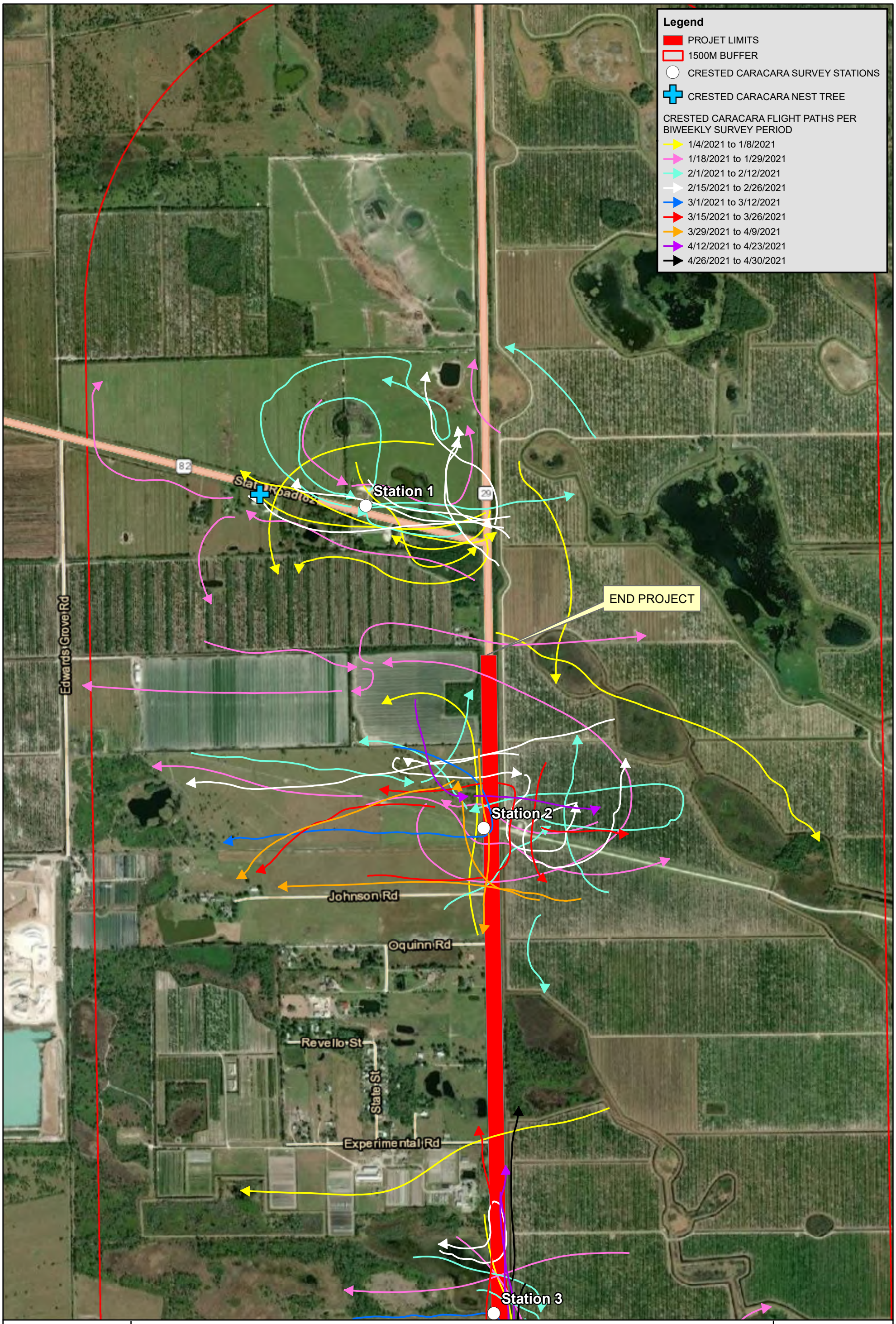

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Figure 4 - Crested Caracara Nest Tree Locations and Flight Paths Map

Sheet 1 of 8

FPID #: 417540-1

SR 29 from Oil Well Road to SR 82

Collier County, Florida

Feet

0 1,000 2,000 3,000

Data Source:
- Lochner
- ESA

Imagery Source:
- Esri

Coordinate System:
NAD 1983 Florida State Plane East

N

Station 2
Station 3
Station 4
Station 5
Johnson Rd
Oquinn Rd
Revello St
Stata St
Experimental Rd
Eden Ave
Lincoln Ave
Lee St
Lake Trafford Rd
Palm Ave
8th Ave
Santa Rosa Ave
5th Ave
Ash Ln
Pine St
Baker St
Titus Ln
Tara St
Dilsa Ln
Max Dr
Dimar Ln
Ashley Ln
Kristy Ln
Carson Rd
Plum St
Tangerine St
Orange St
Apple St
N 18th St
N 19th St N
N 15th St
N 11th St
N 9th St
N 17th St
N 16th St
N 10th St
Nassau St
Monroe St
Jackson St
Hendry St
Clifton St
Washington Ave
Escambia St
Adams Ave W
Jefferson Ave W
New Market Rd W
Manatee Ave W
Madison Ave W
Pine St
ritage Blvd
29

Legend

- PROJET LIMITS
- 1500M BUFFER
- CRESTED CARACARA SURVEY STATIONS
- CRESTED CARACARA NEST TREE

CRESTED CARACARA FLIGHT PATHS PER BIWEEKLY SURVEY PERIOD

- 1/4/2021 to 1/8/2021
- 1/18/2021 to 1/29/2021
- 2/1/2021 to 2/12/2021
- 2/15/2021 to 2/26/2021
- 3/1/2021 to 3/12/2021
- 3/15/2021 to 3/26/2021
- 3/29/2021 to 4/9/2021
- 4/12/2021 to 4/23/2021
- 4/26/2021 to 4/30/2021

Date: xx/xx/xx Rev. Date: xx/xx/xx PM: XXX GIS Analyst: XXX Map Document: XXXXX.mxd Project Number: XXXX PDF Document: XXXXX.pdf Plot Size: 11 x 17

Figure 4 - Crested Caracara Nest Tree Locations and Flight Paths Map

Sheet 2 of 8

FPID #: 417540-1
SR 29 from Oil Well Road to SR 82
Collier County, Florida

0 1,000 2,000 3,000 Feet

Data Source:
- Lochner
- ESA

Imagery Source:
- Esri

Coordinate System:
NAD 1983 Florida State Plane East

N

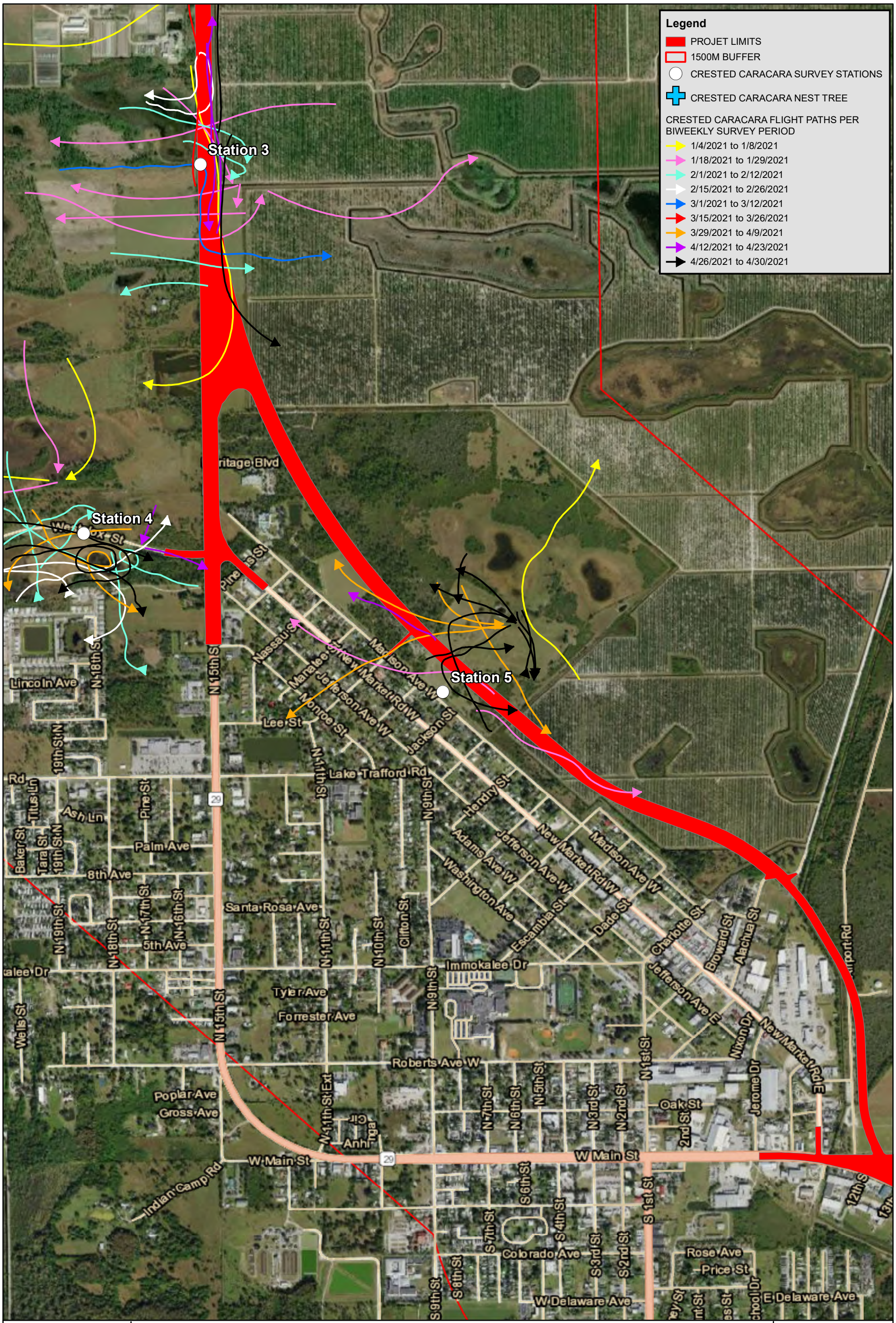

Figure 4 - Crested Caracara Nest Tree Locations and Flight Paths Map

Sheet 3 of 8

FPID #: 417540-1

SR 29 from Oil Well Road to SR 82

Collier County, Florida

0 1,000 2,000 3,000 Feet

Data Source:
- Lochner
- ESA

Imagery Source:
- Esri

Coordinate System:
NAD 1983 Florida State Plane East

N

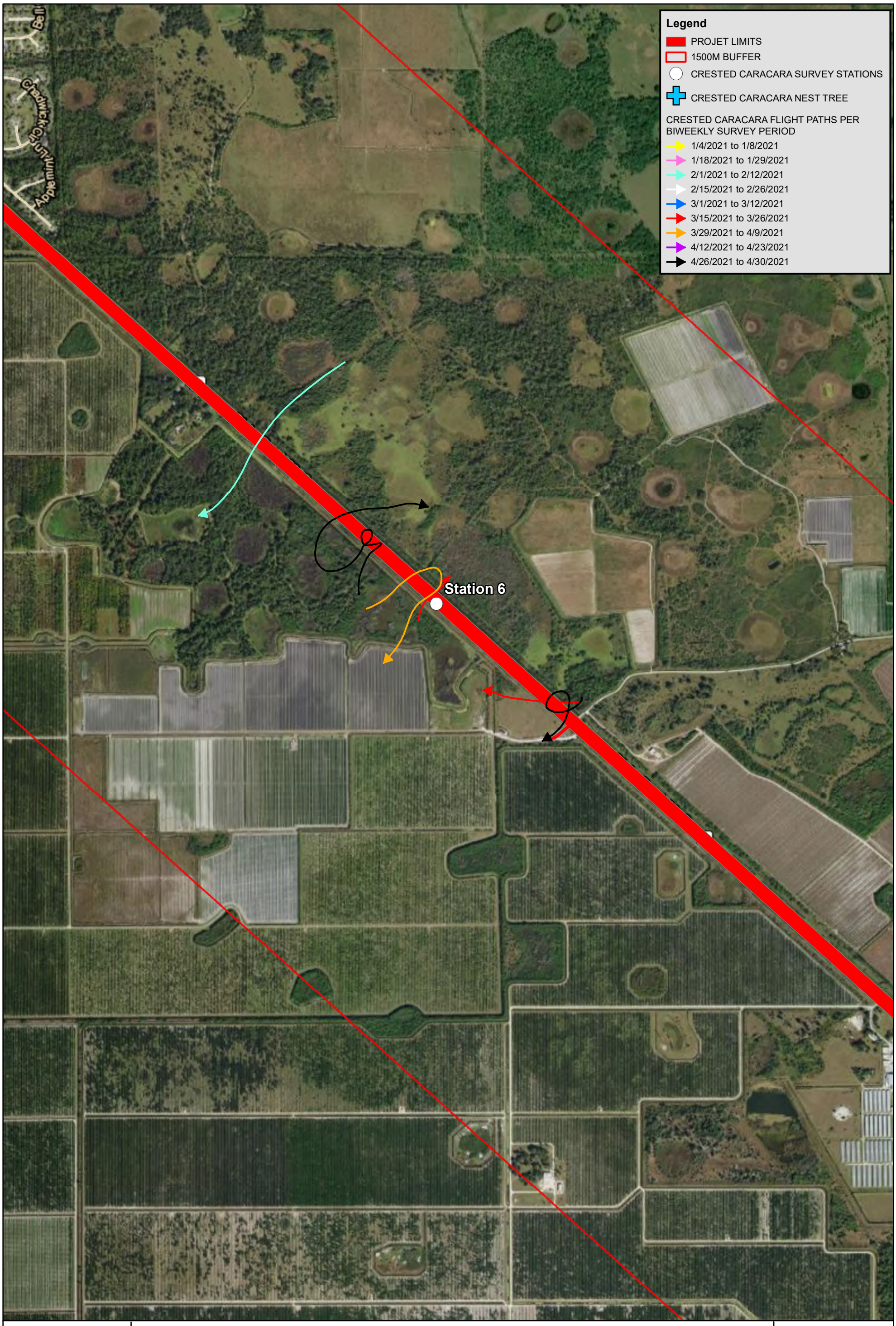

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Figure 4 - Crested Caracara Nest Tree Locations and Flight Paths Map

Sheet 4 of 8

FPID #: 417540-1
SR 29 from Oil Well Road to SR 82
Collier County, Florida

0 1,000 2,000 3,000 Feet

Data Source:
- Lochner
- ESA

Imagery Source:
- Esri

Coordinate System:
NAD 1983 Florida State Plane East

N

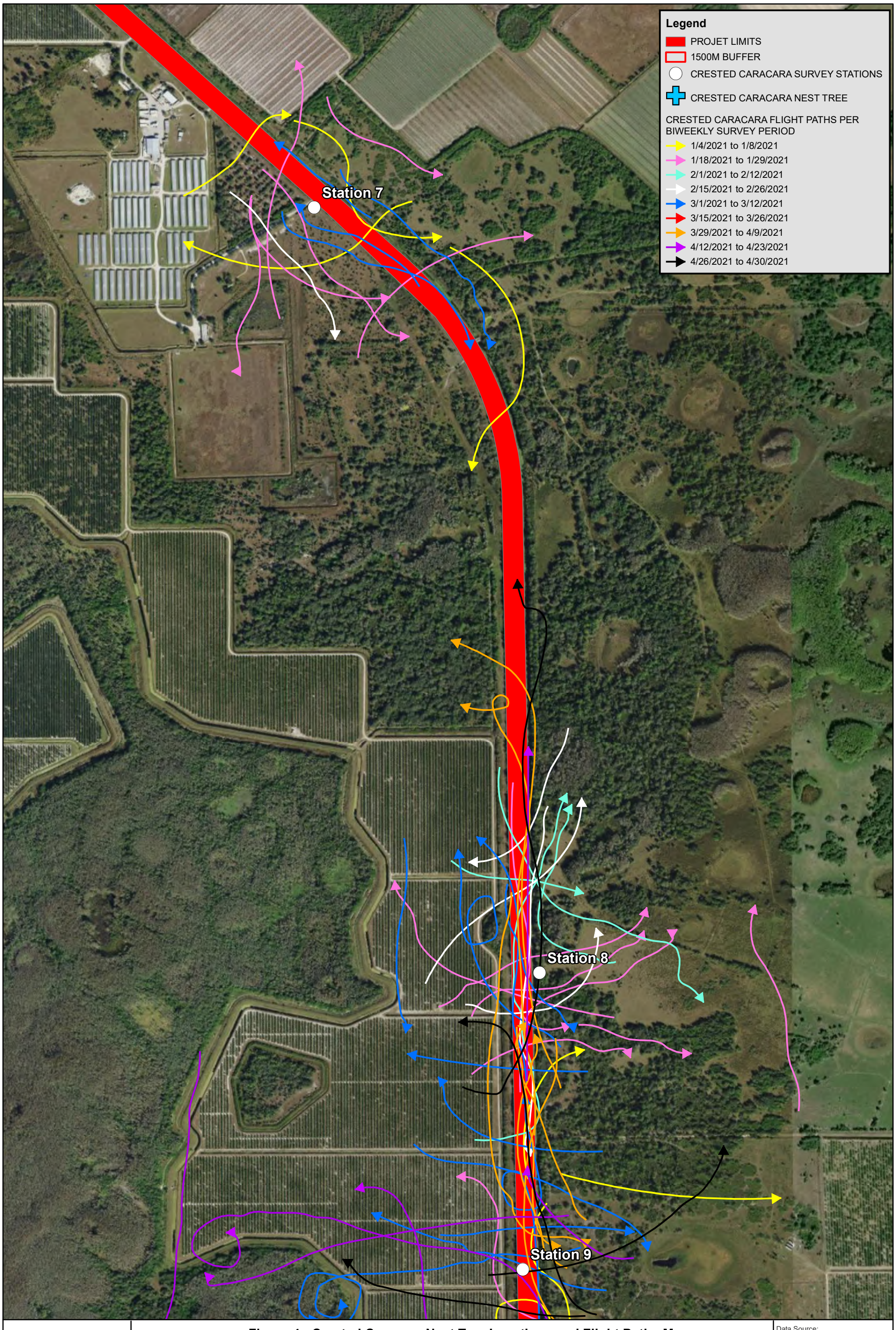

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Figure 4 - Crested Caracara Nest Tree Locations and Flight Paths Map

Sheet 5 of 8

FPID #: 417540-1
SR 29 from Oil Well Road to SR 82
Collier County, Florida

Feet
0 1,000 2,000 3,000

Data Source:
- Lochner
- ESA

Imagery Source:
- Esri

Coordinate System:
NAD 1983 Florida State Plane East

N

Station 8

Station 9

Station 10

Legend

- PROJET LIMITS
- 1500M BUFFER
- CRESTED CARACARA SURVEY STATIONS
- CRESTED CARACARA NEST TREE

CRESTED CARACARA FLIGHT PATHS PER BIWEEKLY SURVEY PERIOD

- 1/4/2021 to 1/8/2021
- 1/18/2021 to 1/29/2021
- 2/1/2021 to 2/12/2021
- 2/15/2021 to 2/26/2021
- 3/1/2021 to 3/12/2021
- 3/15/2021 to 3/26/2021
- 3/29/2021 to 4/9/2021
- 4/12/2021 to 4/23/2021
- 4/26/2021 to 4/30/2021

Date: xx/xx/xx Rev. Date: xx/xx/xx PM: XXX GIS Analyst: XXX Map Document: XXXXX.mxd Project Number: XXXX PDF Document: XXXXX.pdf Plot Size: 11 x 17

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Figure 4 - Crested Caracara Nest Tree Locations and Flight Paths Map

Sheet 6 of 8

FPID #: 417540-1
SR 29 from Oil Well Road to SR 82
Collier County, Florida

0 1,000 2,000 3,000 Feet

Data Source:
- Lochner
- ESA

Imagery Source:
- Esri

Coordinate System:
NAD 1983 Florida
State Plane East

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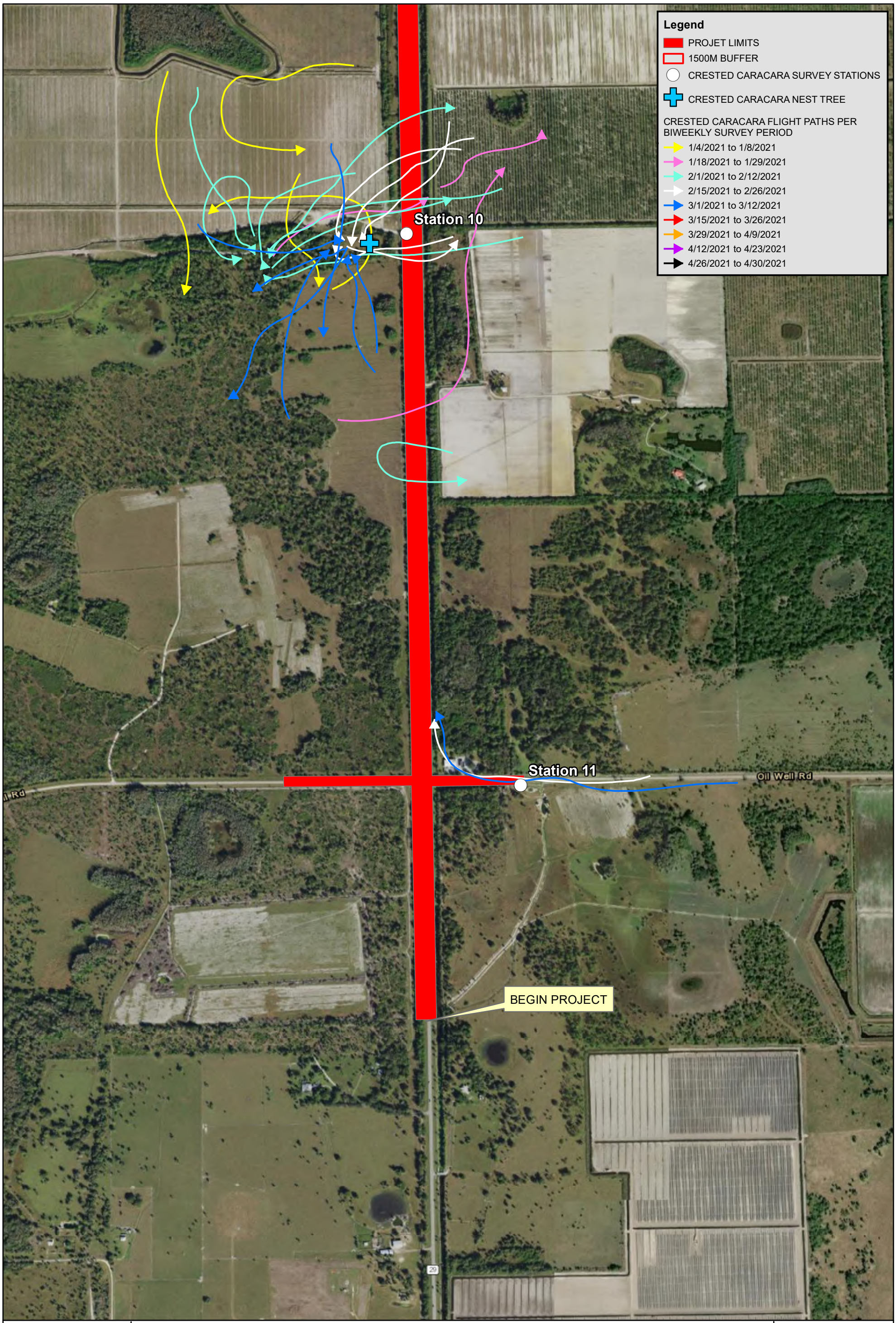

Date: xx/xx/xx Rev. Date: xx/xx/xx PM: XXX GIS Analyst: XXX Map Document: XXXXX.mxd Project Number: XXXX PDF Document: XXXXX.pdf Plot Size: 11 x 17

Figure 4 - Crested Caracara Nest Tree Locations and Flight Paths Map

Sheet 7 of 8

FPID #: 417540-1
SR 29 from Oil Well Road to SR 82
Collier County, Florida

0 1,000 2,000 3,000 Feet

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Data Source:
- Lochner
- ESA

Imagery Source:
- Esri

Coordinate System:
NAD 1983 Florida State Plane East

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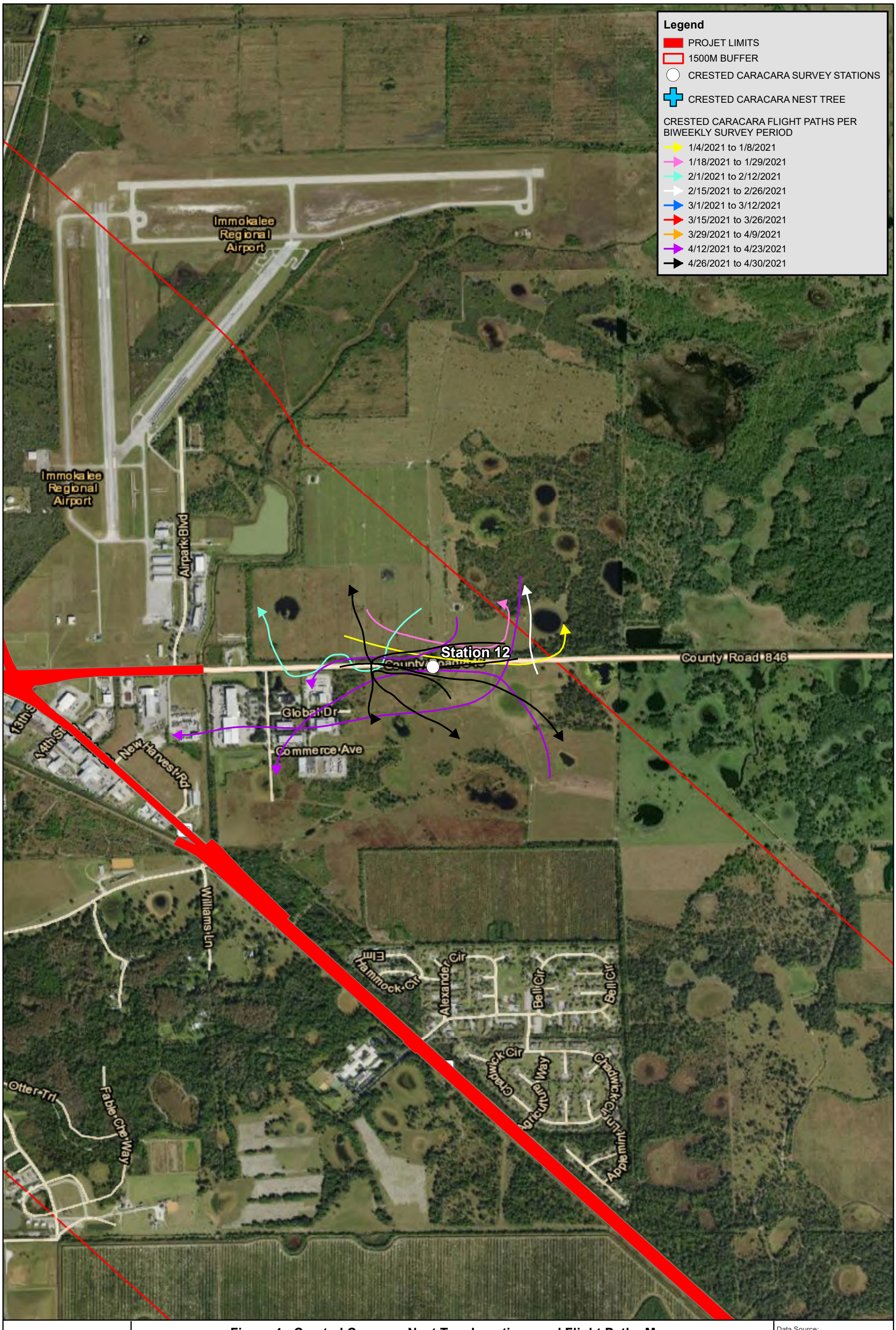


Figure 4 - Crested Caracara Nest Tree Locations and Flight Paths Map

Sheet 8 of 8

FPID #: 417540-1

SR 29 from Oil Well Road to SR 82

Collier County, Florida

Feet

0 1,000 2,000 3,000

All data within this map are supplied as is, without warranty. This product has not been prepared for legal, engineering, or survey purposes. Users of this information should review or consult the primary data sources to ascertain the usability of the information.

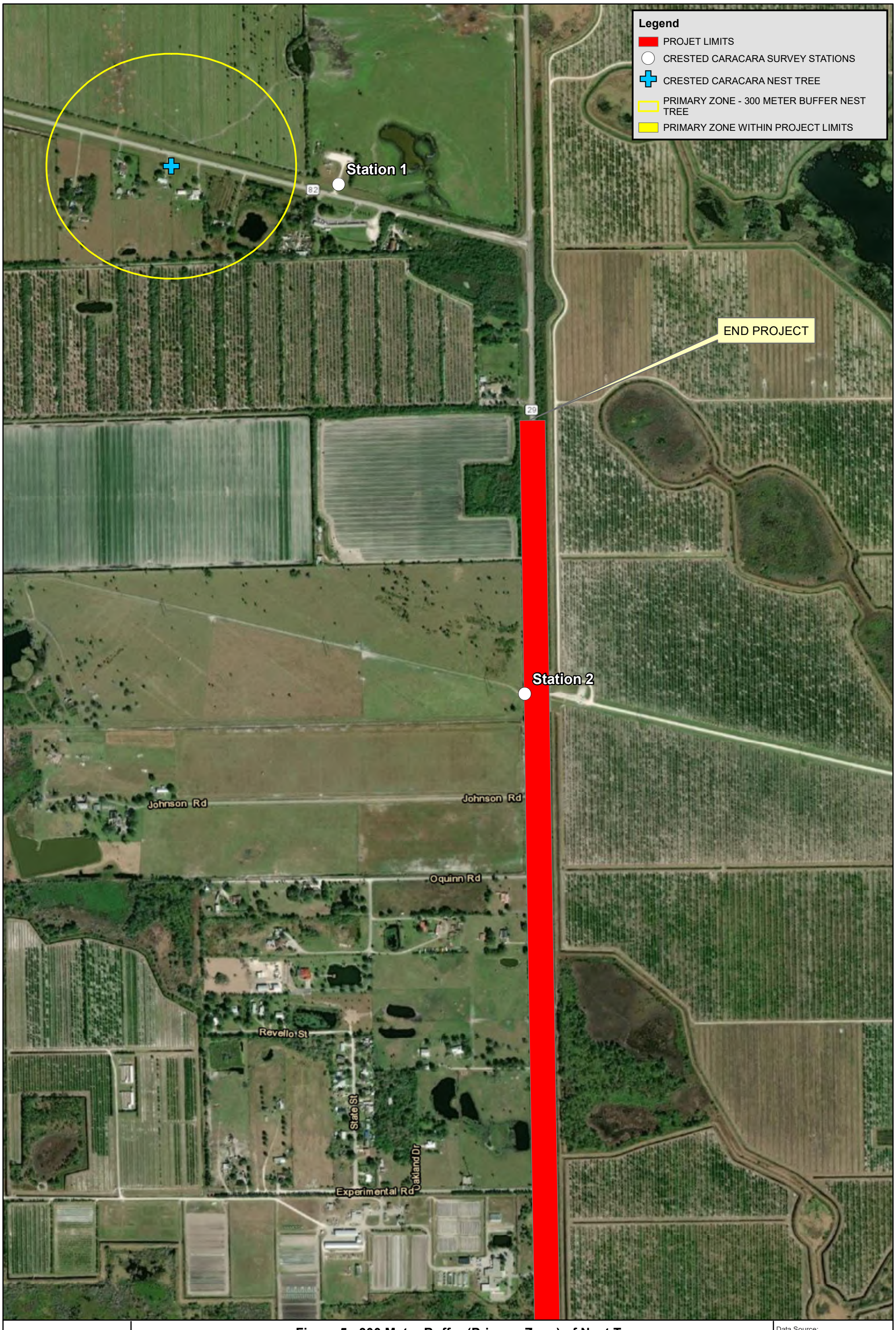
Data Source:
- Lochner
- ESA

Imagery Source:
- Esri

Coordinate System:
NAD 1983 Florida State Plane East

N

Date: xx/xx/xx Rev. Date: xx/xx/xx PM: XXX GIS Analyst: XXX Map Document: XXXXX.mxd Project Number - XXXX PDF Document: XXXXX.pdf Plot Size: 11 x 17



Date: xx/xx/xx Rev. Date: xx/xx/xx PM: XXX GIS Analyst: XXX Map Document: XXXXX.mxd Project Number: XXXX PDF Document: XXXXX.pdf Plot Size: 11 x 17

All data within this map are supplied as is, without warranty. This product has not been prepared for legal, engineering, or survey purposes. Users of this information should review or consult the primary data sources to ascertain the usability of the information.

Figure 5 - 300 Meter Buffer (Primary Zone) of Nest Tree

Sheet 1 of 2

FPID #: 417540-1
SR 29 from Oil Well Road to SR 82
Collier County, Florida

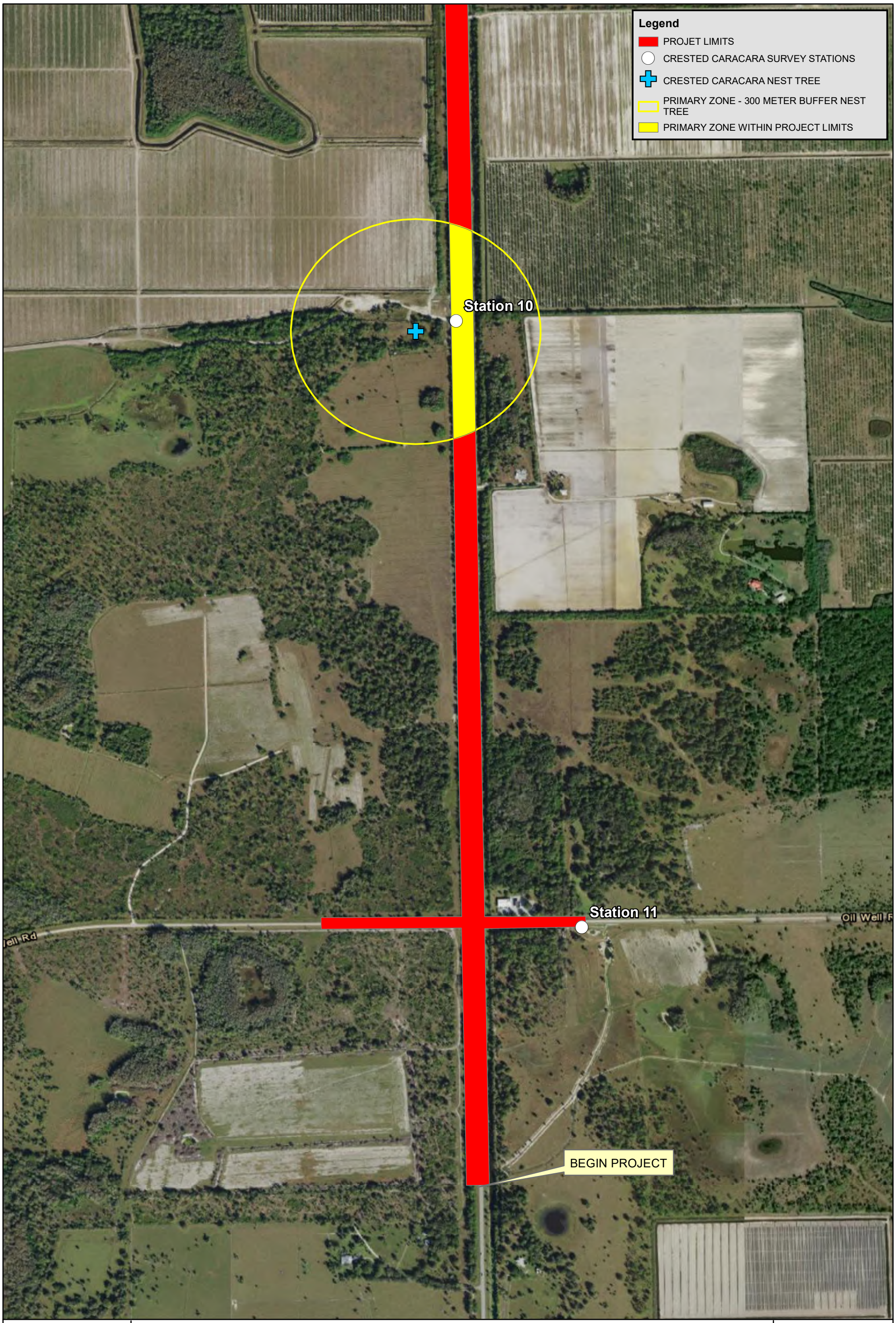
0 1,000 2,000 3,000 Feet

Data Source:
- Lochner
- ESA

Imagery Source:
- Esri

Coordinate System:
NAD 1983 Florida
State Plane East

N



All data within this map are supplied as is, without warranty. This product has not been prepared for legal, engineering, or survey purposes. Users of this information should review or consult the primary data sources to ascertain the usability of the information.

Figure 5 - 300 Meter Buffer (Primary Zone) of Nest Tree

Sheet 2 of 2

FPID #: 417540-1
SR 29 from Oil Well Road to SR 82
Collier County, Florida

0 1,000 2,000 3,000 Feet

Data Source:
- Lochner
- ESA

Imagery Source:
- Esri

Coordinate System:
NAD 1983 Florida
State Plane East

N

Date: xx/xx/xx Rev. Date: xx/xx/xx PM: XXX GIS Analyst: XXX Map Document: XXXXX.mxd Project Number: XXXX PDF Document: XXXXX.pdf Plot Size: 11 x 17

Appendices

A. 2016 USFWS Crested Caracara Draft Survey Protocol – Additional Guidance (2016-2017 Breeding Season)
B. USFWS Caracara Survey Forms
C. Summary of Caracara Survey Data
D. Representative Field of View Photos for Survey Stations

Appendix A

2016 USFWS Crested Caracara Draft Survey Protocol – Additional Guidance (2016-2017 Breeding Season)

USFWS Crested Caracara Draft Survey Protocol – Additional Guidance (2016-2017 Breeding Season)

The northern crested caracara (*Caracara cheriway*) is a resident, diurnal, and non-migratory raptor that occurs primarily in Florida, Texas, Arizona, Cuba, Mexico, Central America, and the northern portions of South America (Morrison and Dwyer 2012). Only the Florida population, which is isolated from the remainder of the species, is listed as threatened under the Endangered Species Act.

In order to avoid the potential for unauthorized take, future project sites within the caracara consultation area (Figure 1) containing habitats (same or similar) as described below should undergo a formal caracara survey to determine site utilization by caracaras. The intent of caracara surveys is three-fold: (1) to determine the location(s) of active caracara nest(s) that could be adversely affected by the proposed project; (2) to determine the presence and use of the project area by breeding and non-breeding caracaras, including the approximate boundaries of breeding territories, if possible; and (3) to determine the fate and productivity of any caracara nest found.

We recommend coordinating with the U.S. Fish and Wildlife Service (Service) prior to conducting surveys, including submittal of a proposed survey plan and list of observers which follows the guidance below. Following the guidance will ensure that the surveys are timed during the period of greatest detection to document caracaras within or adjacent to the proposed project. The Service has caracara observation and nest location data as well as designated caracara congregation areas that may be of use for planning surveys. For project consultations under the Endangered Species Act, surveys must follow this protocol and must be no older than the previous caracara nesting season (January – April) in order to be considered valid. In the event that construction or vegetation clearing activity will occur more than one year after permitting is completed, contact the Service to discuss the need for follow-up surveys.

Foraging and Nesting Habitat

The Florida caracara population commonly occurs on dry or wet prairies with scattered cabbage palms (*Sabal palmetto*). It may also be found in lightly wooded areas. Scattered saw palmetto (*Serenoa repens*), scrub oaks (*Quercus geminata, Q. minima, Q. pumila*), and cypress (*Taxodium* spp.) may also be present. Widespread changes in land use may have caused a change in habitat use in this species. Morrison and Humphrey (2001) found a strong association of caracara home ranges with improved pasture. The presence of seasonal wetlands, which may serve as foraging habitat, is an important factor in the attractiveness of these pastures to caracaras (Service 1999). Therefore, today we recognize caracara foraging habitat (and nesting territories) as those areas with short herbaceous vegetation. This includes native wet and dry prairies, but also improved, unimproved, and woodland pastures, sod farms, row crops, levees, and rangeland. Juvenile caracaras may also use citrus and tree farms.

The primary nesting substrate is cabbage palm, although there have been rare reports of nesting in slash pine (pers. obs.), cypress, oak, red cedar (Morrison 2007), Australian pine

(*Casuarina* sp.), saw palmetto, and black gum (*Nyssa sylvatica*), and even more atypical locations such as an electrical substation, radio tower, and billboard (Dwyer and DallaRosa 2015).

Survey Design and Planning

The protective area for a caracara nest is a radius of about 1,500 meters (m) (4,920 feet) from the nest. Therefore, the survey area should include the project area and a 1,500-m buffer zone around the perimeter of the project area (including access roads) to account for off-site nest trees in territories that might overlap onto the project area. A recent aerial photograph depicting the project boundary and buffer zone should be used to identify all areas of suitable habitat and to preliminarily map observation blocks. An observation block is defined as an area easily observable from one vantage point. Enough observation blocks must be identified to cover all suitable habitats within the project boundary and 1,500-m buffer. Surveyors should try to obtain legal access to non-project property within the survey area where suitable habitat exists; these efforts should be documented (e.g., copy of letter, email, etc.). If permission cannot be obtained, contact the Service for additional guidance prior to initiating surveys.

Prior to the first survey, a site visit should be conducted to confirm suitable habitat and the location of observation blocks. Based on this site assessment (*e.g.*, presence of visual obstructions), observation blocks may need to be revised. During the site visit, also identify observer survey stations (at least one per observation block). Survey stations should be located to allow full, unobstructed view of the observation block – strategic points are those where caracaras are more likely to be seen going to and from potential nesting or foraging sites. Based on the site assessment, update the aerial photo to show suitable habitat, and labeled observation blocks and their respective survey stations. The location of survey stations may be adjusted if needed based on initial survey results in order to obtain a different/better view of caracara activity. Any adjustments to the survey design should be documented via revised maps.

Observer Qualifications

Information from a recent study (Dwyer *et al.* 2012) suggested that the probability that a visit or series of visits (*i.e.*, a survey) would lead to the discovery of an existing caracara nest increases with an experienced observer. Due to their cryptic nest site locations and unorthodox method of foraging (walking on the ground), successful nest site surveys require a specific skillset acquired by conducting numerous surveys under the supervision of an experienced caracara surveyor. In addition, caracaras can be hard to find and identify at long distances, especially under low-light conditions. Caracaras may also be wary of humans and will change their behavior in the presence of people, which can make locating nests extremely difficult for less experienced observers. Due to these factors, surveys must be conducted by a qualified biologist having at least two years of experience conducting bird surveys and at least 40 hours of caracara survey experience (i.e., equivalent to one survey season) under the supervision of an experienced caracara surveyor. If an observer does not meet these minimum qualifications,

the observer should be accompanied by a qualified observer who will serve as the primary observer. Even in cases of qualified observers, and where staff resources allow it, having two observers at the same station can increase the probability of finding a nest.

Conducting Foraging and Nesting Surveys

The highest probability of success in finding caracara nests is during the period of January through March. This period covers the time when adult caracaras are foraging to feed nestlings and therefore, become more visible to observers. As such, surveys must start no later than January 10 and continue through April 30 to provide adequate data to conclude whether or not the site contains an active caracara nest and/or foraging habitat. If the survey starts after January 10, and no nest are found, the survey may not be considered valid by the Service. Surveys considered invalid should be repeated the following nesting season using the latest Service protocol to ensure that early nesting birds were not missed. Surveys should not be conducted in November or December without additional coordination with the Service to avoid disturbing nesting caracaras during nest initiation or incubation, when they are more prone to disturbance.

A complete survey of the project area consists of one survey session every two weeks of each observation block within the project area and the 1,500-m buffer from early January (i.e., Jan 1 - 10) through April 30 (unless a nest is found within the observation block prior to April 30; in that event, begin Productivity Surveys as described below). A survey session is defined as a single survey within an identified observation block initiated at least 15 minutes prior to sunrise and lasting 3 hours (Dwyer et al. 2012). The entire 3-hour survey session must be spent viewing the one observation block – observers cannot rotate between stations, cruise roads, or leave the observation block unless following a flying caracara. If the survey area is large or includes obstructed views, and multiple observation blocks are required, then multiple observers (preferred) or additional survey sessions will be needed to complete the survey of the entire project area. Afternoon or evening surveys are optional, but cannot be substituted for early morning surveys (in the event of not finding a nest). More frequent morning surveys (i.e., more than one during any two-week period) of an observation block are also optional, and can increase the probability of finding a nest, but cannot replace the subsequent “once per two-week surveys” through April 30 (in the event of not finding a nest).

Surveys should be conducted from inside a vehicle (best option is a truck or similar vehicle to maximize height and minimize view obstructions) or an appropriate wildlife blind using high-power binoculars. This minimizes caracara disturbance and behavior alteration, and increases the probability of finding nest locations. Depending on the distance being surveyed, or the proximity of the caracara/nest being observed, it may also be acceptable for the observer to be adjacent to the vehicle if that affords better viewing. A spotting scope is essential when documenting behavior of caracaras and confirming nest tree locations that are far away. If this cannot be accomplished (e.g., due to visibility or vehicle access restrictions), the Service should be contacted to provide site-specific guidance.

Weather conditions must be adequate to clearly view the whole area. Surveys should not be conducted when it is rainy or foggy (Dwyer *et al*. 2012). Wind speed should be less than 12 miles per hour (19 kilometers per hour; Beaufort Number 3). Weather conditions and other important information must be recorded on field data sheets as itemized below (see Reporting).

During the survey, from a stationary position, search for caracara activity, including birds perched in trees or on sentinel posts, flying along roads or levees, or carrying nesting material or food. Watch for other birds, such as American crows (*Corvus brachyrhynchos*), red-tailed hawks (*Buteo jamaicensis*), red-shouldered hawks (*Buteo lineatus*), bald eagles (*Haliaeetus leucocephalus*), and turkey vultures (*Cathertes aura*), that might elicit an aggressive response from caracaras. Nesting caracaras will often chase potential predators away from the nest, thus revealing their presence. Also, vultures can indicate the presence of carrion that may attract caracaras. If the observer is near or on a road, pay attention to road-killed animals that may serve as forage for caracaras. If in a pasture, look for cow or calf carcasses on which caracaras may forage.

If a caracara is sighted, document its activity (*i.e.*, foraging, roosting, preening, territorial behavior, etc.) and location on an aerial map. If a caracara is in flight, document on the aerial map the direction the bird came from, the direction it is flying in, and if it is carrying nesting material or food. Make all reasonable efforts to track the bird to a potential nest location. If a potential nest tree is detected, then the observer can reposition to improve observation of the bird's behavior. All observer locations during a survey should be marked on the aerial. All caracara observations must be recorded on the field data sheets, including time of observation, number of birds, plumage (adult/juvenile), activity/behavior (*e.g.*, perching, foraging, feeding, preening, courtship or territorial display, etc.), and nest stage (building, incubating, nestlings, fledglings), if applicable. Corresponding caracara locations and flight paths must be marked and labeled on the aerial map. Also mark any potential or confirmed nest tree locations on the aerial photo, with GPS coordinates of the observation site and an estimate of the direction and distance of the nest from the observation point (a rangefinder may help to measure distance). Do not try to approach the nest as this may cause the caracara to abandon their nesting attempt. It may be possible to use a compass bearing from two different locations to triangulate the location of a nest tree that may be too far away and not near recognizable landmarks.

Survey sessions of each observation block must be repeated at two week intervals. Once a nest tree location is confirmed, report the location to the Service and transition to Productivity Surveys. In addition to location of nest trees, the survey data described above can be used to understand the use of the survey area (*e.g.*, as foraging or roosting habitat) by both breeding and non-breeding caracaras. Non-breeding caracaras can include both juveniles and adults. Detailed survey data are also useful in approximating boundaries of breeding territories, which is typically important to identifying the number of territories that may be impacted by a proposed project and the anticipated effect that proposed activities may have on a breeding

caracara pair. This is especially true for projects which are large in size or include habitat conversion. For more details on caracaras, see Service (1999) and Morrison and Dwyer (2012).

Conducting Productivity Surveys

Once a nest tree is confirmed or highly suspected, begin productivity surveys. These surveys involve the same repeated, two-week visits, but the surveyor need only observe the nest for the amount of time necessary to determine nest status (*i.e.,* incubating, nestlings, fledglings, or failed) and may survey the nest tree at any time during the day (assuming the weather conditions are appropriate). This will likely require much less effort per day than nest surveys. Many times, a spotting scope can be more useful than binoculars in observing activity in the nest that will indicate the nest status. As nesting progresses, the nestlings will become more active and easier to observe. Record the bird activity and number of nestlings. Record the fledging date and number of fledglings. From the fledging date, and previous observations, estimate the egg-laying date. If the nest appears to fail, continue surveying the nest tree area until April 30 as re-nesting may occur. If nests are deemed active on April 30, continue surveying those nest trees until they are either successful or have failed.

Reporting

An example field data sheet is provided at the end of this document, but observers may use their own data sheet format as long as the required information is collected. Requirements for final reports are as follows:

1. Map of field-verified habitat types within the project area and 1,500-m buffer;
2. Copies of marked aerial photo(s) showing all suitable habitat, with labeled observation blocks and their respective survey stations (including any alternate station locations used);
3. For each survey station, copies of any photos taken that document the field of view, nest tree or caracaras;
4. Documentation of efforts to contact adjacent landowners, and copies of access agreements, if applicable;
5. A summary table with the following information for each observer: name, hours of experience conducting caracara surveys (as of January 1), approximate number of caracara nests previously found, and whether the observer served as a primary or secondary observer;
6. Copies of all individual field data sheets which include the following information for each survey:
    - observation block/survey station identification,
    - survey date,
    - observer name(s),
    - observer location (*e.g.*, in a vehicle, blind, on foot),
    - start and end times,

- start and end weather conditions (temperature, wind speed and direction, cloud cover, visibility, and precipitation),
- caracara location/activity details including (for each observation):
  - time of observation,
  - number of birds,
  - plumage,
  - activity/behavior, and
  - nesting stage, if applicable, and
- an aerial map showing all observed caracara locations and flight paths (labeled to correspond with activity details) and any potential/confirmed nest tree locations; and

7. Location data (*e.g.*, latitude/longitude) for all caracara observations and potential/confirmed nest trees in Excel, projected shapefile (the preferred projection is Florida Albers NAD83 in meters), or .kml/.kmz format and attributed to include the information in (6) above.

Additional survey or reporting requirements may exist if the caracara surveys are required by a Service Biological Opinion (BO)(in this event, refer to the Terms and Conditions of the BO). For questions or additional guidance regarding the above survey protocol, please contact the Service's caracara lead biologist, Steve Schubert, at 772-469-4249 or 772-562-3909.

Literature Cited

Dwyer, J.F., and J.P. Dalla Rosa. 2015. Use of anthropogenic nest substrates by crested caracaras. Southeastern Naturalist 12(1):N10-N15.

Dwyer, J. F., J. L. Morrison, and J. D. Fraser. 2012. Factors influencing detection of nesting crested caracaras. The Journal of Wildlife Management 76(4):857–862.

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U.S. Fish and Wildlife Service (Service). 1999. South Florida multi-species recovery plan. Atlanta, Georgia. http://www.fws.gov/verobeach/MSRPPDFs/AudubonsCrestedCaracara.pdf

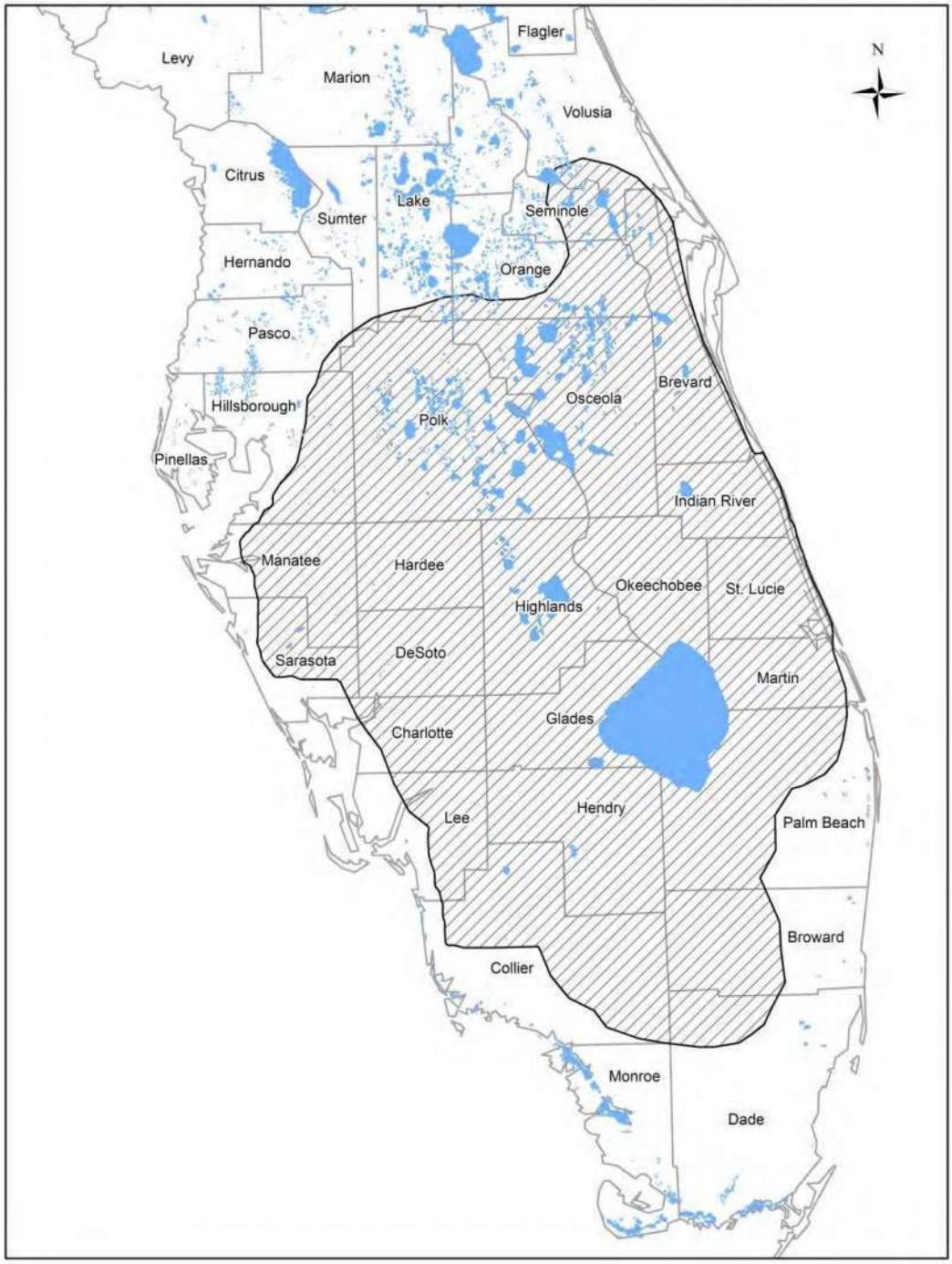

Figure 1. USFWS consultation area for crested caracara.

Appendix B

USFWS Caracara Survey Forms (updated 12/9/2016)

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 1: 26.48703, -81.439267

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
1-4-21	7:22	10:15	Christine Scamino, qualified

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:22	60°	6, N	90%	stratus/cirrus	NONE
Finish: 10:16	61°	6, E	70%	stratus/cirrus	NONE

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Active roadway construction + congestion early, grazing cattle on improved pasture to north, palm nursery w/ sparse ornamentals on furrows to west

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc	
Foot	2, A	7:33, 7:35	2 adults fly in from west, perch briefly at SR 82/29 pole at interchange, fly to pole ~300 ft to north to perch no nesting material or food	Indiv A, B
Foot	A	7:41	1 adult seen flying from SR 29 south + west out of sight	Indiv C
Foot	A	7:48	Indiv B circles to east, lands on bush/ground (out of sight), circles back to pole with Indiv A	
Foot	A	7:53	A+B flyover to west, one carrying nest materials - tracked far west + did not ID nest	

Foot	A	8:50	Indiv D from pasture up to pole, perched 8:55 flies to slash pine at SW quad of 52/29 int. near indiv G	
Foot	A 2	8:53	Indiv E+F circle low at distant pasture + land, ~~E flies to SW is rep'd by G~~ observed ~20 min on occasion popping up above pasture horizon. vultures in area, possibly foraging, as of 10:06 1 indiv still observed standing	standing + walking in distant pasture, no specific foraging, nesting, or roosting behavior observed
Foot	A	8:55	Indiv G noticed at pole SW quad 52/29 flies to SW w/ H	
Foot	A	8:58	Indiv H flyover from North to SW, joined by G	

Incidental species: RSHA, RWBL, MODO, WOST, BLVU, TUVU, GREG, CAEG, CROW, DCCO, NIE pigeon, BTGR, ANHI, GRBH FLSC, ~~KITE~~ KILL, GLIB, WHIB, PAWA, TRCH

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 2: 26.474757, -81.434785

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
1/4/2021	7:18	10:15	T. Kuba – authorized

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:18	60°	5 MPH SE	80%	cirrus/stratus	0
Finish: 10:15	63°	0 MPH	80%	cirrus/stratus	0

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Adjacent to SR 29, with a good view down SR 29, pasture on the west side + citrus on the east side.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
truck	A	8:52	flyover – toward SE until out of sight
truck	A	9:30	flyover – N. along SR 29 then west until out of sight

OTHER OBS SPP: red-shoulder. hawk, great blue heron, northern harrier, mocking bird, cattle egret, black vulture, Am. crow, catbird

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 3: 26.456298, -81.434393

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
1/5/21	7:04	10:20	T. Kuba – authorized

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:04	45°	4MPH SE	0	N/A	0
Finish: 10:20	61°	5MPH S	0	N/A	0

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
adjacent to SR29. View of pasture to east and citrus to the west.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
foot	A	7:12	flyover - south along SR29 hovered around then east out of sight
foot	A	7:38	flyover - from west to east out of sight

OTHER OBS SPP: harrier, Ibis (flyover), cat bird, mocking bird, snowy egret, black vulture, little blue heron, wood stork, starlings, red-shouldered hawk

USFWS Crested Caracara Draft Survey Protocol – Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 4: 26.442269, -81.438832

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
1/4/21	7:20 am	10:40 am	Bob Mrytab – Primary

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:20 am	61°	South NNW	50%	Cirrus	~~None~~ NA
Finish: 10:40 am	64°	" "	10%	Cirrus	NA

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Cattle pastures & suburban residential in Immokalee, FL.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
~~Foot~~ Foot	Adult	7:29 7:36	Flew from west & perched on slash pine Adult flew from pine & west and out of sight.

Black vulture
Great egret
Sandhill crane
Cattle egret
Great blue heron

SE kestrel
wood stork
Anhinga
Common nighthawk
Red-shouldered hawk.

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 5: 26.436236, -81.425164

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
1/5/21	7:09am		Bob Mayfield - Primary

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:09am	46°	4mph, NNW	0%	NA	NA
Finish: 10:12	55°	7mph, N	0%	NA	NA

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Cattle pasture

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Truck	2-Adults	8:27am	Flying from east to north and out of site.

killdeer
common nighthawk
FL sandhill crane
Blue jay
white ibis

european starling
Red-shouldered hawk
Northern mockingbird
Black vulture
Cattle egret.

mourning dove.
Boat-tailed grackle

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 6: 26.384121, -81.370662

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
1/6/21	7:18am		Bob Mytalo – Primary

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:18am	47°	3mph, NNW	20%	Cirrus	NA
Finish: 10:18am	60°	5mph, NNE	0%	NA	NA

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
SR 29 ROW- East side of ROW lined with hundreds of cabbage palms.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Foot			No caracara's observed.

Boat-tailed grackle
Wood stork
Snowy egret
Anhinga

Great egret
Turkey vulture
[redacted]

American crow
Osprey

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 7: 26.364397, -81.349052

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
1-5-2021	7:25	10:25	Christine Sciarrino, qualified

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start:	49°	3 mph, N	0%	N/A	NONE
Finish:	60°	9 mph, NE	0%	N/A	NONE

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
citrus growing/packing operation + improved + unimproved pasture with cabbage palm. Low traffic on this portion of SR 29 but distant machinery noise

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc	
Truck	A	8:13 8:34 8:42	Flies up to perch on distant treetop. hawk calling in area, at 8:34 flies SE to perch on another distant treetop. at 8:42 flies off to S out of sight	Obs/ Indiv A
Truck	A	8:48	Fly over from south	Obs B

Incidental species: RBWO, GREG, AMGR, NOHA, TRHE, BRPE, BLVU, WOST, ANHI, FLSC, PAWA, KILL, GRCA, deer, hawk (~~short-tailed~~ ~~or~~ broad-winged, unsure), NCCA, NOMO, DCCO, TUVU, RSHA, GRBH, SNEG

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 8: 26.344113, -81.343087

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
1/6/21	7:11	10:20	T. Kukla – Am'many

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:11	50%	3 MPH SE	10%	cirrus	0
Finish: 10:20	60%	8 MPH SE	5%	cirrus	0

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Adjacent to SR 29 pasture w/ C. palm to east and citrus to west, Large canal along SR 29 (on east side)

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Foot			None Observed

OTHER OBS SPP: sandhill crane, great blue heron, snowy egret, red-shouldered hawk, Am. Crow, cattle egret, green heron, cat bird, anhinga, [illegible], black vulture, great egret, killdeer, wood stork, ibis

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 9: 26.336258, -81.343532

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
1-6-2021	7:17	10:17	Christine Sciarrino, qualified

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start:	50°	5 mph, N	15%	cirrus	none
Finish:	60°	8 mph, NE	5%	cirrus	none

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Citrus groves + unimproved pasture in immediate area, distant high quality cypress dome to west. Active cattle mooing early. Tractors operating in grove.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Truck ~~bed~~	A	7:32, 7:34	A: Flies in from southeast, lands at canal berm briefly, then to road, 7:34 flies due to traffic, north almost out of sight then perches
Truck	A	7:36, 7:46	B Flies from east + perches on slash pine, 7:46 flies to east out of sight
Truck	A	9:37	C: Flies from south, lands briefly at canal berm, flies back ~~southeast~~

Incidental species: FLSC, WHIB, RBWO, LIBH, GREG, NOCA, GRBH, TRHE, RSHA, PIWO, crow, AMCR, BLVU, DCCO, TUVU, NOMO, ROSP, KILL, TRSW

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 10: 26.317706, -81.343208

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
1/4/20	0740	1040	BJ Quinton, primary

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start:	61°F	Calm	50%	Cirrus	N/A
Finish:	69°F	Calm	30%	Cirrus	N/A

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Improved pasture w/ power easement Bucket trucks idling nearby 0745–0750, then parked, engines off, 0745–0810 when they entered the gate + left the area Farm equipment entered @ 1029

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Bucket Truck	A	0817	Flew in from NE + landed in pasture, grass too tall for further observation, Seen approx 30 min later foraging in grass.
Bucket Truck	A	0900	Same individual flew from ground south behind trees. Did not have access to follow.
Bucket Truck	A	0905	Poss. same individual landed on grass road, preened for several seconds, then departed behind trees again.
Bucket Truck	A	1000	Transitioned across pasture from north to south. Lost behind tree line.

Inc. SP: AMKE, WHIB, RBWO, RSHA, BCJA, NOMO, KILL DCCO, NOPA, GRCA, EAPH, STHA, BCVU, GREG AMCR

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 11: 26.303103, -81.34018

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
1/5/20	0723	1023	BJ Quinton, primary

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start:	48°F	Calm	0%	N/A	N/A
Finish:	61°F	From NE 7mph	0%	N/A	N/A

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Unimproved pasture with wet areas. Several cabbage palms. Moved station for better visibility. Station 11A: 26.303116 -81.338538 High grass. Cattle in pasture.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Truck	No CRCA observations		

Inc. spp: BEKI, WHIB, RBWO, AMCR, GRCA, AMKE, MODO EAME, NOCA, KILL, RSHA, SNEG, DCCO, Deer GREG, TUVU, ANHI

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 12: 26.418763, -81.39254

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
1/6/17	0715	1015	BJ Quinton, primary

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start:	48°F	From NE 3 mph	3%	Cirrus	N/A
Finish:	61°F	From N @ 5 mph	0%	N/A	N/A

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Unimproved pasture with scarce cabbage palms and some shrubs. Some light ag. activity to the south. Ag activity increased starting @ 0800 & continued throughout survey. Some aircraft activity associated with Immokalee Regional Ap.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
~~Stand~~ Foot	A	1008	Flew in from the west, followed road & turned to cabbage palms on N side of rd.

Inc. Spp: AMCR, NOCA, EAME, OCCO, MODO, RBWO, KILL, BCJA, GBHE, GREG, CAEG, WOST, RSHA, LOSH, ~~CARA~~ CARW, NOHA, BLVU, GRCA, COGR, TRES, WHIB, SACR, ANHI, EAPH, [illegible]

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 1: 26.48703, -81.439267

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
1/19/2021	7:00		T. Kuba (authorized) + Z. Yaun (secondary)

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start:	45°	1 MPH SW	0	—	—
Finish:	61°	11 MPH SW	0	—	—

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
improved pasture w/ ditch to west (line w/ BP+C. palm). adj. to SR 82

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
foot	A (adtn)	7:01	obs. 2 caracara from S. headed W. along SR 82 then A perched on pole other (B) perched on adj. tree + flew S.
foot	A	7:12	Indv. A west then North out of sight
foot	A	7:37	from NW perch on pole adj to survey station for 10 minutes then W. and out of sight (unk indv.)
foot	A	7:55	from W. along SR 82 then N. along SR 29 and perched on pole then N. (unk indv.)

SPP. OBS: red-shouldered hawk, anhinga, wood stork, ibis, sandhill crane, catbird, mourning dove, meadowlark, black vulture, killdeer, anhinga,

foot	A	8:20	from E. down SR 82 w/ nesting material to c. palm adj. to pole previously perched (A)
foot	A	8:32	1 individual B w/ nesting material to same location A to ditch adj. to survey station
foot	A	8:43	indv. B SE out of sight, indv. A back to pole adj. to c. palm, indv. B from east to tree
			then pole + indv. A SE out of sight
foot	A	8:50	indv. B SE out of sight (none perched on pole)
foot	A	9:10	from SE to pole adj. to c. palm w/ nesting materia + SE out of sight + back to c. palm + pole
			then SE (and low) out of sight
foot	A	9:25	from SE to c. palm + back SE
			+ back to pole + E along SR 82
foot	A	10:13	from east to c. palm w/ nest material

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 2: 26.474757, -81.434785

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
1/19/21	7:02 AM	10:02 AM	Bob Mrykalo – Authorized observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:02am	46°	2mph N	0%	NA	NA
Finish: 10:02	61°	10mph. NNE	0%	NA	NA

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Cattle pasture west, orang grove east, Work organ in orange grove.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
vehicle	A	7:15	Adult flew from east and landed on oak
	A	7:28	Adult flew large circle and landed on slash pine.
	A	7:30	Adult flew east and out of sight over orange grov
vehicle	A	8:44 –	Adult flew from west and landed on same
	A	8:48 –	slash pine as earlier caracara. Adult preening.
	A	8:53 –	Adult flew north and to ground. Foraging near cattle. Adult flew west and out of site.
Vehicle	2A	9:44	Both on ground near dirt road. 1 caracara flew west to cabbage palm. Wasn't carrying food or nest material. 2nd caracara
		9:52	second caracara flew east, over SR29, and continued east and out of site

Red shouldered hawk
wood stork.
Northern mockingbird
cattle egret
~~mourning dove~~

European starlings
common ground dove
8
turkey vulture
American crow
sandhill crane

USFWS Crested Caracara Draft Survey Protocol –
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Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 3: 26.456298, -81.434393

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
1-19-2021	6:58	10:05	Christine Sciarrino, authorized

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 6:58	49	6 mph, NE	2	cirrus	NONE
Finish: 10:05	59	10 mph, NE	2	cirrus	NONE

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Improved pasture + citrus groves in area. Barking dogs, fairly constant traffic. Herbaceous wetland within pasture. Occasional very low, small aircraft in area. Persistent RSHA presence.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Obs. A ON foot	A	7:22, 7:26	Flies in from North, lands at roadside ~1min Flies to nearby pole at 7:26 RSHA aggressively approaches + indiv defends once then flies west. RSHA then perches on pole
Obs. B ON foot	A	7:42, 7:54	Back perched on pole, 2 very low, small aircraft pass, no reaction. 7:46 RSHA approaches aggressively. caracara holds position. RSHA perches on nearby wire, 7:54 flies to west
Obs C ON foot	A	7:56, 8:00	Flies in from west + perches on pole immed. south of above. Flies away low over grove + to the east
Obs. D ON Foot	A	8:43	Flyover east to west

Obs E	ON foot	2A	9:04	2 individuals flying circling in unison, came from east, disappeared to west

Incidental species: BLVU, GREG, GRCA, GRBH, WOST, TRCH, BTGR, KILL, WHIB, FLSC, RSHA, PAWA, ANHI, crow, RBWO, MODO, LIBH, TUVU, TRSW

USFWS Crested Caracara Draft Survey Protocol –
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Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 4: 26.442269, -81.438832

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
1/20/21	7:02		T. Kuba (authorized)

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:02	46°	2 MPH NE	5%.	cirrus	0|20% fog
Finish: 10:05	64°	4 MPH N	5%	cirrus	0

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Adj. to Westclox Rd, pasture to the south w/ conifer forest beyond that and conifer forest on northside of the rd. (open pasture has herb WL)

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
foot	A	7:30	from NW, perched on pine @ 7:41 flew in western direction out of sight

OBS. SPP.: ibis, wood stork, sandhill crane, redshouldered hawk, great egret, cat bird, warbler, mourning dove, great blue heron, meadow lark, Am. crow, cattle egret, black vulture, cormorant,

USFWS Crested Caracara Draft Survey Protocol –
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Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 5: 26.436236, -81.425164

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
1/20/21	7:10am		Bob Mrykalo, Authorized Observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:10 am	46°	1 mph, SW	0%	NA	Morning Fog, dissipating
Finish: 10:10am	64°	4 mph, N	0%	NA	None

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Cattle pasture. No work ongoing.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle	A	7:45	Adult caracara perched atop slash pine, then caracara quickly flew southeast and out of sight.
Vehicle	A A	8:21 8:28	Adult atop another slash pine, preening & roosting. Adult left pine and flew west and out of sight.

Boat-tailed grackle
Red shouldered hawk.
European starlings
red-bellied woodpecker
common nighthawk

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 6: 26.384121, -81.370662

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
1-20-2021	7:10	10:20	Christine Sciarrino (authorized) Zack Yawn (secondary)

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:10	50°	3 mph NE	10	cirrus	light fog
Finish: 10:20	65°	5 mph, N	15	cirrus	none

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
R.O.W - WL with BP, cabbage palm, Andropogon mostly. undeveloped WL's with distant Ag.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
vehicle			NO observations

Incidental species: FLSC, RSHA, NOCA, crow, TUVU, WHIB TRSW, KILL, PAWA, ANHI, AMRO, GREG, TRHE, YENH

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 7: 26.364397, -81.349052

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
1/25/21	0650	0950	BJ Quinton, Authorized Observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 0650	69°F	Calm	100%	Cumulonimbus	N/A
Finish: 0950	73°F	Calm	60%	Cirrus	N/A

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Improved pasture w/ scattered cabbage palms. Sporadic heavy traffic on side road

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle	2A	0710	Pair flew in from S, across site, then out of sight
Vehicle	2A	0757	Pair flew in from N, across site, then separated, one going E & the other continuing S
Vehicle	A	0801	Flew NW to SE on other side of SR 29
Vehicle	A	0839	Flew NE & landed in a tree Perched approximately 45 minutes, preening occasionally, before departing E

Inc. spp: AMCR, RSHA, GBHE, GREG, WOST, WITE, BLVU GACA, CAEG, LBHE, MODO, SACR, EAME, COGR NOHA, ANHI, BOGA, BLJA

over →

Vehicle	3A	0935	1 Flew in from NW, circled site, vocalizing & showing aggression near clump of cabbage palms, but never landed in it. Departed SE
Vehicle	A	0941	Flew across site, S to N

USFWS Crested Caracara Draft Survey Protocol –
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Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 8: 26.344113, -81.343087

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
2016/01/25	6:55	9:55	BRAD YOUNG AUTH. OBSERVER

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 6:55	64°F	CALM	100%		NONE
Finish: 9:55	75°F	S. 5mph	30%		NONE

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
WEST OF SR29 – CITRUS; EAST OF SR29 – IMPROVED PASTURE WITH SCATTERED AREAS OF PINES, OAKS, SABAL AND ALONG ROW. EASTERN PASTURE HAD AGRICULTURAL ACTIVITIES ACTIVE WITH PICKUPS AND HEAVY EQUIPMENT

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
STA 8	A	7:09	CARACARA FLEW OVER STATION NE to SW
8	A	7:12	CARACARA OVERFLIGHT EAST to NW
8	A	7:18	CARACARA FLYING N to S and landed IN SLASH PINE. DEPARTURE FROM PINE not observed UNTIL 7:28 OBSERVATION
8	A	7:24	FLYING S to N ACROSS pasture at DISTANCE ≈ 2000' - 3000'

WILD LIFE:

PILEATED WOODPECKER
GREAT BLUE HERON
WOODSTORK
ANHINGA
CROW

BLACK VULTURE
TURKEY VULTURE
CATTLE EGRET
WHITE IBIS
BOAT TAILED GRACKLE

ROSETTE SPOONBILL
RED SHOULDERED HAWK
BALD EAGLE
SNOWY EGRET
WHITE EGRET
CORMORANT

USFWS Crested Caracara Draft Survey Protocol –
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8	7:28	A	CARACARA OBSERVED FLYING SW to slash pine where adult from 7:18 is perched. BOTH CARACARAS FLEW OFF TO EAST
8	8:06	A	FLEW FROM SW ACROSS STATION 8 to NE
8	8:32	A	CARACARA FLEW FROM NE ACROSS STATION TO LAND IN SLASH PINE ON WEST SIDE OF ROAD ALONG TREE LINE ON ROW

USFWS Crested Caracara Draft Survey Protocol –
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Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 9: 26.336258, -81.343532

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
1/26/21	0655	0955	BJ Quinton, Qualified Observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 0655	63° F	Calm	5%	C[redacted]irrus*	Heavy Fog
Finish: 0955	74°F	[redacted] mph/S	0%	N/A	N/A

*[redacted] Start cloud cover after fog lifted @0740

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Scattered palms in improved pasture on E side of SR29, orange groves on W side. Dense fog limited visibility to ~ 100 yards before lifting @0740

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
vehicle	A	0810	Flew in from E, [redacted] appeared to be scanning for prey. Perched on pine for a couple minutes, then headed N before turning W + out of sight.

Inc spp: NOCA, GRCA, AMKE, LBHE, CAEG, GREG, RBWO, AMCR, PIWO, NOMO, MODO, BCJA, RSHA, WHIB, TRES, BLVU, ANHI, TUVU, OSPR

USFWS Crested Caracara Draft Survey Protocol –
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Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 10: 26.317706, -81.343208

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
2021/01/26	7:12	10:12	BRAD YOUNG AUTH. OBS.

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:12	65°F	CALM	NA	NA	FOG
Finish: 10:12	76°F	S 10 mph	0%	CLEAR	NA

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
EAST OF 29: AGRICULTURAL OPERATION NW OF 29: CITRUS SW OF 29: CYPRESS AND IMPROVED PASTURE WITH OAK/SABAL AREAS

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
STA 10	A	8:51	CARACARA FLYING EAST ACROSS SR 29 AND TO NORTH
	A	9:40	FLEW FROM EAST ACROSS SR29 AND LANDED ON CYPRESS ALONG R.O.W. OCCASIONALLY PREENING
		9:53	CARACARA (9:40) NOT BOTHERED BY overflight of OSPREY - SAME CARACARA LEFT PERCH TO FLY TO EAST

WHITE IBIS
CATTLE EGRET
CROW
MOURNING DOVE

WHITE EGRET
ANHINGA
SANDHILL CRANE
GREAT BLUE HERON

CORMORANT
BLACK VULTURE
OSPREY

USFWS Crested Caracara Draft Survey Protocol –
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Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 11: 26.303103, -81.34018

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
1/27/21	0656	0956	BJ Quinton, Authorized Observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 0656	66°F	Calm	10% *	Stratocumulus	Dense fog
Finish: 0956	73°F	5mph/S	80%	Stratus/cumulus	N/A

Start cloud cover after fog lifted @ 0815

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Improved pasture with scattered cabbage palms. Dense fog limited visibility to ~100 yards. Started lifting @ 0815, but remained with low visibility (~250 yards) until 0900. Street sweeper started making rounds @ 0930.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle	No	CRCA	Observations

Inc spp: AMCR, NOMO, GRCA, cricket frogs, RBWO, RSHA, PIWO, SNEG, MODO, EAPH, BLJA, LBHE, TRES, EAME, SAVS, KILL, WEVI, SACR, BLVU

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 12: 26.418763, -81.39254

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
2021/01/27	6:50	9:50	BRAD YOUNG AUTH. OBS.

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 6:50	66°F	CALM	NA	NA	FOG
Finish: 9:50	71°F	S 5mph	50%	.	PERSISTANT LOW CLOUDS/FOG

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
NORTH OF SR 846 - ACTIVE SOD OPERATION WITH HEAVY EQUIPMENT AND SOD TRUCK TRAFFIC SOUTH OF CR 846 - IMPROVED PASTURE. PICKUP ENTERED AND DROVE AROUND SITE WITH AGRICULTURAL ACTIVITY

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
12	A	8:04	overflight in heavy fog

European Starling
White Ibis
Grey Squirrel
Black Vulture
Boat Tailed Grackle

Mourning Dove
Sandhill crane
8
White egret
Mockingbird

Wood stork
Great blue heron
Red bellied woodpecker

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 1: 26.48703, -81.439267

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
2/3/21	7:00am	10:15 am	Sandy Scheda - Authorized Observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:00	45°	0	0%	N/A	N/A
Finish: 10:15	54°	5-8mph	0%	N/A	N/A

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Improved pasture with scattered cabbage palms and occasional slash pine. Cattle in pasture. Lots of traffic + related noise.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle	A	7:00	Upon arrival at station, two caracara perched on light pole associated with pasture parking area.
Vehicle	A	7:01	From perching, one flew into nearby cabbage palm clump #1
Vehicle	A	7:04	other flew NW, out of sight then circled back to perch on light pole further north #2
Vehicle	A	7:08	#1 flew back and forth from cabbage palm clump to nearby light pole
Vehicle	A	7:12	Both caracara convene in dirt area on north side of SR 82, east of station. One flew away SSE, the E over SR 29 traffic + circled back to nearby light pole, then into cabbage palm clump. other flew to pasture with something from side of road that looked like food? (it was wiggling), then to cabbage palm clump.

Sandhill crane - flyover
great egret - flyover
black vultures - flyover
turkey vultures - flyover
meadowlark - call
killdeer -

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Vehicle	A	7:26	Both Caracara fly from cabbage palm clump to ENE – low, fast and close to each other – out of sight. Several minutes later they over field to NE.
Vehicle	A	8:43 8:45	One caracara flies from S of SR82 (west of station) into the cabbage palm clump. Flew out of tree, right over truck, to some place on the side of the road and picked around the trash and construction debris there. It brought something that looked like string to the east side of the tallest cabbage palm, landed there, then went inside with string.
Vehicle	A	8:51	Caracara exited cabbage palm and flew west looking along SR82 roadside as it went, until out of sight.

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 2: 26.474757, -81.434785

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
2/3/21	0701	1003	C STOUT - AUTHORIZED

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:01	40°	WNW 6	0	N/A	N/A
Finish: 10:03	52	N 12	0	N/A	N/A

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
ADJACENT TO SR 29 IN THE WEST ROW @ INTERSECTION OF POWER EASEMENT. PASTURE TO WEST, CITRUS GROVE ON EAST SIDE OF SR 29

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

	Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
(1)	VEHICLE	A	7:18	FLYOVER SOUTHEAST OF STATION, DID NOT CROSS SR 29, HEADED SOUTH OUT OF SIGHT
(2)	ON FOOT	A	7:28	FLYOVER EAST OF STATION CONTINUED NORTH W/O CROSSING SR 29
(3)	ON FOOT	A	7:32	FLYOVER STATION FROM SW TO EAST OF STATION ACROSS SR 29 LANDED ON CITRUS TREE ~400 FT FROM ROAD
(4)	ON FOOT	A	7:34	OBSERVED 2ND ADULT PERCHED IN CITRUS TREE WITH PREVIOUS SIGHTED ADULT

OTHER OBSERVED SPECIES - RSHA (RED SHOULDER), BLVU (2) (BLACK VULTURE) GREG (GREAT EGRET), NORTHERN HARRIER, LITTLE BLUE HERON, GROUND DOVE, NORTHERN MOCKINGBIRD, MOURNING DOVE, COMMON GRACKLE AMERICAN KESTREL, CATTLE EGRET, AMERICAN CROW, SNOWY EGRET EUROPEAN STARLING, GREAT BLUE HERON, EURASIAN COLLARED-DOVE, TURKEY/VULTURE

(5)	ON FOOT	A(2)	0752	RED SHOULDER CHASED 2 ADULTS OFF PREVIOUS MENTIONED CITRUS TREE, ~~BOTH~~ 1 ADULT FLEW NW, AND 1 FLEW EAST AND CIRCLED BACK AROUND AND CROSSED
(6)	[redacted]			SR 29 NORTH OF STATION, LOST SIGHT BC OF BRAZ PED, HOWEVER WALKED TO EAST SIDE OF SR 29 AND OBSERVED BOTH ADULTS PERCHED IN A CABBAGE PALM* PREENING
(7)	IN VEHICLE	A(1)	0800	EACH OTHER, ONE ADULT FLEW WEST OUT OF SIGHT, THE OTHER CONTINUED TO STAY PERCHED ON CABBAGE PALM
(8)	IN VEHICLE	A(1)	0810	ADULT TOOK FLIGHT DUE NORTH AND CUT TO THE WEST OUT OF SIGHT
(9)	IN VEHICLE	A	0891-0915	ADULT FLEW IN FROM WEST IN EASTERLY DIRECTION, LANDED IN SCRUBBY PINE IN PASTURE, RANDOM PREENING WHILE PERCHED. FLEW OFF TO NE OUT OF SIGHT

* CABBAGE PALM IS ON THE WEST ROW LINE ~300 FT NORTH OF STATION IN BREAK OF BRAZ PED.

USFWS Crested Caracara Draft Survey Protocol –
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Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 3: 26.456298, -81.434393

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
2/4/21	7:06	10:15	Sandy Scheda - Authorized Observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:06	37°	0mph	10%	cirrus	Patchy ground fog
Finish: 10:15	57°	5mph/N	10%	Cirrus	N/A

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Unimproved pasture with low herbs to west; grove to east of SR 29 No cattle in pasture. Lots of traffic and related noise

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
On foot	A	7:54	One caracara flew from E to W over S end of pasture
on foot	A	8:50	Two caracara over SR 29 at S end of pasture. One flew west. Other flew N over SR 29 surveying road, then headed west N of Station 3
Vehicle	A	9:03	Two cara cara flg from NW of Station to SE of station, 1 onward close, with aerial interplay; go down in grove.
Vehicle	A	9:34	One caracara flies up out of grove, stays low and circles, then goes down in grove again.

Eastern phoebe
Catbird (call)
red-shouldered hawk
black vulture
American kestrel
dove
hogs
meadowlark - call

Vehicle	A	9:48	One caracara flying up out of grove, circling, landing again.
		END	Never saw caracaras leave grove.

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 4: 26.442269, -81.438832

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
2/4/21	0702	1003	C STOUT - AUTHORIZED

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:02	47	4 EAST	10	CIRRUS	N/A
Finish: 10:03	53	4 EAST	20	CIRRUS	N/A

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
STATION IS IN ROW (NORTH) OF WESTCLOX ST. ~~[illegible]~~ PASTURE TO SOUTH, DISTURBED LAND TO NORTH WITH FORRESTED PINE TO NW

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

	Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
(1)	VEHICLE	A	0721	FLEW IN FROM SW IN A NNE DIRECTION PERCHED ON PINE ON NORTH SIDE OF ROAD FLEW DOWN TO EAT ROADKILL IN ROAD
	↓	↓	↓	KEEPS FLYING BACK & FORTH EATING WHEN VEHICLES COME BY, FLEW SW AND PERCHED IN PINE, MOVED ROADKILL OFF ROAD - AND CARACARA CAME
	↓	↓	0753	BACK AND CONTINUES TO FEED ON IT, ROUTINELY PERCHING ON FENCE FLEW OFF TO SOUTHWEST, OUT OF SIGHT
(2)	VEHICLE	A	0810 0815	OBSERVED INDIVIDUAL FORAGING ON ROADKILL FROM PREVIOUS SIGHTING, FLEW OFF TO SW, OUT OF SIGHT

OTHER WILDLIFE: GREAT BLUE HERON, WHITE IBIS, BLACK VULTURE, SANDHILL CRANE, GLOSSY IBIS, LITTLE BLUE HERON, GREAT EGRET, MOURNING DOVE, CAROLINA WREN, PALM WARBLER, BLUE JAY & RED BELLIED WOODPECKER, COMMON GRACKLE, GRAY CATBIRD, AMERICAN KESTREL, PINE WARBLER, NORTHERN CARDINAL, WOOD STORK, NORTHERN FLICKER, NORTHERN MOCKINGBIRD, BLUEGRAY GNATCATCHER, DC CORMORANT, SNOWY EGRET, DOWNY WOODPECKER, EASTERN PHOEBE, TURKEY VULTURE, PILEATED WOODPECKER, KILLDEER, TREE SWALLOW, DEER

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(3)	VEHICLE	A	0822 0836 →	OBSERVED INDIVIDUAL PERCHED ON PINE SNAG WSW OF STATION, BLVU FLEW IN A PERCHED ON SAME BRANCH, CARACARA UNAFFECTED DISAPPEARED FROM SIGHT-NO EXIT OBSERVATION
(4)	VEHICLE	A	0841	FLYOVER WEST OF STATION, NORTH TO SSE DIRECTION
(5)	ON FOOT	A (2)	0854	2 ADULTS FLYING IN FROM SSE IN A NNW DIRECTION. 1 WAS HARASSING OTHER. AFTER LOOPING AROUND, 1 FLEW TO THE NNW AND ONE FLEW TO THE ESE OUT OF SIGHT

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 5: 26.436236, -81.425164

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
2/5/21	7:00am	10:15 am	Sandy Schedar Authorized Observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:00	47°	0	0%	N/A	N/A
Finish: 10:15	72°	10 mph	0%	N/A	N/A

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
N side of road - pasture with occasional cabbage palm, slash pine and clumps of shrubs S side of road - single family residential (Relatively quiet)

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle			No caracaras observed.

Killdeer
turkey vultures
cowbirds
mocking birds
blue jay
red bellied woodpecker
Swallows

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 6: 26.384121, -81.370662

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
2/5/21	0659	1000	C. STOUT - AUTHORIZED

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 0659	41	Ø	Ø	N/A	N/A
Finish: 1000	64	9 SOUTH	Ø	N/A	N/A

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
SR 29 ROW (EAST) – POWER EASEMENT, PARALLEL TO WEST [redacted] - EAST SIDE OF ROAD LINED W/ CABBAGE PALMS WEST SIDE - B PEP & SAUX. ADJACENT PROPERTY CONSIST OF SHRUBBY WETLANDS, LARGE DITCH/CANAL ON EAST SIDE

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
(1) VEHICLE	A	0945	FLYOVER WEST OF STATION NORTH TO SOUTH DIRECTION LOST SIGHT BEHIND TREES

OTHER WILDLIFE: GREAT EGRET, PALM WARBLER, RED SHOULDER HAWK, ANHINGA, WHITE EYED VIREO, AMERICAN CROW, COMMON GRACKLE, BLACK VULTURE, CAROLINA WREN, TUFTED TITMOUSE, AMERICAN ROBIN, CEDAR WAXWING, OSPREY TRI-COLORED HERON, LITTLE BLUE HERON, WOOD STORK, WHITE IBIS, NORTHERN CARDINAL BELTED KINGFISHER, EASTERN PHOEBE, MOURNING DOVE, TURKEY VULTURE, BLUEGRAY GNATCATCHER GRAY CATBIRD, RED-BELLIED WOODPECKER, GREAT BLUE HERON, GREAT CRESTED FLYCATCHER, SNOWY EGRET, [redacted] TREE SWALLOWS, RED TAILED HAWK

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 7: 26.364397, -81.349052

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
2/8/21	0705	1008	BJ Quinton, Authorized Observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 0705	68°F	4mph S	100%	Cirrus	Light Fog
Finish: 1008	72°F	6mph NE	100%	Cirrus	N/A

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Improved pasture w/ scattered cabbage palms

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle			
	No		CRCA observed

Inc. SIP: RSHA, AMCR, GRCA, AMKE, TRHE, BLVU, BCJA, RBWO ROSP, BCNH, MODO, HAWO, GBHE, ANHI, KILL GREG, TUVU, DCCO, EAME, PIWO, NOMO

USFWS Crested Caracara Draft Survey Protocol –
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Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 8: 26.344113, -81.343087

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
2021 FEB 8	7:06	10:06 am	BRAD YOUNG AUTH. OBS

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:06	68°F	N 5mph	100%	LOW CEILING HAZE	NA - HAZE
Finish: 10:06	72°F	N 10-15	100%	LOW CEILING HAZE	NA - HAZE

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
IMPROVED PASTURE TO EAST. CITRUS GROVE TO WEST, WOODED ALONG US 27 ROW W/ CANAL & CYPRESS, Agricultural workers entered eastern property @ 7:42. HEAVY EQUIPMENT USE.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
STA 8	A #1	7:12	FLY OVER US 29 - WEST TO EAST
STA 8	A #2	7:48 - 7:59	FLEW OVER US 29 FROM WEST - LANDED ON EAST SHOULDER, FLEW N. ALONG US 27 - landed on west shoulder - foraging LEFT SITE TO EAST
STA 8	A #3	7:58 - 7:58	FLEW EAST ACROSS US 29 - over #2 - FLEW OFF NORTH ALONG US 27 OUT OF SIGHT
8	A #4	8:06	FLEW SOUTH ALONG US 29 THEN N. OF STATION FLEW EAST ACROSS PASTURE

vehicle

CROW
WOOD STORK
E. starling
pileated woodpecker
gbh
deer

roseate spoonbill
white ibis

SAND HILL CRANE

black vulture
WILD TURKEY ~~(15)~~ (16)
blue jay

BOAT TAILED GRACKLE
cattle egret
white egret
little blue heron
KINGFISHER
BLACK-CROWNED NIGHT HERON
RED BELLIED WOODPECKER

D. B. CORMORANT
Anhinga

USFWS Crested Caracara Draft Survey Protocol –
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Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 9: 26.336258, -81.343532

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
2/10/21	0655	1005	BJ Quinton, Authorized Observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 0655	66°F	Calm	100%	Cumulonimbus	N/A
Finish: 1005	78F	11mph E	40%	Cumulus	N/A

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Improved pasture w/ scattered cabbage palms to E. Orange groves to W.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle			
No CRCA observations			

Inc, spp: WEVI, AMCR, RBWO, PIWO, NOCA, GREG ANHI, CAEG, BEKI, LBHE, GBHE, BLJA RSHA, WHIB, GRCA, GCFL, WOOT, SACR NOMO, BLVU, MODO, STHA, TUVU

321
474
2291

USFWS Crested Caracara Draft Survey Protocol – Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 10: 26.317706, -81.343208

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
2024 FEB 9	7:05	10:05am	BRAD YOUNG ANTH. URS

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:05	63°F	LIGHT/VARIABLE	0%	~~HAZE~~ CLEAR	LIGHT HAZE
Finish: 10:05	77°F	S @ 10 mph	10%	Stratus	NA

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
IMPROVED pasture w/ SABAL & PINES/OAKS TO ~~EAST~~ WEST CANAL w/ BORDERING OAK, CYPRESS, SABALS ON ~~WEST~~ EAST SIDE OF US 29

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle STA 10	A	7:13 ①	overflight to east
10	A	7:22 ②	FLEW INTO CABBAGE PALM AREA WEST OF STATION. DID NOT SEE LAND IN CABBAGE PALM
		7:28 ③ 7:40	PERCHED IN OAK WEST OF ROAD ALONG CANAL. WAS PRESENT ON ARRIVAL? PREENING FLEW DOWN TO ~~SOUTH~~ WEST ROAD SHOULDER, HOPPED ~~ACROSS US 29 TO EAST SHOULDER~~ FLEW SOUTH ALONG US 29 TO PERCH IN OAK ALONG CANAL ALMOST OUT OF BINOCULAR SIGHT

RB woodpecker
KESTREL
WILD TURKEY
cattle egret
CROW

STA 10	~~7:46~~ A (4)	7:49 A (4)	FLYING FROM NW TO SE INTO CABBAGE PALM AREA
STA. 10	A	8:55 (5)	CARACARA FLEW OUT FROM CABBAGE PALM & PINE AREA WEST OF GATE. INTERACTING WITH CROW, CIRCLED BACK TO AREA – CANNOT SEE WHERE CARACARA LANDED.
STA 10	A	9:11 (6)	CARACARA FEW OVER US 29 from EAST, SOUTH OF STA 10, CIRCLE OVER ROAD AND FLEW BACK EAST
STA 10	A	9:31 (7)	CARACARA FLEW OUT OF SUSPECTED NEST AREA OF SABALS / PINES – CROSSED US 29 TO EAST
STA 10 200' N. of GATE	A	9:34 (8)	CARARA FLEW ACROSS US 29 FROM EAST TO SUSPECT AREA – ROOSTED IN SLASH PINE W/ FORAGE
	A	9:38 (9)	2nd CARARA FLEW FROM EAST NEAR ROOSTING BIRD & DOWN TO SUSPECTED SABAL (NOT 100% SURE – OBSURED VIEW) COULD NOT BE OBSERVED WHEN SCOPE RELOCATED
		9:39 (8)	#8 LEFT PINE ROOST – FLEW TO EAST ACROSS US 29

White egret
Bobcat
Morning Dove
Mockingbird
Caracara
Black Vulture

GBH

USFWS Crested Caracara Draft Survey Protocol –
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Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 11: 26.303103, -81.34018

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
2024 FEB 10	6:58	9:58 am	RRD YOUNG AUTH. OBS.

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 6:58	66°F	CALM	100%	Stratus	NA
Finish: 9:58	75°F	10 mph - SE	10%	Stratus	NA

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Improved (semi-improved?) pasture to SOUTH. WOODED UPLAND (OAKS, SABALS, BP) TO NORTH (with slash pine) ROADSIDE SWALES AND CATTLE POND 200' TO SE.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle STA 11	NA	NA	NO CARACARA OBSERVED

CROW
white egret
red shouldered hawk
mockingbird
mourning dove

r.b. woodpecker
~~r.b. heron glossy ibis~~ r.b. heron
pileated woodpecker
~~apple snail shells under adj. fence post~~ (open ditch with a.s. shells ~~in this~~)
American bittern

TURKEY ~~BLACK~~ VULTURE
white ibis

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 12: 26.418763, -81.39254

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
2/9/21	0700	1000	BJ Quinton, Authorized observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 0700	63°F	Calm	0%	N/A	Dense Fog
Finish: 1000	78°F	13mph SE	10%	Cumulus	N/A

vis: ~150yds

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Improved pasture with cabbage palms on N side of road

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
~~OTH~~ on foot	2A	0919	Two adults flew in NW of the ~~sta~~station and criss-crossed across the road before heading NW out of sight

Inc. spp.: BSHA, GRCA, NOCA, AMCR, EAME, MODO, RBWO, EAPH, Coyotes, SACA, OBHE, AMRO, TRES, GREG, BAWW, BLJA, ANHI, NOMO, EUST, BLVU GCFL, HOSP, TUVU, PIWO

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 1: 26.48703, -81.439267

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
2-17-2021	6:50	11:05	Christine Sciarrino, authorized

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 6:50	64°F	5 mph, NE	100%	stratocumulus	thin fog
Finish: 11:05	70°F	5 mph, N	20%	altocumulus	none

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Heavy traffic, active construction, car accident with police activity

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

	Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
A	Truck	Adult	7:00	Flyover east to west to palm (ornamental) grove on north side of SR 82
B	Truck	Adult	7:02, 7:36, 7:41	perched on pole, flies to east at NE quad of 82-29 intersection, perches on pole same individual leaves, flies in large circle to north, lands on ground roadside
C	Truck	Adult	7:44	2 individuals fly together in unison with displays southeast to northwest
D+E	Truck	Adult	7:45	3rd individual (D) southeast to northwest with 4th individual (E) east to west going out of sight in same location as "A" At one point 4 adults flying at same time none with food or nesting material
F	Truck	Adult	8:00	3 adult caracara + 4 BLVU fly tight circles at roadside in front of palm grove, one lands briefly at side of road

USFWS Crested Caracara Draft Survey Protocol –
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Truck	Adult	8:12	2 individuals emerge from behind BP at ~~suspected~~ potential nest tree (#2), shortly one flies NE to nearby ground, other flies SW + perches at pole next to potential nest tree (#1)
Truck	Adult	8:19	Indiv from above walks + scratches around down poles jumps + perches then flies SW passing BP + replaces other individual on same pole next to potential nest tree #1. Unsure where other went
Truck	Adult	8:27	Indiv from above flies from perch on pole deep into potential nest palm ~2 min, emerges + descends to surrounding mowed area, 8:36 back deep into palm
On foot	Adult	8:41	8:41 2nd indiv observed on ground, 8:42 flies into palm without food or nesting material. 2 adults in tree, both entered from south side top. 8:44 one exits +
			perches on pole to south, 8:46 flies far west + north
Truck	Adult	9:20	While spotting pot nest tree # 1, individual appears at pole north of station perched
Truck	Adult	9:30	flyover from south to north
Truck/ on foot	Adult	9:50	Relocated vehicle closer to pot nest tree #1 + observed adult sitting at interior of fronds, from west looking in can identify
			dense dark area that appears to be nest but partially obscured. 2nd individual perched nearby, ~~finds carrion + individual on potential nest~~
			~~does not leave to pursue food~~. enters tree, exits carrying twig to adjacent mowed yard, finds carrion, drops twig + eats. Makes gutteral calls
			Individual in tree does not leave to pursue food.
			As of 11:03 individual still on potential nest
			12:25 drive by observation of individual on pot nest

Incidental species: WHIB, NOHA, BTGR, SNEG, BLVU, MODO, KILL, NOMO, EAME, PAWA, PIWO, WHPE, ANHI, RSHA, STKI, BLJA

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 2: 26.474757, -81.434785

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
2/17/21	6:55am	9:55am	Bob Mrytalo – Authorized observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 6:55am	64°	1mph, NW	100%	cumulous	none
Finish: 9:55am	70°	3mph, NE	40%	cumulous	none

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Active cattle pasture adjacent to SR29, Heavy traffic on SR29.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle	IM(1)	7:10 7:18 7:21 7:30	Flew from east, over pasture, and landed atop same pine Flew from pine, east, and across SR29 into citrus grove Flew from citrus grove to perch on telephone pole near SR29 Caracara near SR29 feeding on roadside trash and crow.
Vehicle	IM(2) IM(3)	7:26 7:32 7:36	2 IM flew north in citrus grove and out of sight. 2 IM drive bombed caracara feeding on trash, then flew into citrus grove. 2 IM feeding on trash, Juvenile nearby SR29 Road. The three Juveniles flew east into citrus grove.
Vehicle	IM(3)	7:45	2 caracaras briefly flew straight up from citrus grove. 1 carrying food other trying to take food. Both flew back to ground.
Vehicle	A(1)	8:37	One caracara flew southwest and far into cattle pasture. Last sight.

Cattle egret
Red shouldered hawk
American crow
White ibis
Turkey vulture

Boat-tailed grackle
Great egret
Black vulture
European starlings

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 3: 26.456298, -81.434393

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
2/16/21	6:50 am	9:50 am	Bob Mytabo - Authorized Observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 6:50am	70°	7mph, SW	100%	Cumulous	none
Finish: 9:50am	73°	7mph, NW	100%	cumulous	none

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
SR 29 Roadway - Heavy traffic.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle	Adult - 1	9:15am	Adult caracara flew from west to east, over SR 29, chasing a juvenile bald eagle. Both flew west, back over SR 29, and out of sight. Drove down SR 29, but couldn't locate them.

Cattle egrets
Juvenile bald eagle
Osprey
caracara (1A)
American crow

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 4: 26.442269, -81.438832

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
2-18-21	6:50	9:59	Christine Sciarrino, authorized

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 6:50	~~6:50~~ 71°F	2mph, SE	15	cirrus	thin fog
Finish: 9:59	79° F	14 mph, S	30	cirrus + altocumulus	NONE

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Light but regular traffic on westclox, grazing cattle, wetlands contain standing water, lots of frog calling

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

	Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
A	Truck	Adult	7:04	Looping flyover generally SW to S out of sight
B	Truck	Adult	8:50	Flies from west to east + lands behind tree line
C	Truck	Adult	9:20	Flies from south with group (kettle?) of vultures then alone to NE

Incidental species: FLSC, SNEG, PIWO, domestic chickens, MODO, BLVU, WHIB, BLJA, COMO, RSHA, BTGR, GRBH, KILL, ANHI, kestrel, OSPR, lots of calling frogs, BAEA (juv.), TUVU, TRSW

2'10454 0867

606 771512

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 5: 26.436236, -81.425164

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
2/18/21	6:49am	10:49am	Bob Mrykalo - Authorized observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 6:49am	71°	5mph, SE	5%	Stratus	none
Finish: 10:49am	78°	0mph,	0%	NA	NA

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Active cattle pasture.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle			No caracaras observed.

common ground dove
killdeer
Black vulture
Northern mockingbird
Red bellied woodpecker

Cattle egret
Turkey vulture
FL Sandhill crane

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 6: 26.384121, -81.370662

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
2/19/21	6:45am	9:45am	Bds Mynatalo - Authorized Observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 6:45am	73°	0 mph	20%	Stratus	Fog lifting
Finish: 9:45am	79°	0 mph	5%	Stratus	None

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
SR 29 ROW, cabbage palms line right-of-way.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle			no caracaras observed.

Northern Mockingbird.
Swallow-tail Kite
Black Vulture
Boat-tailed grackle
American crow

Great blue heron
Osprey
common ground dove
red-winged blackbird
American robin

Turkey vulture
red-bellied woodpecker
White Ibis
Red-shouldered hawk
Roseate spoonbill
Wood Stork

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 7: 26.364397, -81.349052

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
1/23/21	7:12 AM	10:12 am	Bob Mayfield – Authorized observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:12am	57°	2 Mph, SE	50%	Cumulus	sprinkles, clearing
Finish: 10:12am	73°	5 mph, NNW	100%	Stratus	None

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Pasture w/ cabbage palms. Cabbage palms along SR 29.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle	A(1)	8:56 am	Flying from north to south and out of sight.

American crow
swallow tail kite
Gray catbird
Wood stork

Turkey vulture white ibis
Great egret
red-bellied woodpecker
black vulture
common gallinule

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 8: 26.344113, -81.343087

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
2021/02/23	7:20		BRED YOUNG AUTH OBS ZACK YAWN - TRAINEE

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:20	69°F	CALM	30%	CUMULUS	NA
Finish: 10:20	72°F	NW 5-10 mph	100%	Cumulus	NA

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Citrus grove to west, forested pasture to east, cabbage palms in SR 29 ROW.

Observations

(flight data, perching, preening, courtship/feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
STA 8	A	8:02 ①	FLEW FROM WEST OVER ORANGE GROVE - NORTH ALONG SR 29 - ROOST IN TOP OF SLASH PINE
STA 8	A	8:04 ②	2nd CARACARA FLIES FROM NORTH TO ROOSTING PINE - CONTINUED SOUTH ON ROAD
STA 8	A	8:04	① FLEW WITH ② SOUTH along road
STA 8	A	8:06	① LANDED ON SLASH PINE → FLEW SOUTH ② FLYING SOUTH ALONG US 29

Vehicle

GBH
LITTLE BLUE HERON
WOODSTORK
MOURNING DOVE
KINGFISHER
BLACK VULTURE

White egret
cattle egret
CREW

SWALLOW-TAILED KITE

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Vehicle	A	8:30 ③	FLY over PRAIRIE WEST TO NORTHEAST
	A A	9:15 ④ ⑤	PAIR LANDED ON ROADWAY SHOULDER & GRAND RAT — FORAGING — BOTH FLEW OFF TO EAST
	A	9:17 ⑥	⑥ CARACARA FLYING SOUTH ACROSS PASTURE — MAY BE ④ OR ⑤
	A A	9:41 ⑦ ⑧	PAIR OF CARACARA FLING SOUTH ALONG ~~US 27~~ US 27 then WEST
	A	10:08 ⑨	FLYING SOUTH ALONG US 27 - overhead SIGN & then east & South

TURKEY VULTURE
WILD TURKEY
DOUBLE CRESTED CORMORANT
SANDHILL CRANE
OSPREY
ANHINGA

USFWS Crested Caracara Draft Survey Protocol – Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 9: 26.336258, -81.343532

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
2/24/21	7:10am	10:22am	Bob Mrytaj - Authorized observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:10am	65°	3mph, N	75%	Stratus	no
Finish: 10:22am	78°	7mph, E	25%	stratus	no

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
SR 29 ROW, powerline and wooded area adjacent to SR 29 contain numerous cabbage palms.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle			No caracaras observed

American crow, Red-bellied woodpecker, mourning dove, Northern cardinal, Black vulture

Blue jay, great egret

USFWS Crested Caracara Draft Survey Protocol – Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 10: 26.317706, -81.343208

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
2023/02/24	7:18		BRAD YOUNG - ANTH. UBS. ZACK YAWN -

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start:	65°F	LIGHT/VARIABLE	70%	~~Cumulus~~ STRATUS	NA
Finish:	70°F	EAST @ 5-10	20%	STRATUS	NA

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
NO CONSTRUCTION/AGRICULTURE ACTIVITY IMPROVED PASTURE W/ PATCHES OF LIVE OAK, SLASH PINE & SABAL PALMS

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
STA 10	A	7:35 ①	CARACARA W/ FORAGE FLYING TO SUSPECT NEST AREA FROM EAST OF US 29
10A 200' NW OF A UNDER P.L. EASEMENT	A	② 7:47	PERCHED ON DEAD SNAG - PREENING
10A		7:59	② - FLEW FROM PERCH EAST TO US 29 - OUT OF VIEW FROM 10A.
10A	A	9:05 ③ 9:06	CARACARA W/ FORAGE FLIES TO SLASH PINE, then flies into SABAL PALM - SUSPECT NEST TREE - 9:06 - FLIES FROM "NEST" TREE TO EAST

ON FOOT

RED-SHOULDERED HAWK
CROW
BLACK VULTURE
ANHINGA
WILD TURKEY

ROBIN
PILEATED WOODPECKER

COOPERS HAWK
STARLE

USFWS Crested Caracara Draft Survey Protocol –
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On foot

			③ – CARACARA IN "NEST" TREE cannot be observed in tree from 10A – FLEW IN W/ FORAGE & VOCALIZATIONS – LEFT
10A	A	9:30 ④	1-2 minutes later ④ - FLIES IN FROM EAST TO SNAG where ② WAS OBSERVED – FLEW OFF TO EAST – DID NOT FLY TO "NEST" TREE
10A	A	10:21 ⑤	FLEW INTO NEST TREE - LEFT BACK EAST AFTER 2 minutes

killdeer
Kingfisher
tree swallows

woodstork

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 11: 26.303103, -81.34018

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
2/25/2021	6:50 AM	9:55 AM	Bob Mrykalo & Zack Yawn

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 6:50 AM	57°	SSE 0 MPH	0%	NA	N/A
Finish: 9:55 AM	73°	N 7 MPH	0%	NA	NA

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Clear skies, Some morning traffic which slowed around 7:15. Improved pasture, road adjacent to pasture.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle	A ?(1)	7:56	Caracara observed far off site in back of pasture in tree line. Too far to positively ID Age.
vehicle	A(1)	8:05	one adult flying W along road, not carrying food or nesting material. Flew NW and out of sight.

Other Species observed during survey period

- Red bellied woodpecker
- ~~warblers~~
- Cormorant
- NOCO
- Catbird
- Blue Jay 8
- Pilliated woodpecker
- Little blue heron
- Red shoulder hawk
- cattle egret
- Red-tailed hawk
- Great Blue Herring
- Turkey vulture
- Wood Stork
- Anhinga

USFWS Crested Caracara Draft Survey Protocol – Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 12: 26.418763, -81.39254

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
2021/02/25	6:45		B. RITO YOUNG AUTH. OBS.

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 6:45	57°F	CALM	0%	NA	NA
Finish: 9:45	72°F	LIGHT/VARIABLE	CLEAR-0%	NA	NA

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
SOD FARM TO N.E. — ACTIVE OPERATION - MULTIPLE TRUCKS IN/OUT IMPROVED PASTURE TO SE & S — ACTIVE ENTRY @ 8:20 AGRICULTURAL INFRASTRUCTURE TO SW IMPROVED PASTURE TO NW

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
12 Vehicle	A	9:36	CARACARA FORAGING ON ROADKILL W/ VULTURE IN road - hoping off road to avoid traffic. FLEW OFF TO NORTH

Crow
mourning dove
black vulture
d.c. cormorant
killdeer

SANDHILL CRANE
UNID. DUCK 8
palm warbler
tree swallow

wood stork
red shouldered hawk
great blue heron
turkey vulture

USFWS Crested Caracara Draft Survey Protocol –
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Caracara Survey Form (updated 12/9/2016) Productivity Survey

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 1: 26.48703, -81.439267

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
3/2/21	1:29pm	1:40pm	Bob Mrykalo - Authorized observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 1:29pm	85°	3mph, SW	50%	cumulous	none
Finish: 1:40pm	85°	3mph, SW	50%	cumulous	none

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Nest about 300 meters west of SR29 & SR82 intersection and is on SR82, roadwork w/ backhoe occurring about 200 ft west of nest. A crew of 3 people are working on the new roadway.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle	A(1)	1:29pm to 1:40pm	1 adult sitting on nest, very little movement over 10 minutes of observation. Estimate incubating eggs.

USFWS Crested Caracara Draft Survey Protocol –
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Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 2: 26.474757, -81.434785

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
3/2/21	7:00 am	10:00 am	Bob Mrytalo – Authorized Observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:00	68°	1mph, NNE	20%	Cirrus	slight fog
Finish: 10:00	74°	2mph, S	40%	cumulous	none

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
SR 29 ROW, citrus grove to east, cattle pasture west

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle	A(1)	9:01 am 9:28 am	Adult caracara perched atop slash pine in pasture, - flew SW and nearly out of sight. Landed in pasture,

Carolina wren
Cardinal
Northern mockingbird
common ground dove

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 3: 26.456298, -81.434393

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
3/3/21	6:52am	9:52am	Bob Mrytala - Authorized observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 6:52	70°	6mph, SSW	0%	NA	NA
Finish: 9:52	77°	11mph, SW	90%	Stratus	none

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
SR 29 ROW, citrus grove to east & cattle pasture to the west, Normal heavy morning traffic.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle	A(1)	7:08	Flew from west, downs SR 29 to south, then east over citrus grove and out of site.

Boat-tailed grackle
Red-shouldered hawk
Black vulture
Wood stork
Turkey vulture

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 4: 26.442269, -81.438832

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
3/4/21	6:37am	9:37am	Bob Muytalo - Authorized observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 6:37	57°	1mph, E	100%	Stratus	None
Finish: 9:37					

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Pasture to west, wooded pasture to east.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle			No caracaras observed.

Great blue heron
Red-shouldered hawk
FL sandhill crane
White ibis

Black vulture
Gray catbird
Cattle egret
Yellow rumped warbler

Common ground dove
Boat-tailed grackle
Great egret

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 5: 26.436236, -81.425164

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
3-4-21	7:05	10:05	Christine Sciarrino, authorized

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:05	59°F	2mph, N	90%	stratocumulus + altocumulus	NONE
Finish: 10:05	64°F	7mph, N	95%	stratocumulus + altocumulus	NONE

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
very light traffic on residential road, occasional low small aircraft. Cattle grazing, high feral/domestic + wildlife activity: dog, cat, fox, Cooper's hawk plucked ground dove from midflight + ate perched on nearby tree

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle			NO caracara observed

Incidental species: MODO, NOMO, RBWO, GRCA, BTGR, NOCA, FLSC, domestic/feral dog, AMCR, BAEA, domestic chickens + roosters, BLVU, WHIB, domestic/feral cat, COGD, COHA, GREG, fox, BLJA, KILL, TUVU, NOHA, STKI

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 6: 26.384121, -81.370662

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
3/5/21	6:31 am	9:31 am	Bob Mrytak - Authorized observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 6:31	50°	1 mph, S	0%	NA	NA
Finish:					

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
SR 29 ROW, ROW lined w/ cabbage palms

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle			No caracaras observed.

Northern cardinal
Great blue heron
tricolored heron
gray catbird
Great egret
Anhinga
Boat-tailed grackle
Pileated woodpecker
white ibis
turkey vulture

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 7: 26.364397, -81.349052

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
3-5-21	7:25	10:25	Christine Sciarrino, authorized

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:25	54°F	1 mph, N	15%	cirrus	none
Finish: 10:25	69°F	9 mph, E	25%	cirrus	none

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Light traffic, vehicles noisy. Can hear equipment (ag +/or construction) operating when no vehicles are on road.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

	Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
A	Truck	Adult	7:58	Flyover from northwest to follow path of roadway
B	Truck	Adult	8:17	Flyover from southeast, carrying twig to northwest over vegetation
C	Truck	Adult	10:01	Flyover north to south out of sight
D	Truck	Adult	10:10	Flyover along roadway southeast to northwest out of sight

Incidental species: ROSP, NOCA, PAWA, NOPA, GRCA, RSHA, BLJA, MODO, EAME, BLVU, AMCR, DCCO, FLSC, LIBH, BTGR, STKI, ANHI, COGR, deer, RBWO, GREG, WOST, EAPH, WHPE, TUVU

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 8: 26.344113, -81.343087

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
3/9/21	0653	0954	CS - QUALIFIED, EY - TRAINEE

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start:	54°	Ø —	10	STRATUS, CIRRUS	N/A
Finish:	73°	10 NE	10	STRATUS	N/A

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
EAST ROW OF SR 29 - CITRUS ON WEST SIDE, IMPROVED PASTURE ON EAST; STATION BORDERED BY LARGE DITCH/CANAL

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

	Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
(1)	FOOT	A (2)	0700	2 ADULTS TRASITIONING DOWN SR 29 IN A SOUTH → NORTH DIRECTION
(2)	FOOT	A	0707	1 ADULT TRASITIONING DOWN SR 29 FROM NORTH IN A SSE DIRECTION
(3)	FOOT	A	0831	1 ADULT TRANSITIONING IN A NORTH TO SOUTH DIRECTION OVER CITRUS GROVES WEST OF STATION
(4)	FOOT	A	0944	1 ADULT TRANSITIONING FROM SE TO NW DIRECTION

OTHER WILDLIFE - WILD TURKEY, WHITE PELICAN, PILEATED WOODPECKER, RED SHOULDER, GREAT EGRET, GLOSSY IBIS, NORTHERN CARDINAL, NORTHERN PARULA, AMERICAN CROW, BLUE GRAY GNATCATCHER, GRAY CATBIRD, COMMON GRACKLE, TREE SWALLOW, GREAT BLUE HERON, SANDHILL CRANE, EUROPEAN STARLING, RED BELLIED WOODPECKER, PALM WARBLER, MOURNING DOVE, WHITE EYED VIREO, BLACK VULTURE, WOOD STORK, DOUBLE BREASTED CORMORAN, SNOWY EGRET, GROUND DOVE, TURKEY VULTURE, DEER, ROSETTE SPOONBILL, SWALLOWTAIL KITE, LITTLE BLUE HERON, RACCOON, OSPREY

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 9: 26.336258, -81.343532

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
3/10/21	0640	0941	CS-QUALIFIED, ZY-QUALIFIED

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start:	56°	3, NNE	7%	STRATUS	N/A
Finish:	71°	11 ENE	5%	STRATUS	N/A

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
STATION IS WITHIN ROW OF SR 29 WITH PINE FLATWOODS TO EAST AND CITRUS GROVES TO WEST. A LARGE CANAL/DITCH EXISTS DIRECTLY EAST OF STATION

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

	Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
①	FOOT	A	0645	ADULT TRANSITIONING DOWN SR 29 IN A SOUTH TO NORTH DIRECTION - LANDED IN WEST ROW NORTH OF STATION - TOOK FLIGHT AND CONTINUED NORTH AND LANDED IN WEST ROW FURTHER NORTH
②	FOOT	A(2)	0724	2 ADULTS TRANSITIONING FROM EAST TO WEST TOWARDS LARGE WETLAND, INTERACTED WITH 2 ADULTS ③ OVER WETLAND
③	FOOT	A(2)	0725	2 ADULTS INTERACTED WITH 2 ADULTS ② THAT FLEW IN FROM EAST, ALL 4 APPEARED TO LAND IN CYPRESS AFTER SWOOPING/HARASSING EACH OTHER.
④	FOOT	A	0730	1 ADULT TRANSITIONING FROM WEST TO EAST WITH WHAT APPEARED TO BE FOOD IN BEAK

OTHER WILDLIFE: PALM WARBLER, TURKEY VULTURE, WOOD STORK, WHITE IBIS, AMERICAN CROW, REDSHOULDER HAWK, BLUEJAY, GREAT BLUE HERON, NORTHERN CARDINAL, GRAY CATBIRD, SANDHILL CRANE, GREAT EGRET, REDBELLIED WOODPECKER, SWALLOWTAIL KITE, TREE SWALLOW, BLACK VULTURE, GREAT CRESTED FLYCATCHER, COMMON YELLOWTHROAT, COMMON GRACKLE CATTLE EGRET, ROSEATE SPOONBILL, DOUBLE-CRESTED CORMORANT, SNOWY EGRET, LITTLE BLUE HERON, MOURNING DOVE, REDTAIL HAWK, BELTED KINGFISHER, NORTHERN HARRIER GROUND DOVE, AMERICAN KESTREL, BALD EAGLE

(5)	FOOT	A	0743	1 ADULT TRANSITIONING FROM EAST TO WEST NORTH OF STATION
(6)	FOOT	A	0756	1 ADULT TRANSITIONING FROM WEST TO EAST-SOUTH-EAST, NORTH OF STATION
(7)	FOOT	A	0832	1 ADULT TRANSITIONING FROM EAST TO WEST JUST NORTH OF STATION
(8)	FOOT	A	0849	1 ADULT TRANSITIONING FROM EAST TO WEST JUST SOUTH OF STATION &

USFWS Crested Caracara Draft Survey Protocol –
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Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 10: 26.317706, -81.343208

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
3/9/21	6:50am	9:50 am	BJS Manfalo Authorized observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 6:50	53°	4mph, N	5%	Stratus	No
Finish: 9:50am	68°	11mph, NE	10%	Stratus	No

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
cattle pasture & SR29 ROW

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
On foot	A(1)	7:05am	Adult w/ nest material flew to snag, perched for 5 minutes then flew south and out of site, Adult fly to potential nest tree.
↓	A(2)	7:25am	2 adults landed on slash pine carrying nest material. 1 stayed on pine and dropped material, second flew north & out of site.
↓	(1)	7:45am	1 adult, not carrying anything, flew to potential nest tree, perched at base end of cabbage palm on a frond,
↓	(1)	7:48am	second adult flew to cabbage palm carrying nest material.
↓	(1)	7:58am	1 adult flew from nest tree, flew west, and perched on snag.
↓	(1)	8:06am	Caracara on snag flew south and out of site. Could get a good angle to observe potential nest tree. Private land constraints.

gray catbird
common ground dove
swallowtail kite
Red bellied woodpecker

northern cardinal

Great blue heron
wood stork
Great egret

Red-shouldered hawk

On Foot	AF	8:45 am	One adult flew from south and perched on snag. Then flew back south and out of sight.
↓	AC	9:12 am	Switched observation location. Documented caracara on nest.

USFWS Crested Caracara Draft Survey Protocol – Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 11: 26.303103, -81.34018

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
3/11/21	0630	0933	Craig Stout, Zack Yawn "Qualified"

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start:	59°	NE 3 MPH	70%	Stratus	0%
Finish:	69°	SE 2 MPH	90%	Stratus	0%

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
In ROW of Oil well Rd. East of SR 29. Improved pasture to S, wooded pasture to N.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

	Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
①	Foot	A	8:20 AM	1 Adult transitioning in a E→W direction down oil well rd. Headed N up SR 29.

Other wildlife: Great blue heron, Am. Crow, N. Cardinal, Great Crested flycatcher, Red shoulder hawk, Red bellied woodpecker, Eastern meadowlark, Kestral, Red tail hawk, Blue Jay, Great egret, Sandhill crane, E. Phoebe, Gray catbird, Tree Swallows, Woodstork, mourning dove, double crested comorant, Pileated woodpecker, White Ibis, Black vulture, ground dove, Downie woodpecker, European Starling, N. mockingbird, Turkey vulture, Cattle egret, Eagle, Snowy egret, Pine warbler, common grackle,

USFWS Crested Caracara Draft Survey Protocol –
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Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 12: 26.418763, -81.39254

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
3/10/21	6:36 am	9:36 am	BdS Mnytalo Authorized observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 6:36	55°	6 mph, NNE	10%	Stratus	none
Finish: 9:36	70°	11 mph, ENE	10%	Stratus	none

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Airport, woodland pasture, roadway w/ cabbage palms

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle			No caracaras observed,

northern bobwhite
eastern meadowlark
common nighthawk
Tree swallow
Northern mockingbird
black vulture

northern cardinal
red-bellied woodpecker
8 American crow
Gray catbird
" common ground dove
" Mourning dove

boat tailed grackle
wood stork
palm warbler
Great egret
FL sandhill crane

USFWS Crested Caracara Draft Survey Protocol – Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82 Productivity Survey

Location/Observation Block/Lat- Long: Station 1: 26.48703, -81.439267

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
3/15/21	10:40 am	11:05am	Bob Muyka Authorized observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 10:40	78°	6mph, SSE	30%	Cumulus	None
Finish: 11:05	same	same	same	same	same

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Roadwork along SR82. New traffic pattern has brought SR82 roadway within 25 feet of active caracara nest.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle	A(1)	10:43am	one adult caracara on nest. No young observed. Adult stayed on nest during entire monitoring, no sign of second adult.

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Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 2: 26.474757, -81.434785

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
3/15/21	0740	1040	BJ Winkler, Authorized observer / Troy Craig, secondary observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 0740	63°	2mph SE	0%	N/A	Light Fog
Finish: 1040	77°	6 mph SE	30%	Cumulus	N/A

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Improved pasture w/ scattered cabbage palms

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle	A (2)	0754	Two adults observed perched on cattle fencing. Did not observe flight.
Vehicle	A(2)	0810	Two adults observed flying E, turning N, then separating. One flew NE out of sight the other flew back W & landed in pine, left to E.
Vehicle	A	0843	One adult observed flying E
Vehicle	A	0844	one adult observed flying S Both this one & the one @ 0843 observed circling in the area

Incidental spp: ASHA, AMCR, EAME, WOST, AMKE, GRCA, BLVU, NOCA MODO, EUST, SACR, NOMO, GBHE

Vehicle	[redacted]A	0904	One adult observed flying W/SW and out of sight

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Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 3: 26.456298, -81.434393

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
3-16-21	7:20 Am	10:20 Am	Troy Craig secondary BJ Quiton Authorized observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:20 Am	61°F	4mph SE	5	Cirus	Fog Dense
Finish: 10:20 Am	75°F	11mph SE	5	Cirus/Comuls	N/A

Fog lifted 8:20 Am 1/4 mile VIZ

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Improved Pasture with Scattered palms orange grove across highway

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle	A	9:09	1 adult observed North along Road. Flying out of sight

-Inc. Spp -
- NOCA - WOST - COGR - MODO
- GRCA - WHIB - SACR - RSHA
- EAME - LBHE - DCCO - BLVU
- GREG - NOMO - NOHA

USFWS Crested Caracara Draft Survey Protocol –
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Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 4: 26.442269, -81.438832

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
3/15/21	7:30am	10:30am	Bob Maykalo – Authorized Observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:30	63°	None	0%	NA	NA
Finish: 10:30	77°	5mph, SE	25%	Cumulous	None

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Active cattle pasture both sides of roadway.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle			No caracaras observed,

Northern mockingbird
Northern cardinal
gray catbird
Boat-tailed grackle
cattle egret

Blue gray gnatcatcher
White ibis
Great egret
FL sandhill crane
black vulture

USFWS Crested Caracara Draft Survey Protocol –
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Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 5: 26.436236, -81.425164

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
3/16/21	7:25 am	10:25 am	Bob Muytjens - Authorized observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:25	59°	1 mph, NW	10%	Stratus	Fog - lifting on arrival
Finish: 10:25	75°	11 mph, SE	5%	cumulous	None

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Woodland pasture, normal conditions.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle			No caracara's observed.

Northern Mockingbird
Eurasian collared dove
Boat-tailed grackle
Killdeer
Common Nighthawk
Mourning dove
Blue jay
Red bellied woodpecker.
Loggerhead shrike

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Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 6: 26.384121, -81.370662

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
3/17/21	0735	1035	BJ Quinton-Qualified Observer/Trey Lindsey-Trainee.

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 0735	64°F	1mph NW	5%	Cumulus	N/A
Finish: 1035	76°F	3mph S	50%	Cumulus	N/A

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Roadside with numerous cabbage palms. Heavy clearing @ observation point. Very noisy.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle	A	0810	Perched on snag for several minutes. Flew West, showing aggressive behavior towards Amcr before disappearing behind parked trucks
Vehicle	2A	0942	2 Adults observed flying NE over the observation point and disappearing behind the tree line to the East.

Incsp: WHIB GBHE RSHA AMCR STKI CBHE MODO BOGR NOCA GREG BCVU [redacted] GRCFL8 GRCA AIWO OSPR BLJA EAPH AWHI WOST

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Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 7: 26.364397, -81.349052

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
3/17/24	7:31 am	10:31 am	Bob Mrykalo - Authorized observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:31am	63°	2mph, NE	30%	cumulus	No
Finish:					

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Normal conditions, pasture SW, agriculture NE, & west. Cabbage palms along SR29 ROW

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
vehicle			No caracaras observed.

Northern cardinal
Black vulture
Northern mockingbird.
Mourning dove
American crow
Blue jay
gray catbird
boat-tailed grackle.
red-shouldered hawk

USFWS Crested Caracara Draft Survey Protocol – Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 8: 26.344113, -81.343087

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
3/23/2021	7:35AM	10:30	Zack Yawn "Authorized"

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:35AM	57°	SSE 0	75%	Cumulonimbus	Light
Finish: 10:30AM	65°	3 variable	20%	Altocumulus/Sirrus	N/A

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
East ROW of SR 29. Improved pasture to E. Citrus to W. of SR 29.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Station 8 Pedestrian			NO observations of caracaras

Other Species: Great Blue heron, Great egret, Gray catbird, Woodstork, Cattle egret, Black vulture, Red-bellied woodpecker, Sandhill Crane, N. cardinal, Boat-tail grackle, Mourning dove, Swallow Tailed Kite, Am. White Pelican, Am. Crow, Red shouldered hawk, White-tailed deer, Bobwhite, Turkey, Double crested cormorant, Turkey vulture, Osprey, Barred owl, Am. Alligator

USFWS Crested Caracara Draft Survey Protocol – Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 9: 26.336258, -81.343532

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
3/23/21	7:30 Am	10:30 Am	Christine Sciarrino (primary) (authorized) Trey Craig

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:30 Am	56°F	8mph W	80%	Altocumulus	light
Finish: 10:30 Am	65°F	3mph	20%	Alto/cirrus	No fog or rain

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Orange grove → Road hill South bringing lots of Vultures Cabbage Palm + Canal → Improved Pasture

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle			No observations of caracaras.

Incidental species: GRCA, AMCR, RBWO, COGR, WOST, TRSW, GREG, KILL, FLSC, DCCO, NOCA, BRPE, GRBH, MODO, STKI, LIBH, WHPE, RSHA, PAWA, OSPR, BEKI, PIWO, RTHA, BLVU, TUVU

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 10: 26.317706, -81.343208

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
3-23-21	10:45	12:43	Christine Sciarrino, authorized/qualified, Zack Yawn, authorized/qualified, Troy Craig, seconder

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 10:45	67°F	2 mph, W	20%	altocumulus + cirrus	none
Finish: 12:43	72°F	light, variable	50%	altocumulus	none

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Production survey, regular light traffic on SR 29

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Foot	A(1)	10:50	adult flies from general direction of nest tree, did not appear to come from tree but may have, to north
Foot	A(1)	11:35	adult flies from north lands on ground, up to snag, calls flies to snag nearby → same as observed in during prior survey
Foot	A(1)	11:49	adult (same as above) flies from snag to south
Foot	A(1)	12:05	adult flies in from south to behind tree calling

Foot ~~12:20~~	Adult(1) (JM) 1	12:20	Same adult observed on ground, open dirt/herbaceous with Fledgling
	(JM) 1 (A) 1		Fledgling observed flapping, standing, disoriented for ~10 min. Adult flew to south, left Fledgling which
			continued flapping. Only one Fledgling appears to have left nest very recently, today or
			yesterday. Adult calling whenever present, physically encouraging Fledgling.

USFWS Crested Caracara Draft Survey Protocol – Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 11: 26.303103, -81.34018

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
3/24/2021	7:10 AM	10:10 AM	Zack Fawn "Authorized"

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:10AM	55°	NW 0	15 %	Cirrus	Light fog
Finish: 10:10AM	72°	ESE 2	5%	Cirrus	N/A

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Improved Pasture to the South of station 11 + improved Pasture + mixed coniferous, Brazilian Pepper, Hardwood + cabbage palm forest. Minor to moderate traffic pattern on Oilwell Rd.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle			no observations of caracara

Other Species: AM. Crow, Gray catbird, N. cardinal, Roseate Spoonbill, Wood Stork, Red-bellied woodpecker, Blue Jay, Eastern meadowlark, Wild Turkey, Double crested cormorant, Red Shoulder hawk, mourning dove, common grackle, Pine Warbler, common ground dove, Little blue heron, Black vulture Great egret, Great crested flycatcher, Turkey vulture

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 12: 26.418763, -81.39254

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
3-24-21	7:15	10:15	Christine Sciarrino, authorized/qualified Troy Craig, secondary

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:15	56°F	NONE	15%	cirrus	light, distant fog
Finish: 10:15	70°F	3mph, SE	5%.	cirrus	NONE

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Some light small aircraft.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle			NO observations of caracaras.

incidental species: FLSC, EAME, NOPA, deer, GRBH, TUVU, BLVU, GREG, COGR, WOST, crow, RSHA, ~~BOGU~~ NOBO, GRCA, NOCA, TRSW, WHIB, RBWO, MODO, DCCO, NOMO, AMCR, ANHI, BTGR, KILL

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82 Productivity survey

Location/Observation Block/Lat- Long: Station 1: 26.48703, -81.439267

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
3/29/21	1209	1239	BJ Quinton, Bob Mytkalo, Authorized observers

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 1209	84°F	1mph E	20%	Cumulus	N/A
Finish: 1239	85°F	5mph E	50%	Cirrus/cumulus	N/A

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Rural area under construction. Milling & resurfacing ~1mi west

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
vehicle	A (1) Im (2)	1215	One adult with full crop feeding two juveniles. Juveniles show black and white downy feathers w/ light pink bill
vehicle	A (1)	1215	Flew in from west with food item started feeding young with other adult

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 2: 26.474757, -81.434785

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
3/29/21	7:32 am	10:32 am	S.L. Mayfield – Authorized observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:32	68°	1mph, SSE	100%	cirrus	Fog dissipating
Finish: 10:32	78°	5mph, ENE	75%	cirrus	none

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Citrus grove east, cattle pasture west. Normal conditions.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
On Foot	A(2)	8:26	2 adults, separated by time by about 30 seconds, Flew south along SR 29 & out of site
On Foot	A(1)	8:39	Caracara flew west & out of sight.
On foot	A(1) A(2)	9:33 9:36	Adult flew from east and on to strangler fig. 2 minutes later flew NW to cabbage palm. Adult flew from north, was joined by adult in cabbage palm and both flew SW and out of sight.

Northern cardinal
cattle egret
European starling
gray catbird.
Eurasian collared dove

Northern Mockingbird.
boat tailed grackle
Black vulture
eastern meadowlark

Turkey vulture
Anhinga

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 3: 26.456298, -81.434393

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
3/29/21	0737	1037	BJ Quinton, Authorized observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 0737	67°F	Calm	90%	Cirrus	Mod. to heavy Fog Vis ≈ 100
Finish: 1037	79°F	5mph E	25%	Cirrus/Cumulus	N/A

Fog lifted ~0900

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Unimproved pasture w/ scattered palms, heavy Brazilian pepper & wetland on N side. Orange groves on E side of SR-29 with workers present

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle			No CACA Observations

Inc. spp: GREG, EAME, GRCA, COOR, NOCA, RSHA, BOGR, WOST SACR, MODO, LBHE, AMKR, BLJA, NOPA, TUVU, BLVU SNKI

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 4: 26.442269, -81.438832

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
3/30/21	0736	1036	BJ Quinton, Authorized Observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 0736	71°F	5mph E	2%	Cirrus	N/A
Finish: 1036	81°F	11mph E	2%	Cumulus	N/A

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Improved pasture w/ light cattle activity. Large wetland to south. Scattered palms & pines with one shag.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
vehicle	A	0806	One adult flew in from the NW, across the site, circled the SE corner of the site, then flew S out of sight
vehicle	A	0820	One adult flew in from NE, across the site, carrying a food item (mouse). Continued across site before turning hard to the S and disappearing behind the tree line.

Inc. spp: RBWO, NOMO, cricket frogs, GRCA, BRWH, CAHE, SACR BLVU, RODO, MODO, KILL, PIWO, BLJA, RSHA

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 5: 26.436236, -81.425164

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
3/30/21	7:40am	10:40am	Bob Mayfield Authorized Observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:40am	70°	4mph, ENE	10%	Cirrus	Fog lifting
Finish: 10:40	82°	11mph, E	20%	cumulus	None

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Pasture to east, residential west. Normal conditions.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
On Foot	A(1)	8:12	Caracara flew from NW to SE and continued flying until out of sight.
On Foot	A(1) A 8 Total=9	9:45	Caracara perched on snag. Then more caracaras flew into pasture for a total of 9 caracaras. At the limits of binoculars, but all feeding on a large patch of something dumped on the ground for cattle.
		10:18 10:24	2 caracara flew NW & out of sight. Red-tailed hawk & northern harrier flew over feeding caracaras. All caracaras flew up and started mobbing red-tailed. Left harrier alone. All flew north and
			out of sight following red-tailed hawk. Harrier flew NE.

red tailed hawk
northern harrier

Boat-tailed grackle
northern mockingbird
great egret
white winged dove
Red bellied woodpecker

8 european starlings
killdeer
Blue jay
Mourning dove
Loggerhead shrike

Black vulture
turkey vulture

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 6: 26.384121, -81.370662

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
3/31/21	7:34	10:34	Bob Mrytalo Authorized Observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:34	69°	2mph, ENE	0%	NA	Fg lifting
Finish: 10:34	82°	11mph, SE	75%	Cumulus	None

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Normal traffic. SR29 lined w/ cabbage palms.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle	~~Adult~~ A(1)	7:52	Adult caracara flew from west into SR29 ROW, Tried to feed on small roadkill remains, Passing truck caused it to fly off to the west.

Red-bellied woodpecker
Northern cardinal
Gray catbird

USFWS Crested Caracara Draft Survey Protocol – Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 7: 26.364397, -81.349052

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
3/31/21	0730	1030	BJ Quinton, Authorized Observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 0730	69°F	Calm	0%	N/A	Light Fog
Finish: 1030	82°F	11mph SE	80%	Cumulus	N/A

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Improved pasture with evidence of cattle activity & scattered palms. Property owner stopped by around 0950.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle			No CRCA Observations

Inc. spp: GRCA, ABWO, MODO, RSHA, SACR, PIWO, NOCA, STKI GLIB, GREG, TUVU, AMCR, BLVU

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 8: 26.344113, -81.343087

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
21/04/07	6:51	9:51	BRAD YOUNG (AO); TROY CRAIG (T)

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 6:51	56°F	N 5-10 mph	50%	CIRRUS	NA
Finish: 9:51	68°F	N 5 mph	50%	CIRRUS	NA

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
IMPROVED PASTURE TO WEST, ORANGE GROVE TO EAST. NO ACTIVITY OTHER THAN TRAFFIC

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
ON FOOT @ TRUCK	A-1 ①	7:25	FLYING SOUTH TO NORTH ALONG HIGHWAY FORAGING
ON FOOT @ TRUCK	A-1 ②	7:31	FLYING NORTH TO SOUTH ALONG ROAD, PERCHED IN SLASH PINE ON WEST SIDE OF ROAD. FORAGING/PERCHED
ON FOOT @ TRUCK	A-1 ②	7:34	CARACARA #2 FLEW FROM PINE PERCH TO WEST FLYING
ON FOOT @ TRUCK	A-1 ③	8:41	FLEW NORTH ALONG ROADWAY - CIRCLED AND ENTERED ROADSIDE VEGETATION ON WEST SIDE OF ROAD

CATTLE EGR
WILD TU
BARRED C HOO
PIG FRO (AUDIB
BLACK VUL

CROW
RED SHOULDER HAWK
PILEATED WOOD PECKER
WHITE EGRET
BLUE JAY

MOURNING DOVE
KESTREL
DEER
UNID. HAWK
SANDHILL CRANE

MEADOWLARK
COTTONTAIL RABBIT
MOCKING BIRD
WOOD STORK
LITTLE BLUE HERON

TURK VU

USFWS Crested Caracara Draft Survey Protocol – Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 9: 26.336258, -81.343532

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
21/04/08	6:50 am	9:50 am	BRAD YOUNG (AO), TROY CRAIG (T)

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 6:50	56°F	LIGHT/VARIABLE	80%	NA	NA
Finish: 9:52	70°F	SOUTH 5mph	0%	NA	NA

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
NO ACTIVITY EXCEPT TRAFFIC, PASTURE TO EAST, ORANGE GROVE TO WEST

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
ON FOOT @ TRUCK	A - 1	7:26 (1)	FLYING NORTH ALONG ROADWAY – RT. OVER BOTTY SHOULDER FORAGING
ON FOOT @ TRUCK	A-1	7:33 (2)	FLYING SOUTH ALONG ROADWAY STOCKDED LANDED ON SHOULDER, FLEW SOUTH ALONG ROADWAY TO EAST FORAGING
ON FOOT @ TRUCK	A-1	7:35 (3)	FROM EAST (#2?) – FLEW OUT FROM EAST TO NORTH ALONG ROADWAY FORAGING
ON FOOT @ TRUCK	A-1	(4) 7:40	FLYING SOUTH ALONG ROAD – LANDED ON WEST SHOULDER – FLEW TO EAST SHOULDER TORE APART LITTER. -> FLEW SOUTH LANDED ON WEST SHOULDER FORAGING ON LITTER

CROW
GREAT EGRET
mockingbird
CATTLE EGRET
LITTLE BLUE HERON
mourning dove

WOODSTORK
RED SHOULDERED HAWK
TURKEY VULTURE
GREAT BLUE HERON
SWALLOW TAIL KITE

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

on foot @ TREE	~~7:44~~ A	(5) 7:41	FLEW FROM WEST TO JOIN #4 @ NEST - FORAGED WITH #4. FORAGING
on foot @ TRUCK	A	7:46 (4)	#4 TOOK TO FLIGHT TO SOUTH FORAGING
on foot @ TRUCK	A	7:48	#5 - FLEW FROM SHOULDER SOUTH & EAST ACROSS STAND OF SUGAR CANES

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016) Productivity survey

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 10: 26.317706, -81.343208

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
4/7/2021	10:20am	10:50am	Bob Mrykalo (Authorized observer) Brad Young (Authorized observer)

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 10:20am	71°	4mph, E	80%	Stratus	None
Finish: 10:50am	72°	" "	" "	" "	" "

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
cleared vegetation about 300 yards north of nest.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
On foot			Observed nest for 30 minutes w/ spotting scope, no caracaras at nest or observed in area around nest. Assume at least 1
			caracara fledged from nest based on observations from last bi-weekly productivity survey.

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 11: 26.303103, -81.34018

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
4/7/21	7:12am	10:12am	Bob Mraytaulo – Authorized Observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:12am	55°	1 mph, NW	20%	Stratus	No
Finish: 10:12am	70°	4 mph, E	80%	Stratus	No

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Normal conditions. @ cattle pasture to the south.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle			No caracaras observed.

Northern cardinal
Northern bobwhite
Red-bellied woodpecker
Gray catbird
Red-shouldered hawk

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 12: 26.418763, -81.39254

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
4/6/21	7:15am	10:15am	Bob Mrydale – Authorized observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:15am	53°	0 mph,	25%	Stratus	none
Finish: 10:15	72°	2mph, N	cc "	" "	" "

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Normal conditions, pasture to east & west.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
vehicle			No caracaras observed

eastern meadowlark
American crow
gray catbird
FL sandhill crane
red-bellied woodpecker
loggerhead shrike
mourning dove
Blue jay

USFWS Crested Caracara Draft Survey Protocol – Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016) Productive by Survey

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 1: 26.48703, -81.439267

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
4/13/21	9:40	10:15am	Bob Maytok - Authorized observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 9:40	74°	1mph, NE	5%	cirrus	none
Finish: 10:15	77°	1mph, NE	5%	cirrus	none

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
New eastern lane to SR 29 graded. Vehicles traveling north/south on dirt lane.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
on foot	A(1) IM(2)	9:40	Adult flew to nest tree w/ food. Feeding 2 juvenile caracara. both have black head feathers and white neck.
	A(1) IM(2)	9:47 9:49	Adult left ~~nest~~ nest. Adult returns to nest w/ food and is feeding young.
	A(1) IM(2)	9:52	Adult left nest.

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 2: 26.474757, -81.434785

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
4/13/21	6:36 am	9:36	Bob Mytalo – Authorized Observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 6:36	59°	0 mph	0%	NA	Burning off Fog
Finish: 9:36	70°	1 mph, NE	5%	cirrus	none

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Heavy traffic on SR 29 in early morning, stop & go.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
vehicle	0 A(2)	7:16 7:45	flew from North and roosted on slash pine, both flew east & out of sight.
	A(1)	9:14	caracara back & perched on same slash pine, take away briefly and caracara is gone.

northern cardinal
Eurasian collared dove
eastern meadowlark

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 3: 26.456298, -81.434393

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
4/16/21	7:04 am	10:04 am	DL, Mayka G

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:04	64°	0mph,	5%	Cirrus	Slight fog burning off.
Finish: 10:04	77°	2mph, S	25%	Cumulus	none

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Pasture to west, citrus to east, cleary mowing traffic.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle	A(1)	7:43	Caracara flying south down SR 29 and out of sight.
	(1)	8:00	caracara carrying food, flew north along SR 29, actively in prey and out of sight.

Northern cardinal
Boat tailed grackle
Northern Mockingbird

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 4: 26.442269, -81.438832

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
4/14/21	7:04am	10:04am	Bob Mayfield – Authorized observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:04	63°	3 mps, SW	10%	Cirrus	Fog burning off
Finish: 10:04	76°	10 mph, E	5%	cumulus	none

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Normal traffic patterns. cattle pasture to the south & north.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle	A(1)	8:08 8:26	Caracara feeding on road kill opossum. caracara stopped feeding, crop has obvious bulge, and it's roosting in slash pine adjacent to road kill.
		8:41	caracara flew east & out of sight.
	A(1)	9:44 10:04	caracara atop slash pine in cattle pasture. caracara still atop tree at end of survey.

great egret
American crow
Gray catbird
Red-shouldered hawk
Black vulture

Mourning dove
northern mockingbird
8
RL sandhill crane
little blue heron
cattle egret

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 5: 26.436236, -81.425164

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
4/15/21	7:02	10:02	Bob Mrykalo - Authorized Observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:02	58°	1mph, NW	10%	Cirrus	none
Finish: 10:02	74°	12mph, SE	5%	cirrus	none

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Normal conditions, pasture to the east of survey station.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle	A(2)	8:14	2 caracara perched on sign at edge of pasture.
		8:20	one caracara flew north west & out of sight.
		8:30	second caracara flew north west & out of sight

Mourning dove
Northern mockybird
Boat-tailed grackle
loggerhead shrike
Black vulture
European starling
Red-bellied woodpecker
Eurasian collared dove
great egret

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 6: 26.384121, -81.370662

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
4-14-21	7:19	10:25	Christine Sciamino, authorized

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:19	64°F	1 Mph, E	10%	cirrus	dense fog
Finish: 10:25	75°F	10Mph, E	5%	cirrus	NONE

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Occasional low-flying small aircraft

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle			NO caracara observed

Incidental species: GRCA, EAME, GREG, NOCA, PIWO, STKI, MODO, WOST, RBWO, LIBH, CAEG, AMCR, BTGR, RSHA, KILL, SACR, TUVU, BLVU, ANHI

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 7: 26.364397, -81.349052

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
4-15-21	6:53	10:00	Christine Sciarrino, qualified

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 6:53	65°F	4 mph, SE	10%	cirrus	Fog
Finish: 10:00	70°F	9 mph, S	15%	cirrus	NONE

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Red-shouldered hawk activity in area; pair regularly perched at tree within 100 feet of station. Light/infrequent traffic on SR 29 but loud.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle			No caracara observed

Incidental species: RSHA, AMCR, BTGR, GREG, NOCA, SACR, STKI, EAME, deer, GRCA, CAEG, NOMO, GRBH, BLJA, GLIB, RBWO, BNST (black-necked stilt), TUVU, TRHE, LIBH, WOST, BEKI, OSPR

USFWS Crested Caracara Draft Survey Protocol – Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 8: 26.344113, -81.343087

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
4/22/21	6:45Am	9:53Am	Robin Myrtelo / Trey Craig 1. Authorized / Trainning

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 6:45	64°	7mph N	80%	Cumulus	No
Finish: 9:53	73°	6mp s	40%	Cumulus	No

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Pasture to East Orange grove to West Cabbage Palm Line

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle	A (1)	8:18 Am	South → North along SR29 stopped in swale. Then took off North
			red-bellied woodpecker

red-shouldered hawk. Roseate Spoonbill Swallow tail kite Pig frog Alligator

Sand Hill Crane Black Vulture Bobwhite quail Eurasian Collar Dove Florida sandhill crane

Cormorant Cardinal Cattle egret Turkey Vulture. Mourning dove

Wood stork Common Moorhen Great egret Bolted kingfisher Osprey

Gray Catbird boat-tailed grackle Turkey white-tail deer

USFWS Crested Caracara Draft Survey Protocol – Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 9: 26.336258, -81.343532

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
4/22/21	6:50 am	9:50 am	Zack "Authorized Agent"

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 6:50	64°	SSW 1 MPH	90%	Cirrus	N/A
Finish: 9:50	72°	NNE 13 MPH	15%	Cirrus	N/A

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Improved Pasture to East of SR 29 Citrus groves to the West. ROW along SR 29 consists of mostly Pine, Cabbage palm & Palmetto with some ruderal species such as Brazilian Pepper, Rubis & grape vine.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
A1	Ped	A(1)	7:40 AM	Coming from SSE Crossed SR 29 entered Citrus groves after circling once. Looking side to side
A2	Ped	A(1)	7:45	Crossed SR 29 from E entered citrus groves Approx. where A1 landed. Looking side to side
A3	Ped	A(1)	7:46	Flew from N to S Approx over same area A1 + A2 landed.
A4	Ped	A(1)	7:50	Landed on W ROW Flew N down SR 29 before Perching in top of Pine on W ROW. Flew from view 7:52 to E. Flipped trash/cardboard over to investigate for food.

Other wildlife: N. Cardinal, Double crested Cormorant, Cattle Egret, Pileated Woodpecker Blue Jay, Kingfisher, Great Blue Herring, Morning dove, Catbird, Sandhill cranes, Am. Crow, Turkey vulture, Swallow tail Kite, Ibis, Glossy Ibis, Rabbit, Wood Stork, Great egret, Common Grackle, Black vulture, Osprey, Red shoulder hawk,

USFWS Crested Caracara Draft Survey Protocol –
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A5	Ped	A (1)	8:15AM	Flew from E to SR 29 & Followed the road N, landed on the E ROW. Flew N along SR 29 out of sight. Preening & approached road to investigate potential food item.
A6	Ped	A (1)	9:20AM	Flying low over citrus grove from S to N. Circled to W.

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 11: 26.303103, -81.34018

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
4/23/21	7:14 am	10:14 am	Bob Mrykalo – Authorized Observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:14	65°	5mph, NE	10%	Clear	None
Finish: 10:14	78°	14mph, NE	50%	Clear	None

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Pasture to north & south, No unusual conditions,

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle			No caracaras observed,

Red-bellied woodpecker
Great crested Flycatcher
Northern cardinal
bluejay
eastern meadowlark

Red-shouldered hawk
Pileated woodpecker
8 Roseate spoonbill
Turkey vulture
Wood stork

USFWS Crested Caracara Draft Survey Protocol – Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 12: 26.418763, -81.39254

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
4/23/21	7:20 AM	10:20 AM	Zack Authorized Agent

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 7:20AM	64°	NNE 7MPH	15%	Cirrus	N/A
Finish: 10:20AM	77°	ENE 14MPH	20%	Cirrus / Altocirrus	N/A

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Improved Pasture to N & S of County Road 846. Patches of forested areas mostly consisting of a mix of Pine, hardwoods & Cabbage Palm. Consistent morning traffic on County Road 846. Mowed ROW's with some Brazilian Pepper Cabbage Palm & Pines. Immokalee Regional Airport to the N. Residential neighborhoods to S.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
A1 Ped/Vehicle	A	7:45AM	Entered field of view from N, perched on a snag for approx 1-2 minutes, flew W along CR 846 & exited field of view to S over residential area. foraging behavior observed.
A2 A3 Ped/Vehicle	2 A	8:55AM	Entered field of view flying N along treeline to CR 846 then flew W along road & exited field of view to S. Foraging behavior observed. 2nd Caracara followed 1st birds flight path APPROX 50 Yd behind.
A4 Ped/Vehicle	A	9:35AM	Entered field of view from N, crossed CR 846 & turned W flying over the pasture approx. 20 yds from road. Foraging behavior observed.

Other wildlife: Cattle egret, Eastern Meadowlark, Grey catbird, Mourning dove, Am. Crow, Turkey vulture, N. Cardinal, Sandhill Crane, Common ground dove, Roseate Spoonbill, Osprey, Common Grackle, Swallowtail Kite, Chimney Swift.

USFWS Crested Caracara Draft Survey Protocol – Additional Guidance (2016-2017 Breeding Season)

Productivity Survey

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 1: 26.48703, -81.439267

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
4/29/21	9:55	10:46	T. Kuba, B. Quinton (both qualified

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 9:55	81	8 MPH From East	30	cumulus	N/N
Finish: 10:46	81	" "	" "	cumulus	N/N

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Normal conditions.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
foot	Im (2)	9:55-10:46	- obs 2 juvs in nest adult delivered food, they fed, and rested
			- pin feathers have converted to flight feathers - did not show interest in flying

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 2: 26.474757, -81.434785

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
4/29/21	6:35	9:50	Tori Kubo (qualified), Troy Crews (observer)

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 6:35	66°	5 MPH E	0	—	0
Finish 9:50	76°	9 MPH E	0	—	0

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Adjacent to SR 29, citrus on E. side of road, + improved pasture on W. side, large transmission line perpendicular to SR 29

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle			None observed

OTHER species observations: red-shouldered hawk, cattle egrets, snowy egret, grackle, cardinal, cormorant, meadowlark, American Crow, turkey, Sand H. Crane, vulture

USFWS Crested Caracara Draft Survey Protocol – Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 3: 26.456298, -81.434393

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
4/29/21	6:40	9:45	Tori Kuba (qualified) Tray Crais (observer)

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 6:35	67	5 MPH from East	5%	cirrus	No / Yes
Finish: 9:45	81	8 MPH from East	30%	cumulus	No / No

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
citrus on east side of SR 29, improved pastures on west side

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
vehicle	A	7:38	from south, north along SR 29, then west out of sight
vehicle	A (2)	7:59	2 adult from N south on SR 29 and E out of sigh

other obs spp: snowy egret, sandhill crane, great egret, wood stork, grackle, crow, great blue heron, black vulture, turkey, cardinal, swallow-tailed kite

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 4: 26.442269, -81.438832

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
4/26/21	0635	1000	Sandy Schrader, Qualified

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 0635	65°	Calm	0	n/a	n/a
Finish: 1000	78°	5-8 mph/N	0	n/a	n/a

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Active pasture south of road, open field north of road, interspersed with marshes and upland pines. Traffic on road is continual and heavy during morning rush hour. Several walkers/joggers on sidewalk.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle	A	0658	Adult approached from west, surveying road, right over truck, and landed in snag east of truck. 0705- took off, circled pasture and landed in tall pine at SE edge of pasture.
Vehicle	A	0715	Adult approached from west side of pasture, over truck, then circled back, to far side (south side) of pasture and out of sight.
Vehicle	A	0813	Adult approached from west end of pasture, flew the road, then headed south over east end of pasture and out of sight.
		1000	Note: I'd been seeing several vultures aloft to the west since 0915, so at the end of the survey I drove west to investigate. I found 6 black vultures and 1 adult caracara foraging on road kill.

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 5: 26.436236, -81.425164

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
4-27-01	0645	1000	Sandy Schada - Qualified

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 0645	64°	0-2 mph East	<10%	cirrus	n/a
Finish: 1000	81°	8-10 East	20%	cumulus	n/a

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Active pasture with cows present this morning. Scattered cabbage palms and palmetto clumps. Occasional slash pine within and at pasture margins. Residential in the other direction.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle	A	0926 to 1000	During this time, observed up to 6 caracara foraging on the ground in an area of back pasture where 'reject' tomatoes were being discarded from a local packing house,
			(I met the person, watched him discard some on the ground, and watched the cows come to feed on them.)
			During this time, the caracaras foraged on the ground, perched on nearby fence posts, spent time preening while perched, and made short flights to and from this area at ground level within the pasture area nearby.

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Vehicle	1A 1J	0756	Two caracara fly from SE, behind the pens, low to ground and cycle close together and land in pasture close to palmetto clump. Adult flies to ground foraging area (tomatoes) and juvenile follows.
Vehicle	2A	0839 →	Two caracara approach from SE, fly low over truck to NW, then circle around and land at tomato foraging area.
Vehicle	A? (hard to see)	0850	Four caracara are suddenly aloft from tomato area. One circles back & lands. Two others chase the fourth out of the area, flying higher than usual and out of sight to north.
Vehicle	3A	0906	One at a time 3 adults take off and fly directly toward the agricultural area to the east. The breeze is up and I can hear some type of machinery in the grove to the east.
Vehicle	2A 1J	0922– 0933	1A + 1J approach from south, fly low to ground, and acrobatically close to each other, landing nearby in pasture. The adult has food and proceeds to eat while the juvenile walks in circles around it, occasionally trying to get some. At 0931 a second adult lands and a couple minutes later all 3 fly toward the east.

USFWS Crested Caracara Draft Survey Protocol –
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Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 6: 26.384121, -81.370662

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
4/28/21	6:45	10:00	Sandy Scheda – Qualified

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 0645	65°	calm	0%	n/a	n/a
Finish: 1000	81°	10-12 mph E dot	0%	n/a	n/a

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Roadside with constant fast moving traffic, Cabbage palm hammock to east with agriculture beyond. Wetlands to west with agriculture beyond.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle	A	0905	One adult flew from east, circled over road, landed on west edge of road, then took off to the west.
Vehicle	A	0920	One adult approached from west, circled over road and landed on cabbage palm east of road. Took off almost immediately and headed west. Reappeared a few minutes later flying much higher and heading east.

USFWS Crested Caracara Draft Survey Protocol – Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 7: 26.364397, -81.349052

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
4/27/21	6:40 AM	9:40 AM	Zack Yawn Authorized Observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 6:40 AM	64°	N 5 MPH	5%	Cumulonimbus	N/A
Finish: 9:40 AM	77°	ENE 13 MPH	55%	Cumulus	N/A

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Improved pasture consisting of mostly cabbage palms with some hardwoods. Adjacent to survey station are citrus groves, patches of wetlands & an industrial facility.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle			No caracaras observed.

Other species: Great egret, Red Shoulder hawk, Mourning dove, Little blue heron, Am. crow, Cattle egret, Wood Stork, N. Cardinal, Great blue heron, Roseate Spoonbill, Red bellied woodpecker, Black Vulture, Swallow tailed kite, Turkey vulture,

USFWS Crested Caracara Draft Survey Protocol – Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 8: 26.344113, -81.343087

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
4/28/21	6:43 AM	9:43 AM	Zack Yawn Authorized observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 6:43AM	64°	SSE 1 MPH	0%	N/A	N/A
Finish: 9:43AM	79°	E 13 MPH	0%	N/A	N/A

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Large wetland to the west & citrus groves. Improved pasture consisting of Pine + Cabbage palms mostly with some wetlands spread out. Canal on the E of SR 29 consisting of hardwoods, cypress, Cabbage palms + brazilian Pepper.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
A1 Ped	A	8:52 AM	Single adult flying from SW to NE, crossed SR 29 & turned N following the E ROW of SR 29 until out of sight.

Other wildlife: Great blue heron, Am. Alligator, Glossy ibis, Little blue heron, Swallow tailed kite, cattle egret, Am. Crow, Sandhill cranes, double crested ~~Cormorant~~ Cormorant, Red Shoulder hawk wood stork, roseate Spoonbill,

USFWS Crested Caracara Draft Survey Protocol – Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 9: 26.336258, -81.343532

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
4/29/21	6:45AM	9:45AM	Zack Yawn Authorized observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 6:45AM	66°	W 0 MPH	0%	N/A	light fog
Finish: 9:45AM	81°	SE 9 MPH	25%	Cumulus	N/A

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Station 9 is located on the W ROW of SR 29. TO the W is citrus groves followed by a large cypress dome. To the E appears to be improved pasture with mostly cabbage palms + pines.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

	Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
A1	Ped	A	7:02AM	Flew from E across SR 29 + perched in a Pine Facing W. At 7:09AM Flew W over citrus groves and appeared to land on the edge ~~of~~ where citrus ends and cypress begin.
A2	Ped	A	7:07AM	Flew from E approx the same location as A1 but once over SR 29 turned N and followed road approx 500-1000 yrd before turning west.
A3	Ped	A	8:34AM	Flew from W directly E over SR 29 curved slightly NNE. I observed a large hunk of what appeared to be meat carried in mouth.

Other Wildlife: Wood Stork, Belted King fisher, Eastern meadow lark, N. Caracara, Downy woodpecker, Pileated woodpecker, Snail Kite,

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 11: 26.303103, -81.34018

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
4/29/21	0635	0935	BJ Quinton, Authorized Observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 0635	67°F	1mph W	0%	N/A	Low Fog
Finish: 0935	81°F	9mph SE	0%	N/A	N/A

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Improved pasture w/ scattered palms

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle	No CRCA observations		

Inc. Spp: RBWO, PIWO, EAME, WHIB, CREG, SACR, MODO WEVI, NOBO, CAEG, NOCA, ANHI, TUVU, GLIB ~~SOAN~~ STKI

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 12: 26.418763, -81.39254

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
4/30/21	0630		BJ Quinton, Authorized Observer

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 0630	72°F	CALM	0%	N/A	Heavy fog to E
Finish: 0930	80°F	5mph S	25%	Cumulus	N/A

VS = ~50 yrds

Fog lifted @ 0740

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Improved pasture w/ scattered palms. [redacted] Immokallee Airport + crops to the north Paramotor ops near air port

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
vehicle	A	0725	One adult flew over observation point and to the west. When followed, it was discovered to have joined another adult feeding on carrion. Traffic scared them North.
vehicle	A	0729	After returning to observation point, another adult flew from south + over to carrion (possibly one of the original 2). Pulled
			carrion by foot to the side of the road. Foraged for several minutes. When approached by AM CR, retrieved a large piece + departed southeast
vehicle	A	0823	One adult flew over the site from the west, turned southwest and flew out of sight.

Inc. spp: NOCA, EAME, ABWO, AMCR, NOBO, ~~BSACR~~, MODO RTLO, LBHE, RSHA, GREG, BLJA, STKI, LOSH

Vehicle	A	[redacted] 0905	One adult flew in from East and landed in spine with another adult not observed previously. One left in an unknown direction (covered by veg). The other flew back to the carmor.
			A RCVU flew in + the two showed aggression for a brief moment before separating. CRCA departed South.

USFWS Crested Caracara Draft Survey Protocol – Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 1: 26.48703, -81.439267

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
5/4/2021	12:45 pm	1:20 pm	BJ Quinton (Primary Observer)

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 1245	91 F	10 MPH SSE	0%	N/A	N/A
Finish: 1320	91 F	10 MPH SSE	0%	N/A	N/A

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Cabbage palm near dumpster on the side of the road. Ongoing construction on north side.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle	2 Im	1245	Two juveniles observed through spotting scope. Feathers completely grown in. Both appeared robust and healthy. Crops appeared full. No adults observed. Both appeared to leave nest, but unable to track due to obstacles. At least one did return to the nest before observer departed.

USFWS Crested Caracara Draft Survey Protocol –
Additional Guidance (2016-2017 Breeding Season)

Caracara Survey Form (updated 12/9/2016)

Project Name: SR 29 from Oil Well Road to SR 82

Location/Observation Block/Lat- Long: Station 1: 26.48703, -81.439267

Date	Start Time	Stop Time	Observer Name(s) and Experience Level(s)
5/19/21	10:50am	11:15am	Bob Mytalo (Primary Observer) & BJ Quinton (Primary observer)

Weather

Time	Air Temp	Wind Speed and Direction	% Cloud Cover	Cloud Type	Rain/Fog
Start: 10:50am	82°	18 mph, E	80%	Cumulus	None
Finish: 11:15am	"	"	"	"	"

Observation Point Information

General Site and Habitat Conditions; Other Activities in the Area
Roadway construction ongoing. Traffic volumes appear the same as previous caracara surveys.

Observations

(flight data, perching, preening, courtship, feeding, nest building, incubation, head throwback, diving, reaction to passing planes/traffic/pedestrians, other bird species, etc)

Observer Location	Age A/Im	Time	Description of behavior, flight path, etc
Vehicle	None		No caracara's observed via spotting scope. No caracara's observed in the vicinity of the nest.

Appendix C

Summary of Crested Caracara Survey Data

Appendix C. Summary of Caracara Survey Data

Bi-Weekly Survey Period	Survey Station	Survey Date	Time	Number of Caracaras Observed	Activity Observed
January 4, 2021 to January 8, 2021	Survey Station 1	January 4, 2021	7:33 AM	2	2 adults flying from west and perched briefly before flying out of sight.
			7:41 AM	1	One adult flying south and out of sight.
			7:48 AM	1	One adult circled to east, lands out of sight, circles back to pole
			7:53 AM	1	2 adults fly over to west, one with nest materials, tracked far to the west
			8:50AM	1	Adult flies from pasture to pole, flies to SR 82/SR 29 intersection near other adult
			8:53 AM	2	2 Adults circle low, land in pasture, no specific activity observed while in pasture
			8:55 AM	1	Adult at SR 82/SR 29 intersection flies to SW
			8:58 AM	1	Individual flyover from north to SW
	Survey Station 2	January 4, 2021	8:52 AM	1	Adult fly over to SE until out of sight
			9:30AM	1	Adult fly over to N along SR 29 then west until out of sight
	Survey Station 3	January 5, 2021	7:12 AM	1	Adult fly over to S along SR 29 before hovering then flying out of sight
			7:38 AM	1	Adult flyover from W to E then out of sight
	Survey Station 4	January 4, 2021	7:24 AM	1	Adult flies from west, perched on slash pine
			7:36 AM	1	Adult flies from slash pine to west and out of sight
	Survey Station 5	January 5, 2021	8:27 AM	2	Adults flying E to N and out of sight
	Survey Station 6	January 6, 2021	N/A	0	No Caracara observed
	Survey Station 7	January 5, 2021	8:13 AM	1	Adult flies up to perch on distant tree top, then flies SE to perch on another tree top, then flies S and out of sight
			8:48 AM	1	Adult fly over from South
	Survey Station 8	January 6, 2021	N/A	0	No Caracara observed
	Survey Station 9	January 6, 2021	7:32 AM	1	Adult flies in from SE, lands on canal berm, then flies over to road. Leaves due to traffic, flies N almost out of sight then perches
			7:36 AM	1	Adult flies from E and perches on slash pine, then flies E out of sight
			9:37 AM	1	Adult flies from S, lands briefly on canal berm, then flies back south
	Survey Station 10	January 4, 2021	8:17 AM	1	Adult flies from NE and lands in grass that is too tall for further observation. Seen foraging approx. 30 minutes later in grass
			9:00 AM	1	Same individual as above flies to south behind trees and out of sight
			9:05 AM	1	Possibly same individual lands on grass road, preened for several seconds, then flew behind trees
			10:00 AM	1	Adult transitioned across pasture from N to S until out of sight behind tree line
	Survey Station 11	January 5, 2021	N/A	0	No Caracara observed
	Survey Station 12	January 6, 2021	10:08 AM	1	Adult flies in from W, following road and turned to cabbage palms on N side of road
January 18, 2021 to January 29, 2021	Survey Station 1	January 19, 2021	7:01 AM	2	2 adults fly from S to W along SR 82, one perched on pole and the other perched on adjacent tree before flying S
			7:12 AM	1	Adult flying W then N until out of sight
			7:37 AM	1	Adult flies from NW and perched on pole next to station for 10 minutes, then flies W and out of sight
			7:55 AM	1	Adult flies from W along SR 82 then N along SR 29, perched on pole then flew N
			8:20 AM	1	Adult flies E down SR 82 with nesting material to cabbage palm
			8:32 AM	1	Adult with nesting material to same location as previous. Previous adult to ditch next to station
			8:43 AM	1	Adult flies SE out of sight. Previous adult flies back to pole next to palm, first adult flies E to tree
			8:50 AM	1	Adult flies SE out of sight
			9:10 AM	1	Adult flies from SE to pole next to cabbage palm with nesting material, then flies SE out of sight, then back to cabbage palm
			9:25 AM	1	Adult flies from SE to cabbage palm, back SE, back to pole, then E along SR 82
			10:13 AM	1	Adult flies from E to cabbage palm with nest material
	Survey Station 2	January 19, 2021	7:15 AM	1	Adult flies from E and lands on oak
			7:28 AM	1	Adult flies large circle and lands on slash pine
			7:30 AM	1	Adult flies E and out of sight over orange grove
			8:44 AM	1	Adult flies from W and land on same slash pine as above. Adult preening.
			8:48 AM	1	Adult flies N and to ground, foraging near cattle
			8:53 AM	1	Adult flies W and out of sight
			9:44 AM	2	2 adults on found near dirt road. One flies west to cabbage palm. 2nd adult on ground, then flies E over SR 29 and continued E until out of sight.
	Survey Station 3	January 19, 2021	7:22 AM	1	Adult flies in from N, lands roadside, then flies to nearby pole. Approached by aggressive red shouldered hawk, caracara defends position before flying W
			7:42 AM	1	Adult perched on pole, 2 small aircraft flying very low, no reaction. Another red shouldered hawk approaches aggressively, caracara holds position before flying W
			7:56 AM	1	Adult flies from W and perches on pole, then flies away low over grove to E
			8:43 AM	1	Adult flies over E to W
			9:04 AM	2	2 adults circling in unison, came from E heading W until out of sight
	Survey Station 4	January 20, 2021	7:30 AM	1	Adult flies in from NW, perched on pine and flew W until out of sight
	Survey Station 5	January 20, 2021	7:45 AM	1	Adult perched atop slash pine, then flies SE quickly out of sight
			8:21 AM	1	Adult on top of another slash pine, preening and resting until leaving pine flying W until out of sight
	Survey Station 6	January 20, 2021	N/A	0	No Caracara observed
	Survey Station 7	January 25, 2021	7:10 AM	2	Adult pair flies in from SE, across site, then out of sight
			7:57 AM	2	Adult pair flies in from N across site, then separated with one heading E and the other continuing S
			8:01 AM	1	Adult flies NW to SE on other side of SR 29
			8:39 AM	1	Adult flies NE and lands in tree, perched for 45 minutes, preening occasionally before departing to E
			9:35 AM	3	3 adults fly in from NW, circled site, vocalizing and showing aggression near cabbage palms, never landed, departed to SE
			9:41 AM	1	Adult flies across site, from S to N
	Survey Station 8	January 25, 2021	7:09 AM	1	Adult flies over station NE to SW
			7:12 AM	1	Adult flies over station E to NW
			7:18 AM	1	Adult flies N to S and lands in slash pine, departing approx. 10 minutes later
			7:24 AM	1	Adult flies S to N across pasture, approx. 2000-3000 feet away
			7:28 AM	1	Adult flies SW to slash pine with previous adult from 7:18, both depart to E
			8:06 AM	1	Adult flies from SW across station to NE
			8:32 AM	1	Adult flies from NE across station, lands in slash pine on W side of road along tree line
	Survey Station 9	January 26, 2021	8:10 AM	1	Adult flies in from E, appeared to scan for prey. Perched on pine for couple minutes, departed to N before turning W and out of sight
	Survey Station 10	January 26, 2021	8:51 AM	1	Adult flies E across SR 29 to N
			9:40 AM	1	Adult flies from E across SR 29, lands in cypress along ROW. Occasional preening.
			9:53 AM	0	Same adult from above not bothered by osprey overflight. Departed perch to E
	Survey Station 11	January 27, 2021	N/A	0	No Caracara observed
	Survey Station 12	January 27, 2021	8:04 AM	1	Adult over flight in heavy fog
February 1, 2021 to February 12, 2021	Survey Station 1	February 2, 2021	7:00 AM	2	2 adults perched on light pole in pasture parking area
			7:01 AM	1	from perch, one adult flies to nearby cabbage palm clump
			7:04 AM	1	Other adult from perch flies NW out of sight then circled back to perch further north
			7:08 AM	1	First adult flies back and forth from cabbage palm clump to light pole
			7:12 AM	1	Both adults convene in dirt area on north side of SR 82, E of station. One departs to SSE, then E over SR 29 traffic. Other flew to pasture, with possible food, then to cabbage palm clump.
			7:26 AM	2	Both adults fly from cabbage palms to ENE, fast and close to each other until out of sight. Return several minutes later over field to SE
			8:43 AM	1	Adult flies from S of SR 82 W of station into cabbage palm clump, over to side of road, gathered possible nesting material, returned to cabbage palm clump
			8:51 AM	1	Adult leaves cabbage palms, flies W along SR 82 roadside until out of sight
	Survey Station 2	February 3, 2021	7:18 AM	1	Adult flyover from SE of station, did not cross SR 29, heading S out of sight
			7:28 AM	1	Adult flyover E of station, continued N without crossing SR 29
			7:32 AM	1	Adult flyover station from SW to E of station across SR 29, landed on citrus tree approx. 400 feet from road
			7:34 AM	1	Observed 2nd adult perched on citrus tree with adult from previous observation
			7:52 AM	2	2 adults from citrus tree chased by red shouldered hawk, 1 adult flies NW, other adult flies E and circled back crossing SR 29. Lost sight due to Brazilian pepper, walked to E side of SR 29 and observed both adults preening each other.
			8:00 AM	1	One adult flies W out of sight, the other adult remains in cabbage palm
			8:10 AM	1	Adult flies N and heads W until out of sight
			8:41 AM	1	Adult flies in from W and lands in slash pine in pasture. Random preening while perched before flying NE until out of sight
	Survey Station 3	February 4, 2021	7:54 AM	1	Adult flies from E to W over S end of pasture
			8:50 AM	2	2 adults over SR 29 at S end of pasture. One flies W, other flies N over SR 29, then headed W to N of station
			9:03 AM	2	2 adults fly from NW of station to SE with aerial interplay, land in grove
			9:34 AM	1	One adult flies up and out of grove, stays low, circles, returns to grove
			9:48 AM	1	One adult flies up out of grove, circles, and lands again
	Survey Station 4	February 4, 2021	7:21 AM	1	Adult flies in from SW, perched on pine before flying down to eat roadkill between intermittent vehicles. Flies SW perches on pine, before moving roadkill off road. Continues feeding before flying SW until out of sight
			8:10 AM	1	Adult feeding on roadkill from previous sighting, before flying off to SW until out of sight
			8:22 AM	1	Adult perched on pine WSW of station, black vulture approached and perched on same branch, caracara unaffected. Disappeared from sight, no exit observation.
			8:41 AM	1	Adult flyover west of station, from N heading SSE
			8:54 AM	2	2 adults flying in from SSE to NNW, one was harassing the other. After circling, I flew NNW and the other flew ESE out of sight
	Survey Station 5	February 5, 2021	N/A	0	No Caracara observed

Appendix C. Summary of Caracara Survey Data

Bi-Weekly Survey Period	Survey Station	Survey Date	Time	Number of Caracaras Observed	Activity Observed
February 15, 2021 to February 26, 2021	Survey Station 6	February 5, 2021	9:45 AM	1	Adult flyover W of station from N to S, lost sight behind trees
	Survey Station 7	February 8, 2021	N/A	0	No Caracara observed
	Survey Station 8	February 8, 2021	7:12 AM	1	Adult flyover SR 29 W to E
			7:48 AM	1	Adult flies over SR 29 from W, landed on E roadway shoulder, flew N then landed and foraged, departed to E
			7:50 AM	1	Adult flies E across SR 29 over previous adult, then departed N along SR 29 out of sight
			8:06 AM	1	Adult flew S along SR 29 then N of station, then E across pasture
	Survey Station 9	February 10, 2021	N/A	0	No Caracara observed
	Survey Station 10	February 9, 2021	7:13 AM	1	Adult overflight to E
			7:22 AM	1	Adult flew into cabbage palm W of station. Did not observe landing in Sabal palm
			7:28 AM	1	Adult perched in oak west of road along canal. Preening.
			7:40 AM	1	Adult from above flew down to W road shoulder, hopped across SR 29 to E shoulder then flew S along SR 29 to perch in oak along canal.
			7:49 AM	1	Adult flying from NW to SE into cabbage palm
			8:55 AM	1	Adult flies out of cabbage palm, interacts with cross, circled back to area, did not observe where it landed
			9:11 AM	1	Adult flies over SR 29 from E, south of station, circled over road and flew back E
			9:31 AM	1	Adult flies out of suspected nest area of Sabal palm/pine and crossed SR 29 to the E
			9:34 AM	1	Adult flew across SR 29 from E, roosted in slash pine with forage
			9:38 AM	1	2nd adult flew from E near roosting adult and down to Sabal palm
			9:39 AM	1	Adult from 9:34 observation left pine roost, flew E across SR 29
	Survey Station 11	February 10, 2021	N/A	0	No Caracara observed
	Survey Station 12	February 9, 2021	9:19 AM	2	2 adults flew in NW of station and crisscrossed across road before departing NW out of sight
	Survey Station 1	February 17, 2021	7:00 AM	1	Adult flyover from E to W to palm grove on N side of SR 82
			7:02 AM	1	Adult perched on pole, flies to E at NE corner of SR 29/SR 82, perches on pole, then leaves, flies in large circle to N, lands on ground roadside.
			7:44 AM	2	2 adults fly together in unison with displays, SE to NW
			7:45 AM	2	One adult flies SE to NW with another adult flying E to W going out of sight. At one point 4 adults flying at same time, one with forage or nesting material.
			8:00 AM	3	3 adults and 4 black vultures fly tight circles roadside in front of grove, one lands briefly on side of road
			8:12 AM	2	2 adults emerge from vegetation at potential nest tree, one flies NE to nearby ground, the other flies SW and perches at pole next to potential nest tree
			8:19 AM	2	1 adult from above walks and scratches around down poles, jumps and perches then flies SW passing Brazilian pepper, replaces other adult on same pole next to potential nest location
			8:27 AM	1	Adult from above flies from perch on pole deep into potential nest location for about 2 minutes, emerges and descends to surrounding mowed area, then back into palm
			8:41 AM	2	Second adult viewed on ground, flies into palm without food or nest material. 2 adults now in tree, both entered from top on south side. One exits at 8:44, perches on pole to south, then departs W and N
			9:20 AM	1	While spotting potential nest 1, 1 adult appears at pole north of station perched
			9:30 AM	1	Adult flyover from S to N
			9:50 AM		Observed adult sitting inside palm fronds, in what appears to be nest but is partially obscured. 2nd adult perched nearby, exits carrying twig to adjacent mowed area, drops twig to forage. Makes guttural calls. Other adult in tree does not leave to pursue food. At 11:03 individual still in potential nest, and again at 12:25 PM.
	Survey Station 2	February 17, 2021	7:10 AM	1	1 juvenile flew from E over pasture and landed on pine. Flew from pine across SR 29 into citrus grove. from citrus grove to perch on telephone pole near SR 29, then observed foraging on roadside trash near crow
			7:26 AM	2	2 juveniles flew N in citrus grove and out of sight. 2 juveniles dive bombed adult feeding on trash, then flew into citrus grove.
			7:36 AM	3	3 juveniles (from above) flew E into citrus grove
			7:45 AM	2	2 juveniles briefly flew straight up from citrus grove, one carrying food and other trying to take food. Both flew back to ground.
			8:37 AM	1	Adult flew SW and far into cattle pasture, last sighting.
	Survey Station 3	February 16, 2021	9:15 AM	1	Adult flew from W to E over SR 29 chasing juvenile bald eagle. Both flew west, back over SR 29 and out of sight, drove that direction but could not locate.
	Survey Station 4	February 18, 2021	7:04 AM	1	Adult performed looping flyover SW to S until out of sight
			8:50 AM	1	Adult flies from W to E and lands behind tree line
			9:20 AM	1	Adult flies from S within group of vultures, then alone to NE
	Survey Station 5	February 18, 2021	N/A	0	No Caracara observed
	Survey Station 6	February 19, 2021	N/A	0	No Caracara observed
	Survey Station 7	February 23, 2021	8:56 AM	1	Adult flying from N to S and out of sight
	Survey Station 8	February 23, 2021	8:02 AM	1	Adult flew from W over orange grove, then N along SR 29 to roost atop slash pine
			8:04 AM	1	2nd adult flies from N to roosting pine, continued S on road
			8:04 AM	2	First adult flies south with second adult along road
			8:06 AM	2	First adult landed in slash pine then flew S, second adult flying S along SR 29
			8:30 AM	1	3rd adult flyover from W to NE
			9:15 AM	2	New adult pair lands on roadway shoulder, foraging before flying off to E
			9:17 AM	1	Adult flying N near pasture, may be previous adults identified
			9:44 AM	2	Adult pair flying S over SR 29 then W
			10:08 AM	1	Adult flying S along SR 29 over station then E and S
	Survey Station 9	February 24, 2021	N/A	0	No Caracara observed
	Survey Station 10	February 24, 2021	7:35 AM	1	One adult with forage flying to suspect nest area E of SR 29
			7:47 AM	1	One adult perched on dead snag, preening
			7:59 AM	1	Adult flew from perch E to SR 29 until out of view
			9:05 AM	1	Adult with forage flies to slash pine, then flies to Sabal palm
			9:06 AM	1	Adult from above suspect nest tree leaves nest to the E.
			9:30 AM	1	Adult flies in from E to dead snag where previous adult was observed, flew off to E, did not go to nest tree
			10:21 AM	1	Adult flies to nest tree, after 2 minutes left heading E
	Survey Station 11	February 25, 2021	7:56 AM	1	Possible adult observed far off site in back of pasture in tree line. To far to get positive ID
			8:05 AM	1	Adult flying W along road, not carrying food or nesting material. Flew NW and out of sight.
	Survey Station 12	February 25, 2021	9:36 AM	1	Adult foraging on roadkill with vulture in road. Hopping off road to avoid traffic, flew off to N
March 1, 2021 to March 12, 2021	Survey Station 1	March 2, 2021	1:29 PM	1	Adult sitting on nest. Very little movement over 10 minutes of observation, presumed to be incubating eggs
	Survey Station 2	March 2, 2021	9:01 AM	1	Adult perched atop slash pine in pasture. Flew SW nearly out of sight, landed in pasture.
	Survey Station 3	March 3, 2021	7:08 AM	1	Adult flew from W, down SR 29 to S, then E over citrus grove and out of sight.
	Survey Station 4	March 4, 2021	N/A	0	No Caracara observed
	Survey Station 5	March 4, 2021	N/A	0	No Caracara observed
	Survey Station 6	March 5, 2021	N/A	0	No Caracara observed
	Survey Station 7	March 5, 2021	7:58 AM	1	Adult flyover from NW following roadway
			8:17 AM	1	Adult flyover from SE, carrying twig to NW over vegetation
			10:01 AM	1	Adult flyover N to S until out of sight
			10:10 AM	1	Adult flyover along roadway SE to NW until out of sight
	Survey Station 8	March 9, 2021	7:00AM	2	2 adults transitioning down SR 29 in a S to N direction
			7:07 AM	1	1 adult transitioning down SR 29 from N in a SSE direction
			8:31 AM	1	1 adult transitioning in a N to S direction over citrus groves W of station
			9:44 AM	1	1 adult transitioning from SE to NW
	Survey Station 9	March 10, 2021	6:45 AM	1	Adult transitioning down SR 29 from S to N, landed in W ROW N of station, flew N to W ROW further N
			7:24 AM	2	2 adults transitioning from E to W towards large wetland, interacted with 2 adults over wetland
			7:25 AM	2	2 adults interacted with the 2 adults from above that flew in from E, all 4 appeared to land in cypress after swooping/harassing each other
			7:30 AM	1	Adult transitioning from W to E with what appeared to be food in beak
			7:43 AM	1	Adult transitioning from E to W, N of station
			7:56 AM	1	Adult transitioning from W to ESE, N of station
			8:32 AM	1	Adult transitioning from E to W just N of station
			8:49 AM	1	Adult transitioning from E to W just S of station
	Survey Station 10	March 9, 2021	7:05 AM	1	Adult with nest material flew to snag, perched for 5 minutes, the flew S and out of sight. Didn't fly to potential nest area
			7:28 AM	2	2 adults landed on slash pine with nest material. 1 stayed on pine and dropped material, second flew N and out of sight
			7:45 AM	1	1 adult not carrying anything flew to potential nest tree, perched at back of cabbage palm on frond
			7:48 AM	1	Another adult flies to cabbage palm carrying nest material
			7:58 AM	1	Adult flew from nest tree to W, perched on snag
			8:06 AM	1	Adult on snag flew S and out of sight. Could not see potential nest tree due to private land constraints
			8:45 AM	1	Adult flew from S and perched on snag, then flew back S and out of sight
			9:12 AM	1	Switched observation location, documented adult on nest
	Survey Station 11	March 11, 2021	8:20 AM	1	Adult transitioning from E to W direction down Oil Well Road, headed N up SR 29
	Survey Station 12	March 10, 2021	N/A	0	No Caracara observed
	Survey Station 1	March 15, 2021	10:43 AM	1	Adult on nest, no young observed. Stayed on nest during entire monitoring period, no sign of second adult
	Survey Station 2	March 15, 2021	7:54 AM	2	2 adults observed perched on cattle fence, did not observe flight
			8:10 AM	2	2 adults observed flying E, turning N, then separating. One flew NE out of sight, the other flew back W and landed in pine, then left to E
			8:43 AM	1	Adult observed flying E
			8:44 AM	1	Adult observed flying S, previous adult from 8:43 joined and circled the area
			9:04 AM	1	Adult observed flying WSW and out of sight

Appendix C. Summary of Caracara Survey Data

Bi-Weekly Survey Period	Survey Station	Survey Date	Time	Number of Caracaras Observed	Activity Observed
March 15, 2021 to March 26, 2021	Survey Station 3	March 16, 2021	9:09 AM	1	Adult observed N along road until flying out of sight
	Survey Station 4	March 15, 2021	N/A	0	No Caracara observed
	Survey Station 5	March 15, 2021	N/A	0	No Caracara observed
	Survey Station 6	March 17, 2021	8:10 AM	1	Adult perched on snag for several minutes. Flew W showing aggressive behavior towards AMCR before appearing behind parked trucks
			9:42 AM	2	2 adults observed flying NE over observation point and disappearing behind tree line to E
	Survey Station 7	March 17, 2021	N/A	0	No Caracara observed
	Survey Station 8	March 23, 2021	N/A	0	No Caracara observed
	Survey Station 9	March 23, 2021	N/A	0	No Caracara observed
	Survey Station 10	March 23, 2021	10:50 AM	1	Adult flies from general direction of nest tree, did not appear to come from tree but may have, to N
			11:35 AM	1	Adult flies from N and lands on ground, up to snag, calls, flies to nearby snag
			11:49 AM	1	Adult from above flies S from snag
			12:05 PM	1	Adult flies in from S to behind tree while calling
			12:20 PM	2	Same adult observed on ground, open dirt/herbaceous with fledgling. Fledgling observed flapping, standing, disoriented for about 10 minutes. Adult flew to S and left fledgling which continued flapping. Appears to have left nest very recently. Adult calling whenever present, physically encouraging fledgling
	Survey Station 11	March 24, 2021	N/A	0	No Caracara observed
	Survey Station 12	March 24, 2021	N/A	0	No Caracara observed
March 29, 2021 to April 9, 2021	Survey Station 1	March 29, 2021	12:15 PM	3	Adult with full crop feeding 2 juveniles. Juveniles show black and white downy feathers
			12:15 PM	1	Adult flies in from W with food, started feeding young with other adult
	Survey Station 2	March 29, 2021	8:16 AM	2	2 adults separated in time by about 30 seconds, flew S and out of sight along SR 29
			8:39 AM	1	Adult flew W and out of sight
			9:33 AM	1	Adult flew from E, 2 minutes later flew NW to cabbage palm
			9:36 AM	2	Adult flies from N, joined by adult from cabbage palm, both flew SW until out of sight
	Survey Station 3	March 29, 2021	N/A	0	No Caracara observed
	Survey Station 4	March 30, 2021	8:06 AM	1	Adult flew in from NW across site, circled SE corner, then flew S until out of sight
			8:20 AM	1	Adult flew in from NE across site carrying a mouse. Continued across site before turning hard to S and disappearing behind tree line
	Survey Station 5	March 30, 2021	8:12 AM	1	Adult flew from NW to SE until out of sight
			9:46 AM	9	Adult perched on snag. More adults flew into pasture for total of 9. Appeared to be feeding on large patch of something put on ground for cattle
			10:18 AM	2	2 adults flew NW until out of sight
			10:24 AM	2	Red tailed hawk flew over feeding adults, all remaining caracara flew up and started mobbing hawk, left harrier alone. All flew N and out of sight, harrier flew NE
	Survey Station 6	March 31, 2021	7:52 AM	1	Adult flew from W into SR 29 ROW trying to feed on small roadkill remains. Passing truck caused it to fly off to W
	Survey Station 7	March 31, 2021	N/A	0	No Caracara observed
	Survey Station 8	April 7, 2021	7:25 AM	1	Adult flying S to N along roadway foraging
			7:31 AM	1	Adult flying N to S along road, perched in slash pine W of road. Foraging/perched.
			7:34 AM	1	Previous adult flew from pine to W
			8:41 AM	1	Adult flew N along roadway, circled and entered roadside vegetation on W side of road
	Survey Station 9	April 8, 2021	7:26 AM	1	Adult flying N along roadway, alternating over both shoulders. Foraging
			7:33 AM	1	Adult flying S along roadway, landed on shoulder, flew S along roadway to E
			7:35 AM	1	Adult from E (possible from above), flew from E to N along roadway foraging
			7:40 AM	1	Adult flying S along road, landed on W shoulder, flew to E shoulder and tore apart litter. Flew S, landed on W shoulder, foraging on litter
			7:41 AM	1	Adult flew form W to join previous adult and forage on litter
			7:46 AM	1	Adult took flight to S
			7:48 AM	1	Adult flew form shoulder S and E across stand of slash pine
	Survey Station 10	April 7, 2021	N/A	0	Observed nest for 30 minutes with spotting scope. No caracara in nest or observed in area around nest. Assume at least one fledged from nest upon observations from last survey
	Survey Station 11	April 7, 2021	N/A	0	No Caracara observed
	Survey Station 12	April 6, 2021	N/A	0	No Caracara observed
April 12, 2021 to April 23, 2021	Survey Station 1	April 13, 2021	9:40 AM	3	Adult flew to nest tree with food. Feeding 2 juveniles, both have black head feathers and white neck
			9:47 AM	1	Adult left nest
			9:49 AM	2	Adult returns to nest with food, feeds 2 juveniles
			9:52 AM	3	Adult left nest, 2 juveniles remain
	Survey Station 2	April 13, 2021	7:16 AM	2	2 adults flew from N and roosted on slash pine
			7:45 AM	2	Both adults flew E until out of sight
			9:14 AM	1	Adult perched on same slash pine, looked away briefly and caracara was gone
	Survey Station 3	April 16, 2021	7:43 AM	1	Adult flying S down SR 29 until out of sight
			8:00 AM	1	Adult carrying food flew N along SR 29 in ROW until out of sight
	Survey Station 4	April 14, 2021	8:08 AM	1	Adult feeding on roadkill opossum. Approx. 20 minutes later stops feeding, roosted in pine next to road kill for 15 minutes then flew E until out of sight
			9:44 AM	1	Adult atop slash pine in cattle pasture, remained for 20 minutes until end of survey
	Survey Station 5	April 15, 2021	8:14 AM	2	2 adults perched on snag at edge of pasture. Approx. 6 minutes later one leaves to NW until out of sight
			8:30 AM	1	Second adult from above departs to NW until out of sight
	Survey Station 6	April 14, 2021	N/A	0	No Caracara observed
	Survey Station 7	April 15, 2021	N/A	0	No Caracara observed
	Survey Station 8	April 22, 2021	8:18 AM	1	Adult flying S to N along SR 29, stopped in swale, then departed to N
	Survey Station 9	April 22, 2021	7:40 AM	1	Adult from SSE crossed SR 29 into citrus grove after circling once. Looking side to side
			7:45 AM	1	Adult crossed SR 29 from E, entered citrus groves near previous adult. Looking side to side
			7:46 AM	1	Adult flew N to S near same area as previous adult
			7:50 AM	1	Adult landed on ROW and flew N down SR 29 before perching atop pine at W ROW. Flew to E out of sight
			8:15 AM	1	Adult flew from E to SR 29 following road to N and landed on E ROW. Flew N along SR 29 out of sight. Preening and approached road to investigate potential food item
			9:20 AM	1	Adult flying low over citrus grove from S to N, circled to W
	Survey Station 11	April 23, 2021	N/A	0	No Caracara observed
	Survey Station 12	April 23, 2021	7:45 AM	1	Adult enters view from N, perched on snag for 1-2 minutes, flew W along CR 846 and exited view to S over residential area. Foraging behavior observed
			8:55 AM	2	Adult entered view flying N along tree line to CR 846, then flew W along road until out of sight. Foraging behavior observed. Second adult followed first adult flight path approx.. 50 yards behind
			9:35 AM	1	Adult flew in from N, crossed CR 846 and turned W flying over pasture approx. 20 yards from road. Foraging behavior observed
April 26, 2021 to April 30, 2021	Survey Station 1	April 29, 2021	9:55 AM	3	Observed 2 juveniles in nest, adult delivered food, juveniles fed then rested. Pin feathers converted to flight feathers, did not show interest in flying
	Survey Station 2	April 28, 2021	N/A	0	No Caracara observed
	Survey Station 3	April 29, 2021	7:38 AM	1	Adult flew from S to N along SR 29, then W out of sight
			7:59 AM	2	2 adults flew in from N heading S along SR 29, then E until out of sight
	Survey Station 4	April 26, 2021	6:58 AM	1	Adult approached from W, surveying road, landed in snag E of vehicle. Approx.. 7 minutes later departed and circled pasture, landed in tall pine at SE edge of pasture
			7:15 AM	1	Adult approached from W side of pasture, circled back to S side of pasture and out of sight
			8:13 AM	1	Adult approached from W end of pasture, flew the road then headed S over E end of pasture until out of sight
	Survey Station 5	April 27, 2021	7:26 AM	6	from 7:26 until 10:00 AM observed up to 6 adult caracara foraging on the ground in a pasture where "reject" tomatoes where being discarded. During this time they also perched on nearby fence posts, preened while perched, and made short flights to/from the area.
			7:56 AM	2	1 adult and 1 juvenile approach from SE behind the pines, adult flies to foraging area with tomatoes
			8:39 AM	2	2 adults approach from SE, fly low to NW, circle around to tomato foraging area
			8:50 AM	4	4 adults suddenly aloft from tomato foraging area, one circles back and lands, 2 others chase the fourth adult out of area, flying higher than usual out of sight to N
			9:06 AM	3	One at a time 3 adults depart and fly to agricultural area to E
			9:22 AM	3	1 adult and 1 juvenile approach from S, flying low and close to ground landing in pasture. Adult has food and eats while juvenile walks in circles. A second adult appears and a few minutes later all 3 depart to E
	Survey Station 6	April 28, 2021	7:05 AM	1	Adult flies from E, circles over road, landed on W edge of road, then departed to W
			9:20 AM	1	Adult approached from W, circles over road and landed on cabbage palm E of road. Quickly departed to W, reappeared a few minutes later flying higher to E
	Survey Station 7	April 27, 2021	N/A	0	No Caracara observed
	Survey Station 8	April 28, 2021	8:52 AM	1	Adult flying from SW to NE, crossed SR 29 and turned N following E ROW until out of sight
	Survey Station 9	April 29, 2021	7:02 AM	1	Adult flew from E across SR 29 and perched in pine. Approx. 7 minutes later flew W over citrus groves and appeared to land at edge of grove and cypress
			7:07 AM	1	Adult flew E in approx. same location as previous but once over SR 29 turned N and followed roadway for 500-1000 yards before turning W
			8:34 AM	1	Adult flew from W directly E over SR 29, curved slightly NNE. Observed what appeared to be large hunk of meat in mouth
	Survey Station 11	April 29, 2021	N/A	0	No Caracara observed
	Survey Station 12	April 30, 2021	7:25 AM	1	Adult flew over observation point to W. When followed it was discovered to have joined another adult feeding on carrion. Traffic scared them to the N
			7:29 AM	1	After returning to observation point, another adult flew from S and over to carrion (possible one of original 2). Pulled carrion to side of road, foraged for several minutes. Approached by AMCR, retrieved large piece and departed to SE
			8:23 AM	1	Adult flew over site from W, turned SW and flew out of sight
			9:05 AM	1	Adult flew in from E and landed in pine with another adult not observed previously. One left in unknown direction, the other flew back to carrion. A black vulture arrived and both adults showed aggression for a moment before separating and both departed S
May 4, 2021	Station 1	May 4, 2021	12:45 PM	2	2 juveniles observed through spotting scope. Feathers completely grown in. Both appeared robust and healthy. Crops appeared full. No adults observed. Both appeared to leave nest, but unable to track due to obstacles. At least one did return to the nest before observer departed at end of survey.
May 19, 2021	Station 1	May 19, 2021	11:15 AM	0	No caracaras observed in nest via spotting scope. No caracaras observed in vicinity of nest. Caracaras from nest have fledged.

Appendix D

Representative Field of View Photos for Survey Stations

Survey Station No. 1 – View to North

Survey Station No. 1- View to East

Survey Station No. 1 – View to South

Survey Station No. 1- View to West

Survey Station No. 2 – View to North

Survey Station No. 2- View to East

Survey Station No. 2 – View to South

Survey Station No. 2- View to West

Survey Station No. 3 – View to North

Survey Station No. 3- View to East

Survey Station No. 3 – View to South

Survey Station No. 3- View to West

Survey Station No. 4 – View to North

Survey Station No. 4- View to East

Survey Station No. 4 – View to South

Survey Station No. 4- View to West

Survey Station No. 5 – View to North

Survey Station No. 5- View to East

Survey Station No. 5 – View to South

Survey Station No. 5- View to West

Survey Station No. 6 – View to North

Survey Station No. 6- View to East

Survey Station No. 6 – View to South

Survey Station No. 6- View to West

Survey Station No. 7 – View to North

Survey Station No. 7- View to East

Survey Station No. 7 – View to South

Survey Station No. 7- View to West

Survey Station No. 8 – View to North

Survey Station No. 8- View to East

Survey Station No. 8 – View to South

Survey Station No. 8- View to West

Survey Station No. 9 – View to North

Survey Station No. 9- View to East

Survey Station No. 9 – View to South

Survey Station No. 9- View to West

Survey Station No. 10– View to North

Survey Station No. 10- View to East

Survey Station No. 10 – View to South

Survey Station No. 10- View to West

Survey Station No. 11– View to North

Survey Station No. 11- View to East

Survey Station No. 11 – View to South

Survey Station No. 11- View to West

Survey Station No. 12– View to North

Survey Station No. 12- View to East

Survey Station No. 12 – View to South

Survey Station No. 12- View to West

Appendix D
Wood Stork Documentation

Appendix D-1
Wood Stork Programmatic Effect Determination Key (South Florida)

United States Department of the Interior

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

May 18, 2010

Donnie Kinard
Chief, Regulatory Division
Jacksonville District Corps of Engineers
Post Office Box 4970
Jacksonville, Florida 32232-0019

Service Federal Activity Code: 41420-2007-FA-1494
Service Consultation Code: 41420-2007-I-0964
Subject: South Florida Programmatic Concurrence
Species: Wood Stork

Dear Mr. Kinard:

This letter addresses minor errors identified in our January 25, 2010, wood stork key and as such, supplants the previous key. The key criteria and wood stork biomass foraging assessment methodology have not been affected by these minor revisions.

The Fish and Wildlife Service's (Service) South Florida Ecological Services Office (SFESO) and the U.S. Army Corps of Engineers Jacksonville District (Corps) have been working together to streamline the consultation process for federally listed species associated with the Corps' wetland permitting program. The Service provided letters to the Corps dated March 23, 2007, and October 18, 2007, in response to a request for a multi-county programmatic concurrence with a criteria-based determination of "may affect, not likely to adversely affect" (NLAA) for the threatened eastern indigo snake (*Drymarchon corais couperi*) and the endangered wood stork (*Mycteria americana*) for projects involving freshwater wetland impacts within specified Florida counties. In our letters, we provided effect determination keys for these two federally listed species, with specific criteria for the Service to concur with a determination of NLAA.

The Service has revisited these keys recently and believes new information provides cause to revise these keys. Specifically, the new information relates to foraging efficiencies and prey base assessments for the wood stork and permitting requirements for the eastern indigo snake. This letter addresses the wood stork key and is submitted in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act) (87 Stat. 884; 16 U.S.C. 1531 *et seq.*). The eastern indigo snake key will be provided in a separate letter.

Wood stork

Habitat

The wood stork is primarily associated with freshwater and estuarine habitats that are used for nesting, roosting, and foraging. Wood storks typically construct their nests in medium to tall

trees that occur in stands located either in swamps or on islands surrounded by relatively broad expanses of open water (Ogden 1991, 1996; Rodgers et al. 1996). Successful colonies are those that have limited human disturbance and low exposure to land-based predators. Nesting colonies protected from land-based predators are characterized as those surrounded by large expanses of open water or where the nest trees are inundated at the onset of nesting and remain inundated throughout most of the breeding cycle. These colonies have water depths between 0.9 and 1.5 meters (3 and 5 feet) during the breeding season.

Successful nesting generally involves combinations of average or above-average rainfall during the summer rainy season and an absence of unusually rainy or cold weather during the winter-spring breeding season (Kahl 1964; Rodgers et al. 1987). This pattern produces widespread and prolonged flooding of summer marshes, which maximize production of freshwater fishes, followed by steady drying that concentrate fish during the season when storks nest (Kahl 1964). Successful nesting colonies are those that have a large number of foraging sites. To maintain a wide range of foraging sites, a variety of wetland types should be present, with both short and long hydroperiods. The Service (1999) describes a short hydroperiod as a 1 to 5-month wet/dry cycle, and a long hydroperiod as greater than 5 months. During the wet season, wood storks generally feed in the shallow water of the short-hydroperiod wetlands and in coastal habitats during low tide. During the dry season, foraging shifts to longer hydroperiod interior wetlands as they progressively dry-down (though usually retaining some surface water throughout the dry season).

Wood storks occur in a wide variety of wetland habitats. Typical foraging sites for the wood stork include freshwater marshes and stock ponds, shallow, seasonally flooded roadside and agricultural ditches, narrow tidal creeks and shallow tidal pools, managed impoundments, and depressions in cypress heads and swamp sloughs. Because of their specialized feeding behavior, wood storks forage most effectively in shallow-water areas with highly concentrated prey. Through tactolocation, or grope feeding, wood storks in south Florida feed almost exclusively on fish between 2 and 25 centimeters [cm] (1 and 10 inches) in length (Ogden et al. 1976). Good foraging conditions are characterized by water that is relatively calm, uncluttered by dense thickets of aquatic vegetation, and having a water depth between 5 and 38 cm (5 and 15 inches) deep, although wood storks may forage in other wetlands. Ideally, preferred foraging wetlands would include a mosaic of emergent and shallow open-water areas. The emergent component provides nursery habitat for small fish, frogs, and other aquatic prey and the shallow, open-water areas provide sites for concentration of the prey during seasonal dry-down of the wetland.

Conservation Measures

The Service routinely concurs with the Corps' "may affect, not likely to adversely affect" determination for individual project effects to the wood stork when project effects are insignificant due to scope or location, or if assurances are given that wetland impacts have been avoided, minimized, and adequately compensated such that there is no net loss in foraging potential. We utilize our *Habitat Management Guidelines for the Wood Stork in the Southeast Region* (Service 1990) (Enclosure 1) (HMG) in project evaluation. The HMG is currently under review and once final will replace the enclosed HMG. There is no designated critical habitat for the wood stork.

The SFESO recognizes a 29.9 kilometer [km] (18.6-mile) core foraging area (CFA) around all known wood stork colonies in south Florida. Enclosure 2 (to be updated as necessary) provides locations of colonies and their CFAs in south Florida that have been documented as active within the last 10 years. The Service believes loss of suitable wetlands within these CFAs may reduce foraging opportunities for the wood stork. To minimize adverse effects to the wood stork, we recommend compensation be provided for impacts to foraging habitat. The compensation should consider wetland type, location, function, and value (hydrology, vegetation, prey utilization) to ensure that wetland functions lost due to the project are adequately offset. Wetlands offered as compensation should be of the same hydroperiod and located within the CFAs of the affected wood stork colonies. The Service may accept, under special circumstances, wetland compensation located outside the CFAs of the affected wood stork nesting colonies. On occasion, wetland credits purchased from a "Service Approved" mitigation bank located outside the CFAs could be acceptable to the Service, depending on location of impacted wetlands relative to the permitted service area of the bank, and whether or not the bank has wetlands having the same hydroperiod as the impacted wetland.

In an effort to reduce correspondence in effect determinations and responses, the Service is providing the Wood Stork Effect Determination Key below. If the use of this key results in a Corps determination of "no effect" for a particular project, the Service supports this determination. If the use of this Key results in a determination of NLAA, the Service concurs with this determination[1]. This Key is subject to revisitation as the Corps and Service deem necessary.

The Key is as follows:

A. Project within 0.76 km (0.47 mile)[2] of an active colony site[3] ..... "*may affect*[4]"

Project impacts Suitable Foraging Habitat (SFH)[5] at a location greater than 0.76 km (0.47 mile) from a colony site..... ..... "*go to* B"

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[1] With an outcome of "no effect" or "NLAA" as outlined in this key, and the project has less than 20.2 hectares (50 acres) of wetland impacts, the requirements of section 7 of the Act are fulfilled for the wood stork and no further action is required. For projects with greater than 20.2 hectares (50 acres) of wetland impacts, written concurrence of NLAA from the Service is necessary.

[2] Within the secondary zone (the average distance from the border of a colony to the limits of the secondary zone is 0.76 km (2,500 feet, or 0.47 mi).

[3] An active colony is defined as a colony that is currently being used for nesting by wood storks or has historically over the last 10 years been used for nesting by wood storks.

[4] Consultation may be concluded informally or formally depending on project impacts.

[5] Suitable foraging habitat (SFH) includes wetlands that typically have shallow-open water areas that are relatively calm and have a permanent or seasonal water depth between 5 to 38 cm (2 to 15 inches) deep. Other shallow non-wetland water bodies are also SFH. SFH supports and concentrates, or is capable of supporting and concentrating small fish, frogs, and other aquatic prey. Examples of SFH include, but are not limited to freshwater marshes, small ponds, shallow, seasonally flooded roadside or agricultural ditches, seasonally flooded pastures, narrow tidal creeks or shallow tidal pools, managed impoundments, and depressions in cypress heads and swamp sloughs.

Project does not affect SFH..... *"no effect[1]"*.

B. Project impact to SFH is less than 0.20 hectare (one-half acre)[6].....*NLAA[1]"*

Project impact to SFH is greater in scope than 0.20 hectare (one-half acre).....*go to* C

C. Project impacts to SFH not within the CFA (29.9 km, 18.6 miles) of a colony site .....*go to* D

Project impacts to SFH within the CFA of a colony site .....*go to* E

D. Project impacts to SFH have been avoided and minimized to the extent practicable; compensation (Service approved mitigation bank or as provided in accordance with Mitigation Rule 33 CFR Part 332) for unavoidable impacts is proposed in accordance with the CWA section 404(b)(1) guidelines; and habitat compensation replaces the foraging value matching the hydroperiod[7] of the wetlands affected and provides foraging value similar to, or higher than, that of impacted wetlands. See Enclosure 3 for a detailed discussion of the hydroperiod foraging values, an example, and further guidance[8]..... *NLAA[1]"*

Project not as above..... *"may affect[4]"*

E. Project provides SFH compensation in accordance with the CWA section 404(b)(1) guidelines and is not contrary to the HMG; habitat compensation is within the appropriate CFA or within the service area of a Service-approved mitigation bank; and habitat compensation replaces foraging value, consisting of wetland enhancement or restoration matching the hydroperiod[7] of the wetlands affected, and provides foraging value similar

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[6] On an individual basis, SFH impacts to wetlands less than 0.20 hectare (one-half acre) generally will not have a measurable effect on wood storks, although we request that the Corps require mitigation for these losses when appropriate. Wood storks are a wide ranging species, and individually, habitat change from impacts to SFH less than one-half acre are not likely to adversely affect wood storks. However, collectively they may have an effect and therefore regular monitoring and reporting of these effects are important.

[7] Several researchers (Flemming et al. 1994; Ceilley and Bortone 2000) believe that the short hydroperiod wetlands provide a more important pre-nesting foraging food source and a greater early nestling survivor value for wood storks than the foraging base (grams of fish per square meter) than long hydroperiod wetlands provide. Although the short hydroperiod wetlands may provide less fish, these prey bases historically were more extensive and met the foraging needs of the pre-nesting storks and the early-age nestlings. Nest productivity may suffer as a result of the loss of short hydroperiod wetlands. We believe that most wetland fill and excavation impacts permitted in south Florida are in short hydroperiod wetlands. Therefore, we believe that it is especially important that impacts to these short hydroperiod wetlands within CFAs are avoided, minimized, and compensated for by enhancement/restoration of short hydroperiod wetlands.

[8] For this Key, the Service requires an analysis of foraging prey base losses and enhancements from the proposed action as shown in the examples in Enclosure 3 for projects with greater than 2.02 hectares (5 acres) of wetland impacts. For projects with less than 2.02 hectares (5 acres) of wetland impacts, an individual foraging prey base analysis is not necessary although type for type wetland compensation is still a requirement of the Key.

to, or higher than, that of impacted wetlands. See Enclosure 3 for a detailed discussion of the hydroperiod foraging values, an example, and further guidance[8].....*"NLAA[1]"*

Project does not satisfy these elements .....*"may affect[4]"*

This Key does not apply to Comprehensive Everglades Restoration Plan projects, as they will require project-specific consultations with the Service.

Monitoring and Reporting Effects

For the Service to monitor cumulative effects, it is important for the Corps to monitor the number of permits and provide information to the Service regarding the number of permits issued where the effect determination was: "may affect, not likely to adversely affect." We request that the Corps send us an annual summary consisting of: project dates, Corps identification numbers, project acreages, project wetland acreages, and project locations in latitude and longitude in decimal degrees.

Thank you for your cooperation and effort in protecting federally listed species. If you have any questions, please contact Allen Webb at extension 246.

Sincerely yours,

Paul Souza
Field Supervisor
South Florida Ecological Services Office

Enclosures

cc: w/enclosures (electronic only)
Corps, Jacksonville, Florida (Stu Santos)
EPA, West Palm Beach, Florida (Richard Harvey)
FWC, Vero Beach, Florida (Joe Walsh)
Service, Jacksonville, Florida (Billy Brooks)

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Appendix D-2
Wood Stork Suitable Foraging Habitat Assessment

Wood Stork Foraging Habitat Assessment

Introduction

The wood stork (*Mycteria americana*) is federal listed as threatened by the US Fish and Wildlife Service (USFWS) due to a sharp decline in breeding populations. This opportunistic wading bird utilizes various open hydric pine- cypress habitats, herbaceous marshes, and man-made wetlands and canals. A specialized method of feeding (commonly referred to as groping) limits its foraging ability to shallow waters with dense concentrations of small fish. Wood storks use freshwater and estuarine habitats for nesting, foraging, and roosting. They are typically colonial nesters and construct their nests in medium to tall trees located within wetlands or on islands.

The USFWS has defined an area with a radius of 18.6 miles (30 kilometers) from nesting wood stork colonies as the Core Foraging Area (CFA) for those colonies. The project study area falls within the CFA of three active nesting wood stork colonies (**Figure 1**).

As defined by the USFWS in the *Habitat Management Guidelines for the Wood Stork in the Southeast Region*, types of wetland habitats that provide good feeding conditions for storks include: drying marshes or stock ponds, shallow roadside or agricultural ditches, narrow tidal creeks or shallow tidal pools, arid depressions in cypress heads, or swamp sloughs. Almost any shallow wetland depression where fish tend to become concentrated, either through local reproduction or the consequences of area drying, may be used by wood storks. Wood stork suitable foraging habitat (SFH) is described as those sites that have water levels between 2 and 16 inches deep. Good feeding conditions usually occur where water is relatively calm and uncluttered by dense thickets of aquatic vegetation. Habitats with an open or sparse tree canopy is preferred (median 32 percent) so wood storks can land easily and also take flight quickly to evade predators. Often a dropping water level is necessary to concentrate fish at suitable densities. Conversely, a rise in water table, especially when it occurs abruptly, disperses fish and reduces the value of a site as suitable habitat.

Project Impacts

The Preferred Alternative would result in 19.67 acres of wetland and OSW impacts that may be considered wood stork SFH. Field reviews and desktop research was used to determine which wetlands and OSWs met the criteria of SFH. **Table 1** includes the individual wetlands and OSWs impacted by the Preferred Alternative. The highlighted features represent suitable wood stork habitat presence. Since greater than 5 acres of SFH would be impacted by the Preferred Alternative, a prey foraging analysis, pursuant to the *USFWS Wood Stork Foraging Habitat Assessment Methodology* (USFWS 2012), is outlined below.

TABLE 1
WETLANDS AND OTHER SURFACE WATERS CONSIDERED TO BE WOOD STORK SFH

Wetland / OSW ID	FLUCFCS Description	FLUCFCS Code	FWS Wetland Classification*	Acres in Preferred Alternative
Wetlands				
WL-1	Mixed Wetland Hardwoods	617	PFO1/3C	0.83
WL-2	Wetland Forested Mixed	630	PFO1/2C	1.68
WL-3	Cypress	621	PFO2C	0.56
WL-4	Wetland Forested Mixed	630	PFO1/2C	2.55
WL-5	Freshwater Marshes	641	PEM1C	0.62
	Mixed Wetland Hardwoods	617	PFO1/3C	0.16
WL-6	Wetland Forested Mixed	630	PFO1/2C	3.89
WL-7	Freshwater Marshes	641	PEM1C	0.76
WL-8	Mixed Wetland Hardwoods	617	PFO1/3C	0.96
WL-9	Freshwater Marshes	641	PEM1C	0.77
WL-10	Freshwater Marshes	641	PEM1C	0.44
WL-11	Freshwater Marshes	641	PEM1C	0.81
WL-12	Freshwater Marshes	641	PEM1C	0.30
			Total Forested Wetlands SFH	***0.56***
			Total Herbaceous Wetlands SFH	***3.70***
			Total Wetlands SFH	***4.26***
Other Surface Waters				
Linear Ditches	Streams and Waterways	510	PUB2F	14.78
Reservoirs	Reservoirs <10 acres	534	PSS1C / PUB2C	0.63
			Total Other Surface Waters SFH	***15.41***
			Total	**19.67**

*** USFWS Wetland Descriptions:**
PEM1C: Palustrine, Emergent, Persistent, Seasonally Flooded
PFO1/2 C: Palustrine, Forested, Broad-Leaved Deciduous/Needle-Leaved Deciduous, Seasonally Flooded
PFO1/3 C: Palustrine, Forested, Broad-Leaved Deciduous/Broad-Leaved Evergreen, Seasonally Flooded
PSS1C: Palustrine, Scrub-Shrub, Broad-Leaved Deciduous, Seasonally Flooded
PUB2F: Palustrine, Unconsolidated Bottom, Sand, Semi-permanently Flooded

WL/OSW# – denotes Wood Stork Suitable Foraging Habitat (SFH)

Wood Stork Foraging Analysis

In total 19.67 acres of wetlands, OSWs, and recommended pond sites (4.26 acres of wetlands, 14.78 acres of linear ditches, and 0.63 acres of reservoirs less than 10 acres) were determined to be wood stork SFH. In order to determine appropriate mitigation for the loss of habitat from project impacts, a habitat analysis was performed. The analysis takes into account the foraging suitability, hydroperiod data, and quantity of food source in each impacted wetland and OSW. Ultimately, a total biomass lost value is calculated for the impacted wetland land uses, which will determine appropriate mitigation requirements for the wood stork for the SR 29 project.

The USFWS has identified four parameters that can be used in the estimation of wood stork prey biomass:

1. Vegetation Density – the density of vegetation within habitats suitable for wood stork foraging;
2. Wetland Hydroperiod – the hydroperiod of the wetland, which includes two subcomponents, (1) the fish density per hydroperiod and (2) the fish biomass per hydroperiod;
3. Prey Size Suitability – the suitability of prey size for the wood stork, which provides an adjustment to the fish biomass per hydroperiod and is referenced hereafter as the "wood stork suitability prey base", and
4. Competition with other wading bird species – the likelihood that the wood stork is the wading bid species that actually consumes the concentrated prey.

Exotic Vegetation Density

Foraging suitability percentages were determined, based off the presence of exotic vegetation species, and are represented in **Table 2**. Wetland suitability for wood stork foraging is partially dependent on vegetation density. Availability of prey base for wood storks greatly decreases with the presence of dense exotic vegetation. Based on field reviews, all wetland habitats in the SR 29 project area were determined to have minimal exotic vegetation present (Exotic Percentage – 0 to 25 percent coverage). Therefore, a Foraging Suitability Value of 100 percent (1.0) was used in the analysis.

TABLE 2
EXOTIC VEGETATION COVER PERCENTAGE FORAGING SUITABILITY

Exotic Plants (percent coverage)	Foraging Suitability Index
0 to 25	1.00
26 to 50	0.64 (rounded up from 0.639)
51 to 75	0.37 (rounded down from 0.372)
76 to 100	0.03 (rounded up from 0.025)

- Referenced as Table WSM3 in the Wood Stork Foraging Habitat Assessment Methodology (USFWS 2012).

Wetland Hydroperiod

South Florida Water Management District (SFWMD) developed seven hydroperiod classes (Class 1-7), which evaluate restoration projects and wetland systems based on the number of days in a year the system is inundated. The class specification helps estimate fish density per hydroperiod, which ultimately determines the fish biomass per hydroperiod and the amount of biomass consumed by wood storks. Within the Preferred Alternative, the linear ditches, totaling 14.78 acres, were assigned a Class 2 hydroperiod (60-120 days inundated) and the wetlands and reservoirs, totaling 4.89 acres, were assigned Class 3 hydroperiod (120-180 days inundated). These classifications were deduced based off observations during field reviews and hydrology/rain estimates for a south Florida year. The USFWS defines wetlands inundated from 0 to 180 days per year as "short hydroperiod" wetlands and wetlands inundated from 180 to 360 days per year as "long hydroperiod" wetlands. SFWMD hydroperiod classes and project impacts are shown in **Table 3**. The proposed project includes linear ditches, wetlands, and reservoirs within hydroperiod Class 2 and Class 3.

TABLE 3
SFWMD HYDROPERIOD CLASSES — EVERGLADES PROTECTION AREA

Hydroperiod Class	Days Inundated	Wetlands within the Preferred Alternative (Acres)
Short Hydroperiod		
Class 1	0-60	--
Class 2	**60-120**	**14.78**
Class 3	**120-180**	**4.89**
Long Hydroperiod		
Class 4	180-240	--
Class 5	240-300	--
Class 6	300-330	--
Class 7	330-365	--

- Referenced as Table WSM4 in the Wood Stork Foraging Habitat Assessment Methodology (USFWS 2012).

Wood Stork Suitability Prey Base

The wood stork suitability prey base is comprised of two components: (1) the amount of biomass per hydroperiod class within the range of fish sizes likely to be consumed by wood storks and (2) the likelihood that this prey base is actually consumed by the wood stork.

Fish biomass present in a wetland can be estimated using hydroperiod data. Wood storks prey on several fish species including sunfishes, bullheads, and killifish, among others, and the amount of fish biomass in a wetland represents the amount of food that is available to wood storks to forage. To accurately determine the amount of fish biomass available, the USFWS estimated mean annual fish biomass for each hydroperiod to reflect the size of fish most likely consumed by wood storks.

Additionally, the USFWS includes crayfish biomass as part of the estimate of biomass production per hydroperiod, since crayfish have been noted in wood stork diets and appear to be an important source of food for the species.

To estimate the total forage biomass available to the wood stork for each wetland hydroperiod, mean annual fish biomass and mean annual crayfish biomass are combined. Suitable biomass for hydroperiod Class 2 wetlands is 0.62 grams/m^2 and 1.32 grams/m^2 for hydroperiod Class 3 wetlands.

Competition with other Wading Birds

Competition with other wading bird species limits the availability of prey to wood storks. The USFWS has established a competition factor of 0.325, to account for factors which would reduce the wood storks ability to forage, which includes not only competition with other wading bird species but also the three factors described in the previous sections (exotic vegetation density, wetland hydroperiod, and suitability prey base). Within the Preferred Alternative, the Class 2, "short hydroperiod" wetlands are estimated to have 0.2015 grams/m^2 of total prey biomass, and the Class 3, "short hydroperiod" wetlands are estimated to have 0.4290 grams/m^2 of total prey

biomass. By calculating the total biomass lost for the impacted wetlands and OSWs in the project study area, appropriate mitigation requirements can be determined.

Biomass Calculations for Wetlands and OSWs Impacted by the Preferred Alternative
The equation to calculate the biomass lost is: Wetland/OSW impact acres (converted to square-meters), multiplied by the amount of total biomass consumed by the wood stork, multiplied by the exotic foraging suitability index. This value, converted to kilograms, represents the total biomass lost for the impacted wood stork SFH within the SR 29 project study area. Calculations for each wetland use is listed below. Total biomass lost is shown in **Table 4**.

Linear Ditches – Short Hydroperiod (Class 2)

Impacts = 14.78 acres (59,814.66 meters^2)
Fish Biomass = 0.2015 grams/m^2
Foraging Suitability Value = 100 percent (1.0)
Biomass lost (kg) = (59,814.66 meters^2 * 0.2015 grams/m^2* 1.0) = 12,052.65grams / 1000 = ***12.05 kg***

Wetlands – Short Hydroperiod (Class 3)

Impacts = 4.26 acres total (0.56 acres forested wetlands and 5.28 acres herbaceous wetlands)

Forested Wetlands

Impacts = 0.56 acres (2,266.32 meters2)
Fish Biomass = 0.4290 grams/m2
Foraging Suitability Value = 100 percent (1.0)
Biomass lost (kg) = (2,266.32 meters2 * 0.4290 grams/m2 * 1.0) = 972.25 grams / 1000 = ***0.97 kg***

Herbaceous Wetlands

Impacts = 3.70 acres (14,973.90 meters^2)
Fish Biomass = 0.4290 grams/m^2
Foraging Suitability Value = 100 percent (1.0)
Biomass lost (kg) = (14,973.90 meters^2 * 0.4290 grams/m^2 * 1.0) = 6,423.80 grams / 1000 = ***6.42 kg***

Reservoirs less than 10 acres – Short Hydroperiod (Class 3)

Impacts = 0.63 acres (2,549.61 meters^2)
Fish Biomass = 0.4290 grams/m^2
Foraging Suitability Value = 100 percent (1.0)
Biomass lost (kg) = (2,549.61 meters^2 * 0.4290 grams/m^2 * 1.0) = 1,093.78 grams / 1000 = ***1.09 kg***

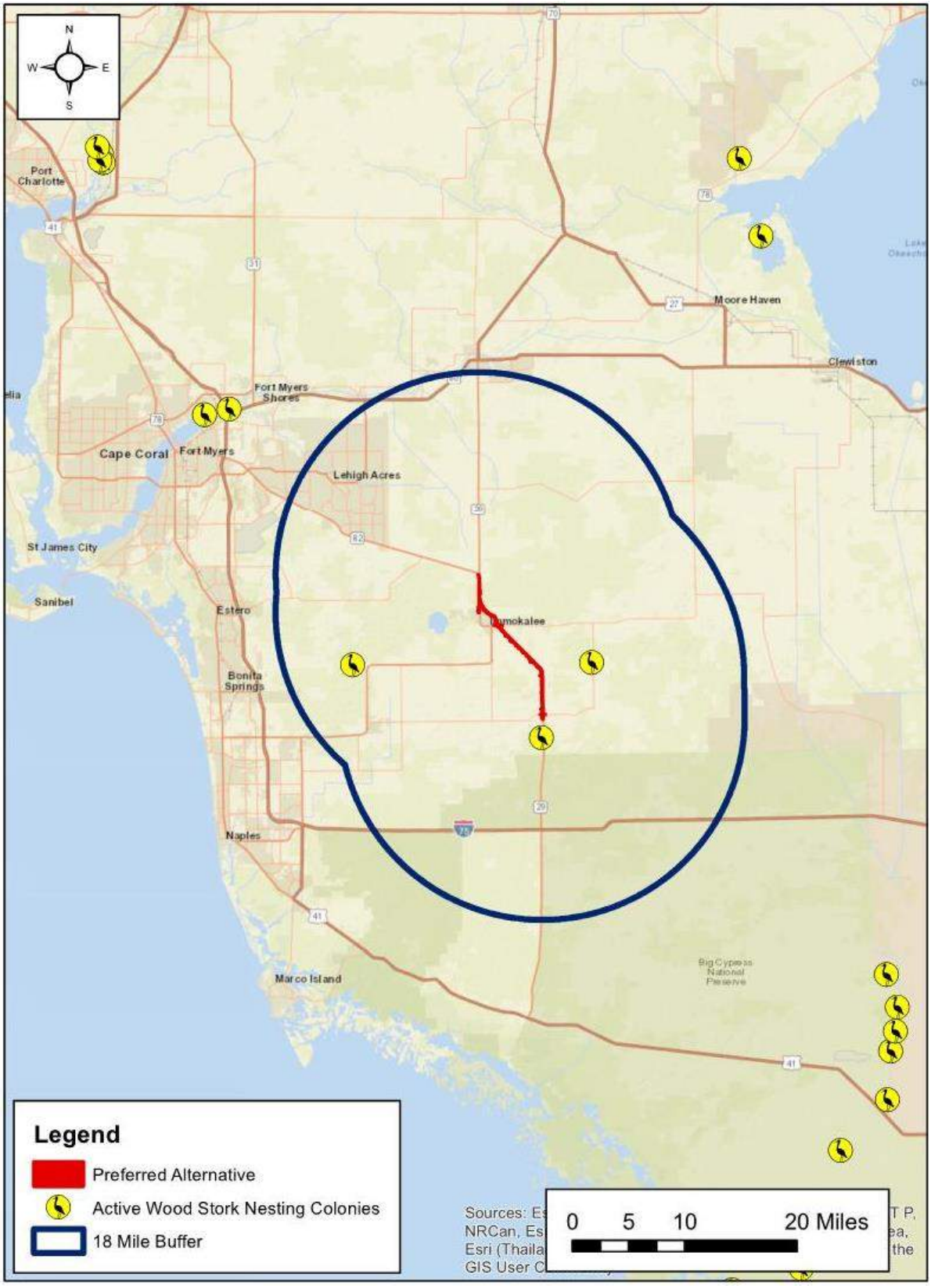
Total biomass lost for all wood stork SFH wetland and other surface waters within the project area is **20.53 kilograms**.

TABLE 4
TOTAL BIOMASS LOST WITHIN THE SR 29 PROJECT STUDY AREA

Hydroperiod Class	Wetland Type	Acres	Biomass Loss
Class 2 (60-120 days inundated)	Linear Ditches	14.78	12.05 kg
Class 3 (120-180 days inundated)	Wetlands - Forested	0.56	0.97 kg
	Wetlands - Herbaceous	3.70	6.42 kg
Class 3 (120-180 days inundated)	Reservoirs less than 10 acres	0.63	1.09 kg
		Total Short Hydroperiod Biomass Lost:	***20.53 kg***

Impacts to suitable wood stork foraging habitat will be replaced in-kind or mitigated through the purchase of wetland credits from a USFWS-approved wetland mitigation bank. All wetlands and other surface waters impacted by the proposed project have a hydroperiod class of Class 2 or Class 3, which are also categorized as "short hydroperiod" wetlands. Compensation through the purchase of short hydroperiod wetland credits, to mitigate total biomass lost (20.53 kg), at a USFWS-approved mitigation bank, will be determined during the permitting phase of the project. The *Wood Stork Effect Determination Key (South Florida)* was utilized for this project (**Appendix C-1**). The path followed through the Key was A > B > C > E = NLAA. Based on this information, the Preferred Alternative "**May Affect but is Not Likely to Adversely Affect**" the wood stork.

FIGURE 1
ACTIVE WOOD STORK COLONIES



Appendix E
Eastern Indigo Snake Documentation

Appendix E-1
Standard Protection Measures for the Eastern Indigo Snake

STANDARD PROTECTION MEASURES FOR THE EASTERN INDIGO SNAKE
U.S. Fish and Wildlife Service
August 12, 2013

The eastern indigo snake protection/education plan (Plan) below has been developed by the U.S. Fish and Wildlife Service (USFWS) in Florida for use by applicants and their construction personnel. At least **30 days prior** to any clearing/land alteration activities, the applicant shall notify the appropriate USFWS Field Office via e-mail that the Plan will be implemented as described below (North Florida Field Office: jaxregs@fws.gov; South Florida Field Office: verobeach@fws.gov; Panama City Field Office: panamacity@fws.gov). As long as the signatory of the e-mail certifies compliance with the below Plan (including use of the attached poster and brochure), no further written confirmation or "approval" from the USFWS is needed and the applicant may move forward with the project.

If the applicant decides to use an eastern indigo snake protection/education plan other than the approved Plan below, written confirmation or "approval" from the USFWS that the plan is adequate must be obtained. At least 30 days prior to any clearing/land alteration activities, the applicant shall submit their unique plan for review and approval. The USFWS will respond via e-mail, typically within 30 days of receiving the plan, either concurring that the plan is adequate or requesting additional information. A concurrence e-mail from the appropriate USFWS Field Office will fulfill approval requirements.

The Plan materials should consist of: 1) a combination of posters and pamphlets (see **Poster Information** section below); and 2) verbal educational instructions to construction personnel by supervisory or management personnel before any clearing/land alteration activities are initiated (see **Pre-Construction Activities** and **During Construction Activities** sections below).

POSTER INFORMATION

Posters with the following information shall be placed at strategic locations on the construction site and along any proposed access roads (a final poster for Plan compliance, to be printed on 11" x 17" or larger paper and laminated, is attached):

DESCRIPTION: The eastern indigo snake is one of the largest non-venomous snakes in North America, with individuals often reaching up to 8 feet in length. They derive their name from the glossy, blue-black color of their scales above and uniformly slate blue below. Frequently, they have orange to coral reddish coloration in the throat area, yet some specimens have been reported to only have cream coloration on the throat. These snakes are not typically aggressive and will attempt to crawl away when disturbed. Though indigo snakes rarely bite, they should NOT be handled.

SIMILAR SNAKES: The black racer is the only other solid black snake resembling the eastern indigo snake. However, black racers have a white or cream chin, thinner bodies, and WILL BITE if handled.

LIFE HISTORY: The eastern indigo snake occurs in a wide variety of terrestrial habitat types throughout Florida. Although they have a preference for uplands, they also utilize some wetlands

and agricultural areas. Eastern indigo snakes will often seek shelter inside gopher tortoise burrows and other below- and above-ground refugia, such as other animal burrows, stumps, roots, and debris piles. Females may lay from 4 - 12 white eggs as early as April through June, with young hatching in late July through October.

PROTECTION UNDER FEDERAL AND STATE LAW: The eastern indigo snake is classified as a Threatened species by both the USFWS and the Florida Fish and Wildlife Conservation Commission. "Taking" of eastern indigo snakes is prohibited by the Endangered Species Act without a permit. "Take" is defined by the USFWS as an attempt to kill, harm, harass, pursue, hunt, shoot, wound, trap, capture, collect, or engage in any such conduct. Penalties include a maximum fine of $25,000 for civil violations and up to $50,000 and/or imprisonment for criminal offenses, if convicted.

Only individuals currently authorized through an issued Incidental Take Statement in association with a USFWS Biological Opinion, or by a Section 10(a)(1)(A) permit issued by the USFWS, to handle an eastern indigo snake are allowed to do so.

IF YOU SEE A <u>LIVE</u> EASTERN INDIGO SNAKE ON THE SITE:

- Cease clearing activities and allow the live eastern indigo snake sufficient time to move away from the site without interference;
- Personnel must NOT attempt to touch or handle snake due to protected status.
- Take photographs of the snake, if possible, for identification and documentation purposes.
- Immediately notify supervisor or the applicant's designated agent, **and** the appropriate USFWS office, with the location information and condition of the snake.
- If the snake is located in a vicinity where continuation of the clearing or construction activities will cause harm to the snake, the activities must halt until such time that a representative of the USFWS returns the call (within one day) with further guidance as to when activities may resume.

IF YOU SEE A <u>DEAD</u> EASTERN INDIGO SNAKE ON THE SITE:

- Cease clearing activities and immediately notify supervisor or the applicant's designated agent, **and** the appropriate USFWS office, with the location information and condition of the snake.
- Take photographs of the snake, if possible, for identification and documentation purposes.
- Thoroughly soak the dead snake in water and then freeze the specimen. The appropriate wildlife agency will retrieve the dead snake.

Telephone numbers of USFWS Florida Field Offices to be contacted if a live or dead eastern indigo snake is encountered:

North Florida Field Office – (904) 731-3336
Panama City Field Office – (850) 769-0552
South Florida Field Office – (772) 562-3909

PRE-CONSTRUCTION ACTIVITIES

1. The applicant or designated agent will post educational posters in the construction office and throughout the construction site, including any access roads. The posters must be clearly visible to all construction staff. A sample poster is attached.

2. Prior to the onset of construction activities, the applicant/designated agent will conduct a meeting with all construction staff (annually for multi-year projects) to discuss identification of the snake, its protected status, what to do if a snake is observed within the project area, and applicable penalties that may be imposed if state and/or federal regulations are violated. An educational brochure including color photographs of the snake will be given to each staff member in attendance and additional copies will be provided to the construction superintendent to make available in the onsite construction office (a final brochure for Plan compliance, to be printed double-sided on 8.5" x 11" paper and then properly folded, is attached). Photos of eastern indigo snakes may be accessed on USFWS and/or FWC websites.

3. Construction staff will be informed that in the event that an eastern indigo snake (live or dead) is observed on the project site during construction activities, all such activities are to cease until the established procedures are implemented according to the Plan, which includes notification of the appropriate USFWS Field Office. The contact information for the USFWS is provided on the referenced posters and brochures.

DURING CONSTRUCTION ACTIVITIES

1. During initial site clearing activities, an onsite observer may be utilized to determine whether habitat conditions suggest a reasonable probability of an eastern indigo snake sighting (example: discovery of snake sheds, tracks, lots of refugia and cavities present in the area of clearing activities, and presence of gopher tortoises and burrows).

2. If an eastern indigo snake is discovered during gopher tortoise relocation activities (i.e. burrow excavation), the USFWS shall be contacted within one business day to obtain further guidance which may result in further project consultation.

3. Periodically during construction activities, the applicant's designated agent should visit the project area to observe the condition of the posters and Plan materials, and replace them as needed. Construction personnel should be reminded of the instructions (above) as to what is expected if any eastern indigo snakes are seen.

POST CONSTRUCTION ACTIVITIES

Whether or not eastern indigo snakes are observed during construction activities, a monitoring report should be submitted to the appropriate USFWS Field Office within 60 days of project completion. The report can be sent electronically to the appropriate USFWS e-mail address listed on page one of this Plan.

Appendix E-2
Eastern Indigo Snake Programmatic Effect Determination Key (South Florida)

United States Department of the Interior

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

August 1, 2017

Donnie Kinard
U.S. Army Corps of Engineers
Post Office Box 4970
Jacksonville, Florida 32232-0019

Subject: Consultation Key for the Eastern Indigo Snake – Revised

Dear Mr. Kinard:

This letter revises and replaces the January 25, 2010, and August 13, 2013, letters to the U.S. Army Corps of Engineers (Corps) regarding the use of the eastern indigo snake programmatic effect determination key (Key) for projects occurring within the South Florida Ecological Service's Office (SFESO) jurisdiction. This revision supersedes all prior versions of the Key in the SFESO area. The purpose of this revision is to clarify portions of the previous keys based on questions we have been asked, specifically related to habitat and refugia used by eastern indigo snakes (*Drymarchon corais couperi*), in the southern portion of their range and within the jurisdiction of the SFESO. This Key is provided pursuant to the Service's authorities under the Endangered Species Act of 1973, as amended (Act) (87 Stat. 884; 16 U.S.C.1531 *et seq.*). This Key revision has been assigned Service Consultation Code: 41420-2009-I-0467-R001.

The purpose of this Key is to assist the Corps (or other Federal action agency) in making appropriate effects determinations for the eastern indigo snake under section 7 of the Act, and streamline informal consultation with the SFESO for the eastern indigo snake when the proposed action can be walked through the Key. The Key is a tool available to the Corps (or other Federal action agency) for the purposes of expediting section 7 consultations. There is no requirement to use the Key. There will be cases when the use of the Key is not appropriate. These include, but are not limited to: where project specific information is outside of the scope of the Key or instances where there is new biological information about the species. In these cases, we recommend the Corps (or other Federal action agency) initiates traditional consultation pursuant to section 7 of the Act, and identify that consultation is being requested outside of the Key.

This Key uses project size and home ranges of eastern indigo snakes as the basis for making determinations of "may affect, but is not likely to adversely affect" (NLAA) and "may affect. and is likely to adversely affect" (may affect). Suitable habitat for the eastern indigo snake consists of a mosaic of habitats types, most of which occur throughout South Florida. Information on home ranges for individuals is not available in specific habitats in South Florida. Therefore, the SFESO uses the information from a 26-year study conducted by Layne and Steiner (1996) at Archbold Biological Station, Lake Placid, Florida, as the best available

information. Layne and Steiner (1996) determined the average home range size for a female eastern indigo snake was 46 acres and 184 acres for a male.

Projects that would remove/destroy less than 25 acres of eastern indigo snake habitat are expected to result in the loss of a portion of an eastern indigo snakes home range that would not impair the ability of the individual to feed, breed, and shelter. Therefore, the Service finds that take would not be reasonably certain to occur due to habitat loss. However, these projects have the potential to injure or kill an eastern indigo snake if the individual is crushed by equipment during site preparation or other project aspects. The Service's *Standard Protection Measures for the Eastern Indigo Snake* (Service 2013 or most current version) and the excavation of underground refugia (where a snake could be buried, trapped and/or injured), when implemented, are designed to avoid these forms of take. Consequently, projects less than 25 acres that include the Service's *Standard Protection Measures for the Eastern Indigo Snake* (Service 2013 or most current version) and a commitment to excavate underground refugia as part of the proposed action would be expected to avoid take and thus, may affect, but are not likely to adversely affect the species.

If a proposed project would impact less than 25 acres of vegetated eastern indigo snake habitat (not urban/ human-altered) completely surrounded by urban development, and an eastern indigo snake has been observed on site, the Key should not be used. The Service recommends formal consultation for this situation because of the expected increased value of the vegetated habitat within the individual's home range.

Projects that would remove 25 acres or more of eastern indigo snake habitat could remove more than half of a female eastern indigo snakes home range. This loss of habitat within a home range would be expected to significantly impair the ability of that individual to feed, breed, and shelter. Therefore, the Service finds take through habitat loss would be reasonably certain to occur and formal consultation is appropriate. Furthermore, these projects have the potential to injure or kill an eastern indigo snake if the individual is crushed by equipment during site preparation or other project aspects. The Service's *Standard Protection Measures* for the *Eastern Indigo Snake* (Service 2013 or most current version) and the excavation of underground refugia (where a snake could be buried, trapped and/or injured), when implemented, are designed to avoid these forms of take.

Eastern indigo snakes use a variety of habitat and are difficult to detect. Therefore, site specific information on the land use, observations of eastern indigo snakes within the vicinity, as well as other factors, as appropriate, will all be considered by the Service when making a final recommendation on the appropriate effects determination and whether it is appropriate to conclude consultation with the Corps (or other Federal action agency) formally or informally for projects that will impact 25 acres or more of habitat. Accordingly, when the use of the Key results in a determination of "may affect," the Corps (or other Federal action agency) is advised that consultation may be concluded informally or formally, depending on the project specific effects to eastern indigo snakes. Technical assistance from the Service can assist you in making a determination prior to submitting a request for consultation. In circumstances where the Corps (or other Federal action agency) desires to proceed with a consultation request prior to receiving

additional technical assistance from the Service, we recommend the agency documents the biological rationale for their determination and proceed with a request accordingly.

If the use of the Key results in a determination of "no effect," no further consultation is necessary with the SFESO. If the use of the Key results in a determination of "NLAA," the SFESO concurs with this determination based on the rationale provide above, and no further consultation is necessary for the effects of the proposed action on the eastern indigo snake. For "no effect" or "NLAA" determinations, the Service recommends that the Corps (or other Federal action agency) documents the pathway used to reach your no effect or NLAA determination in the project record and proceed with other species analysis as warranted.

Eastern Indigo Snake Programmatic Effect Determination Key
Revised July 2017
South Florida Ecological Service Office

Scope of the Key

This Key should be used only in the review of permit applications for effects determinations for the eastern indigo snake (*Drymarchon corais couperi*) within the South Florida Ecological Service's Office (SFESO) area (Broward, Charlotte, Collier, De Soto, Glades, Hardee, Hendry, Highlands, Lee, Indian River, Martin, Miami-Dade, Monroe, Okeechobee, Osceola, Palm Beach, Polk, Sarasota, and St. Lucie Counties). There is no designated critical habitat for the eastern indigo snake.

This Key is subject to revision as the Corps (or other Federal action agency) and Service deem necessary and in particular whenever there is new information on eastern indigo snake biology and effects of proposed projects.

The Key is a tool available to the Corps (or other Federal action agency) for the purposes of expediting section 7 consultations. There is no requirement to use the Key. There will be cases when the use of the Key is not appropriate. These include, but are not limited to: where project specific information is outside of the scope of the Key or instances where there is new biological information about the species. In these cases, we recommend the Corps (or other Federal action agency) initiates traditional consultation pursuant to section 7 of the Act, and identify that consultation is being requested outside of the Key.

Habitat

Habitat use varies seasonally between upland and wetland areas, especially in the more northern parts of the species' range. In southern parts of their range eastern indigo snakes are habitat generalists which use most available habitat types. Movements between habitat types in northern areas of their range may relate to the need for thermal refugia (protection from cold and/or heat).

In northern areas of their range eastern indigo snakes prefer an interspersion of tortoise-inhabited sandhills and wetlands (Landers and Speake 1980). In these northern regions eastern indigo

snakes most often use forested areas rich with gopher tortoise burrows, hollowed root channels, hollow logs, or the burrows of rodents, armadillos, or land crabs as thermal refugia during cooler seasons (Lawler 1977; Moler 1985a; Layne and Steiner 1996). The eastern indigo snake in the northern region is typically classified as a longleaf pine savanna specialist because here, in the northern four-fifths of its range, the eastern indigo snake is typically only found in vicinity of xeric longleaf pine–turkey oak sandhills inhabited by the gopher tortoise (Means 2006).

In the milder climates of central and southern Florida, comprising the remaining one fifth of its range, thermal refugia such as those provided by gopher tortoise burrows may not be as critical to survival of indigo snakes. Consequently, eastern indigo snakes in these regions use a more diverse assemblage of habitats such as pine flatwoods, scrubby flatwoods, floodplain edges, sand ridges, dry glades, tropical hammocks, edges of freshwater marshes, muckland fields, coastal dunes, and xeric sandhill communities; with highest population concentrations of eastern indigo snakes occurring in the sandhill and pineland regions of northern and central Florida (Service 1999). Eastern indigo snakes have also been found on agricultural lands with close proximity to wetlands (Zeigler 2006).

In south Florida, agricultural sites (*e.g.*, sugar cane fields and citrus groves) are occupied by eastern indigo snakes. The use of sugarcane fields by eastern indigo snakes was first documented by Layne and Steiner in 1996. In these areas there is typically an abundance of wetland and upland ecotones (due to the presence of many ditches and canals), which support a diverse prey base for foraging. In fact, some speculate agricultural areas may actually have a higher density of eastern indigo snakes than natural communities due to the increased availability of prey. Gopher tortoise burrows are absent at these locations but there is an abundance of both natural and artificial refugia. Enge and Endries (2009) reporting on the status of the eastern indigo snake included sugarcane fields and citrus groves in a Global Information Systems (GIS)-base map of potential eastern indigo snake habitat. Numerous sightings of eastern indigo snakes within sugarcane fields have been reported within south Florida (Florida Fish and Wildlife Conservation Commission Indigo Snake Database [Enge 2017]). A recent study associated with the Comprehensive Everglades Restoration Plan (CERP) (A-1 FEB Project formerly A-1 Reservoir; Service code: 41420-2006-F-0477) documented eastern indigo snakes within sugarcane fields. The snakes used artificial habitats such as piles of limerock, construction debris, and pump stations. Recent studies also associated with the CERP at the C-44 Project (Service code: 41420-2009-FA-0314), and C-43 Project (Service code: 41420-2007-F-0589) documented eastern indigo snakes within citrus groves. The snakes used artificial habitats such as boards, sheets of tin, construction debris, pipes, drain pipes in abandoned buildings and septic tanks.

In extreme south Florida (*i.e.*, the Everglades and Florida Keys), eastern indigo snakes also utilize tropical hardwood hammocks, pine rocklands, freshwater marshes, abandoned agricultural land, coastal prairie, mangrove swamps, and human-altered habitats. Though eastern indigo snakes have been found in all available habitats of south Florida it is thought they prefer hammocks and pine forests since most observations occur there and use of these areas is disproportionate compared to the relatively small total area of these habitats (Steiner *et al.* 1983).

Even though thermal stress may not be a limiting factor throughout the year in south Florida, eastern indigo snakes still seek and use underground refugia. On the sandy central ridge of central Florida, eastern indigo snakes use gopher tortoise burrows more (62 percent) than other underground refugia (Layne and Steiner 1996). Other underground refugia used include armadillo (*Dasypus novemcinctus*) burrows near citrus groves, cotton rat (*Sigmodon hispidus*) burrows, and land crab (*Cardisoma guanhumi*) burrows in coastal areas (Layne and Steiner 1996; Wilson and Porras 1983). Natural ground holes, hollows at the base of trees or shrubs, ground litter, trash piles, and crevices of rock-lined ditch walls are also used (Layne and Steiner 1996). These refugia are used most frequently where tortoise burrows are not available, principally in low-lying areas off the central and coastal ridges.

Minimization Measures

The Service developed protection measures for the eastern indigo snake "Standard Protection Measures for the Eastern Indigo Snake" (Service 2013) located at: https://www.fws.gov/verobeach/ReptilesPDFs/20130812_EIS%20Standard%20Protection%20Measures_final.pdf. These protections measures (or the most updated version) are considered a minimization measure for projects proposed within eastern indigo snake habitat.

Determinations

If the use of this Key results in a determination of "**no effect**," no further consultation is necessary with the SFESO.

If the use of this Key results in a determination of "**NLAA**," the SFESO concurs with this determination and no further consultation is necessary for the effects of the proposed action on the eastern indigo snake.

For no effect or NLAA determinations, the Corps (or other Federal action agency) should make a note in the project file indicating the pathway used to reach your no effect or NLAA determination.

If a proposed project would impact less than 25 acres of vegetated eastern indigo snake habitat (not urban/ human-altered) completely surrounded by urban development, and an eastern indigo snake has been observed on site, the subsequent Key should not be used. The Service recommends formal consultation for this situation because of the expected increased value of the vegetated habitat within the individual's home range.

If the use of this Key results in a determination of "**may affect**," consultation may be concluded informally or formally depending on project effects to eastern indigo snakes. Technical assistance from the Service can assist you in making a determination prior to submitting a request for consultation. In circumstances where the Corps desires to proceed with a consultation request prior to receiving additional technical assistance from the Service, we recommend the Corps document the biological rationale for their determination and proceed with a request accordingly.

A. Project is not located in open water or salt marsh.....go to B

Project is located solely in open water or salt marsh.....**no effect**

B. Permit will be conditioned for use of the Service's most current guidance for Standard Protection Measures For The Eastern Indigo Snake (currently 2013) during site preparation and project construction.....go to C

Permit will not be conditioned as above for the eastern indigo snake, or it is not known whether an applicant intends to use these measures and consultation with the Service is requested.....**may affect**

C. The project will impact less than 25 acres of eastern indigo snake habitat (*e.g.*, sandhill, scrub, pine flatwoods, pine rocklands, scrubby flatwoods, high pine, dry prairie, coastal prairie, mangrove swamps, tropical hardwood hammocks, hydric hammocks, edges of freshwater marshes, agricultural fields [including sugar cane fields and active, inactive, or abandoned citrus groves], and coastal dunes).....go to D

The project will impact 25 acres or more of eastern indigo snake habitat (*e.g.*, sandhill, scrub, pine flatwoods, pine rocklands, scrubby flatwoods, high pine, dry prairie, coastal prairie, mangrove swamps, tropical hardwood hammocks, hydric hammocks, edges of freshwater marshes, agricultural fields [including sugar cane fields and active, inactive, or abandoned citrus groves], and coastal dunes).....**may affect**

D. The project has no known holes, cavities, active or inactive gopher tortoise burrows, or other underground refugia where a snake could be buried, trapped and/or injured during project activities.....NLAA

The project has known holes, cavities, active or inactive gopher tortoise burrows, or other underground refugia where a snake could be buried, trapped and /or injured.....go to E

E. Any permit will be conditioned such that all gopher tortoise burrows, active or inactive, will be excavated prior to site manipulation in the vicinity of the burrow[1]. If an eastern indigo snake is encountered, the snake must be allowed to vacate the area prior to additional site manipulation in the vicinity. Any permit will also be conditioned such that holes, cavities, and snake refugia other than gopher tortoise burrows will be inspected each morning before planned site manipulation of a particular area, and, if occupied by an eastern indigo snake, no work will commence until the snake has vacated the vicinity of proposed work.....NLAA[2]

Permit will not be conditioned as outlined above.....**may affect**

End Key

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[1] If excavating potentially occupied burrows, active or inactive, individuals must first obtain state authorization via a Florida Fish and Wildlife Conservation Commission Authorized Gopher Tortoise Agent permit. The excavation method selected should also minimize the potential for injury of an indigo snake. Applicants should follow the excavation guidance provided within the most current Gopher Tortoise Permitting Guidelines found at http://myfwc.com/gophertortoise.

[2] Please note, if the proposed project will impact less than 25 acres of vegetated eastern indigo snake habitat (not urban/ human-altered) completely surrounded by urban development, and an eastern indigo snake has been observed on site, NLAA is not the appropriate conclusion. The Service recommends formal consultation for this situation because of the expected increased value of the vegetated habitat within the individual's home range

Working with the Fish and Wildlife Foundation of Florida, the Service has established a fund to support conservation and recovery for the eastern indigo snake. Any project that has the potential to affect the eastern indigo snake and/or its habitat is encouraged to make a voluntary contribution to this fund. If you would like additional information about how to make a contribution and how these monies are used to support eastern indigo snake recovery please contact Ashleigh Blackford, Connie Cassler, or José Rivera at 772-562-3559.

This revised Key is effective immediately upon receipt by the Corps. Should circumstances change or new information become available regarding the eastern indigo snake and/or implementation of the Key, the determinations herein may be reconsidered and this Key further revised or amended.

Thank you for your continued cooperation in the effort to conserve fish and wildlife resources. If you have any questions or comments regarding this Key, please contact the SFESO at 772-562-3909.

Sincerely,

Roxanna Hinzman
Field Supervisor
South Florida Ecological Services

Cc:
Corps, Jacksonville, Florida (Dale Beter, Muriel Blaisdell, Ingrid Gilbert, Angela Ryan, Irene Sadowski, Victoria White, Alisa Zarbo)
Service, Athens, Georgia (Michelle Elmore)
Service, Jacksonville, Florida (Annie Dziergowski)
Service, Panama City, Florida (Sean Blomquist)

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Appendix F
Florida Scrub-Jay Survey Technical Report

Florida Scrub-Jay Survey Technical Report

Introduction

The Florida scrub-jay (*Aphelocoma coerulescens*) is federally-listed as threatened primarily due to habitat loss and degradation. This species is typically found in early successional stages of xeric oak communities that are occasionally burned. Its preferred habitat consists of scrub oaks that are less than 10 feet tall with open sand and grass patches. Species Conservation Guidelines for the Florida scrub-jay (USFWS 2004) defines three suitable habitat types as follows:

Type I: any upland plant community in which percent cover of the substrate by scrub oak species is 15 percent or more.

Type II: any plant community, not meeting the definition of Type I habitat, in which one or more scrub oak species is represented.

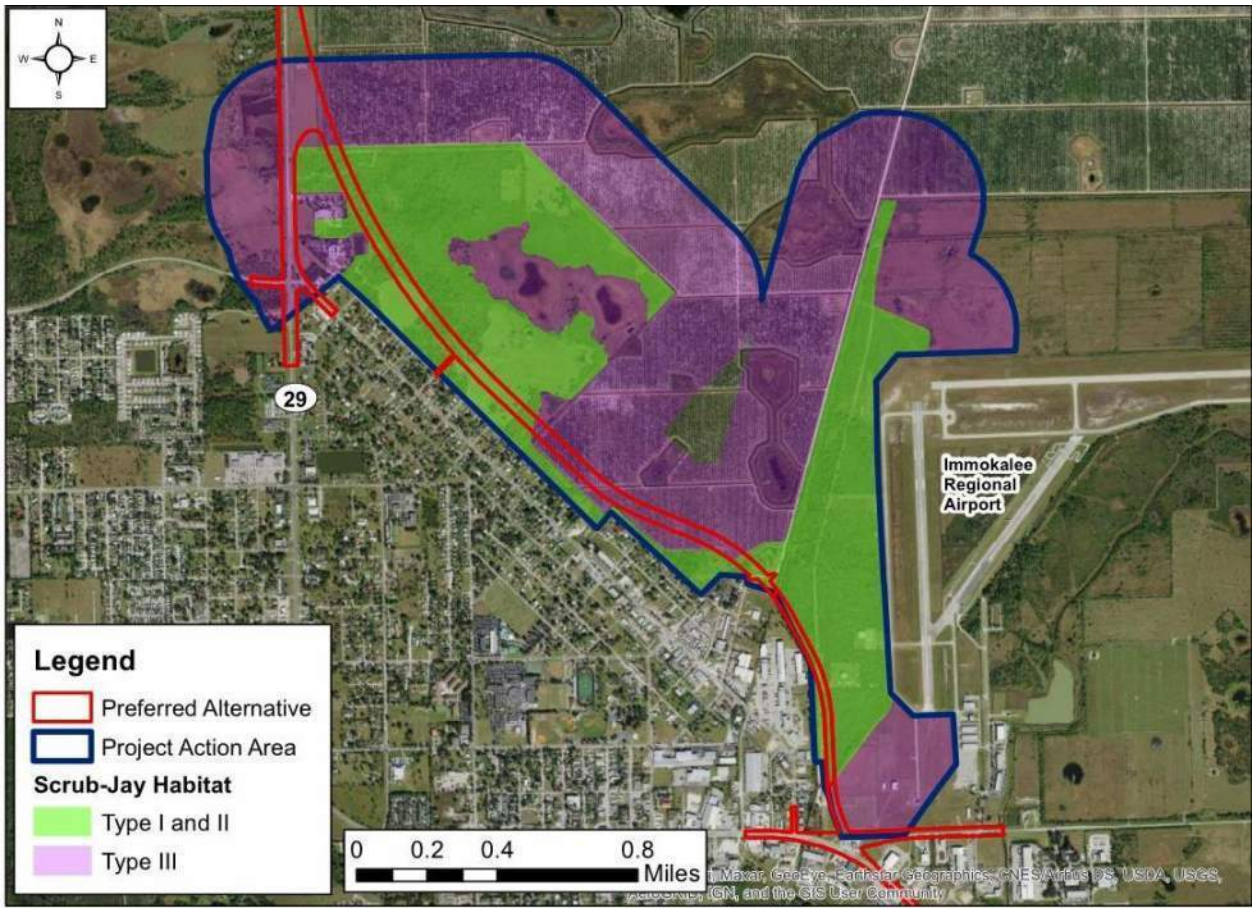
Type III: any upland or seasonally dry wetland within 400 m (0.25 mi) of any area designated as Type I or II habitats.

Due to proposed impacts to scrub-jay habitat and previous observations of scrub-jay within the project study area, potential involvement of the project with the Florida scrub-jay was determined to be high. Scrub-jay surveys were needed to determine the presence of the species within the proposed footprint of the Preferred Alternative.

Action Area

For the SR 29 PD&E study, the Action Area for the Florida scrub-jay has been designated as the areas that exhibit Type I, II, and III scrub-jay suitable habitat. Following 11 years of field observations and land use determinations, scientists deduced scrub habitat is present in the northern portion of the Preferred Alternative, specifically at the Immokalee Regional Airport and in the lands adjacent to the bypass corridor, east of the city of Immokalee. Scrub-jays have been documented in these areas dating back to the USFWS 1992-1993 statewide survey. Additionally, scientists have observed scrub-jays in these areas since the PD&E study began in October 2010. The scrub-jay Action Area for the SR 29 project is presented in **Figure 1**.

FIGURE 1
FLORIDA SCRUB-JAY ACTION AREA

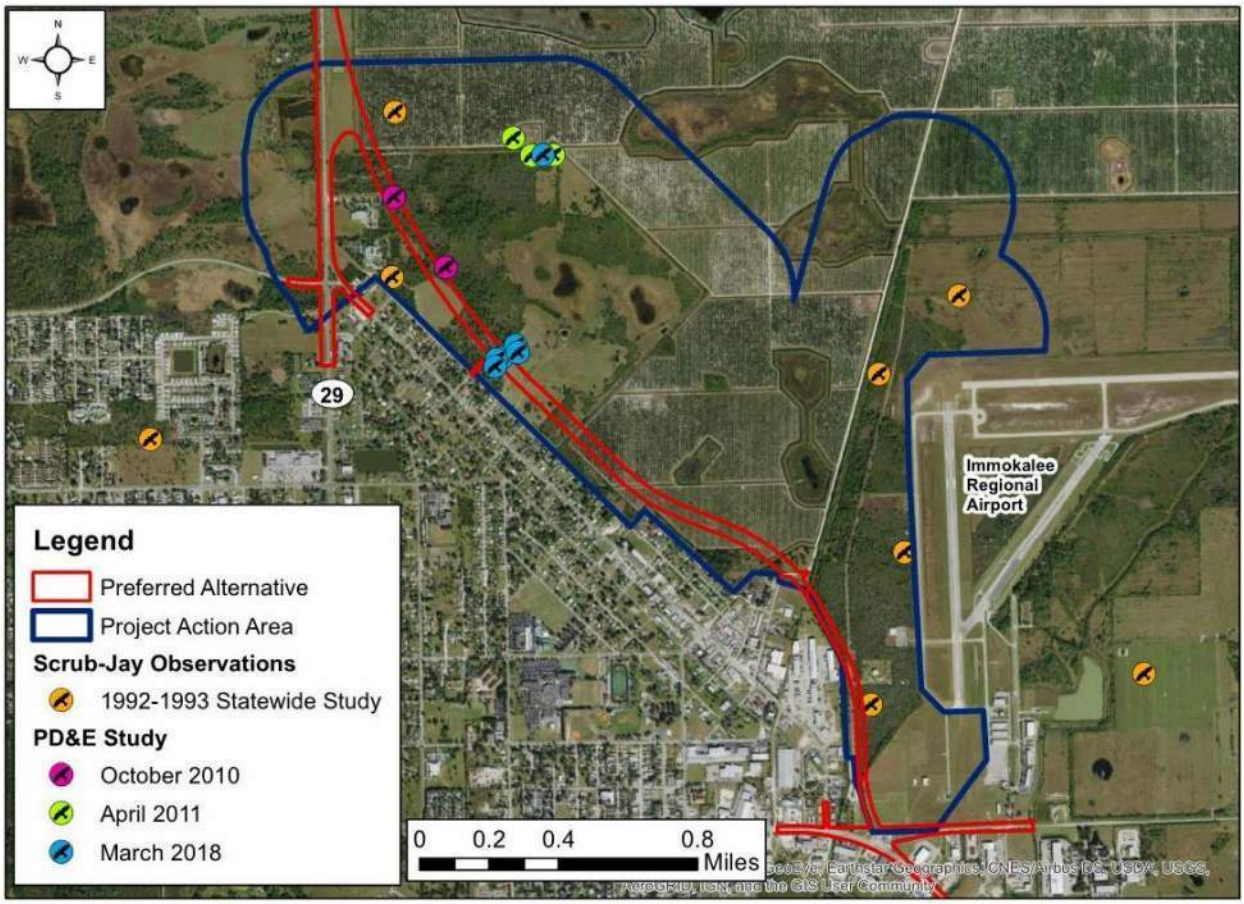


Scrub-Jay Surveys within the Action Area

The study area has been reviewed on multiple occasions within the last 11 years. It was determined, through field reviews, desktop research, and historical data that the UMA at the Immokalee Regional Airport and the Collier Property exhibit suitable habitat for the Florida scrub-jay.

In 1992-1993, the USFWS conducted a statewide study to estimate the population of scrub-jays and the number of breeding pairs (Fitzpatrick 1994). In 1992-1993, scrub-jays were observed at the Immokalee Regional Airport and in the western portion of the Collier Property parcel. For the SR 29 PD&E Study, field biologists have conducted scrub-jay surveys during site reviews in October 2010, April 2011, and March 2018. Scrub-jays were documented in multiple locations throughout the Collier Property since 2018. Historic observations of scrub-jays within the Action Area are depicted on **Figure 2**.

FIGURE 2
SCRUB-JAY OBSERVATIONS - PRIOR TO 2020

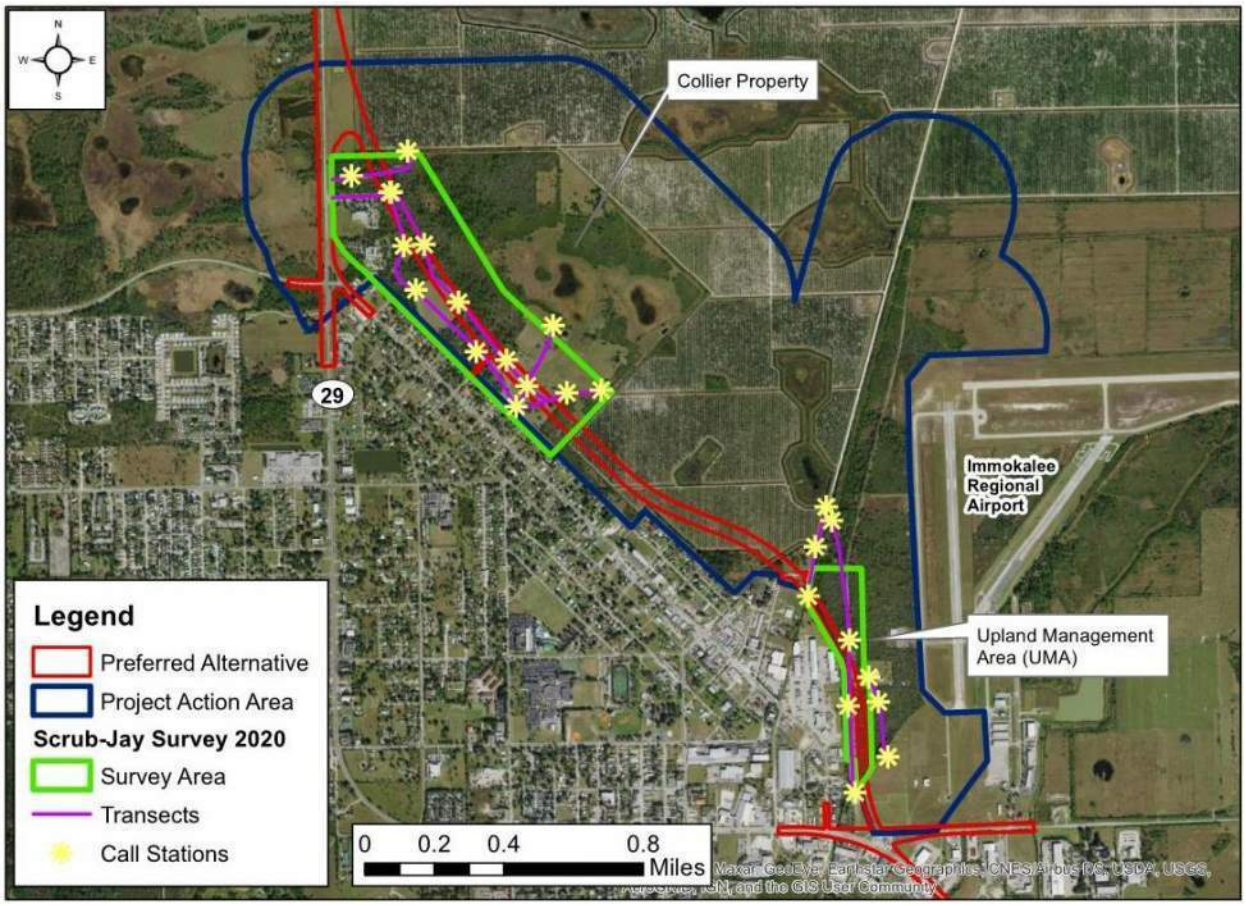


Scrub-jay surveys were performed in October 2020 following the re-initiation of Section 7 consultation for the USFWS. Surveys were conducted along the construction limits of the Preferred Alternative, specifically at the UMA at the Immokalee Regional Airport and Collier Property. The objective of the 2020 surveys was to confirm the presence or absence of scrub-jays, determine resident family size, and approximate the resident scrub-jay family home territory within the direct impacts of the Preferred Alternative.

Methodology

As stated above, the October 2020 scrub-jay survey was focused on determining family size and territorial boundaries within the direct impacts of the proposed roadway. The USFWS Scrub-jay Survey Guidelines (Updated 08/24/2007) document was referenced prior to conducting surveys. Surveys were performed for a total of five days at each site (UMA at the Immokalee Regional Airport and Collier Property) either just after sunrise and/or in the late afternoon. Resident family size, home range boundaries, flight direction, and behavior was noted where scrub-jays were present. **Figure 3** presents the scrub-jay survey areas with transects and call locations.

FIGURE 3
SCRUB-JAY SURVEY METHODOLOGY - OCTOBER 2020



Results

UMA at the Immokalee Regional Airport

No scrub-jays were observed at the UMA at the Immokalee Regional Airport during the entirety of the survey. Scientists deduced that current site conditions no longer provided suitable habitat for the species. Maintenance constraints, especially the restriction of prescribed burns, at the UMA have resulted in the rapid growth of muscadine vine and invasive species throughout the site. Since the site has been under conservation easement (1999), management practices have not included controlled burns due to the close proximity of the airport and associated residential and commercial businesses in the town of Immokalee. Mowing and maintenance activities alone, have not had success in sustaining the Type I and II scrub habitat. Invasive species and dominating vines have transformed the habitat in such a way, that no scrub-jays have been documented at the site since the USFWS 1992-1993 statewide survey.

Collier Property

A total of two resident families (identified as Group A: two individuals and Group B: three individuals) were observed at the Collier Property. Presence of at least two individuals of each group, at least once a day, throughout the entirety of the five day survey was confirmed. Included

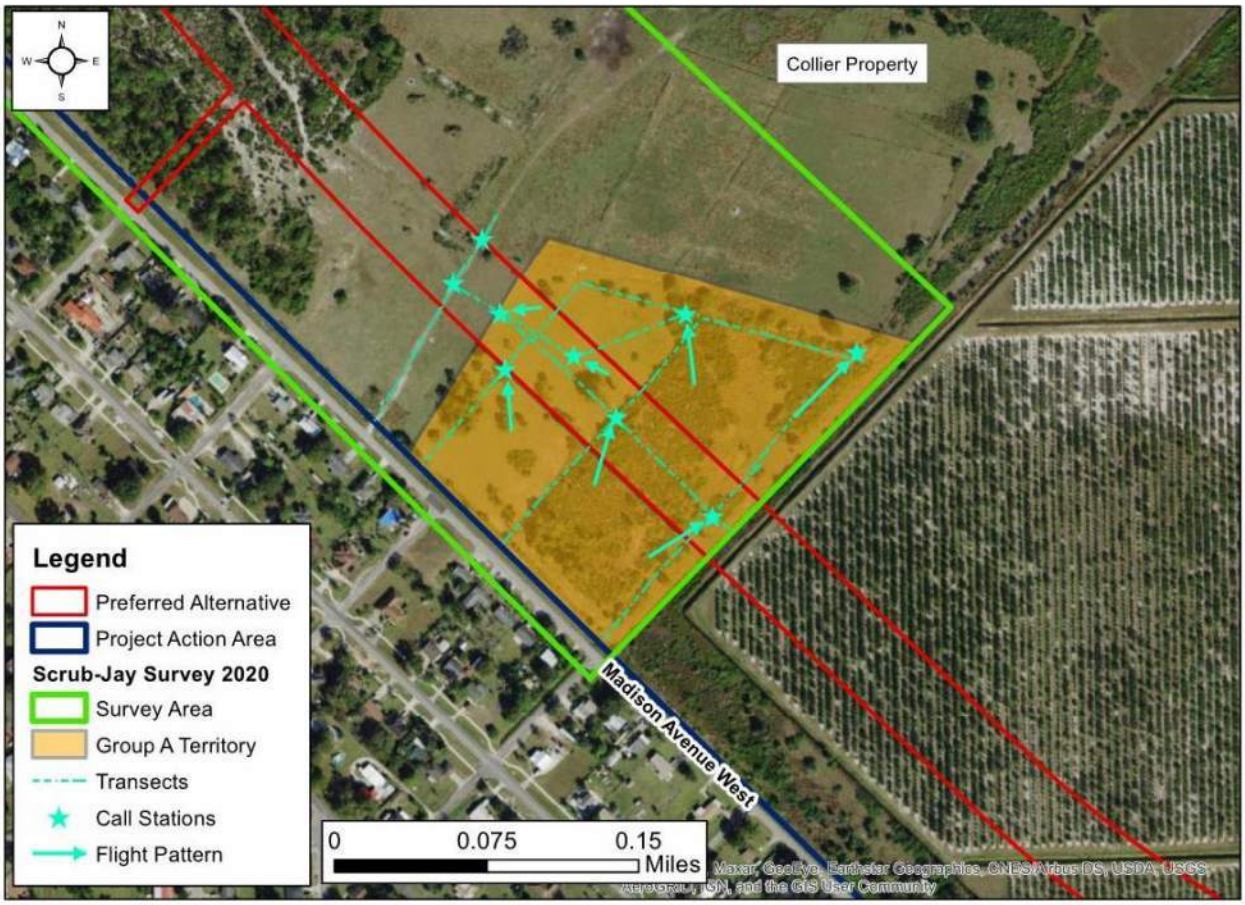
on the figure are resident family group size, direction the jays approached surveyors, and approximate territory boundaries.

Resident Family – Group A

Day 1-5 Behavior

On the morning of survey day 1, scientists entered the central pasture area and were approached by a resident family, comprised of two individuals, identified as Group A. Scrub-jays of Group A approached scientists from a southeast direction, with aggressive calls and dive bombing behavior. While walking transects and playing scrub-jay vocalizations, members of Group A remained in the southeast portion of the Collier Property. Throughout the five days of surveys, scientists noted that the jays did not travel beyond the property line to the southeast (citrus groves to the east), across Madison Avenue West to the southwest, or across the central pasture area to the west. On a few occasions, the scrub-jays in Group A flew to the northeast (outside the limits of construction) of the Collier Property, most likely an extension of their home range territory. Resident family – Group A – flight patterns are depicted in **Figure 4**.

FIGURE 4
GROUP A RESIDENT FAMILY SURVEY RESULTS – DAYS 1-5



Home Territory Conclusions

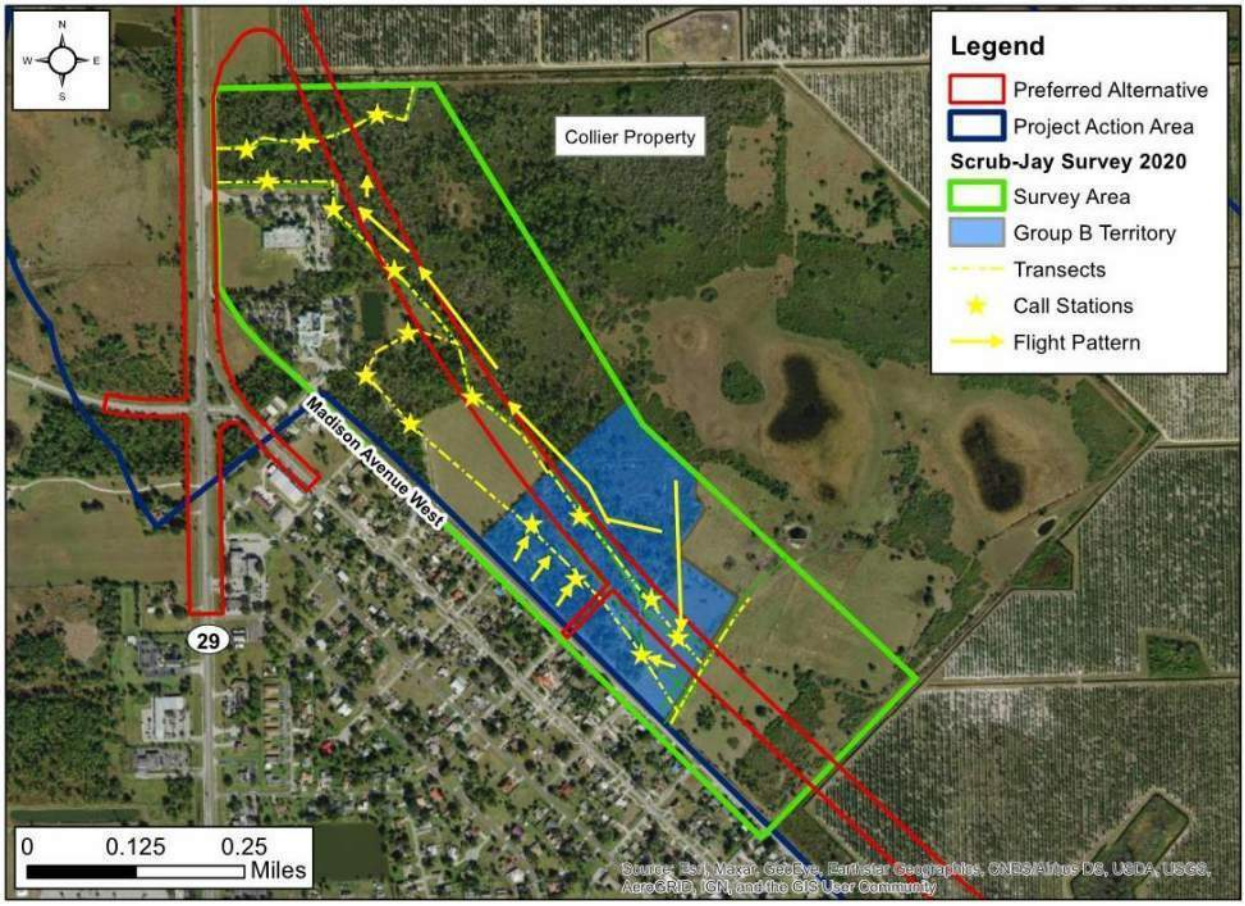
Scientists determined the territory of Group A encompasses the shrub and brushland habitat in the southeastern portion of the property, east of the central pasture. The territory does not extend beyond the citrus groves to the southeast or across Madison Avenue West to the southwest. Group A is comprised of two individuals, and the approximate territory size is estimated to be 17.23 acres.

Resident Family – Group B

Day 1 Behavior

On the morning of survey day 1, scientists entered the central pasture area and were approached by a resident family, comprised of three individuals, identified as Group B. The individuals of Group B approached scientists from a northwest direction, with aggressive calls and dive bombing behavior. While walking transects and playing scrub-jay vocalizations, individuals of Group B followed scientists from the central improved pasture, northwest through the pine flatwoods habitat and beyond to a second improved pasture area. Two out of the three individuals continued to follow scientists further, in the northwest direction, into a continuation of the pine flatwoods habitat at the northwest limits of the Collier Property. Resident family – Group B – flight patterns for day 1 are depicted in **Figure 5**.

FIGURE 5
GROUP B RESIDENT FAMILY SURVEY RESULTS – DAY 1

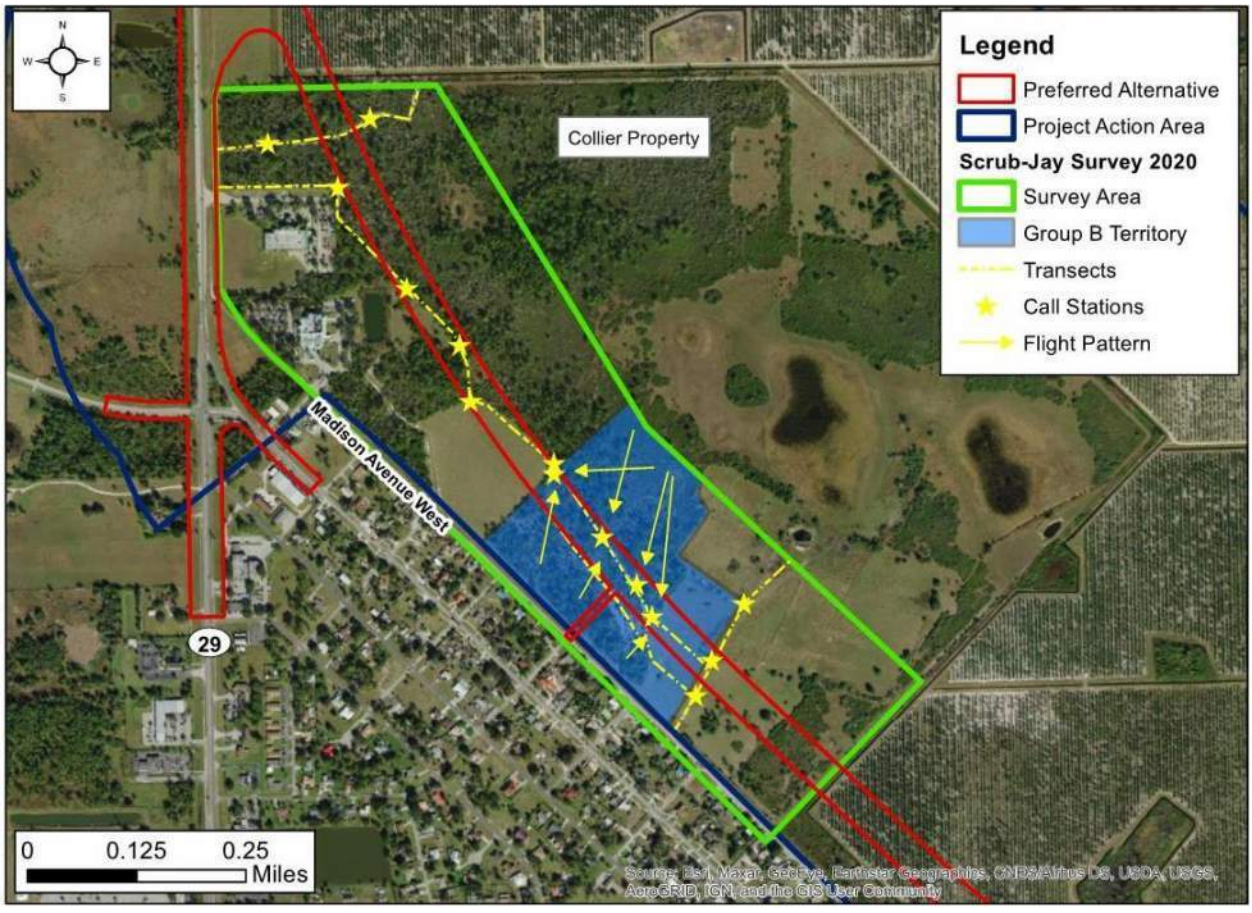


Day 2-5 Behavior

On Day 2, scientists entered the survey area from two different access points –one scientist entered from the pine flatwoods habitat in the northwest portion of the property and one scientist entered at the central pasture. Survey start times of the scientists were staggered in order to better define the home territory for Group B. The scientist from the northwest began the survey first, and was not approached by the three individuals until the pine flatwoods habitat in the middle of the two open pasture areas. The jays approached from a north-northwest direction. The second scientist began playing calls from the central open pasture. The three jays approached from a west direction, but stopped just at the edge of the pine flatwoods habitat. Similar to Day 1, the scrub-jays exhibited dive bombing and aggressive calling behavior to both scientists.

During subsequent survey days (Days 3-5), scientists entered the central pasture and traversed west through the pine flatwoods habitat. On Days 3-5, the three individuals of Group B remained in the pine flatwoods area, approaching from a north-northwest direction each time. Resident family, Group B, did not travel beyond the westernmost improved pasture for the reminder of the surveys. Resident family – Group B – flight patterns for Days 2-5 are depicted in **Figure 6**.

FIGURE 6
GROUP B RESIDENT FAMILY SURVEY RESULTS – DAYS 2-5



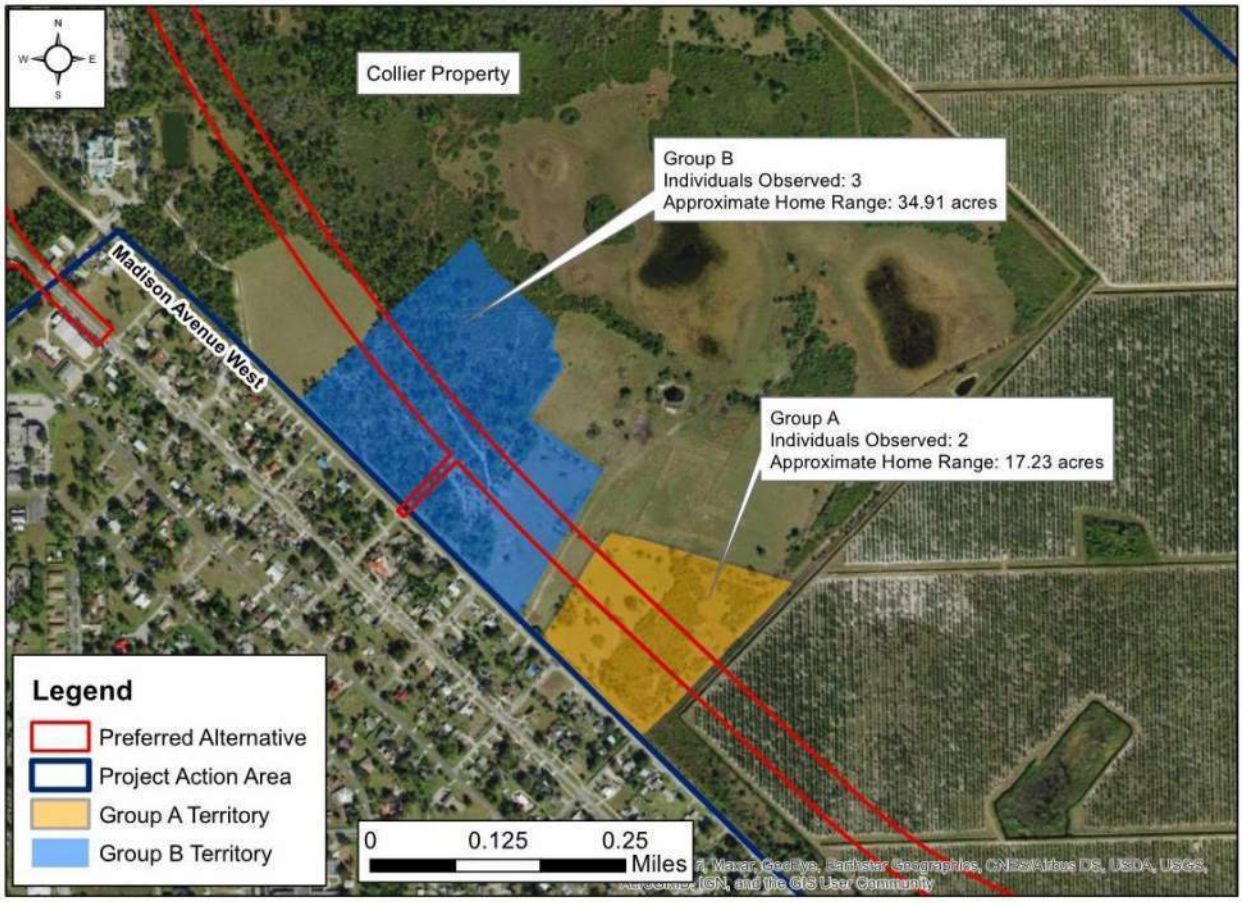
Home Territory Conclusions

Scientists determined the home range limits of Group B is located in the pine flatwoods habitat to the west of the central pasture. The home range of Group B may include lands to the north, outside of the Preferred Alternative construction footprint. Group B is comprised of three individuals, and the approximate territory is estimated to be 34.91 acres.

General Observations for Both Resident Families at the Collier Property

On Day 1 of surveys, aggressive calling, flight patterns, and territorial behaviors of Group A and Group B overlapped in the central improved pasture. The high level of distressed calling and agitated behavior appeared to be caused by the presence of humans and possibly the neighboring scrub-jay families. During Days 2-5 of scrub-jay surveys, territory boundaries were more clearly defined between Group A and Group B; Group A remained in the area to the east and southeast and Group B remained in the area to the west and northwest of the central improved pasture. Scientists concluded the central pasture area acts as a territory line/buffer zone between the two resident scrub-jay families. A Scrub-Jay Territory Map is included as **Figure 7**. Additional information is included in the Biological Assessment chapter of the *NRE Addendum #*. Survey data sheets are provided in **Attachment A**.

FIGURE 7
SCRUB-JAY TERRITORY MAP



Attachment A
Scrub-Jay Survey Data Sheets

TUESDAY, OCTOBER 13, 2020			
Site	*Collier Property*		
Start time	*0800*	**End time**	*0930*
Weather conditions	*Sunny, 73°F* *Winds 1 MPH, SSE direction*		
Total number of scrub-jay groups		*2*	
		Group A: 2 adult individuals observed to the east *Group B: 3 adult individuals observed to the north-northwestern limits of the property*	
Wildlife Observations		*loggerhead shrike (perched) turkey vulture (flyover), black vulture (flyover), blue jays (calling), common grackle (calling), Northern mockingbird (calling), 2 Florida sandhill cranes (flyover)*	
Site	*UMA at the Immokalee Regional Airport*		
Start time	*1530*	**End time**	*1700*
Weather conditions	*Sunny, 83°F* *Winds 9 MPH, W direction*		
Total number of scrub-jay groups		*0*	
Wildlife observations		*brown thrasher (calling), blue-gray gnatcatcher (calling), gopher tortoise (foraging and burrows), red-bellied woodpecker (calling), great blue heron (foraging), turkey vulture (flyover), black vulture (flyover), blue jays (calling), Northern mockingbird (calling), Northern cardinal (calling), mourning dove (calling)*	

WEDNESDAY, OCTOBER 14, 2020			
Site	*Collier Property*		
Start time	*0740*	**End time**	*0910*
Weather conditions	*Sunny, 71°F* *Winds 1 MPH, NNW direction*		
Total number of scrub-jay groups		*2*	
		Group A: 2 adult individuals observed in the east *Group B: 3 adult individuals observed in the west (migrated from the north)*	
Wildlife observations		*N/A*	
Site	*UMA at the Immokalee Regional Airport*		
Start time	*0800*	**End time**	*0915*
Weather conditions	*Sunny, 71°F* *Winds 4 MPH, NNW direction*		
Total number of scrub-jay groups		*0*	
Wildlife Observations		*blue-gray gnatcatcher (calling), gopher tortoise (burrows), great blue heron (foraging, flyover), blue jays (calling), Northern mockingbird (calling), Northern cardinal (calling), gray catbird (calling), common grackle (calling)*	
Site	*Collier Property*		
Start time	*0930*	**End time**	*1100*
Weather conditions	*Sunny, 77°F, 10 miles visibility* *Winds 2 MPH, SW direction*		
Total number of scrub-jay groups		*2*	
		Group A: 2 adult individuals observed in the east *Group B: 2 adult individuals observed in the west*	
Wildlife observations		*blue jays (calling), common grackle (calling), Northern mockingbird (calling), ground doves (sight)*	

THURSDAY, OCTOBER 15, 2020			
Site	*Collier Property*		
Start time	*0800*	**End time**	*0915*
Weather conditions	*Sunny, 71°F, 8 miles visibility* *Winds 1 MPH, S direction*		
Total number of scrub-jay groups		*2*	
		Group A: 2 adult individuals observed in the east *Group B: 2 adult Individuals observed in the west*	
Wildlife observations		*blue jays (calling), common grackle (calling), Northern mockingbird (calling), ground doves (sight), blue-gray gnatcatcher (calling), red-bellied woodpecker (sight, calling), gray catbird (calling), Florida sandhill crane (calling), 2 red-shouldered hawks (perched)*	
Site	*UMA at the Immokalee Regional Airport*		
Start time	*0930*	**End time**	*1100*
Weather conditions	*Sunny, 78°F* *Winds 6 MPH, SW direction*		
Total number of scrub-jay groups		*0*	
Wildlife observations		*blue-gray gnatcatcher (calling), gopher tortoise (burrows), blue jays (calling), Northern mockingbird (calling), Northern cardinal (calling), common grackle (calling), 2 Florida sandhill cranes (flyover), black vulture (flyover), red-bellied woodpecker (calling), mourning dove (calling)*	

TUESDAY, OCTOBER 20, 2020			
Site	*Collier Property*		
Start time	*0800*	**End time**	*0930*
Weather conditions	*Cloudy, 76°F, 10 miles visibility* *Winds 7 MPH, S direction*		
Total number of scrub-jay groups		*2*	
		Group A: 2 adult individuals observed in the east *Group B: 3 adult individuals observed in the west*	
Wildlife observations		*blue jays (calling), common grackle (calling), Northern mockingbird (calling), ground doves (sight), blue-gray gnatcatcher (calling), red-bellied woodpecker (sight, calling), gray catbird (calling), turkey vulture (flyover), Northern flicker (calling, perched), downy woodpecker (calling), wild turkey (sight)*	
Site	*UMA at the Immokalee Regional Airport*		
Start time	*0950*	**End time**	*1100*
Weather conditions	*Partly cloudy, 79°F, 9 miles visibility* *Winds 10 MPH, W direction*		
Total number of scrub-jay groups found		*0*	
Wildlife observations		*gopher tortoise (burrows), blue jays (calling), Northern mockingbird (calling), Florida sandhill crane (calling)*	

WEDNESDAY, OCTOBER 21, 2020			
Site	*Collier Property*		
Start time	*0800*	**End time**	*0900*
Weather conditions	*Partly cloudy, 74°F, visibility 10 miles* *Winds 10 MPH, W direction*		
Total number of scrub-jay groups		*1*	
		Group A: 2 adult individuals observed in the east	
Wildlife observations		*blue jays (calling), common grackle (calling), Northern mockingbird (calling), blue-gray gnatcatcher (calling), red-bellied woodpecker (sight, calling), black vulture (flyover), Northern cardinal (sight, calling), great-crested flycatcher (calling), Florida sandhill crane (calling), palm warbler (sight), loggerhead shrike (sight)*	
Site	*UMA at the Immokalee Regional Airport*		
Start time	*0920*	**End time**	*1030*
Weather conditions	*Partly cloudy, 77°F, visibility 10 miles* *Winds 13 MPH, W direction*		
Total number of scrub-jay groups		*0*	
Wildlife observations		*gopher tortoise (burrows), Northern mockingbird (calling), great blue heron (foraging), ground dove (sight), black vulture (flyover), American crow (calling)*	

Appendix G
Florida Bonneted Bat Documentation

Appendix G-1
Florida Bonneted Bat Survey Technical Report

DRAFT

SR 29 FROM OIL WELL ROAD TO SR 82

FPID No. 417540-1
Florida Bonneted Bat Survey Technical Report

Prepared for:
FDOT District 1

May 2021

Prepared by:
ESA

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SR 29 FROM OIL WELL ROAD TO SR 82

Florida Bonneted Bat

Introduction

This report summarizes the methods and results of a 2021 species-specific Florida bonneted bat (*Eumops floridanus*) survey conducted for the proposed improvements to State Road (SR) 29 from Oil Well Road to SR 82 in Collier County, Florida (**Figure 1**). The U.S Fish and Wildlife Service (USFWS) Florida bonneted bat Consultation Area (CA) overlaps the entire project limits; therefore, there is the potential for habitat of this species to be impacted. This survey was conducted in accordance with the 2019 USFWS Florida Bonneted Bat Consultation Guidelines.

Species Information

Species and Habitat Description

The Florida bonneted bat has a body length of between 84 to 108 millimeters (mm) (approximately 3.75 inches) with a wingspan of 490 to 530 mm (approximately 20 inches), making it the largest species of bat in Florida. Its fur color can range from a dark grey to reddish brown and a distinguishing characteristic of the Florida bonneted bat is its large, rounded ears which are joined at the midline of the forehead. There is no significant difference in size or appearance between males and females. Florida bonneted bat echolocations have a minimum frequency of 10-18 kilohertz (kHz) and a maximum frequency of 16-22 kHz.

Very little is known about the life history and ecology of the Florida bonneted bat. Natural roosting habitat for this species includes forested areas containing tall mature trees such as pine flatwoods, mixed or hardwood hammocks, wetland forested systems, and sand pine scrub. In these natural habitats Florida bonneted bats may roost in tree snags, tree cavities, under loose bark, tree crevices, or other deformities within mature trees. Documented roosts have occurred in trees greater than 6 meters (20 feet) tall, with a diameter at breast height of 20.3 centimeters (cm) (8 inches), and having cavities higher than 4.6 meters (15 feet) above ground. Florida bonneted bats have also been documented roosting in urban/suburban areas. Roosting habitat in these areas includes the shafts of royal palm (*Roystonea regia*) leaves, underneath tiles in Spanish tile roofs, attics, rock or brick chimneys of buildings, utility poles, and manmade bat houses.

This species can cover large areas when foraging. Studies at the Babcock-Webb WMA, from Florida bonneted bats fitted with GPS satellite tags, documented the maximum distance detected from a capture site was 24.2 miles and the largest path length traveled by a Florida bonneted bat in a single

night was 56.3 miles. Florida bonneted bats were documented traveling a mean maximum distance of 9.5 miles from a roost from a sample size of eight individuals fitted with GPS satellite tags.

Status

The Florida bonneted bat is listed as a federally designated endangered species by the USFWS and is protected by the Endangered Species Act (ESA), as amended (16 U.S. Code (U.S.C.) 1531-1544, 87 Stat. 884). No Critical Habitat has been designated for this species; however, USFWS has proposed critical habitat. This project is not located in the proposed critical habitat. The closest critical habitat is approximately 0.6 miles south and east of the project.

Florida bonneted bats are unique from other bat species in Florida due to their ability to forage far from their roosts and reproduce throughout most of the year. As a result, disturbances to their roosts can have an adverse effect on the species throughout a greater portion of the year. Furthermore, impacts to their foraging habitat can also have adverse effects, even if the impacts are located a significant distance from their roosts.

Methodology

Primary Data Collection

A comprehensive literature and GIS database search was conducted for the project area to determine if the Florida bonneted bat was previously documented within the project limits and if suitable roosting or foraging habitat was available. The literature and database search included standard references such as the Rare and Endangered Biota of Florida Series, Florida Geographic Data Library (FGDL) GIS databases, as well as the Florida Fish and Wildlife Conservation Commission (FWC) and USFWS lists of protected species and their GIS databases. Additionally, the literature and database search included the 2016 South Florida Water Management District Land Use Land Cover spatial data, 2019 U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory spatial data, USFWS Florida Bonneted Bat Consultation Area spatial data, 2019 USFWS Consultation Key for the Florida Bonneted Bat, 2020 Federal Register Endangered and Threatened Wildlife and Plants; proposed Designated Critical Habitat for the Florida Bonneted Bat, and current aerial imagery.

Based on this preliminary protected species data collection effort, Florida bonneted bat findings include the following:

- The project falls within the USFWS Florida bonneted bat CA;
- The project does not fall within the South Florida Urban Bat Area;
- The project does not fall within the species' proposed Critical Habitat (CH); and
- Potentially suitable foraging and roosting habitat was identified within the project boundary.

Field Survey Methodology

The Florida bonneted bat acoustic surveys followed the protocol documented in the October 2019 U.S. Fish and Wildlife Service (USFWS) South Florida Ecological Services Office - Florida Bonneted Bat Consultation Guidelines (USFWS 2019) for linear projects that contain potential bonneted bat roosting and foraging habitat and that are also greater than five acres in size. For the SR 29 project mainline, twenty-five (25) acoustic survey stations were developed based on the minimum requirements of five (5) detector nights per 0.60 miles for linear projects.

The acoustic survey station locations are depicted in **Figure 2**. Representative photos of the acoustic survey stations are provided in **Appendix A** and the survey locations and dates for each survey station are provided in **Table 1** below.

TABLE 1
EQUIPMENT DEPLOYMENT DETAILS

Location	Latitude	Longitude	2021 Deployment Dates	Notes
Station 1	26.307471 N	-81.342895 W	March 2 – March 16	External microphone vertically oriented on a 9-foot high pole
Station 2	26.314669 N	-81.343048 W	March 2 – March 16	
Station 3	26.325723 N	-81.343246 W	March 2 – March 16; March 30	
Station 4	26.336293 N	-81.343246 W	March 2 – March 16; March 30	
Station 5	26.343468 N	-81.343632 W	March 2 – March 16	
Station 6	26.353127 N	-81.343822 W	March 17 – March 28	
Station 7	26.359796 N	-81.344633 W	March 17 – March 28	
Station 8	26.365339 N	-81.349754 W	March 17 – March 30	
Station 9	26.373439 N	-81.358815 W	March 17 – March 30	
Station 10	26.382051 N	-81.368417 W	March 17 – March 30	
Station 11	26.389530 N	-81.376672 W	March 17 – March 30	
Station 12	26.393303 N	-81.380868 W	April 15 – April 21; April 29 – May 3	
Station 13	26.398005 N	-81.386319 W	March 17 – March 30; April 15 – April 21	
Station 14	26.405007 N	-81.394086 W	March 31 – April 14	
Station 15	26.410042 N	-81.399740 W	March 31 – April 14	
Station 16	26.418783 N	-81.401129 W	April 15 – April 21	
Station 17	26.430213 N	-81.416900 W	April 15 – April 21	
Station 18	26.431414 N	-81.420041 W	April 15 – April 21	
Station 19	26.434230 N	-81.423233 W	April 15 – April 21	
Station 20	26.440928 N	-81.434195 W	April 15 – April 21	
Station 21	26.445996 N	-81.434290 W	March 31 – April 14	
Station 22	26.452543 N	-81.434424 W	March 31 – April 14; April 25 – May 3	
Station 23	26.459961 N	-81.434550 W	March 31 – April 14	
Station 24	26.467033 N	-81.434643 W	March 31 – April 14	
Station 25	26.476023 N	-81.434711 W	March 31 – April 14	

Each acoustic survey station was placed in an area that could be used as a potential flight path for the Florida bonneted bat and where nearby habitat contained mature forested areas and also an open water source to maximize chances of detecting foraging bats and potential roosting areas. At each survey station, a Wildlife Acoustics Song Meter SM4BAT Full Spectrum (FS) detector was deployed and was set to record 15-second file lengths, with a two-second trigger window, and each detector automatically began collecting data continuously from 30 minutes before sunset to 30 minutes after sunrise. For each detector, an omnidirectional Wildlife Acoustic SMM-U2 External Ultrasonic Microphone placed on a 9-foot high pole was utilized. The microphone was not placed beneath tree canopies and was situated away from echo-producing surfaces including open water.

Per the USFWS South Florida Ecological Services Office Florida Bonneted Bat Consultation Guidelines (October 2019), the following weather conditions need to be met each night during the first five hours of acoustic surveys:

• Temperature at or above 65 degrees Fahrenheit;

• Precipitation cannot exceed 30 minutes in length; and

• Wind speeds cannot be greater than 9 miles per hour.

The Wildlife Acoustics Song Meter SM4BAT Full Spectrum detector records bat echolocations as Waveform Audio (WAV) files. A single WAV file is made up of a series of pulses which is considered a single bat pass. The WAV files recorded at each survey station were analyzed using Wildlife Acoustics Kaleidoscope Pro version 5.4.1. The auto-identification parameters utilized via Kaleidoscope Pro include Bats of North America (Version 5.4.0), region Florida, and the sensitivity setting utilized was zero balanced (neutral). The species to be selected in the auto identification classifier included: big brown bat (*Eptesicus fuscus*), Florida bonneted bat, eastern red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), northern yellow bat (*Lasiurus intermedius*), Seminole bat (*Lasiurus seminolus*), southeastern myotis (*Myotis austroriparius*), evening bat (*Nycticeius humeralis*), tri-colored bat (*Perimyotis subflavus*), and Brazilian free-tailed bat (*Tadarida brasiliensis*).

The bat acoustic data was retrieved, saved, analyzed, and interpreted by experienced biologists who have taken one or more bat acoustic courses/workshops and who have also previously reviewed Florida bonneted bat echolocations using Kaleidoscope Pro. All echolocations auto identified by Kaleidoscope Pro as being created by a Florida bonneted bat were visually reviewed and manually verified by experienced biologists. The parameters used to manually verify a sequence of echolocations as coming from a Florida bonneted bat included the following:

- Whether the characteristic frequency of echolocations fell within the documented range for the Florida bonneted bat;

- Whether there are eight or more echolocations where the time between echolocations remained consistent across the sequence of echolocations;
- Whether the minimum frequency remained consistent across the sequence of echolocations;
- Whether the slope and bandwidth remained consistent from echolocation to echolocation; and
- Whether there was good signal to noise ratio as evidenced by a crisp, clean oscillogram.

If a series of echolocations only meet some of these requirements, and they were within the characteristic frequency of the Florida bonneted bat, these echolocations were classified as as potentially coming from a Florida bonneted bat. All WAV files between 8 kHz and 20 kHz not assigned an auto identification and classified by Kaleidoscope Pro as "No ID" were manually reviewed to determine if they were misclassified and could contain Florida bonneted bat echolocations.

Results

Weather data was collected from the National Oceanic and Atmospheric Administration (NOAA) National Weather Service from 30 minutes prior to sunset to 30 minutes after sunrise and is provided in **Appendix B**. Several acoustic detectors were deployed for more than five nights because some nights didn't meet the survey weather conditions specified in the USFWS Florida Bonneted Bat Consultation Guidelines. One acoustic detector malfunctioned in the field and additional field data was collected by redeploying an acoustic detector.

A summary of the acoustic data collected at each acoustic survey station is listed in **Appendix C** and is detailed below, including the total nights the detectors were deployed and the nights for which the weather conditions met the requirements of the guidelines.

ACOUSTIC SURVEY STATION 1

Station 1 was surveyed from March 2 to March 16, 2021. The nights with acceptable weather conditions included March 2 and March 13 – March 16. A total of 9,098 WAV files were recorded and of these 6,125 WAV files were auto-identified to the species level, 1,977 WAV files were not assigned an auto-identification, and 996 WAV files were classified as noise. Twenty-six WAV files were auto-identified as containing Florida bonneted bat echolocations. These WAV files were analyzed by biologists and four were verified as containing Florida bonneted bat echolocations. However, these WAV files did not meet the USFWS definition indicating either high bonneted bat activity or roosting. The following is a summary of the auto-identification data:

- Big brown bat (1,484 WAV files),
- Eastern red bat (5 WAV files),
- Hoary bat (621 WAV files),

- Northern yellow bat (1,234 WAV files),
- Seminole bat (40 WAV files),
- Evening bat (145 WAV files),
- Tricolored bat (225 WAV files),
- Brazilian free-tailed bat (2,345 WAV files), and
- Florida bonneted bat (26 WAV files).

ACOUSTIC SURVEY STATION 2

Station 2 was surveyed from March 2 to March 16, 2021. The nights with acceptable weather conditions included March 2 and March 13 – March 16. A total of 11,147 WAV files were recorded and of these 7,316 WAV files were auto-identified to the species level, 2,618 WAV files were not assigned an auto-identification, and 1,213 WAV files were classified as noise. Twenty-three WAV files were auto-identified as containing Florida bonneted bat echolocations. These WAV files were analyzed by biologists and seven were verified as containing Florida bonneted bat echolocations. One WAV file containing Florida bonneted bat echolocations was recorded within 30 minutes of sunset to 1 ½ hours following sunset, meeting the USFWS definition of roosting likely. However, this single WAV file was recorded on March 10, 2021 when the weather conditions did not meet the USFWS criteria for conducting acoustic surveys. The following is a summary of the auto-identification data:

- Big brown bat (2,091 WAV files),
- Eastern red bat (12 WAV files),
- Hoary bat (583 WAV files),
- Northern yellow bat (1,258 WAV files),
- Seminole bat (32 WAV files),
- Evening bat (83 WAV files),
- Tricolored bat (82 WAV files),
- Brazilian free-tailed bat (3,151 WAV files), and
- Florida bonneted bat (23 WAV files).

ACOUSTIC SURVEY STATION 3

Station 3 was surveyed from March 2 to March 16, 2021. The nights with acceptable weather conditions included March 2 and March 13 – March 16. A total of 16,720 WAV files were recorded and of these 10,752 WAV files were auto-identified to the species level, 3,641 WAV files were not assigned an auto-identification, and 2,327 WAV files were classified as noise. Thirty-two WAV files were auto-identified as containing Florida bonneted bat echolocations. These WAV files were analyzed by biologists and four were verified as containing Florida bonneted bat echolocations. However, these WAV files did not meet the USFWS definition for either high bonneted bat activity or roosting. The following is a summary of the auto-identification data:

- Big brown bat (3,379 WAV files),
- Eastern red bat (14 WAV files),
- Hoary bat (1,004 WAV files),
- Northern yellow bat (3,309 WAV files),
- Seminole bat (36 WAV files),
- Evening bat (108 WAV files),
- Tricolored bat (59 WAV files),
- Brazilian free-tailed bat (3,811 WAV files), and
- Florida bonneted bat (32 WAV files).

ACOUSTIC SURVEY STATION 4

Station 4 was surveyed from March 2 to March 16, 2021. The nights with acceptable weather conditions included March 2 and March 13 – March 16. A total of 12,447 WAV files were recorded and of these 5,966 WAV files were auto-identified to the species level, 2,283 WAV files were not assigned an auto-identification, and 4,198 WAV files were classified as noise. Fifty-seven WAV files were auto-identified as containing Florida bonneted bat echolocations. These WAV files were analyzed by biologists and six were verified as containing Florida bonneted bat echolocations. However, these WAV files did not meet the USFWS definition for either high bonneted bat activity or roosting. The following is a summary of the auto-identification data:

- Big brown bat (1,226 WAV files),
- Eastern red bat (10 WAV files),
- Hoary bat (401 WAV files),
- Northern yellow bat (1,376 WAV files),
- Seminole bat (85 WAV files),
- Evening bat (320 WAV files),
- Tricolored bat (54 WAV files),
- Brazilian free-tailed bat (2,437 WAV files), and
- Florida bonneted bat (57 WAV files).

ACOUSTIC SURVEY STATION 5

Station 5 was surveyed from March 2 to March 16, 2021. The nights with acceptable weather conditions included March 2 and March 13 – March 16. A total of 11,427 WAV files were recorded and of these 7,279 WAV files were auto-identified to the species level, 2,258 WAV files were not assigned an auto-identification, and 1,890 WAV files were classified as noise. Twenty-one WAV files were auto-identified as containing Florida bonneted bat echolocations. These WAV files were analyzed by biologists and nine were verified as containing Florida bonneted bat echolocations. However, these WAV files were recorded on several different nights. Hence, these WAV files did not meet the USFWS definition for either high bonneted bat activity or roosting. The following is a summary of the auto-identification data:

- Big brown bat (1,610 WAV files),
- Eastern red bat (22 WAV files),
- Hoary bat (420 WAV files),
- Northern yellow bat (1,730 WAV files),
- Seminole bat (50 WAV files),
- Evening bat (290 WAV files),
- Tricolored bat (156 WAV files),
- Brazilian free-tailed bat (2,980 WAV files), and
- Florida bonneted bat (21 WAV files).

ACOUSTIC SURVEY STATION 6

Station 6 was surveyed from March 17 to March 28, 2021. The nights with acceptable weather conditions included March 17, March 24, and March 26 – March 28. A total of 8,745 WAV files were recorded and of these 5,579 WAV files were auto-identified to the species level, 2,271 WAV files were not assigned an auto-identification, and 895 WAV files were classified as noise. Ten WAV files were auto-identified as containing Florida bonneted bat echolocations. These WAV files were analyzed by biologists and one was verified as containing Florida bonneted bat echolocations. However, this WAV file did not meet the USFWS definition for either high bonneted bat activity or roosting. The following is a summary of the auto-identification data:

- Big brown bat (879 WAV files),
- Eastern red bat (12 WAV files),
- Hoary bat (874 WAV files),
- Northern yellow bat (909 WAV files),
- Seminole bat (101 WAV files),
- Evening bat (263 WAV files),
- Tricolored bat (99 WAV files),
- Brazilian free-tailed bat (2,432 WAV files), and
- Florida bonneted bat (10 WAV files).

ACOUSTIC SURVEY STATION 7

Station 6 was surveyed from March 17 to March 28, 2021. The nights with acceptable weather conditions included March 17, March 24, and March 26 – March 28. A total of 10,513 WAV files were recorded and of these 2,170 WAV files were auto-identified to the species level, 819 WAV files were not assigned an auto-identification, and 7,524 WAV files were classified as noise. Two WAV files were auto-identified as containing Florida bonneted bat echolocations. These WAV files were analyzed by biologists and one was verified as containing Florida bonneted bat echolocations. However, this WAV file did not meet the USFWS definition for either high bonneted bat activity or roosting. The following is a summary of the auto-identification data:

- Big brown bat (135 WAV files),
- Eastern red bat (5 WAV files),
- Hoary bat (296 WAV files),
- Northern yellow bat (268 WAV files),
- Seminole bat (30 WAV files),
- Evening bat (72 WAV files),
- Tricolored bat (52 WAV files),
- Brazilian free-tailed bat (1,310 WAV files), and
- Florida bonneted bat (2 WAV files).

ACOUSTIC SURVEY STATION 8

Station 8 was surveyed from March 17 to March 30, 2021. The nights with acceptable weather conditions included March 17, March 24 and March 26 – March 30. A total of 21,153 WAV files were recorded and of these 2,170 WAV files were auto-identified to the species level, 819 WAV files were not assigned an auto-identification, and 7,145 WAV files were classified as noise. Nine WAV files were auto-identified as containing Florida bonneted bat echolocations. These WAV files were analyzed by biologists and three were verified as containing Florida bonneted bat echolocations. However, these WAV files did not meet the USFWS definition for either high bonneted bat activity or roosting. The following is a summary of the auto-identification data:

- Big brown bat (1,289 WAV files),
- Eastern red bat (28 WAV files),
- Hoary bat (660 WAV files),
- Northern yellow bat (1,353 WAV files),
- Seminole bat (46 WAV files),
- Evening bat (120 WAV files),
- Tricolored bat (52 WAV files),
- Brazilian free-tailed bat (6,757 WAV files), and
- Florida bonneted bat (9 WAV files).

ACOUSTIC SURVEY STATION 9

Station 9 was surveyed from March 17 to March 30, 2021. The nights with acceptable weather conditions included March 17, March 24 and March 26 – March 30. A total of 10,651 WAV files were recorded and of these 7,487 WAV files were auto-identified to the species level, 2,693 WAV files were not assigned an auto-identification, and 471 WAV files were classified as noise. Ten WAV files were auto-identified as containing Florida bonneted bat echolocations. These WAV files were analyzed by biologists and five were verified as containing Florida bonneted bat echolocations. However, these WAV files did not meet the USFWS definition for either high bonneted bat activity or roosting. The following is a summary of the auto-identification data:

- Big brown bat (2,514 WAV files),
- Eastern red bat (12 WAV files),
- Hoary bat (795 WAV files),
- Northern yellow bat (350 WAV files),
- Seminole bat (31 WAV files),
- Evening bat (128 WAV files),
- Tricolored bat (55 WAV files),
- Brazilian free-tailed bat (3,592 WAV files), and
- Florida bonneted bat (10 WAV files).

ACOUSTIC SURVEY STATION 10

Station 10 was surveyed from March 17 to March 30, 2021. The nights with acceptable weather conditions included March 17, March 24 and March 26 – March 30. A total of 5,567 WAV files were recorded and of these 3,550 WAV files were auto-identified to the species level, 1,207 WAV files were not assigned an auto-identification, and 810 WAV files were classified as noise. Ten WAV files were auto-identified as containing Florida bonneted bat echolocations. These WAV files were analyzed by biologists and two were verified as containing Florida bonneted bat echolocations. Neither of these WAV files contained Florida bonneted bat echolocations that met the USFWS definition indicating either high bonneted bat activity or roosting. The following is a summary of the auto-identification data:

- Big brown bat (287 WAV files),
- Eastern red bat (7 WAV files),
- Hoary bat (379 WAV files),
- Northern yellow bat (378 WAV files),
- Seminole bat (74 WAV files),
- Evening bat (86 WAV files),
- Tricolored bat (255 WAV files),
- Brazilian free-tailed bat (2,074 WAV files), and
- Florida bonneted bat (10 WAV files).

ACOUSTIC SURVEY STATION 11

Station 11 was surveyed from March 17 to March 30, 2021. The nights with acceptable weather conditions included March 17, March 24 and March 26 – March 30. A total of 5,527 WAV files were recorded and of these 3,351 WAV files were auto-identified to the species level, 1,232 WAV files were not assigned an auto-identification, and 944 WAV files were classified as noise. Thirty-six WAV files were auto-identified as containing Florida bonneted bat echolocations. These WAV files were analyzed by biologists and two were verified as containing Florida bonneted bat echolocations. Neither of these WAV files contained Florida bonneted bat

echolocations that met the USFWS definition indicating either high bonneted bat activity or roosting. The following is a summary of the auto-identification data:

- Big brown bat (357 WAV files),
- Eastern red bat (9 WAV files),
- Hoary bat (337 WAV files),
- Northern yellow bat (245 WAV files),
- Seminole bat (48 WAV files),
- Evening bat (179 WAV files),
- Tricolored bat (140 WAV files),
- Brazilian free-tailed bat (2,000 WAV files), and
- Florida bonneted bat (36 WAV files).

ACOUSTIC SURVEY STATION 12

Station 12 was surveyed from April 15 to April 21, 2021 and April 30 to May 3. The nights with acceptable weather conditions included April 15 – April 16, April 18 – April 21, and April 30 – May 3. A total of 5,833 WAV files were recorded and of these 4,151 WAV files were auto-identified to the species level, 1,239 WAV files were not assigned an auto-identification, and 433 WAV files were classified as noise. Six WAV files were auto-identified as containing Florida bonneted bat echolocations. These WAV files were analyzed by biologists and none contained Florida bonneted bat echolocations. The following is a summary of the auto-identification data:

- Big brown bat (175 WAV files),
- Eastern red bat (3 WAV files),
- Hoary bat (845 WAV files),
- Northern yellow bat (227 WAV files),
- Seminole bat (158 WAV files),
- Evening bat (87 WAV files),
- Tricolored bat (46 WAV files),
- Brazilian free-tailed bat (2,604 WAV files), and
- Florida bonneted bat (6 WAV files).

ACOUSTIC SURVEY STATION 13

Station 13 was surveyed from April 15 to April 21, 2021. The nights with acceptable weather conditions included April 15 – April 16 and April 18 – April 21. A total of 41 WAV files were recorded and of these 18 WAV files were auto-identified to the species level, 18 WAV files were not assigned an auto-identification, and five WAV files were classified as noise. No WAV files were auto-identified as containing Florida bonneted bat echolocations. The following is a summary of the auto-identification data:

- Big brown bat (4 WAV files),

- Seminole bat (1 WAV file),
- Evening bat (10 WAV files), and
- Tricolored bat (3 WAV files).

ACOUSTIC SURVEY STATION 14

Station 14 was surveyed from April 7 to April 14, 2021. The nights with acceptable weather conditions included April 7 – April 9 and April 12 – April 14. A total of 7,222 WAV files were recorded and of these 4,474 WAV files were auto-identified to the species level, 1,691 WAV files were not assigned an auto-identification, and 1,057 WAV files were classified as noise. Fifty-six WAV files were auto-identified as containing Florida bonneted bat echolocations. These WAV files were analyzed by biologists and none contained Florida bonneted bat echolocations. The following is a summary of the auto-identification data:

- Big brown bat (322 WAV files),
- Eastern red bat (6 WAV files),
- Hoary bat (909 WAV files),
- Northern yellow bat (202 WAV files),
- Seminole bat (77 WAV files),
- Evening bat (96 WAV files),
- Tricolored bat (29 WAV files),
- Brazilian free-tailed bat (2,776 WAV files), and
- Florida bonneted bat (57 WAV files).

ACOUSTIC SURVEY STATION 15

Station 15 was surveyed from April 7 to April 14, 2021. The nights with acceptable weather conditions included April 7 – April 9 and April 12 – April 14. A total of 7,030 WAV files were recorded and of these 4,521 WAV files were auto-identified to the species level, 1,522 WAV files were not assigned an auto-identification, and 987 WAV files were classified as noise. Three WAV files were auto-identified as containing Florida bonneted bat echolocations. These WAV files were analyzed by biologists and none contained Florida bonneted bat echolocations. The following is a summary of the auto-identification data:

- Big brown bat (285 WAV files),
- Eastern red bat (5 WAV files),
- Hoary bat (769 WAV files),
- Northern yellow bat (244 WAV files),
- Seminole bat (157 WAV files),
- Evening bat (146 WAV files),
- Tricolored bat (93 WAV files),
- Brazilian free-tailed bat (2,819 WAV files), and

- Florida bonneted bat (3 WAV files).

ACOUSTIC SURVEY STATION 16

Station 16 was surveyed from April 15 to April 21, 2021. The nights with acceptable weather conditions included April 15 – April 16 and April 18 – April 21. A total of 8,338 WAV files were recorded and of these 6,321 WAV files were auto-identified to the species level, 1,040 WAV files were not assigned an auto-identification, and 977 WAV files were classified as noise. Twenty-five WAV files were auto-identified as containing Florida bonneted bat echolocations. These WAV files were analyzed by biologists and none contained Florida bonneted bat echolocations. The following is a summary of the auto-identification data:

- Big brown bat (49 WAV files),
- Eastern red bat (1 WAV file),
- Hoary bat (681 WAV files),
- Northern yellow bat (94 WAV files),
- Seminole bat (5 WAV files),
- Evening bat (3 WAV files),
- Tricolored bat (1 WAV file),
- Brazilian free-tailed bat (5,462 WAV files), and
- Florida bonneted bat (25 WAV files).

ACOUSTIC SURVEY STATION 17

Station 17 was surveyed from April 15 to April 21, 2021. The nights with acceptable weather conditions included April 15 – April 16 and April 18 – April 21. A total of 9,291 WAV files were recorded and of these 6,198 WAV files were auto-identified to the species level, 2,101 WAV files were not assigned an auto-identification, and 992 WAV files were classified as noise. One WAV file was auto-identified as containing Florida bonneted bat echolocations. This WAV file was analyzed by biologists and was determined not to contain Florida bonneted bat echolocations. The following is a summary of the auto-identification data:

- Big brown bat (198 WAV files),
- Eastern red bat (20 WAV files),
- Hoary bat (463 WAV files),
- Northern yellow bat (756 WAV files),
- Seminole bat (178 WAV files),
- Evening bat (465 WAV files),
- Tricolored bat (8 WAV files),
- Brazilian free-tailed bat (4,109 WAV files), and
- Florida bonneted bat (1 WAV file).

ACOUSTIC SURVEY STATION 18

Station 18 was surveyed from April 15 to April 21, 2021. The nights with acceptable weather conditions included April 15 – April 16 and April 18 – April 21. A total of 8,586 WAV files were recorded and of these 4,881 WAV files were auto-identified to the species level, 924 WAV files were not assigned an auto-identification, and 2,781 WAV files were classified as noise. Thirteen WAV files were auto-identified as containing Florida bonneted bat echolocations. These WAV files were analyzed by biologists and none contained Florida bonneted bat echolocations. The following is a summary of the auto-identification data:

- Big brown bat (51 WAV files),
- Eastern red bat (1 WAV file),
- Hoary bat (415 WAV files),
- Northern yellow bat (168 WAV files),
- Seminole bat (26 WAV files),
- Evening bat (43 WAV files),
- Brazilian free-tailed bat (4,164 WAV files), and
- Florida bonneted bat (13 WAV files).

ACOUSTIC SURVEY STATION 19

Station 19 was surveyed from April 15 to April 21, 2021. The nights with acceptable weather conditions included April 15 – April 16 and April 18 – April 21. A total of 7,993 WAV files were recorded and of these 6,181 WAV files were auto-identified to the species level, 1,431 WAV files were not assigned an auto-identification, and 381 WAV files were classified as noise. Forty-five WAV files were auto-identified as containing Florida bonneted bat echolocations. These WAV files were analyzed by ESA scientists and none contained Florida bonneted bat echolocations. The following is a summary of the auto-identification data:

- Big brown bat (169 WAV files),
- Eastern red bat (6 WAV files),
- Hoary bat (586 WAV files),
- Northern yellow bat (370 WAV files),
- Seminole bat (81 WAV files),
- Evening bat (53 WAV files),
- Tricolored bat (4 WAV files),
- Brazilian free-tailed bat (4,867 WAV files), and
- Florida bonneted bat (45 WAV files).

ACOUSTIC SURVEY STATION 20

Station 20 was surveyed from April 15 to April 21, 2021. The nights with acceptable weather conditions included April 15 – April 16 and April 18 – April 21. A total of 5,801 WAV files were recorded and of these 3,879 WAV files were auto-identified to the species level, 1,093 WAV files were not assigned an auto-identification, and 829 WAV files were classified as noise. Thirty WAV files were auto-identified as containing Florida bonneted bat echolocations. These WAV files were analyzed by biologists and none contained Florida bonneted bat echolocations. The following is a summary of the auto-identification data:

- Big brown bat (92 WAV files),
- Eastern red bat (18 WAV files),
- Hoary bat (389 WAV files),
- Northern yellow bat (222 WAV files),
- Seminole bat (161 WAV files),
- Evening bat (106 WAV files),
- Tricolored bat (1 WAV file),
- Brazilian free-tailed bat (2,860 WAV files), and
- Florida bonneted bat (30 WAV files).

ACOUSTIC SURVEY STATION 21

Station 21 was surveyed from April 7 to April 14, 2021. The nights with acceptable weather conditions included April 7 – April 9 and April 12 – April 14. A total of 6,051 WAV files were recorded and of these 4,005 WAV files were auto-identified to the species level, 1,518 WAV files were not assigned an auto-identification, and 528 WAV files were classified as noise. Twenty-six WAV files were auto-identified as containing Florida bonneted bat echolocations. These WAV files were analyzed by biologists and none contained Florida bonneted bat echolocations. The following is a summary of the auto-identification data:

- Big brown bat (552 WAV files),
- Eastern red bat (26 WAV files),
- Hoary bat (610 WAV files),
- Northern yellow bat (282 WAV files),
- Seminole bat (140 WAV files),
- Evening bat (73 WAV files),
- Tricolored bat (9 WAV files),
- Brazilian free-tailed bat (2,288 WAV files), and
- Florida bonneted bat (26 WAV files).

ACOUSTIC SURVEY STATION 22

Station 22 was surveyed from April 7 to April 14, 2021 and April 25 to May 3. The nights with acceptable weather conditions included April 7 – April 9, April 12 – April 14, April 25, and April 30 – May 3. A total of 540 WAV files were recorded and of these 367 WAV files were auto-identified to the species level, 161 WAV files were not assigned an auto-identification, and 12 WAV files were classified as noise. No WAV files were auto-identified as containing Florida bonneted bat echolocations. The following is a summary of the auto-identification data:

- Big brown bat (59 WAV files),
- Eastern red bat (5 WAV files),
- Northern yellow bat (202 WAV files),
- Seminole bat (17 WAV files),
- Evening bat (81 WAV files), and
- Brazilian free-tailed bat (2,288 WAV files).

ACOUSTIC SURVEY STATION 23

Station 23 was surveyed from April 7 to April 14, 2021. The nights with acceptable weather conditions included April 7 – April 9 and April 12 – April 14. A total of 7,065 WAV files were recorded and of these 5,224 WAV files were auto-identified to the species level, 1,421 WAV files were not assigned an auto-identification, and 420 WAV files were classified as noise. Fifty WAV files were auto-identified as containing Florida bonneted bat echolocations. These WAV files were analyzed by biologists and none contained Florida bonneted bat echolocations. The following is a summary of the auto-identification data:

- Big brown bat (321 WAV files),
- Eastern red bat (40 WAV files),
- Hoary bat (626 WAV files),
- Northern yellow bat (365 WAV files),
- Seminole bat (128 WAV files),
- Evening bat (113 WAV files),
- Tricolored bat (14 WAV files),
- Brazilian free-tailed bat (3,567 WAV files), and
- Florida bonneted bat (50 WAV files).

ACOUSTIC SURVEY STATION 24

Station 24 was surveyed from April 7 to April 14, 2021. The nights with acceptable weather conditions included April 7 – April 9 and April 12 – April 14. A total of 6,859 WAV files were recorded and of these 4,192 WAV files were auto-identified to the species level, 1,218 WAV files were not assigned an auto-identification, and 1,449 WAV files were classified as noise. Eighteen

WAV files were auto-identified as containing Florida bonneted bat echolocations. These WAV files were analyzed by biologists and none contained Florida bonneted bat echolocations. The following is a summary of the auto-identification data:

- Big brown bat (269 WAV files),
- Hoary bat (521 WAV files),
- Northern yellow bat (392 WAV files),
- Seminole bat (45 WAV files),
- Evening bat (56 WAV files),
- Tricolored bat (12 WAV files),
- Brazilian free-tailed bat (2,852 WAV files), and
- Florida bonneted bat (18 WAV files).

ACOUSTIC SURVEY STATION 25

Station 25 was surveyed from April 7 to April 14, 2021. The nights with acceptable weather conditions included April 7 – April 9 and April 12 – April 14. A total of 1,960 WAV files were recorded and of these 1,405 WAV files were auto-identified to the species level, 501 WAV files were not assigned an auto-identification, and 54 WAV files were classified as noise. No WAV files were auto-identified as containing Florida bonneted bat echolocations. The following is a summary of the auto-identification data:

- Big brown bat (367 WAV files),
- Eastern red bat (8 WAV files),
- Hoary bat (58 WAV files),
- Northern yellow bat (735 WAV files),
- Seminole bat (24 WAV files),
- Evening bat (143 WAV files), and
- Brazilian free-tailed bat (70 WAV files).

Conclusion

A total of 205,605 WAV files were recorded at the 25 acoustic survey stations during Florida bonneted bat acoustic surveys for the proposed SR 29 project. Of those, 510 WAV files from 22 acoustic survey stations (Stations 1 – 12, 14 – 21, and 23 – 24) were auto identified by Kaleidoscope Pro as containing Florida bonneted bat echolocations. Biologists manually verified each of the 510 WAV files and 37 WAV files contained echolocations from the Florida bonneted bat. Only one WAV file, recorded at survey station 2, contained Florida bonneted bat echolocations that were recorded within 30 minutes before sunset to 1 ½ hours following sunset, meeting the USFWS definition of roosting likely. However, this one WAV file was recorded on March 10, 2021 when the weather conditions did not meet the USFWS criteria for conducting Florida bonneted bat acoustic surveys.

The USFWS Florida Bonneted Bat Consultation Key was used to determine the effect determination for the proposed SR 29 from Oil Well Road to SR 82 project. The following sections of the key were applicable (1a, 2a, 3b, 6a, 7b, 10b, 12a); resulting in an effect determination of Likely to Adversely Affect (**LAA^{+} Further**). This determination requires further consultation with USFWS. However, project modifications could change this determination to May Affect Not Likely to Adversely Affect (MANLAA).

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Figure 1
Project Location Map

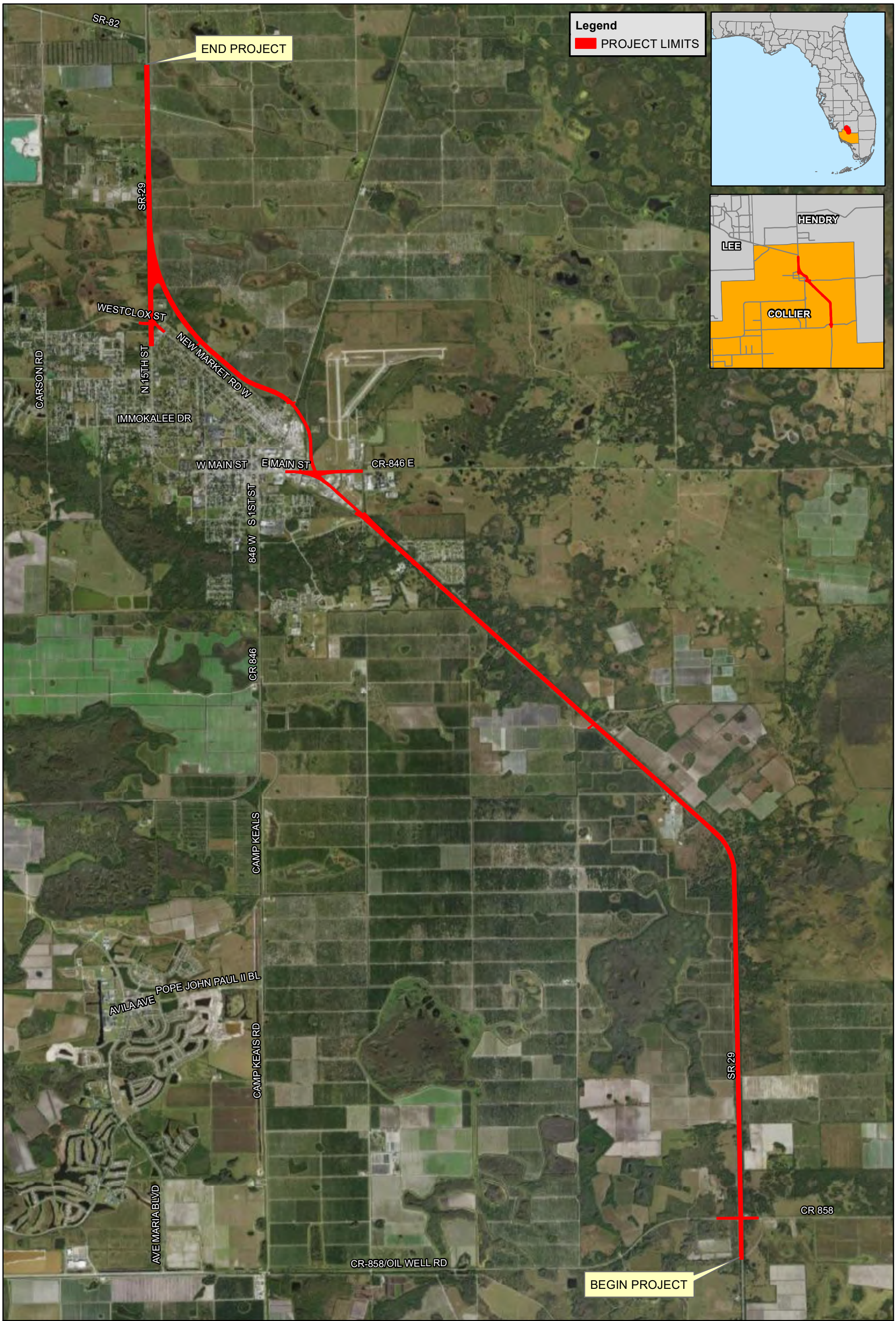

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Figure 1 - Project Location Map

FPID #: 417540-1
SR 29 from Oil Well Road to SR 82
Collier County, Florida

0 4,000 8,000 12,000 Feet

Data Source:
- Lochner
- ESA

Imagery Source:
- Esri

Coordinate System:
WGS 84

N

Figure 2
Location of Acoustic Survey Stations

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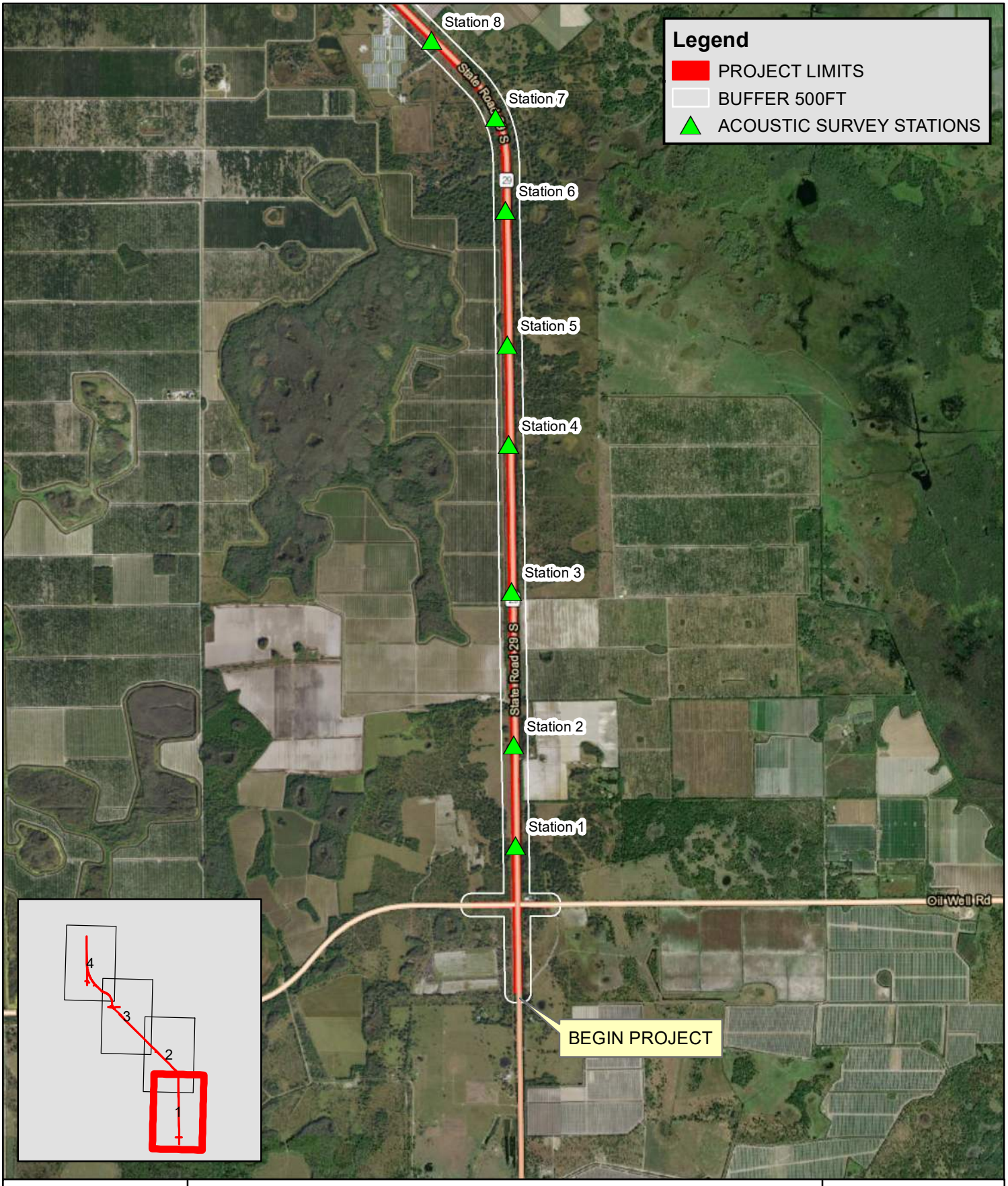

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Figure 2 - Location of Acoustic Survey Stations

Sheet 1 of 4

FPID #: 417540-1
SR 29 from Oil Well Road to SR 82
Collier County, Florida

0 0.5 1 1.5 Miles

Data Source:
- Lochner
- ESA

Imagery Source:
- Esri

Coordinate System:
WSG 84

N

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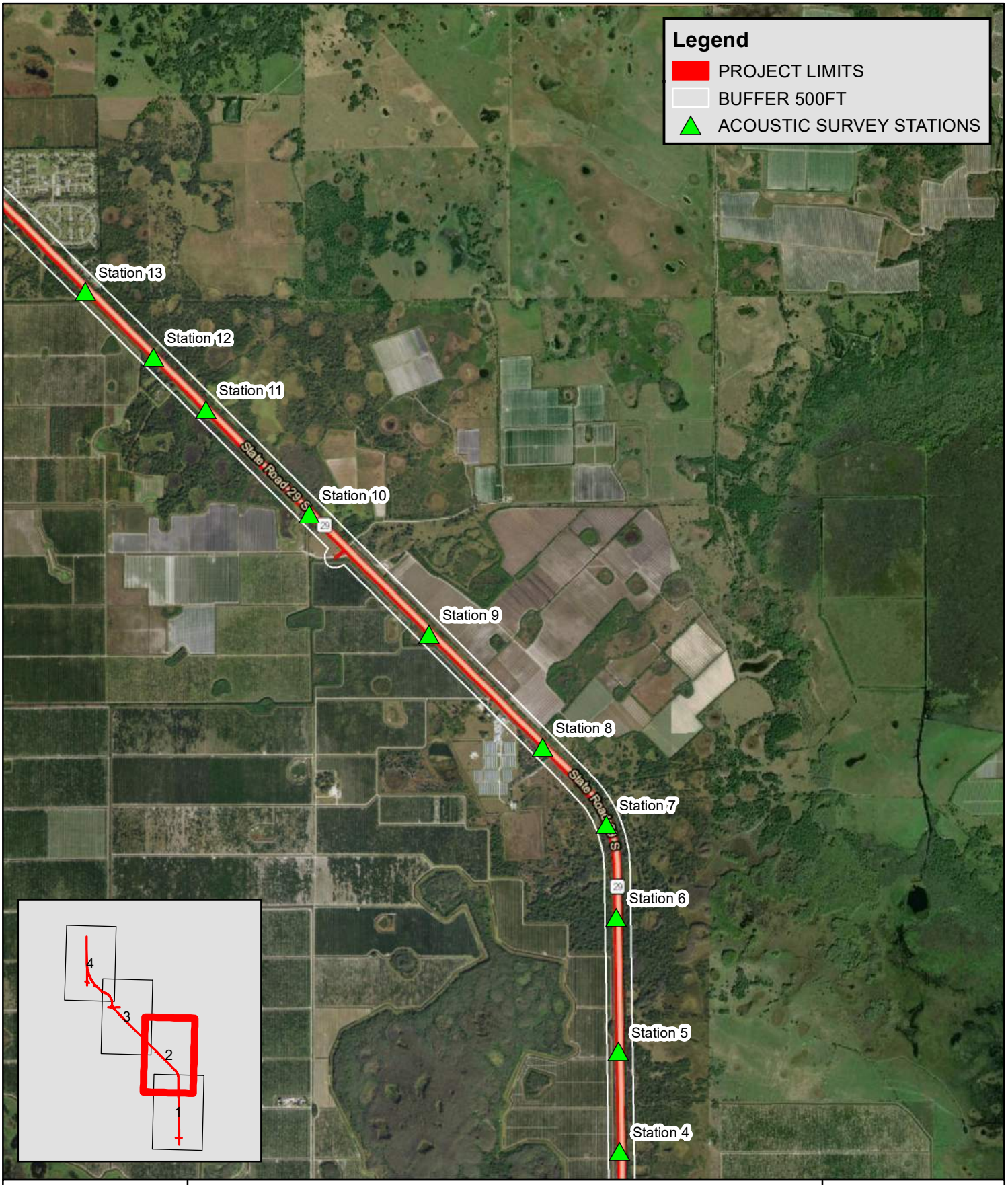

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Figure 2 - Location of Acoustic Survey Stations

Sheet 2 of 4

FPID #: 417540-1
SR 29 from Oil Well Road to SR 82
Collier County, Florida

Miles
0 0.5 1 1.5

Data Source:
- Lochner
- ESA

Imagery Source:
- Esri

Coordinate System:
WSG 84

N

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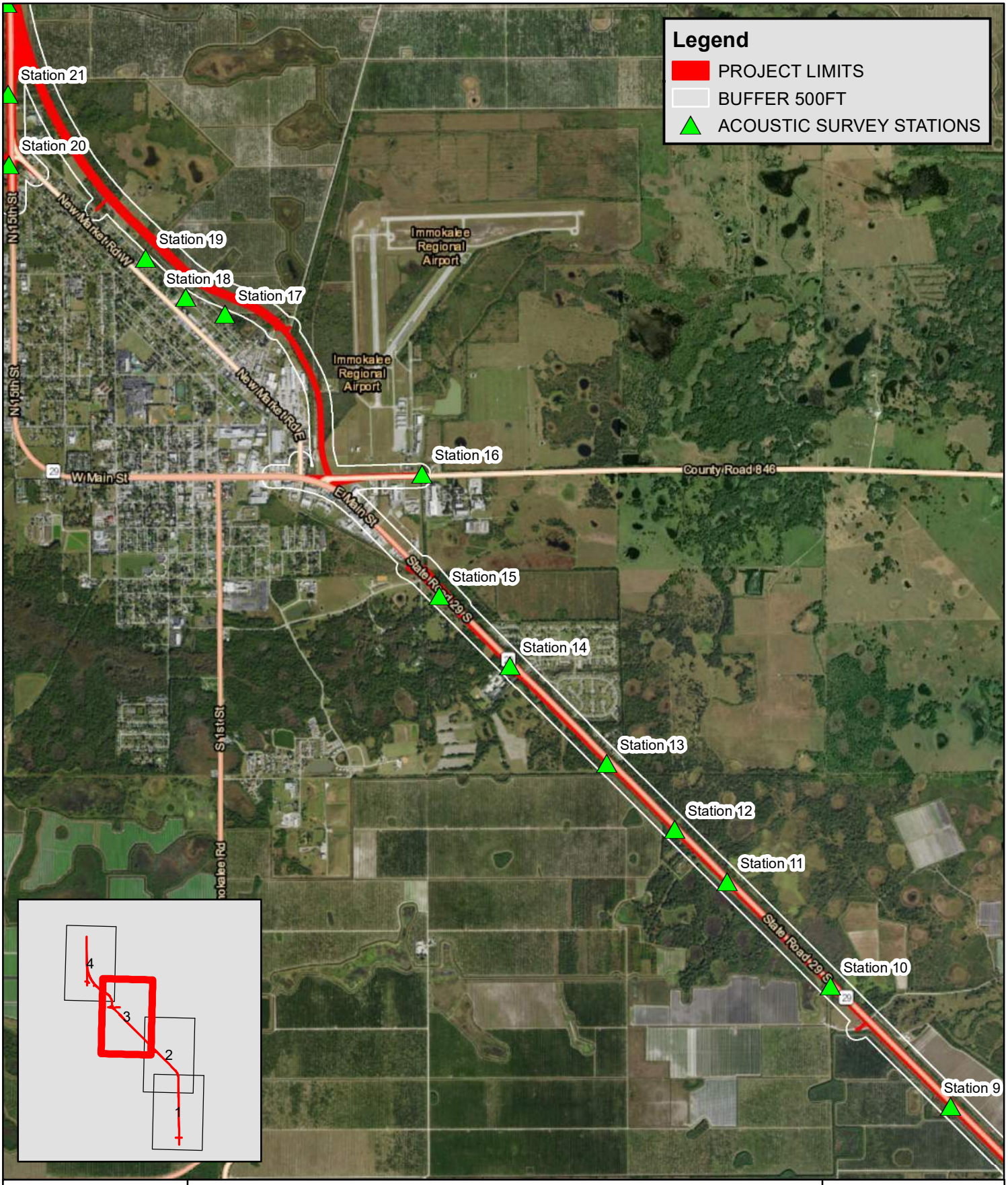

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Figure 2 - Location of Acoustic Survey Stations

Sheet 3 of 4

FPID #: 417540-1
SR 29 from Oil Well Road to SR 82
Collier County, Florida

0 0.5 1 1.5 Miles

Data Source:
- Lochner
- ESA

Imagery Source:
- Esri

Coordinate System:
WSG 84

N

Document Path: U:\GIS\GIS\Projects\16xxxx\D160696.13_SR29_FBB_Survey\04_Working\Figure 2 Location of Acoustic Survey Stations Map.mxd

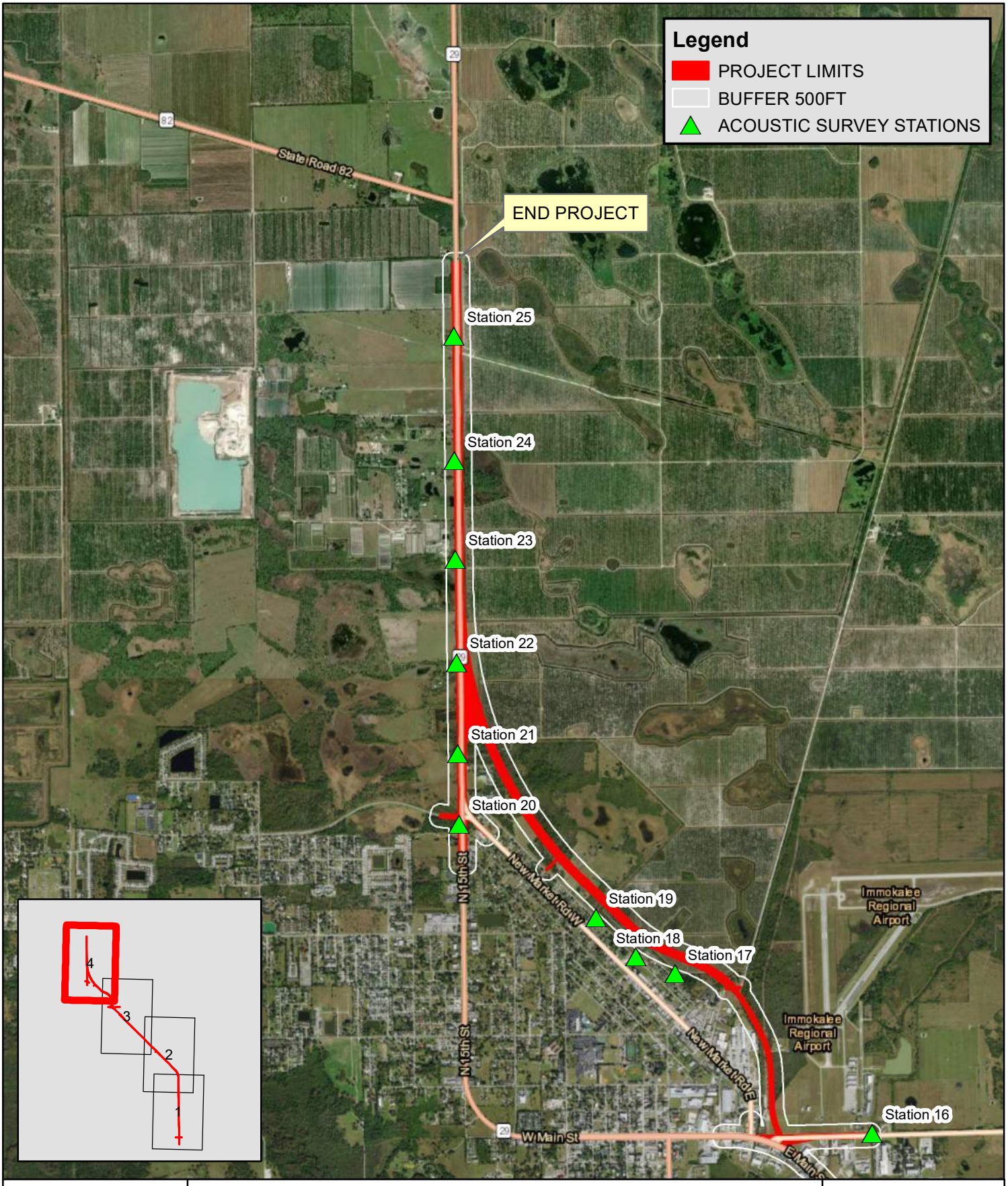

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Figure 2 - Location of Acoustic Survey Stations

Sheet 4 of 4

FPID #: 417540-1
SR 29 from Oil Well Road to SR 82
Collier County, Florida

Miles
0 0.5 1 1.5

Data Source:
- Lochner
- ESA

Imagery Source:
- Esri

Coordinate System:
WSG 84

N

Appendix A
Representative Photos of Acoustic Survey Stations

Survey Station No. 1

Survey Station No. 2

Survey Station No. 3

Survey Station No. 4

Survey Station No. 5

Survey Station No. 6

Survey Station No. 7

Survey Station No. 8

Survey Station No. 9

Survey Station No. 10

Survey Station No. 11

Survey Station No. 12

Survey Station No. 13

Survey Station No. 14

Survey Station No. 15

Survey Station No. 16

Survey Station No. 17

Survey Station No. 18

Survey Station No. 19

Survey Station No. 20

Survey Station No. 21

Survey Station No. 22

Survey Station No. 23

Survey Station No. 24

Survey Station No. 25

Appendix B
NOAA National Weather Service Data

Appendix B. NOAA National Weather Service Data

Date	Time	Temperature	Dew Point	Humidity	Wind	Wind Speed	Wind Gust	Pressure	Precipitation	Description
3/2/2010	6:53 PM	75 F	67 F	76 %	WSW	7 mph	0 mph	29.97 in	0.0 in	
	7:53 PM	73 F	67 F	81 %	WSW	6 mph	0 mph	29.97 in	0.0 in	
	8:53 PM	73 F	68 F	84 %	W	3 mph	0 mph	29.98 in	0.0 in	
	9:53 PM	71 F	67 F	87 %	SW	3 mph	0 mph	29.97 in	0.0 in	
	10:53 PM	70 F	67 F	90 %	SW	5 mph	0 mph	29.96 in	0.0 in	
	11:53 PM	70 F	67 F	90 %	SSW	6 mph	0 mph	29.95 in	0.0 in	
3/3/2021	12:53 AM	70 F	67 F	90 %	SSW	8 mph	0 mph	29.94 in	0.0 in	
	1:53 AM	68 F	66 F	93 %	SSW	6 mph	0 mph	29.93 in	0.0 in	
	2:41 AM	71 F	68 F	90 %	SW	8 mph	0 mph	29.91 in	0.0 in	
	2:53 AM	72 F	69 F	91 %	SW	8 mph	0 mph	29.91 in	0.0 in	
	3:02 AM	71 F	68 F	90 %	SW	8 mph	0 mph	29.91 in	0.0 in	Night 1, Stations 1-5
	3:33 AM	71 F	69 F	93 %	SW	9 mph	0 mph	29.90 in	0.0 in	
	3:53 AM	72 F	69 F	91 %	SW	10 mph	0 mph	29.89 in	0.0 in	
	4:12 AM	73 F	69 F	87 %	WSW	13 mph	0 mph	29.89 in	0.0 in	
	4:53 AM	72 F	69 F	91 %	SW	10 mph	0 mph	29.89 in	0.0 in	
	5:53 AM	73 F	69 F	87 %	SW	12 mph	0 mph	29.90 in	0.0 in	
	5:56 AM	73 F	69 F	87 %	SW	14 mph	0 mph	29.90 in	0.0 in	
	6:10 AM	72 F	68 F	87 %	SW	12 mph	0 mph	29.90 in	0.0 in	
	6:20 AM	73 F	69 F	87 %	SW	12 mph	0 mph	29.91 in	0.0 in	
	6:53 AM	73 F	68 F	84 %	SW	12 mph	0 mph	29.91 in	0.0 in	
	7:33 AM	73 F	69 F	87 %	WSW	13 mph	0 mph	29.92 in	0.0 in	
3/3/2021	6:53 PM	67 F	57 F	70 %	WNW	9 mph	0 mph	29.93 in	0.0 in	
	7:53 PM	65 F	57 F	75 %	WNW	8 mph	0 mph	29.95 in	0.0 in	
	8:53 PM	63 F	55 F	75 %	NW	9 mph	0 mph	29.97 in	0.0 in	
	9:53 PM	61 F	54 F	78 %	NW	8 mph	0 mph	30.00 in	0.0 in	
	10:41 PM	61 F	54 F	78 %	NNW	5 mph	0 mph	30.01 in	0.0 in	
	10:53 PM	61 F	54 F	78 %	NNW	8 mph	0 mph	30.01 in	0.0 in	
	11:53 PM	60 F	53 F	78 %	NNW	8 mph	0 mph	30.00 in	0.0 in	
3/4/2021	12:53 AM	60 F	52 F	75 %	NNW	7 mph	0 mph	29.98 in	0.0 in	
	1:35 AM	59 F	51 F	75 %	NNW	5 mph	0 mph	29.99 in	0.0 in	Evening doesn't meet weather conditions, Stations 1-5
	1:53 AM	59 F	51 F	75 %	N	5 mph	0 mph	29.98 in	0.0 in	
	2:51 AM	57 F	52 F	82 %	N	6 mph	0 mph	29.97 in	0.0 in	
	2:53 AM	59 F	52 F	78 %	N	6 mph	0 mph	29.97 in	0.0 in	
	3:53 AM	60 F	52 F	75 %	NW	5 mph	0 mph	29.96 in	0.0 in	
	4:12 AM	60 F	52 F	75 %	NNW	5 mph	0 mph	29.97 in	0.0 in	
	4:53 AM	60 F	52 F	75 %	N	6 mph	0 mph	29.98 in	0.0 in	
	5:53 AM	60 F	52 F	75 %	NNE	5 mph	0 mph	29.98 in	0.0 in	
	6:53 AM	59 F	53 F	81 %	NNE	5 mph	0 mph	30.00 in	0.0 in	
3/4/2021	6:53 PM	67 F	57 F	70 %	WNW	7 mph	0 mph	29.94 in	0.0 in	
	7:53 PM	65 F	57 F	75 %	NW	5 mph	0 mph	29.95 in	0.0 in	
	8:53 PM	64 F	56 F	75 %	NW	3 mph	0 mph	29.97 in	0.0 in	
	9:53 PM	63 F	53 F	70 %	NNW	5 mph	0 mph	29.97 in	0.0 in	
	10:53 PM	62 F	52 F	70 %	NNW	5 mph	0 mph	29.97 in	0.0 in	
	11:53 PM	60 F	51 F	72 %	NNW	7 mph	0 mph	29.97 in	0.0 in	
3/5/2021	12:53 AM	60 F	50 F	69 %	N	7 mph	0 mph	29.97 in	0.0 in	Evening doesn't meet weather conditions, Stations 1-5
	1:53 AM	59 F	48 F	67 %	N	7 mph	0 mph	29.96 in	0.0 in	
	2:53 AM	58 F	48 F	70 %	N	6 mph	0 mph	29.96 in	0.0 in	
	3:53 AM	57 F	48 F	72 %	N	5 mph	0 mph	29.95 in	0.0 in	
	4:53 AM	56 F	48 F	75 %	N	5 mph	0 mph	29.95 in	0.0 in	
	5:53 AM	55 F	48 F	77 %	N	3 mph	0 mph	29.96 in	0.0 in	
	6:53 AM	54 F	48 F	80 %	NNE	5 mph	0 mph	29.97 in	0.0 in	
3/5/2021	6:53 PM	71 F	48 F	44 %	NNW	3 mph	0 mph	29.92 in	0.0 in	
	7:53 PM	68 F	52 F	56 %	NW	6 mph	0 mph	29.93 in	0.0 in	
	8:53 PM	66 F	53 F	63 %	CALM	0 mph	0 mph	29.96 in	0.0 in	
	9:53 PM	65 F	52 F	63 %	NNW	5 mph	0 mph	29.96 in	0.0 in	
	10:53 PM	63 F	53 F	70 %	NNE	3 mph	0 mph	29.96 in	0.0 in	
	11:53 PM	62 F	53 F	72 %	CALM	0 mph	0 mph	29.95 in	0.0 in	Evening doesn't meet weather conditions, Stations 1-5
3/6/2021	12:53 AM	60 F	53 F	78 %	ENE	3 mph	0 mph	29.93 in	0.0 in	
	1:53 AM	58 F	53 F	84 %	ENE	5 mph	0 mph	29.93 in	0.0 in	
	2:53 AM	59 F	52 F	78 %	CALM	0 mph	0 mph	29.92 in	0.0 in	
	3:53 AM	58 F	54 F	87 %	E	3 mph	0 mph	29.92 in	0.0 in	
	4:53 AM	59 F	55 F	87 %	ENE	3 mph	0 mph	29.93 in	0.0 in	
	5:53 AM	59 F	55 F	87 %	E	5 mph	0 mph	29.93 in	0.0 in	
	6:53 AM	60 F	56 F	86 %	ESE	3 mph	0 mph	29.94 in	0.0 in	
3/6/2021	6:53 PM	62 F	60 F	93 %	NE	8 mph	0 mph	29.89 in	0.0 in	
	7:04 PM	62 F	60 F	93 %	NE	7 mph	0 mph	29.89 in	0.0 in	
	7:53 PM	63 F	61 F	93 %	ENE	7 mph	0 mph	29.91 in	0.0 in	
	8:50 PM	63 F	61 F	94 %	NE	8 mph	0 mph	29.93 in	0.0 in	
	8:53 PM	63 F	61 F	93 %	NE	8 mph	0 mph	29.93 in	0.0 in	
	9:04 PM	63 F	60 F	90 %	ENE	7 mph	0 mph	29.94 in	0.0 in	
	9:16 PM	63 F	60 F	90 %	ENE	8 mph	0 mph	29.94 in	0.0 in	
	9:53 PM	63 F	60 F	90 %	ENE	7 mph	0 mph	29.95 in	0.0 in	
	10:53 PM	63 F	60 F	90 %	NE	10 mph	0 mph	29.96 in	0.0 in	
	11:02 PM	62 F	59 F	90 %	NE	9 mph	0 mph	29.96 in	0.0 in	Evening doesn't meet weather conditions, Stations 1-5
	11:53 PM	62 F	58 F	86 %	N	3 mph	0 mph	29.97 in	0.0 in	
3/7/2021	12:08 AM	61 F	58 F	90 %	N	7 mph	0 mph	29.98 in	0.0 in	
	12:53 AM	61 F	58 F	90 %	NNE	9 mph	0 mph	29.97 in	0.0 in	
	1:53 AM	61 F	57 F	87 %	N	9 mph	0 mph	29.97 in	0.0 in	
	2:53 AM	60 F	56 F	86 %	NNE	10 mph	0 mph	29.97 in	0.0 in	
	3:51 AM	61 F	55 F	82 %	N	10 mph	0 mph	29.98 in	0.0 in	
	3:53 AM	60 F	55 F	83 %	N	8 mph	0 mph	29.98 in	0.0 in	
	4:53 AM	59 F	55 F	87 %	N	8 mph	0 mph	30.00 in	0.0 in	
	5:48 AM	59 F	54 F	82 %	NNE	8 mph	0 mph	30.03 in	0.0 in	
	5:53 AM	58 F	54 F	87 %	NNE	9 mph	0 mph	30.03 in	0.0 in	
	6:53 AM	57 F	51 F	81 %	NNE	8 mph	0 mph	30.06 in	0.0 in	
3/7/2021	5:53 PM	70 F	45 F	41 %	NE	14 mph	0 mph	30.14 in	0.0 in	
	6:53 PM	67 F	45 F	45 %	NE	10 mph	0 mph	30.17 in	0.0 in	
	7:53 PM	64 F	44 F	48 %	NE	12 mph	0 mph	30.21 in	0.0 in	
	8:53 PM	61 F	42 F	50 %	NE	15 mph	0 mph	30.25 in	0.0 in	
	9:53 PM	57 F	37 F	47 %	NE	13 mph	0 mph	30.28 in	0.0 in	Evening doesn't meet weather conditions, Stations 1-5
	10:53 PM	55 F	39 F	55 %	NNE	12 mph	21 mph	30.30 in	0.0 in	
	11:53 PM	54 F	39 F	57 %	NNE	13 mph	0 mph	30.29 in	0.0 in	
3/8/2021	12:53 AM	53 F	37 F	55 %	NNE	9 mph	0 mph	30.30 in	0.0 in	

Date	Time	Temperature	Dew Point	Humidity	Wind	Wind Speed	Wind Gust	Pressure	Precipitation	Description
	1:53 AM	55 F	33 F	43 %	NNE	14 mph	0 mph	30.29 in	0.0 in	
	2:53 AM	53 F	36 F	52 %	NNE	10 mph	0 mph	30.29 in	0.0 in	
	3:53 AM	52 F	38 F	59 %	NNE	9 mph	0 mph	30.29 in	0.0 in	Evening doesn't meet weather conditions, Stations 1-5
	4:53 AM	52 F	37 F	57 %	NNE	10 mph	0 mph	30.30 in	0.0 in	
	5:53 AM	51 F	37 F	59 %	NNE	9 mph	0 mph	30.32 in	0.0 in	
	6:53 AM	50 F	38 F	63 %	NNE	8 mph	0 mph	30.33 in	0.0 in	
3/8/2021	5:53 PM	70 F	49 F	47 %	E	18 mph	0 mph	30.33 in	0.0 in	
	6:53 PM	67 F	50 F	54 %	ENE	9 mph	0 mph	30.35 in	0.0 in	
	7:53 PM	67 F	50 F	54 %	NE	10 mph	0 mph	30.36 in	0.0 in	
	8:53 PM	64 F	50 F	60 %	NE	10 mph	0 mph	30.38 in	0.0 in	
	9:53 PM	62 F	49 F	62 %	NE	12 mph	0 mph	30.39 in	0.0 in	
	10:53 PM	60 F	49 F	67 %	NE	10 mph	0 mph	30.40 in	0.0 in	
	11:53 PM	59 F	49 F	69 %	NNE	10 mph	0 mph	30.39 in	0.0 in	Evening doesn't meet weather conditions, Stations 1-5
3/9/2021	12:53 AM	58 F	49 F	72 %	NNE	8 mph	0 mph	30.39 in	0.0 in	
	1:53 AM	57 F	48 F	72 %	NNE	9 mph	0 mph	30.37 in	0.0 in	
	2:53 AM	56 F	48 F	75 %	NE	8 mph	0 mph	30.36 in	0.0 in	
	3:53 AM	55 F	48 F	77 %	NE	10 mph	0 mph	30.35 in	0.0 in	
	4:53 AM	55 F	48 F	77 %	NNE	9 mph	0 mph	30.36 in	0.0 in	
	5:53 AM	54 F	48 F	80 %	NE	9 mph	0 mph	30.37 in	0.0 in	
	6:53 AM	54 F	48 F	80 %	NE	10 mph	0 mph	30.38 in	0.0 in	
3/9/2021	5:53 PM	72 F	49 F	44 %	ENE	21 mph	0 mph	30.33 in	0.0 in	
	6:53 PM	68 F	49 F	50 %	ENE	12 mph	0 mph	30.34 in	0.0 in	
	7:53 PM	66 F	50 F	56 %	ENE	10 mph	0 mph	30.35 in	0.0 in	
	8:53 PM	65 F	53 F	65 %	ENE	10 mph	0 mph	30.36 in	0.0 in	
	9:53 PM	63 F	53 F	70 %	NE	7 mph	0 mph	30.37 in	0.0 in	
	10:53 PM	60 F	52 F	75 %	NE	7 mph	0 mph	30.37 in	0.0 in	
	11:53 PM	59 F	52 F	78 %	NE	3 mph	0 mph	30.35 in	0.0 in	Evening doesn't meet weather conditions, Stations 1-5
3/10/2021	12:53 AM	58 F	51 F	78 %	NE	8 mph	0 mph	30.34 in	0.0 in	
	1:53 AM	58 F	50 F	75 %	NNE	7 mph	0 mph	30.32 in	0.0 in	
	2:53 AM	57 F	50 F	77 %	NE	10 mph	0 mph	30.31 in	0.0 in	
	3:53 AM	56 F	50 F	80 %	NE	8 mph	0 mph	30.30 in	0.0 in	
	4:53 AM	57 F	50 F	77 %	NE	8 mph	0 mph	30.31 in	0.0 in	
	5:53 AM	56 F	50 F	80 %	NE	9 mph	0 mph	30.32 in	0.0 in	
	6:53 AM	57 F	50 F	77 %	NE	9 mph	0 mph	30.33 in	0.0 in	
3/10/2021	5:53 PM	74 F	53 F	48 %	ENE	21 mph	24 mph	30.25 in	0.0 in	
	6:53 PM	71 F	53 F	53 %	ENE	12 mph	0 mph	30.27 in	0.0 in	
	7:53 PM	69 F	54 F	58 %	ENE	12 mph	0 mph	30.29 in	0.0 in	
	8:53 PM	67 F	55 F	66 %	ENE	9 mph	0 mph	30.29 in	0.0 in	
	9:53 PM	64 F	55 F	72 %	ENE	6 mph	0 mph	30.31 in	0.0 in	
	10:53 PM	63 F	56 F	78 %	NE	7 mph	0 mph	30.31 in	0.0 in	
	11:53 PM	63 F	56 F	78 %	NE	7 mph	0 mph	30.30 in	0.0 in	Evening doesn't meet weather conditions, Stations 1-5
3/11/2021	12:53 AM	61 F	56 F	83 %	ENE	6 mph	0 mph	30.29 in	0.0 in	
	1:53 AM	61 F	55 F	81 %	NNE	7 mph	0 mph	30.28 in	0.0 in	
	2:53 AM	60 F	55 F	83 %	NE	7 mph	0 mph	30.26 in	0.0 in	
	3:53 AM	59 F	55 F	87 %	NE	7 mph	0 mph	30.25 in	0.0 in	
	4:53 AM	58 F	55 F	90 %	ENE	6 mph	0 mph	30.25 in	0.0 in	
	5:53 AM	58 F	54 F	87 %	NE	5 mph	0 mph	30.26 in	0.0 in	
	6:53 AM	58 F	55 F	90 %	ENE	5 mph	0 mph	30.28 in	0.0 in	
3/11/2021	5:53 PM	77 F	53 F	43 %	ENE	13 mph	0 mph	30.21 in	0.0 in	
	6:53 PM	74 F	53 F	48 %	ENE	13 mph	0 mph	30.23 in	0.0 in	
	7:53 PM	71 F	55 F	57 %	E	12 mph	0 mph	30.25 in	0.0 in	
	8:53 PM	68 F	56 F	65 %	E	8 mph	0 mph	30.29 in	0.0 in	
	9:53 PM	65 F	57 F	75 %	ENE	7 mph	0 mph	30.30 in	0.0 in	
	10:53 PM	63 F	57 F	81 %	E	6 mph	0 mph	30.29 in	0.0 in	
	11:53 PM	63 F	58 F	84 %	ENE	7 mph	0 mph	30.28 in	0.0 in	Evening doesn't meet weather conditions, Stations 1-5
3/12/2021	1:53 AM	62 F	58 F	86 %	E	6 mph	0 mph	30.27 in	0.0 in	
	2:53 AM	61 F	58 F	90 %	NE	3 mph	0 mph	30.25 in	0.0 in	
	3:53 AM	60 F	58 F	93 %	ENE	5 mph	0 mph	30.23 in	0.0 in	
	4:53 AM	60 F	58 F	93 %	NE	5 mph	0 mph	30.23 in	0.0 in	
	5:53 AM	58 F	56 F	93 %	NE	5 mph	0 mph	30.23 in	0.0 in	
	6:53 AM	58 F	56 F	93 %	NE	3 mph	0 mph	30.23 in	0.0 in	
3/12/2021	5:53 PM	80 F	50 F	35 %	ENE	14 mph	0 mph	30.20 in	0.0 in	
	6:53 PM	77 F	52 F	42 %	ENE	13 mph	0 mph	30.20 in	0.0 in	
	7:53 PM	73 F	53 F	49 %	E	9 mph	0 mph	30.21 in	0.0 in	
	8:53 PM	71 F	56 F	59 %	ENE	9 mph	0 mph	30.22 in	0.0 in	
	9:53 PM	69 F	57 F	65 %	E	10 mph	0 mph	30.24 in	0.0 in	
	10:53 PM	66 F	56 F	70 %	E	8 mph	0 mph	30.25 in	0.0 in	
	11:53 PM	64 F	56 F	75 %	E	6 mph	0 mph	30.26 in	0.0 in	Evening doesn't meet weather conditions, Stations 1-5
3/13/2021	12:53 AM	63 F	56 F	78 %	ENE	5 mph	0 mph	30.24 in	0.0 in	
	1:53 AM	62 F	57 F	84 %	E	5 mph	0 mph	30.24 in	0.0 in	
	2:53 AM	63 F	56 F	78 %	E	8 mph	0 mph	30.21 in	0.0 in	
	3:53 AM	61 F	56 F	83 %	E	5 mph	0 mph	30.19 in	0.0 in	
	4:53 AM	60 F	56 F	86 %	ENE	7 mph	0 mph	30.17 in	0.0 in	
	5:53 AM	60 F	56 F	86 %	NE	6 mph	0 mph	30.18 in	0.0 in	
	6:53 AM	59 F	55 F	87 %	NE	6 mph	0 mph	30.19 in	0.0 in	
3/13/2021	5:53 PM	81 F	53 F	38 %	E	8 mph	0 mph	30.13 in	0.0 in	
	6:53 PM	81 F	54 F	39 %	E	7 mph	0 mph	30.13 in	0.0 in	
	7:53 PM	73 F	56 F	55 %	VAR	6 mph	0 mph	30.15 in	0.0 in	
	8:53 PM	71 F	56 F	59 %	NW	5 mph	0 mph	30.16 in	0.0 in	
	9:53 PM	71 F	57 F	61 %	NE	3 mph	0 mph	30.17 in	0.0 in	
	10:53 PM	70 F	57 F	63 %	SE	3 mph	0 mph	30.17 in	0.0 in	
	11:53 PM	67 F	57 F	70 %	ESE	3 mph	0 mph	30.16 in	0.0 in	
	12:53 AM	64 F	58 F	80 %	E	5 mph	0 mph	30.16 in	0.0 in	Night 2, Stations 1-5
3/14/2021	1:53 AM	63 F	58 F	84 %	E	3 mph	0 mph	30.14 in	0.0 in	
	3:53 AM	62 F	58 F	86 %	ENE	3 mph	0 mph	30.12 in	0.0 in	
	3:53 AM	62 F	57 F	84 %	CALM	0 mph	0 mph	30.11 in	0.0 in	
	4:53 AM	59 F	55 F	87 %	ENE	3 mph	0 mph	30.09 in	0.0 in	
	5:53 AM	58 F	56 F	93 %	NE	3 mph	0 mph	30.09 in	0.0 in	
	6:53 AM	58 F	55 F	90 %	ENE	3 mph	0 mph	30.10 in	0.0 in	
3/14/2021	6:53 PM	77 F	59 F	54 %	WSW	12 mph	0 mph	30.04 in	0.0 in	
	7:53 PM	75 F	60 F	60 %	W	3 mph	0 mph	30.05 in	0.0 in	
	8:53 PM	72 F	60 F	66 %	CALM	0 mph	0 mph	30.06 in	0.0 in	Night 3, Stations 1-5.
	9:53 PM	71 F	61 F	70 %	NW	3 mph	0 mph	30.08 in	0.0 in	

Appendix B. NOAA National Weather Service Data

Date	Time	Temperature	Dew Point	Humidity	Wind	Wind Speed	Wind Gust	Pressure	Precipitation	Description
	10:53 PM	70 F	61 F	73 %	N	5 mph	0 mph	30.09 in	0.0 in	
	11:53 PM	68 F	62 F	81 %	CALM	0 mph	0 mph	30.09 in	0.0 in	
3/15/2021	12:53 AM	65 F	60 F	84 %	CALM	0 mph	0 mph	30.09 in	0.0 in	
	1:53 AM	65 F	61 F	87 %	NE	3 mph	0 mph	30.07 in	0.0 in	
	2:53 AM	65 F	60 F	84 %	CALM	0 mph	0 mph	30.06 in	0.0 in	
	3:53 AM	63 F	60 F	90 %	CALM	0 mph	0 mph	30.05 in	0.0 in	Night 3, Stations 1-5.
	4:53 AM	64 F	60 F	87 %	CALM	0 mph	0 mph	30.05 in	0.0 in	
	5:53 AM	61 F	58 F	90 %	CALM	0 mph	0 mph	30.06 in	0.0 in	
	6:53 AM	61 F	58 F	90 %	CALM	0 mph	0 mph	30.06 in	0.0 in	
	7:53 AM	63 F	59 F	87 %	CALM	0 mph	0 mph	30.08 in	0.0 in	
3/15/2021	6:53 PM	78 F	63 F	60 %	WSW	9 mph	0 mph	30.04 in	0.0 in	
	7:53 PM	73 F	63 F	71 %	WSW	6 mph	0 mph	30.05 in	0.0 in	
	8:53 PM	74 F	63 F	68 %	CALM	0 mph	0 mph	30.06 in	0.0 in	
	9:53 PM	72 F	63 F	73 %	CALM	0 mph	0 mph	30.07 in	0.0 in	
	10:53 PM	70 F	63 F	78 %	CALM	0 mph	0 mph	30.08 in	0.0 in	
	11:53 PM	70 F	63 F	78 %	ESE	6 mph	0 mph	30.09 in	0.0 in	
3/16/2021	12:53 AM	70 F	62 F	76 %	SSE	7 mph	0 mph	30.08 in	0.0 in	Night 4, Stations 1-5.
	1:53 AM	68 F	62 F	81 %	SSE	5 mph	0 mph	30.07 in	0.0 in	
	2:53 AM	67 F	61 F	81 %	SSE	6 mph	0 mph	30.05 in	0.0 in	
	3:53 AM	66 F	61 F	84 %	SE	3 mph	0 mph	30.04 in	0.0 in	
	4:53 AM	64 F	60 F	87 %	CALM	0 mph	0 mph	30.04 in	0.0 in	
	5:53 AM	63 F	60 F	90 %	E	3 mph	0 mph	30.04 in	0.0 in	
	6:53 AM	62 F	59 F	90 %	ESE	5 mph	0 mph	30.04 in	0.0 in	
3/16/2021	6:53 PM	79 F	64 F	60 %	SW	13 mph	0 mph	30.00 in	0.0 in	
	7:53 PM	74 F	64 F	71 %	SW	8 mph	0 mph	30.01 in	0.0 in	
	8:53 PM	72 F	64 F	76 %	SW	7 mph	0 mph	30.02 in	0.0 in	
	9:53 PM	73 F	63 F	71 %	S	6 mph	0 mph	30.04 in	0.0 in	
	10:53 PM	72 F	63 F	73 %	SSE	3 mph	0 mph	30.05 in	0.0 in	
	11:53 PM	68 F	62 F	81 %	E	3 mph	0 mph	30.05 in	0.0 in	
3/17/2021	12:53 AM	68 F	62 F	81 %	CALM	0 mph	0 mph	30.05 in	0.0 in	
	1:53 AM	65 F	61 F	87 %	CALM	0 mph	0 mph	30.04 in	0.0 in	
	2:53 AM	65 F	61 F	87 %	CALM	0 mph	0 mph	30.03 in	0.0 in	
	3:53 AM	64 F	61 F	90 %	NE	3 mph	0 mph	30.02 in	0.0 in	
	4:24 AM	63 F	61 F	93 %	ENE	6 mph	0 mph	30.02 in	0.0 in	
	4:31 AM	62 F	60 F	93 %	ENE	5 mph	0 mph	30.02 in	0.0 in	Night 5, Stations 1-5.
	4:53 AM	62 F	60 F	93 %	E	3 mph	0 mph	30.02 in	0.0 in	
	5:07 AM	63 F	60 F	90 %	E	3 mph	0 mph	30.02 in	0.0 in	
	5:18 AM	63 F	60 F	90 %	E	5 mph	0 mph	30.02 in	0.0 in	
	5:25 AM	63 F	60 F	90 %	E	6 mph	0 mph	30.02 in	0.0 in	
	5:32 AM	63 F	60 F	90 %	E	5 mph	0 mph	30.02 in	0.0 in	
	5:48 AM	63 F	61 F	94 %	E	5 mph	0 mph	30.02 in	0.0 in	
	5:53 AM	62 F	60 F	93 %	E	5 mph	0 mph	30.02 in	0.0 in	
	6:17 AM	63 F	60 F	90 %	E	9 mph	0 mph	30.03 in	0.0 in	
	6:53 AM	63 F	60 F	90 %	E	7 mph	0 mph	30.04 in	0.0 in	
	7:53 AM	65 F	62 F	90 %	ESE	7 mph	0 mph	30.04 in	0.0 in	
3/17/2021	6:53 PM	79 F	66 F	64 %	WSW	13 mph	0 mph	29.96 in	0.0 in	
	7:53 PM	75 F	66 F	73 %	WSW	8 mph	0 mph	29.97 in	0.0 in	
	8:53 PM	73 F	66 F	79 %	WSW	5 mph	0 mph	29.98 in	0.0 in	
	9:53 PM	72 F	66 F	81 %	SW	5 mph	0 mph	30.00 in	0.0 in	
	10:53 PM	71 F	66 F	84 %	SSW	5 mph	0 mph	30.00 in	0.0 in	
	11:53 PM	70 F	66 F	87 %	S	6 mph	0 mph	30.00 in	0.0 in	
3/18/2021	12:53 AM	72 F	66 F	81 %	S	9 mph	0 mph	30.00 in	0.0 in	
	1:53 AM	70 F	66 F	87 %	SSE	7 mph	0 mph	30.00 in	0.0 in	
	2:53 AM	68 F	65 F	90 %	E	3 mph	0 mph	30.00 in	0.0 in	
	3:36 AM	69 F	66 F	90 %	CALM	0 mph	0 mph	29.99 in	0.0 in	
	3:53 AM	69 F	66 F	90 %	ESE	3 mph	0 mph	29.99 in	0.0 in	
	4:23 AM	68 F	66 F	93 %	CALM	0 mph	0 mph	29.99 in	0.0 in	Night 1, Stations 6-13.
	4:48 AM	68 F	64 F	88 %	CALM	0 mph	0 mph	29.99 in	0.0 in	
	4:53 AM	68 F	65 F	90 %	ESE	3 mph	0 mph	29.99 in	0.0 in	
	5:38 AM	68 F	66 F	93 %	SSE	6 mph	0 mph	29.99 in	0.0 in	
	5:53 AM	68 F	66 F	93 %	SSE	5 mph	0 mph	30.00 in	0.0 in	
	6:00 AM	68 F	66 F	93 %	SSE	6 mph	0 mph	30.00 in	0.0 in	
	6:14 AM	69 F	67 F	93 %	SSE	7 mph	0 mph	30.00 in	0.0 in	
	6:27 AM	68 F	67 F	96 %	SSE	7 mph	0 mph	30.00 in	0.0 in	
	6:53 AM	68 F	67 F	96 %	SSE	8 mph	0 mph	29.99 in	0.0 in	
	7:18 AM	68 F	67 F	96 %	SSE	8 mph	0 mph	30.00 in	0.0 in	
	7:26 AM	68 F	67 F	96 %	SSE	5 mph	0 mph	30.00 in	0.0 in	
3/18/2021	6:53 PM	78 F	66 F	66 %	SW	18 mph	0 mph	29.93 in	0.0 in	
	7:53 PM	75 F	69 F	82 %	SW	14 mph	0 mph	29.94 in	0.0 in	
	8:53 PM	74 F	69 F	85 %	SW	10 mph	0 mph	29.95 in	0.0 in	
	9:53 PM	73 F	69 F	87 %	SW	8 mph	0 mph	29.96 in	0.0 in	
	10:53 PM	74 F	69 F	85 %	S	8 mph	0 mph	29.96 in	0.0 in	
	11:53 PM	73 F	69 F	87 %	SSW	7 mph	0 mph	29.95 in	0.0 in	
3/19/2021	12:53 AM	74 F	70 F	87 %	SW	8 mph	0 mph	29.95 in	0.0 in	
	1:15 AM	74 F	70 F	87 %	WSW	7 mph	0 mph	29.95 in	0.0 in	
	1:53 AM	74 F	70 F	87 %	SW	10 mph	0 mph	29.94 in	0.0 in	Evening doesn't meet weather conditions, Stations 6-13.
	2:53 AM	75 F	70 F	84 %	W	10 mph	0 mph	29.93 in	0.0 in	
	3:12 AM	75 F	70 F	84 %	W	9 mph	0 mph	29.93 in	0.0 in	
	3:32 AM	74 F	68 F	82 %	WNW	7 mph	0 mph	29.93 in	0.0 in	
	3:53 AM	73 F	66 F	79 %	WNW	7 mph	0 mph	29.92 in	0.0 in	
	4:53 AM	71 F	66 F	84 %	WNW	3 mph	0 mph	29.91 in	0.0 in	
	5:53 AM	71 F	65 F	81 %	WNW	5 mph	0 mph	29.93 in	0.0 in	
	6:53 AM	71 F	65 F	81 %	NW	5 mph	0 mph	29.94 in	0.0 in	
	7:53 AM	70 F	60 F	71 %	NW	7 mph	0 mph	29.95 in	0.0 in	
3/19/2021	6:53 PM	70 F	52 F	53 %	WNW	8 mph	20 mph	30.00 in	0.0 in	
	7:53 PM	66 F	52 F	60 %	NNW	9 mph	21 mph	30.01 in	0.0 in	
	8:53 PM	64 F	50 F	60 %	NW	7 mph	0 mph	30.03 in	0.0 in	
	9:53 PM	62 F	49 F	62 %	NNW	8 mph	0 mph	30.05 in	0.0 in	
	10:53 PM	60 F	49 F	67 %	N	8 mph	0 mph	30.07 in	0.0 in	Evening doesn't meet weather conditions, Stations 6-13.
	11:53 PM	59 F	49 F	69 %	N	8 mph	0 mph	30.08 in	0.0 in	
3/20/2021	12:53 AM	58 F	49 F	72 %	N	8 mph	0 mph	30.08 in	0.0 in	
	1:53 AM	57 F	48 F	72 %	N	6 mph	0 mph	30.08 in	0.0 in	
	2:53 AM	56 F	48 F	75 %	N	6 mph	0 mph	30.07 in	0.0 in	

Date	Time	Temperature	Dew Point	Humidity	Wind	Wind Speed	Wind Gust	Pressure	Precipitation	Description
	3:53 AM	56 F	48 F	75 %	NNW	6 mph	0 mph	30.06 in	0.0 in	
	4:53 AM	57 F	49 F	74 %	N	6 mph	0 mph	30.06 in	0.0 in	
	5:20 AM	57 F	48 F	72 %	NNW	6 mph	0 mph	30.06 in	0.0 in	
	5:53 AM	57 F	48 F	72 %	N	5 mph	0 mph	30.07 in	0.0 in	Evening doesn't meet weather conditions, Stations 6-13.
	6:07 AM	58 F	49 F	72 %	NNW	6 mph	0 mph	30.07 in	0.0 in	
	6:43 AM	58 F	49 F	72 %	NNW	5 mph	0 mph	30.08 in	0.0 in	
	6:53 AM	58 F	49 F	72 %	NNW	6 mph	0 mph	30.08 in	0.0 in	
	7:53 AM	58 F	50 F	75 %	NNW	3 mph	0 mph	30.09 in	0.0 in	
3/20/2021	6:53 PM	71 F	55 F	57 %	N	7 mph	0 mph	30.02 in	0.0 in	
	7:53 PM	68 F	54 F	61 %	NNE	12 mph	0 mph	30.04 in	0.0 in	
	8:53 PM	65 F	53 F	65 %	NNE	10 mph	0 mph	30.05 in	0.0 in	
	9:53 PM	63 F	52 F	67 %	NNE	12 mph	0 mph	30.07 in	0.0 in	
	10:53 PM	62 F	52 F	70 %	NE	14 mph	18 mph	30.09 in	0.0 in	
	11:53 PM	60 F	52 F	75 %	NE	8 mph	0 mph	30.09 in	0.0 in	
3/21/2021	12:53 AM	59 F	52 F	78 %	NE	8 mph	0 mph	30.09 in	0.0 in	
	1:53 AM	58 F	51 F	78 %	N	7 mph	0 mph	30.07 in	0.0 in	Evening doesn't meet weather conditions, Stations 6-13.
	2:53 AM	57 F	50 F	77 %	N	8 mph	0 mph	30.06 in	0.0 in	
	3:53 AM	57 F	50 F	77 %	N	7 mph	0 mph	30.05 in	0.0 in	
	4:53 AM	57 F	50 F	77 %	N	7 mph	0 mph	30.03 in	0.0 in	
	5:53 AM	56 F	50 F	80 %	N	7 mph	0 mph	30.03 in	0.0 in	
	6:35 AM	56 F	50 F	80 %	N	8 mph	0 mph	30.04 in	0.0 in	
	6:53 AM	56 F	50 F	80 %	NNW	8 mph	0 mph	30.05 in	0.0 in	
	7:53 AM	55 F	50 F	83 %	N	6 mph	0 mph	30.05 in	0.0 in	
3/21/2021	6:53 PM	66 F	52 F	60 %	WNW	13 mph	22 mph	30.00 in	0.0 in	
	7:53 PM	64 F	52 F	65 %	NNW	13 mph	20 mph	30.01 in	0.0 in	
	8:06 PM	64 F	52 F	65 %	NW	10 mph	0 mph	30.01 in	0.0 in	
	8:53 PM	63 F	52 F	67 %	NW	10 mph	21 mph	30.01 in	0.0 in	
	9:53 PM	63 F	52 F	67 %	NNW	7 mph	0 mph	30.02 in	0.0 in	
	10:53 PM	62 F	52 F	70 %	NNW	7 mph	0 mph	30.03 in	0.0 in	
	11:53 PM	62 F	52 F	70 %	N	6 mph	0 mph	30.03 in	0.0 in	
3/22/2021	12:53 AM	61 F	52 F	72 %	NW	3 mph	0 mph	30.01 in	0.0 in	
	1:53 AM	61 F	52 F	72 %	CALM	0 mph	0 mph	30.01 in	0.0 in	Evening doesn't meet weather conditions, Stations 6-13.
	2:53 AM	61 F	52 F	72 %	W	3 mph	0 mph	29.99 in	0.0 in	
	4:35 AM	60 F	51 F	72 %	NNW	5 mph	0 mph	29.96 in	0.0 in	
	4:53 AM	60 F	51 F	72 %	NW	3 mph	0 mph	29.96 in	0.0 in	
	5:24 AM	59 F	53 F	81 %	N	6 mph	0 mph	29.97 in	0.0 in	
	5:39 AM	59 F	53 F	81 %	N	5 mph	0 mph	29.97 in	0.0 in	
	5:50 AM	59 F	54 F	82 %	N	5 mph	0 mph	29.97 in	0.0 in	
	5:53 AM	59 F	53 F	81 %	N	5 mph	0 mph	29.97 in	0.0 in	
	6:53 AM	59 F	53 F	81 %	CALM	0 mph	0 mph	29.99 in	0.0 in	
	7:37 AM	58 F	53 F	84 %	NNW	3 mph	0 mph	29.99 in	0.0 in	
3/22/2021	6:53 PM	69 F	58 F	68 %	NW	6 mph	0 mph	29.92 in	0.0 in	
	7:53 PM	67 F	59 F	76 %	WNW	6 mph	0 mph	29.92 in	0.0 in	
	8:53 PM	66 F	59 F	78 %	NW	5 mph	0 mph	29.93 in	0.0 in	
	9:53 PM	65 F	59 F	81 %	WNW	3 mph	0 mph	29.94 in	0.0 in	
	10:53 PM	64 F	59 F	84 %	CALM	0 mph	0 mph	29.95 in	0.0 in	
	11:53 PM	63 F	57 F	81 %	NNW	3 mph	0 mph	29.96 in	0.0 in	
3/23/2021	12:53 AM	62 F	57 F	84 %	NNW	5 mph	0 mph	29.96 in	0.0 in	
	1:53 AM	62 F	58 F	86 %	N	7 mph	0 mph	29.96 in	0.0 in	Evening doesn't meet weather conditions, Stations 6-13.
	2:53 AM	60 F	57 F	90 %	NE	6 mph	0 mph	29.94 in	0.0 in	
	3:53 AM	60 F	57 F	90 %	CALM	0 mph	0 mph	29.94 in	0.0 in	
	4:53 AM	59 F	57 F	93 %	CALM	0 mph	0 mph	29.93 in	0.0 in	
	5:53 AM	58 F	56 F	93 %	CALM	0 mph	0 mph	29.94 in	0.0 in	
	6:25 AM	57 F	56 F	96 %	NNE	6 mph	0 mph	29.94 in	0.0 in	
	6:53 AM	57 F	55 F	93 %	NE	5 mph	0 mph	29.95 in	0.0 in	
	7:53 AM	58 F	56 F	93 %	CALM	0 mph	0 mph	29.97 in	0.0 in	
3/23/2021	6:53 PM	72 F	54 F	53 %	WSW	10 mph	0 mph	29.91 in	0.0 in	
	7:53 PM	68 F	54 F	61 %	WSW	8 mph	0 mph	29.92 in	0.0 in	
	8:53 PM	67 F	55 F	66 %	W	3 mph	0 mph	29.94 in	0.0 in	
	9:53 PM	66 F	56 F	70 %	CALM	0 mph	0 mph	29.95 in	0.0 in	
	10:53 PM	65 F	56 F	73 %	CALM	0 mph	0 mph	29.96 in	0.0 in	
	11:53 PM	60 F	55 F	83 %	ENE	3 mph	0 mph	29.96 in	0.0 in	
3/24/2021	12:53 AM	60 F	55 F	83 %	CALM	0 mph	0 mph	29.96 in	0.0 in	
	1:53 AM	58 F	54 F	87 %	SE	6 mph	0 mph	29.96 in	0.0 in	Evening doesn't meet weather conditions, Stations 6-13.
	2:53 AM	59 F	55 F	87 %	CALM	0 mph	0 mph	29.94 in	0.0 in	
	3:53 AM	59 F	55 F	87 %	CALM	0 mph	0 mph	29.95 in	0.0 in	
	4:53 AM	56 F	53 F	90 %	CALM	0 mph	0 mph	29.94 in	0.0 in	
	5:53 AM	56 F	53 F	90 %	E	3 mph	0 mph	29.94 in	0.0 in	
	6:53 AM	56 F	53 F	90 %	CALM	0 mph	0 mph	29.95 in	0.0 in	
	7:53 AM	57 F	54 F	89 %	E	3 mph	0 mph	29.97 in	0.0 in	
3/24/2021	6:53 PM	81 F	64 F	56 %	W	5 mph	0 mph	29.97 in	0.0 in	
	7:53 PM	76 F	65 F	69 %	WSW	6 mph	0 mph	29.98 in	0.0 in	
	8:53 PM	74 F	64 F	71 %	WSW	5 mph	0 mph	29.99 in	0.0 in	
	9:53 PM	73 F	65 F	76 %	CALM	0 mph	0 mph	30.02 in	0.0 in	
	10:53 PM	70 F	64 F	81 %	CALM	0 mph	0 mph	30.03 in	0.0 in	
	11:53 PM	69 F	65 F	87 %	CALM	0 mph	0 mph	30.01 in	0.0 in	
3/25/2021	12:53 AM	68 F	64 F	87 %	CALM	0 mph	0 mph	30.01 in	0.0 in	
	1:53 AM	68 F	64 F	87 %	SE	5 mph	0 mph	30.00 in	0.0 in	
	2:53 AM	69 F	66 F	90 %	SSE	10 mph	0 mph	29.97 in	0.0 in	
	3:53 AM	69 F	66 F	90 %	SE	7 mph	0 mph	29.97 in	0.0 in	
	4:38 AM	68 F	66 F	93 %	SE	3 mph	0 mph	29.97 in	0.0 in	
	4:53 AM	68 F	66 F	93 %	SSE	5 mph	0 mph	29.97 in	0.0 in	Night 2, Stations 6-13.
	5:07 AM	68 F	66 F	93 %	SSE	6 mph	0 mph	29.97 in	0.0 in	
	5:35 AM	68 F	66 F	93 %	SSE	5 mph	0 mph	29.97 in	0.0 in	
	5:53 AM	68 F	66 F	93 %	SSE	6 mph	0 mph	29.97 in	0.0 in	
	6:10 AM	69 F	66 F	90 %	SE	6 mph	0 mph	29.98 in	0.0 in	
	6:18 AM	69 F	67 F	93 %	SSE	7 mph	0 mph	29.98 in	0.0 in	
	6:31 AM	70 F	68 F	93 %	SSE	8 mph	0 mph	29.99 in	0.0 in	
	6:35 AM	70 F	68 F	93 %	SSE	9 mph	0 mph	29.99 in	0.0 in	
	6:53 AM	70 F	69 F	97 %	SSE	8 mph	0 mph	30.00 in	0.0 in	
	7:06 AM	71 F	69 F	93 %	SSE	10 mph	0 mph	30.00 in	0.0 in	
	7:48 AM	72 F	70 F	94 %	SSE	10 mph	0 mph	30.01 in	0.0 in	
3/25/2021	7:53 PM	83 F	63 F	51 %	S	10 mph	0 mph	30.01 in	0.0 in	Evening doesn't meet weather conditions, Stations 6-13.

Appendix B. NOAA National Weather Service Data

Date	Time	Temperature	Dew Point	Humidity	Wind	Wind Speed	Wind Gust	Pressure	Precipitation	Description
	8:53 PM	81 F	65 F	58 %	S	6 mph	0 mph	30.03 in	0.0 in	
	9:53 PM	77 F	66 F	69 %	SSE	5 mph	0 mph	30.05 in	0.0 in	
	10:53 PM	76 F	68 F	76 %	SSE	6 mph	0 mph	30.07 in	0.0 in	
	11:53 PM	74 F	67 F	79 %	SSE	7 mph	0 mph	30.07 in	0.0 in	
3/26/2021	12:53 AM	74 F	67 F	79 %	SE	8 mph	0 mph	30.06 in	0.0 in	
	1:53 AM	73 F	68 F	84 %	SE	5 mph	0 mph	30.06 in	0.0 in	
	2:53 AM	71 F	68 F	90 %	ESE	6 mph	0 mph	30.05 in	0.0 in	
	3:53 AM	70 F	68 F	93 %	SE	5 mph	0 mph	30.04 in	0.0 in	Evening doesn't meet weather conditions, Stations 6-13.
	4:53 AM	70 F	68 F	93 %	SSE	5 mph	0 mph	30.04 in	0.0 in	
	5:02 AM	71 F	68 F	90 %	SSE	7 mph	0 mph	30.04 in	0.0 in	
	5:35 AM	71 F	70 F	96 %	SSE	8 mph	0 mph	30.05 in	0.0 in	
	5:53 AM	72 F	70 F	93 %	SSE	7 mph	0 mph	30.05 in	0.0 in	
	6:00 AM	72 F	70 F	93 %	SSE	8 mph	0 mph	30.05 in	0.0 in	
	6:50 AM	73 F	70 F	88 %	SSE	10 mph	0 mph	30.07 in	0.0 in	
	6:53 AM	73 F	70 F	90 %	SSE	9 mph	0 mph	30.07 in	0.0 in	
	7:53 AM	73 F	71 F	93 %	SE	9 mph	0 mph	30.09 in	0.0 in	
3/26/2021	7:53 PM	79 F	67 F	66 %	SW	9 mph	0 mph	30.10 in	0.0 in	
	8:53 PM	78 F	68 F	71 %	WSW	7 mph	0 mph	30.11 in	0.0 in	
	9:53 PM	77 F	68 F	74 %	SW	3 mph	0 mph	30.13 in	0.0 in	
	10:53 PM	76 F	68 F	76 %	SSE	5 mph	0 mph	30.14 in	0.0 in	
	11:53 PM	74 F	68 F	82 %	ESE	5 mph	0 mph	30.14 in	0.0 in	
3/27/2021	12:53 AM	73 F	68 F	84 %	E	3 mph	0 mph	30.14 in	0.0 in	
	1:53 AM	71 F	68 F	90 %	ENE	3 mph	0 mph	30.12 in	0.0 in	
	2:53 AM	70 F	66 F	87 %	CALM	0 mph	0 mph	30.12 in	0.0 in	
	3:53 AM	68 F	65 F	90 %	E	5 mph	0 mph	30.09 in	0.0 in	Night 3, Stations 6-13.
	4:53 AM	68 F	65 F	90 %	NE	5 mph	0 mph	30.11 in	0.0 in	
	5:53 AM	67 F	64 F	90 %	ENE	3 mph	0 mph	30.11 in	0.0 in	
	6:15 AM	67 F	65 F	93 %	ENE	6 mph	0 mph	30.12 in	0.0 in	
	6:17 AM	67 F	65 F	93 %	E	6 mph	0 mph	30.12 in	0.0 in	
	6:27 AM	66 F	65 F	96 %	E	3 mph	0 mph	30.12 in	0.0 in	
	6:53 AM	67 F	65 F	93 %	ENE	6 mph	0 mph	30.13 in	0.0 in	
	7:27 AM	66 F	65 F	96 %	E	5 mph	0 mph	30.14 in	0.0 in	
	7:38 AM	66 F	65 F	96 %	ENE	3 mph	0 mph	30.14 in	0.0 in	
3/27/2021	7:53 PM	78 F	68 F	71 %	WSW	7 mph	0 mph	30.08 in	0.0 in	
	8:53 PM	77 F	68 F	74 %	CALM	0 mph	0 mph	30.09 in	0.0 in	
	9:53 PM	76 F	69 F	79 %	CALM	0 mph	0 mph	30.11 in	0.0 in	
	10:53 PM	74 F	66 F	76 %	ESE	3 mph	0 mph	30.11 in	0.0 in	
	11:53 PM	72 F	64 F	76 %	ESE	6 mph	0 mph	30.10 in	0.0 in	
3/28/2021	12:53 AM	70 F	64 F	81 %	ESE	5 mph	0 mph	30.09 in	0.0 in	
	1:53 AM	71 F	67 F	87 %	SE	6 mph	0 mph	30.06 in	0.0 in	Night 4, Stations 6-13.
	2:53 AM	70 F	67 F	90 %	E	5 mph	0 mph	30.05 in	0.0 in	
	3:53 AM	69 F	66 F	90 %	E	5 mph	0 mph	30.03 in	0.0 in	
	4:53 AM	70 F	67 F	90 %	CALM	0 mph	0 mph	30.02 in	0.0 in	
	5:53 AM	71 F	68 F	90 %	ESE	6 mph	0 mph	30.01 in	0.0 in	
	6:53 AM	71 F	68 F	90 %	ESE	3 mph	0 mph	30.04 in	0.0 in	
	7:53 AM	70 F	68 F	93 %	CALM	0 mph	0 mph	30.06 in	0.0 in	
3/28/2021	7:53 PM	78 F	68 F	71 %	W	6 mph	0 mph	30.05 in	0.0 in	
	8:53 PM	77 F	68 F	74 %	W	6 mph	0 mph	30.06 in	0.0 in	
	9:53 PM	75 F	69 F	82 %	WNW	3 mph	0 mph	30.08 in	0.0 in	
	10:53 PM	73 F	68 F	84 %	W	3 mph	0 mph	30.08 in	0.0 in	
	11:53 PM	73 F	69 F	87 %	WSW	3 mph	0 mph	30.09 in	0.0 in	
3/29/2021	12:53 AM	74 F	69 F	85 %	CALM	0 mph	0 mph	30.09 in	0.0 in	
	1:53 AM	71 F	67 F	87 %	CALM	0 mph	0 mph	30.08 in	0.0 in	
	2:53 AM	71 F	68 F	90 %	CALM	0 mph	0 mph	30.07 in	0.0 in	Night 5, Stations 6-13.
	3:18 AM	70 F	67 F	90 %	CALM	0 mph	0 mph	30.06 in	0.0 in	
	3:53 AM	71 F	68 F	90 %	CALM	0 mph	0 mph	30.05 in	0.0 in	
	4:16 AM	71 F	69 F	93 %	CALM	0 mph	0 mph	30.05 in	0.0 in	
	4:53 AM	70 F	67 F	90 %	CALM	0 mph	0 mph	30.05 in	0.0 in	
	5:53 AM	71 F	69 F	93 %	CALM	0 mph	0 mph	30.04 in	0.0 in	
	6:53 AM	69 F	67 F	93 %	ESE	3 mph	0 mph	30.05 in	0.0 in	
	7:53 AM	70 F	68 F	93 %	CALM	0 mph	0 mph	30.06 in	0.0 in	
3/29/2021	7:53 PM	79 F	68 F	69 %	WSW	8 mph	0 mph	30.05 in	0.0 in	
	8:53 PM	78 F	69 F	74 %	CALM	0 mph	0 mph	30.06 in	0.0 in	
	9:53 PM	76 F	70 F	82 %	E	7 mph	0 mph	30.07 in	0.0 in	
	10:53 PM	75 F	70 F	84 %	E	6 mph	0 mph	30.09 in	0.0 in	
	11:09 PM	75 F	70 F	84 %	E	6 mph	0 mph	30.10 in	0.0 in	
	11:53 PM	74 F	69 F	85 %	ESE	7 mph	0 mph	30.09 in	0.0 in	
3/30/2021	12:53 AM	74 F	68 F	82 %	ESE	7 mph	0 mph	30.09 in	0.0 in	Night 6, Stations 8-13. Removed bat detectors from stations 6 and 7 and redeployed to stations 3 and 4 for two nights of data collection (3/29/2021 is night 4 for those two stations).
	1:53 AM	74 F	69 F	85 %	ENE	6 mph	0 mph	30.08 in	0.0 in	
	2:53 AM	74 F	69 F	85 %	E	7 mph	0 mph	30.07 in	0.0 in	
	3:53 AM	73 F	69 F	87 %	E	7 mph	0 mph	30.07 in	0.0 in	
	4:53 AM	73 F	69 F	87 %	E	6 mph	0 mph	30.08 in	0.0 in	
	5:53 AM	71 F	69 F	93 %	ENE	5 mph	0 mph	30.09 in	0.0 in	
	6:53 AM	71 F	68 F	90 %	ENE	6 mph	0 mph	30.10 in	0.0 in	
	7:53 AM	71 F	68 F	90 %	ENE	5 mph	0 mph	30.12 in	0.0 in	
3/30/2021	7:53 PM	79 F	70 F	74 %	SW	8 mph	0 mph	30.06 in	0.0 in	
	8:53 PM	78 F	70 F	76 %	CALM	0 mph	0 mph	30.07 in	0.0 in	
	9:53 PM	75 F	70 F	84 %	CALM	0 mph	0 mph	30.10 in	0.0 in	
	10:53 PM	75 F	69 F	82 %	ESE	7 mph	0 mph	30.12 in	0.0 in	
	11:53 PM	74 F	66 F	76 %	E	5 mph	0 mph	30.12 in	0.0 in	
3/31/2021	12:53 AM	72 F	65 F	78 %	E	6 mph	0 mph	30.12 in	0.0 in	
	1:53 AM	71 F	66 F	84 %	E	6 mph	0 mph	30.11 in	0.0 in	Night 5, stations 3 and 4. Night 7, Stations 8-13.
	2:53 AM	71 F	67 F	87 %	E	3 mph	0 mph	30.10 in	0.0 in	
	3:53 AM	71 F	68 F	90 %	NE	6 mph	0 mph	30.08 in	0.0 in	
	4:53 AM	71 F	68 F	90 %	NE	5 mph	0 mph	30.08 in	0.0 in	
	5:53 AM	70 F	68 F	93 %	NE	5 mph	0 mph	30.08 in	0.0 in	
	6:53 AM	70 F	68 F	93 %	ENE	6 mph	0 mph	30.09 in	0.0 in	
	7:53 AM	70 F	68 F	93 %	E	8 mph	0 mph	30.09 in	0.0 in	
3/31/2021	7:53 PM	78 F	69 F	74 %	WSW	10 mph	0 mph	30.01 in	0.0 in	
	8:53 PM	78 F	69 F	74 %	W	7 mph	0 mph	30.03 in	0.0 in	
	9:53 PM	77 F	70 F	79 %	W	3 mph	0 mph	30.06 in	0.0 in	Evening doesn't meet weather conditions, Stations 14, 15, 21-25.
	10:53 PM	76 F	71 F	85 %	WNW	3 mph	0 mph	30.07 in	0.0 in	
	11:53 PM	74 F	70 F	87 %	ESE	3 mph	0 mph	30.07 in	0.0 in	

Appendix B. NOAA National Weather Service Data

Date	Time	Temperature	Dew Point	Humidity	Wind	Wind Speed	Wind Gust	Pressure	Precipitation	Description
4/1/2021	12:53 AM	75 F	71 F	87 %	CALM	0 mph	0 mph	30.06 in	0.0 in	
	1:53 AM	74 F	70 F	87 %	CALM	0 mph	0 mph	30.04 in	0.0 in	
	2:53 AM	72 F	68 F	87 %	SE	3 mph	0 mph	30.01 in	0.0 in	
	3:32 AM	71 F	68 F	90 %	ENE	3 mph	0 mph	30.01 in	0.0 in	
	3:42 AM	72 F	69 F	91 %	CALM	0 mph	0 mph	30.01 in	0.0 in	
	3:51 AM	72 F	70 F	94 %	CALM	0 mph	0 mph	30.00 in	0.0 in	
	3:53 AM	72 F	70 F	93 %	ENE	3 mph	0 mph	30.00 in	0.0 in	Evening doesn't meet weather conditions, Stations 14, 15, 21-25.
	4:53 AM	73 F	70 F	90 %	NE	5 mph	0 mph	30.00 in	0.0 in	
	5:53 AM	73 F	70 F	90 %	NNE	3 mph	0 mph	30.00 in	0.0 in	
	6:16 AM	72 F	70 F	93 %	N	3 mph	0 mph	30.00 in	0.0 in	
	6:53 AM	72 F	70 F	93 %	NE	6 mph	0 mph	30.01 in	0.0 in	
	7:53 AM	73 F	70 F	90 %	CALM	0 mph	0 mph	30.03 in	0.0 in	
4/1/2021	7:53 PM	76 F	64 F	67 %	N	13 mph	23 mph	29.96 in	0.0 in	
	8:53 PM	74 F	61 F	64 %	N	15 mph	23 mph	29.99 in	0.0 in	
	9:53 PM	71 F	49 F	45 %	N	10 mph	0 mph	30.03 in	0.0 in	
	10:53 PM	67 F	52 F	59 %	NE	14 mph	0 mph	30.04 in	0.0 in	
	11:53 PM	64 F	49 F	58 %	NE	8 mph	0 mph	30.05 in	0.0 in	
4/2/2021	12:53 AM	62 F	45 F	53 %	NE	14 mph	24 mph	30.06 in	0.0 in	
	1:53 AM	60 F	45 F	57 %	NNE	7 mph	0 mph	30.07 in	0.0 in	Evening doesn't meet weather conditions, Stations 14, 15, 21-25.
	2:53 AM	59 F	40 F	49 %	NNE	12 mph	22 mph	30.07 in	0.0 in	
	3:53 AM	56 F	39 F	53 %	NNE	9 mph	0 mph	30.07 in	0.0 in	
	4:53 AM	55 F	38 F	53 %	N	9 mph	20 mph	30.07 in	0.0 in	
	5:53 AM	53 F	35 F	50 %	N	12 mph	20 mph	30.09 in	0.0 in	
	6:53 AM	52 F	33 F	49 %	N	12 mph	0 mph	30.10 in	0.0 in	
	7:53 AM	52 F	33 F	49 %	N	13 mph	20 mph	30.13 in	0.0 in	
4/2/2021	7:53 PM	65 F	46 F	50 %	NE	18 mph	0 mph	30.16 in	0.0 in	
	8:53 PM	62 F	45 F	53 %	NE	20 mph	25 mph	30.20 in	0.0 in	
	9:53 PM	60 F	44 F	55 %	NE	14 mph	24 mph	30.23 in	0.0 in	
	10:53 PM	57 F	43 F	59 %	NE	16 mph	23 mph	30.25 in	0.0 in	
	11:53 PM	55 F	44 F	67 %	NE	14 mph	20 mph	30.25 in	0.0 in	
4/3/2021	12:53 AM	53 F	42 F	66 %	NE	14 mph	21 mph	30.25 in	0.0 in	
	1:53 AM	52 F	42 F	69 %	NNE	10 mph	0 mph	30.25 in	0.0 in	Evening doesn't meet weather conditions, Stations 14, 15, 21-25.
	2:53 AM	51 F	42 F	71 %	NNE	13 mph	0 mph	30.24 in	0.0 in	
	3:53 AM	50 F	42 F	74 %	NNE	10 mph	0 mph	30.23 in	0.0 in	
	4:53 AM	50 F	42 F	74 %	NNE	9 mph	0 mph	30.23 in	0.0 in	
	5:53 AM	49 F	42 F	77 %	NNE	10 mph	0 mph	30.24 in	0.0 in	
	6:53 AM	49 F	42 F	77 %	NNE	10 mph	0 mph	30.26 in	0.0 in	
	7:53 AM	50 F	42 F	74 %	NNE	9 mph	0 mph	30.28 in	0.0 in	
4/3/2021	7:53 PM	68 F	45 F	43 %	ENE	9 mph	0 mph	30.23 in	0.0 in	
	8:53 PM	67 F	49 F	52 %	ENE	10 mph	0 mph	30.25 in	0.0 in	
	9:53 PM	65 F	50 F	58 %	ENE	10 mph	0 mph	30.27 in	0.0 in	
	10:53 PM	64 F	48 F	56 %	NE	9 mph	0 mph	30.27 in	0.0 in	
	11:53 PM	61 F	48 F	62 %	NE	9 mph	0 mph	30.27 in	0.0 in	
4/4/2021	12:53 AM	59 F	47 F	64 %	NE	7 mph	0 mph	30.26 in	0.0 in	
	1:53 AM	59 F	47 F	64 %	NE	6 mph	0 mph	30.25 in	0.0 in	Evening doesn't meet weather conditions, Stations 14, 15, 21-25.
	2:53 AM	59 F	47 F	64 %	NNE	7 mph	0 mph	30.23 in	0.0 in	
	3:53 AM	59 F	47 F	64 %	NNE	9 mph	0 mph	30.22 in	0.0 in	
	4:53 AM	59 F	47 F	64 %	NE	9 mph	0 mph	30.23 in	0.0 in	
	5:53 AM	57 F	47 F	69 %	NE	8 mph	0 mph	30.24 in	0.0 in	
	6:53 AM	57 F	47 F	69 %	NNE	7 mph	0 mph	30.24 in	0.0 in	
	7:53 AM	58 F	49 F	72 %	NNE	8 mph	0 mph	30.25 in	0.0 in	
4/4/2021	7:53 PM	71 F	47 F	42 %	E	9 mph	0 mph	30.12 in	0.0 in	
	8:53 PM	69 F	49 F	49 %	E	9 mph	0 mph	30.14 in	0.0 in	
	9:53 PM	65 F	51 F	61 %	E	7 mph	0 mph	30.16 in	0.0 in	
	10:53 PM	63 F	51 F	65 %	E	6 mph	0 mph	30.18 in	0.0 in	
	11:53 PM	62 F	51 F	67 %	E	7 mph	0 mph	30.17 in	0.0 in	
4/5/2021	12:53 AM	60 F	51 F	72 %	E	6 mph	0 mph	30.16 in	0.0 in	
	1:53 AM	59 F	51 F	75 %	E	3 mph	0 mph	30.15 in	0.0 in	
	2:53 AM	58 F	51 F	78 %	ENE	3 mph	0 mph	30.14 in	0.0 in	
	3:53 AM	56 F	51 F	84 %	ENE	5 mph	0 mph	30.13 in	0.0 in	
	4:53 AM	57 F	51 F	81 %	NE	7 mph	0 mph	30.13 in	0.0 in	Evening doesn't meet weather conditions, Stations 14, 15, 21-25.
	5:53 AM	56 F	52 F	87 %	NNE	3 mph	0 mph	30.13 in	0.0 in	
	6:53 AM	55 F	51 F	86 %	NE	6 mph	0 mph	30.14 in	0.0 in	
	7:53 AM	57 F	52 F	83 %	NE	5 mph	0 mph	30.15 in	0.0 in	
4/5/2021	7:53 PM	73 F	47 F	39 %	E	7 mph	0 mph	30.06 in	0.0 in	
	8:53 PM	70 F	49 F	47 %	ESE	9 mph	0 mph	30.08 in	0.0 in	
	9:53 PM	68 F	53 F	59 %	SE	8 mph	0 mph	30.10 in	0.0 in	
	10:53 PM	67 F	53 F	61 %	ESE	8 mph	0 mph	30.11 in	0.0 in	
	11:53 PM	65 F	53 F	65 %	ESE	7 mph	0 mph	30.11 in	0.0 in	
4/6/2021	12:53 AM	63 F	52 F	67 %	E	7 mph	0 mph	30.10 in	0.0 in	
	1:53 AM	62 F	51 F	67 %	ESE	7 mph	0 mph	30.08 in	0.0 in	
	2:53 AM	62 F	50 F	65 %	ESE	6 mph	0 mph	30.07 in	0.0 in	
	3:53 AM	59 F	50 F	72 %	CALM	0 mph	0 mph	30.07 in	0.0 in	
	4:53 AM	59 F	52 F	78 %	CALM	0 mph	0 mph	30.07 in	0.0 in	
	5:53 AM	58 F	50 F	75 %	CALM	0 mph	0 mph	30.08 in	0.0 in	
	6:53 AM	58 F	50 F	75 %	NE	3 mph	0 mph	30.09 in	0.0 in	Evening doesn't meet weather conditions, Stations 14, 15, 21-25.
	7:53 AM	58 F	52 F	81 %	ENE	3 mph	0 mph	30.10 in	0.0 in	
4/6/2021	7:53 PM	75 F	49 F	40 %	VAR	5 mph	0 mph	30.03 in	0.0 in	
	8:53 PM	71 F	55 F	57 %	WNW	3 mph	0 mph	30.05 in	0.0 in	
	9:53 PM	70 F	56 F	61 %	CALM	0 mph	0 mph	30.08 in	0.0 in	
	10:53 PM	69 F	54 F	58 %	ESE	8 mph	0 mph	30.08 in	0.0 in	
	11:53 PM	69 F	56 F	63 %	SE	10 mph	0 mph	30.07 in	0.0 in	
4/7/2021	12:53 AM	69 F	57 F	65 %	SSE	14 mph	0 mph	30.07 in	0.0 in	
	1:53 AM	69 F	58 F	68 %	S	9 mph	0 mph	30.06 in	0.0 in	
	2:53 AM	66 F	58 F	75 %	SSE	6 mph	0 mph	30.05 in	0.0 in	
	3:53 AM	62 F	57 F	84 %	CALM	0 mph	0 mph	30.04 in	0.0 in	
	4:53 AM	60 F	56 F	86 %	CALM	0 mph	0 mph	30.03 in	0.0 in	Evening doesn't meet weather conditions, Stations 14, 15, 21-25.
	5:53 AM	59 F	56 F	90 %	CALM	0 mph	0 mph	30.03 in	0.0 in	
	6:53 AM	58 F	55 F	90 %	CALM	0 mph	0 mph	30.05 in	0.0 in	
	7:53 AM	60 F	56 F	86 %	CALM	0 mph	0 mph	30.06 in	0.0 in	
4/7/2021	7:53 PM	74 F	57 F	55 %	W	3 mph	0 mph	29.99 in	0.0 in	
	8:53 PM	72 F	58 F	61 %	CALM	0 mph	0 mph	30.00 in	0.0 in	Night 1, Stations 14, 15, 21-25.
	9:53 PM	71 F	58 F	63 %	SSW	3 mph	0 mph	30.02 in	0.0 in	

Appendix B. NOAA National Weather Service Data

Date	Time	Temperature	Dew Point	Humidity	Wind	Wind Speed	Wind Gust	Pressure	Precipitation	Description
	10:53 PM	71 F	59 F	66 %	CALM	0 mph	0 mph	30.03 in	0.0 in	
	11:53 PM	68 F	59 F	73 %	E	3 mph	0 mph	30.02 in	0.0 in	
4/8/2021	12:53 AM	70 F	60 F	71 %	S	6 mph	0 mph	30.02 in	0.0 in	
	1:53 AM	67 F	58 F	73 %	SE	5 mph	0 mph	29.99 in	0.0 in	
	2:53 AM	64 F	57 F	78 %	SW	5 mph	0 mph	29.99 in	0.0 in	Night 1, Stations 14, 15, 21-25.
	3:53 AM	62 F	56 F	80 %	CALM	0 mph	0 mph	29.97 in	0.0 in	
	4:53 AM	61 F	56 F	83 %	CALM	0 mph	0 mph	29.96 in	0.0 in	
	5:53 AM	59 F	55 F	87 %	E	3 mph	0 mph	29.97 in	0.0 in	
	6:53 AM	59 F	55 F	87 %	CALM	0 mph	0 mph	29.98 in	0.0 in	
	7:53 AM	62 F	57 F	84 %	ESE	5 mph	0 mph	29.99 in	0.0 in	
4/8/2021	7:53 PM	73 F	55 F	53 %	WSW	8 mph	0 mph	29.95 in	0.0 in	
	8:53 PM	73 F	58 F	59 %	SSW	6 mph	0 mph	29.95 in	0.0 in	
	9:53 PM	72 F	60 F	66 %	S	9 mph	0 mph	29.95 in	0.0 in	
	10:53 PM	71 F	61 F	70 %	S	7 mph	0 mph	29.97 in	0.0 in	
	11:53 PM	70 F	62 F	76 %	E	3 mph	0 mph	30.00 in	0.0 in	
4/9/2021	12:53 AM	69 F	62 F	78 %	ESE	5 mph	0 mph	29.99 in	0.0 in	
	1:53 AM	68 F	60 F	76 %	SSE	7 mph	0 mph	29.98 in	0.0 in	Night 2, Stations 14, 15, 21-25.
	2:53 AM	66 F	59 F	78 %	SE	6 mph	0 mph	29.96 in	0.0 in	
	3:53 AM	65 F	58 F	78 %	SSE	7 mph	0 mph	29.95 in	0.0 in	
	4:53 AM	64 F	57 F	78 %	SE	6 mph	0 mph	29.95 in	0.0 in	
	5:53 AM	64 F	57 F	78 %	CALM	0 mph	0 mph	29.97 in	0.0 in	
	6:53 AM	61 F	57 F	87 %	E	3 mph	0 mph	29.98 in	0.0 in	
	7:53 AM	63 F	59 F	87 %	E	3 mph	0 mph	29.99 in	0.0 in	
4/9/2021	7:53 PM	75 F	64 F	69 %	WSW	9 mph	0 mph	29.95 in	0.0 in	
	8:53 PM	75 F	65 F	71 %	SW	6 mph	0 mph	29.97 in	0.0 in	
	9:53 PM	75 F	64 F	69 %	ESE	3 mph	0 mph	30.00 in	0.0 in	
	10:53 PM	72 F	59 F	64 %	SE	6 mph	0 mph	30.01 in	0.0 in	
	11:53 PM	69 F	59 F	70 %	ESE	6 mph	0 mph	30.00 in	0.0 in	
4/10/2021	12:53 AM	67 F	59 F	76 %	ESE	6 mph	0 mph	29.99 in	0.0 in	
	1:53 AM	66 F	59 F	78 %	ESE	5 mph	0 mph	29.98 in	0.0 in	Night 3, Stations 14, 15, 21-25.
	2:53 AM	66 F	61 F	84 %	SE	9 mph	0 mph	29.94 in	0.0 in	
	3:53 AM	66 F	61 F	84 %	SSE	9 mph	0 mph	29.90 in	0.0 in	
	4:53 AM	67 F	62 F	84 %	SSE	13 mph	0 mph	29.87 in	0.0 in	
	5:53 AM	67 F	62 F	84 %	SSE	6 mph	0 mph	29.89 in	0.0 in	
	6:53 AM	66 F	62 F	87 %	SE	3 mph	0 mph	29.89 in	0.0 in	
	7:53 AM	67 F	63 F	87 %	ESE	3 mph	0 mph	29.90 in	0.0 in	
4/10/2021	7:53 PM	78 F	69 F	74 %	WSW	10 mph	0 mph	29.87 in	0.0 in	
	8:19 PM	69 F	60 F	73 %	N	20 mph	31 mph	29.93 in	0.0 in	
	8:53 PM	67 F	61 F	81 %	NNE	7 mph	0 mph	29.89 in	0.0 in	
	9:53 PM	67 F	61 F	81 %	ENE	5 mph	0 mph	29.89 in	0.0 in	
	10:53 PM	67 F	61 F	81 %	SSE	9 mph	0 mph	29.86 in	0.0 in	
	11:53 PM	68 F	60 F	76 %	SSE	8 mph	0 mph	29.84 in	0.0 in	
4/11/2021	12:53 AM	70 F	60 F	71 %	SSE	9 mph	0 mph	29.84 in	0.0 in	Evening doesn't meet weather conditions, Stations 14, 15, 21-25.
	1:53 AM	70 F	60 F	71 %	SSE	12 mph	0 mph	29.82 in	0.0 in	
	2:53 AM	69 F	60 F	73 %	S	12 mph	0 mph	29.81 in	0.0 in	
	3:53 AM	70 F	60 F	71 %	S	10 mph	0 mph	29.80 in	0.0 in	
	4:53 AM	69 F	59 F	70 %	SSE	12 mph	0 mph	29.79 in	0.0 in	
	5:53 AM	69 F	61 F	75 %	SSE	9 mph	0 mph	29.76 in	0.0 in	
	6:53 AM	70 F	63 F	78 %	S	9 mph	0 mph	29.77 in	0.0 in	
	7:53 AM	70 F	65 F	84 %	S	10 mph	0 mph	29.76 in	0.0 in	
4/11/2021	7:53 PM	64 F	61 F	90 %	ESE	7 mph	0 mph	29.84 in	0.1 in	
	8:53 PM	64 F	62 F	93 %	ESE	6 mph	0 mph	29.81 in	0.0 in	
	9:53 PM	65 F	62 F	90 %	WSW	7 mph	0 mph	29.84 in	0.0 in	
	10:24 PM	66 F	62 F	87 %	WSW	5 mph	0 mph	29.82 in	0.1 in	
	10:53 PM	67 F	63 F	87 %	S	13 mph	0 mph	29.81 in	0.2 in	
	11:53 PM	67 F	64 F	90 %	SSW	9 mph	0 mph	29.81 in	0.1 in	
4/12/2021	12:53 AM	67 F	64 F	90 %	SW	10 mph	0 mph	29.78 in	0.0 in	Evening doesn't meet weather conditions, Stations 14, 15, 21-25.
	1:53 AM	68 F	66 F	93 %	SW	13 mph	0 mph	29.77 in	0.0 in	
	2:53 AM	68 F	66 F	93 %	SSE	5 mph	0 mph	29.74 in	0.0 in	
	3:53 AM	68 F	66 F	93 %	SSW	8 mph	0 mph	29.74 in	0.0 in	
	4:53 AM	69 F	67 F	93 %	S	5 mph	0 mph	29.75 in	0.0 in	
	5:53 AM	70 F	67 F	90 %	SSW	8 mph	0 mph	29.78 in	0.0 in	
	6:53 AM	69 F	66 F	90 %	WSW	6 mph	0 mph	29.79 in	0.0 in	
	7:53 AM	70 F	67 F	90 %	CALM	0 mph	0 mph	29.81 in	0.0 in	
4/12/2021	7:53 PM	77 F	63 F	62 %	VAR	5 mph	0 mph	29.85 in	0.0 in	
	8:53 PM	75 F	64 F	69 %	NNW	3 mph	0 mph	29.87 in	0.0 in	
	9:53 PM	73 F	62 F	68 %	WNW	3 mph	0 mph	29.90 in	0.0 in	
	10:53 PM	71 F	62 F	73 %	NNW	5 mph	0 mph	29.91 in	0.0 in	
	11:53 PM	71 F	60 F	68 %	NNE	7 mph	0 mph	29.93 in	0.0 in	
4/13/2021	12:53 AM	68 F	61 F	78 %	N	5 mph	0 mph	29.94 in	0.0 in	
	1:53 AM	67 F	61 F	81 %	CALM	0 mph	0 mph	29.94 in	0.0 in	Night 4, Stations 14, 15, 21-25.
	2:53 AM	65 F	60 F	84 %	CALM	0 mph	0 mph	29.93 in	0.0 in	
	3:53 AM	63 F	59 F	87 %	CALM	0 mph	0 mph	29.93 in	0.0 in	
	4:53 AM	62 F	59 F	90 %	CALM	0 mph	0 mph	29.94 in	0.0 in	
	5:53 AM	62 F	59 F	90 %	CALM	0 mph	0 mph	29.97 in	0.0 in	
	6:53 AM	59 F	57 F	93 %	CALM	0 mph	0 mph	29.99 in	0.0 in	
	7:53 AM	63 F	60 F	90 %	NNE	5 mph	0 mph	30.01 in	0.0 in	
4/13/2021	7:53 PM	79 F	55 F	44 %	SW	6 mph	0 mph	29.99 in	0.0 in	
	8:53 PM	76 F	65 F	69 %	W	6 mph	0 mph	30.01 in	0.0 in	
	9:53 PM	75 F	64 F	69 %	CALM	0 mph	0 mph	30.04 in	0.0 in	
	10:53 PM	73 F	63 F	71 %	CALM	0 mph	0 mph	30.04 in	0.0 in	
	11:53 PM	69 F	62 F	78 %	ENE	5 mph	0 mph	30.05 in	0.0 in	
4/14/2021	12:53 AM	68 F	60 F	76 %	E	3 mph	0 mph	30.06 in	0.0 in	
	1:53 AM	69 F	61 F	75 %	NE	3 mph	0 mph	30.06 in	0.0 in	Night 5, Stations 14, 15, 21-25.
	2:53 AM	65 F	61 F	87 %	E	5 mph	0 mph	30.04 in	0.0 in	
	3:53 AM	67 F	63 F	87 %	ENE	6 mph	0 mph	30.04 in	0.0 in	
	4:53 AM	66 F	63 F	90 %	ENE	5 mph	0 mph	30.05 in	0.0 in	
	5:53 AM	64 F	62 F	93 %	ENE	7 mph	0 mph	30.05 in	0.0 in	
	6:53 AM	64 F	61 F	90 %	E	6 mph	0 mph	30.07 in	0.0 in	
	7:53 AM	65 F	63 F	93 %	ENE	5 mph	0 mph	30.08 in	0.0 in	
4/14/2021	7:53 PM	75 F	67 F	76 %	WSW	8 mph	0 mph	30.02 in	0.0 in	
	8:53 PM	75 F	68 F	79 %	NW	3 mph	0 mph	30.04 in	0.0 in	Night 6, Stations 14, 15, 21-25.
	9:53 PM	74 F	68 F	82 %	CALM	0 mph	0 mph	30.05 in	0.0 in	

Appendix B. NOAA National Weather Service Data

Date	Time	Temperature	Dew Point	Humidity	Wind	Wind Speed	Wind Gust	Pressure	Precipitation	Description
	10:53 PM	72 F	67 F	84 %	SE	3 mph	0 mph	30.05 in	0.0 in	
	11:53 PM	70 F	66 F	87 %	CALM	0 mph	0 mph	30.04 in	0.0 in	
4/15/2021	12:34 AM	71 F	67 F	87 %	SSE	6 mph	0 mph	30.03 in	0.0 in	
	12:53 AM	71 F	66 F	84 %	SSE	6 mph	0 mph	30.02 in	0.0 in	
	1:07 AM	70 F	65 F	84 %	ESE	3 mph	0 mph	30.02 in	0.0 in	
	1:53 AM	69 F	63 F	81 %	CALM	0 mph	0 mph	30.02 in	0.0 in	Night 6, Stations 14, 15, 21-25.
	2:53 AM	66 F	61 F	84 %	CALM	0 mph	0 mph	29.99 in	0.0 in	
	3:53 AM	67 F	62 F	84 %	SSE	3 mph	0 mph	29.96 in	0.0 in	
	4:53 AM	66 F	61 F	84 %	SSE	6 mph	0 mph	29.96 in	0.0 in	
	5:53 AM	65 F	61 F	87 %	SSE	8 mph	0 mph	29.95 in	0.0 in	
	6:53 AM	64 F	60 F	87 %	ESE	3 mph	0 mph	29.97 in	0.0 in	
	7:53 AM	66 F	62 F	87 %	CALM	0 mph	0 mph	29.97 in	0.0 in	
4/15/2021	7:53 PM	74 F	67 F	79 %	WSW	7 mph	0 mph	29.90 in	0.0 in	
	8:53 PM	73 F	67 F	81 %	SW	7 mph	0 mph	29.88 in	0.0 in	
	9:53 PM	73 F	67 F	81 %	WSW	5 mph	0 mph	29.90 in	0.0 in	
	10:53 PM	73 F	68 F	84 %	SSW	6 mph	0 mph	29.88 in	0.0 in	
	11:53 PM	72 F	67 F	84 %	CALM	0 mph	0 mph	29.89 in	0.0 in	
4/16/2021	12:53 AM	72 F	67 F	84 %	WSW	3 mph	0 mph	29.89 in	0.0 in	
	1:53 AM	70 F	67 F	90 %	CALM	0 mph	0 mph	29.89 in	0.0 in	Night 1, Stations 12, 13, 16-20.
	2:53 AM	69 F	66 F	90 %	SW	5 mph	0 mph	29.87 in	0.0 in	
	3:53 AM	69 F	66 F	90 %	SSW	3 mph	0 mph	29.86 in	0.0 in	
	4:53 AM	69 F	66 F	90 %	CALM	0 mph	0 mph	29.85 in	0.0 in	
	5:53 AM	68 F	65 F	90 %	CALM	0 mph	0 mph	29.87 in	0.0 in	
	6:37 AM	66 F	64 F	93 %	CALM	0 mph	0 mph	29.86 in	0.0 in	
	6:53 AM	67 F	64 F	90 %	CALM	0 mph	0 mph	29.87 in	0.0 in	
	7:53 AM	68 F	65 F	90 %	CALM	0 mph	0 mph	29.87 in	0.0 in	
4/16/2021	7:53 PM	76 F	66 F	71 %	WSW	8 mph	0 mph	29.84 in	0.0 in	
	8:53 PM	77 F	68 F	74 %	SSW	8 mph	0 mph	29.83 in	0.0 in	
	9:53 PM	74 F	68 F	82 %	SW	7 mph	0 mph	29.85 in	0.0 in	
	10:53 PM	74 F	68 F	82 %	CALM	0 mph	0 mph	29.86 in	0.0 in	
	11:53 PM	72 F	67 F	84 %	SSW	3 mph	0 mph	29.86 in	0.0 in	
4/17/2021	12:53 AM	71 F	68 F	90 %	CALM	0 mph	0 mph	29.86 in	0.0 in	
	1:53 AM	70 F	67 F	90 %	S	3 mph	0 mph	29.84 in	0.0 in	Night 2, Stations 12, 13, 16-20.
	2:53 AM	70 F	67 F	90 %	S	5 mph	0 mph	29.83 in	0.0 in	
	3:53 AM	71 F	68 F	90 %	S	3 mph	0 mph	29.82 in	0.0 in	
	4:53 AM	71 F	68 F	90 %	S	5 mph	0 mph	29.82 in	0.0 in	
	5:53 AM	71 F	69 F	93 %	SW	5 mph	0 mph	29.84 in	0.0 in	
	6:53 AM	71 F	68 F	90 %	CALM	0 mph	0 mph	29.84 in	0.0 in	
	7:28 AM	72 F	70 F	93 %	CALM	0 mph	0 mph	29.85 in	0.0 in	
4/17/2021	7:53 PM	76 F	69 F	79 %	WSW	10 mph	0 mph	29.85 in	0.0 in	
	8:53 PM	77 F	70 F	79 %	W	6 mph	0 mph	29.87 in	0.0 in	
	9:53 PM	74 F	70 F	87 %	SW	5 mph	0 mph	29.87 in	0.0 in	
	10:53 PM	73 F	70 F	90 %	SW	5 mph	0 mph	29.89 in	0.0 in	
	11:53 PM	73 F	70 F	90 %	SW	3 mph	0 mph	29.89 in	0.0 in	
4/18/2021	12:53 AM	73 F	69 F	87 %	CALM	0 mph	0 mph	29.89 in	0.0 in	
	1:53 AM	71 F	68 F	90 %	CALM	0 mph	0 mph	29.90 in	0.0 in	Evening doesn't meet weather conditions, Stations 12, 13, 16-20.
	2:53 AM	71 F	68 F	90 %	CALM	0 mph	0 mph	29.89 in	0.0 in	
	3:53 AM	71 F	68 F	90 %	SSE	3 mph	0 mph	29.89 in	0.0 in	
	4:53 AM	70 F	68 F	93 %	CALM	0 mph	0 mph	29.89 in	0.0 in	
	5:53 AM	70 F	67 F	90 %	SSE	3 mph	0 mph	29.89 in	0.0 in	
	6:53 AM	72 F	69 F	91 %	S	6 mph	0 mph	29.91 in	0.0 in	
	7:53 AM	72 F	70 F	93 %	SSE	7 mph	0 mph	29.92 in	0.0 in	
4/18/2021	7:53 PM	80 F	70 F	71 %	SW	9 mph	0 mph	29.87 in	0.0 in	
	8:53 PM	78 F	71 F	79 %	SW	9 mph	0 mph	29.89 in	0.0 in	
	9:53 PM	77 F	72 F	84 %	SW	8 mph	0 mph	29.91 in	0.0 in	
	10:53 PM	77 F	72 F	84 %	SW	6 mph	0 mph	29.92 in	0.0 in	
	11:53 PM	78 F	73 F	84 %	SSW	7 mph	0 mph	29.91 in	0.0 in	
4/19/2021	12:53 AM	78 F	71 F	79 %	S	7 mph	0 mph	29.90 in	0.0 in	
	1:53 AM	78 F	73 F	84 %	SSW	8 mph	0 mph	29.89 in	0.0 in	Night 3, Stations 12, 13, 16-20.
	2:53 AM	78 F	73 F	84 %	SW	8 mph	0 mph	29.88 in	0.0 in	
	3:53 AM	79 F	73 F	82 %	S	10 mph	0 mph	29.83 in	0.0 in	
	4:53 AM	78 F	72 F	81 %	S	10 mph	0 mph	29.82 in	0.0 in	
	5:53 AM	78 F	72 F	81 %	SSW	12 mph	0 mph	29.82 in	0.0 in	
	6:53 AM	78 F	73 F	84 %	SW	16 mph	0 mph	29.85 in	0.0 in	
	7:53 AM	79 F	73 F	82 %	SW	15 mph	0 mph	29.86 in	0.0 in	
4/19/2021	7:53 PM	77 F	73 F	88 %	S	7 mph	0 mph	29.88 in	0.0 in	
	8:53 PM	76 F	72 F	87 %	S	6 mph	0 mph	29.89 in	0.0 in	
	9:53 PM	75 F	72 F	90 %	CALM	0 mph	0 mph	29.90 in	0.0 in	
	10:53 PM	74 F	72 F	93 %	CALM	0 mph	0 mph	29.90 in	0.0 in	
	11:53 PM	74 F	71 F	91 %	CALM	0 mph	0 mph	29.91 in	0.0 in	
4/20/2021	12:53 AM	72 F	70 F	93 %	E	3 mph	0 mph	29.91 in	0.0 in	
	1:53 AM	72 F	70 F	93 %	SE	5 mph	0 mph	29.90 in	0.0 in	
	2:53 AM	73 F	71 F	93 %	SSE	7 mph	0 mph	29.89 in	0.0 in	Night 4, Stations 12, 13, 16-20.
	3:53 AM	73 F	70 F	90 %	SW	3 mph	0 mph	29.89 in	0.0 in	
	4:53 AM	73 F	70 F	90 %	S	5 mph	0 mph	29.89 in	0.0 in	
	5:41 AM	73 F	69 F	87 %	S	8 mph	0 mph	29.90 in	0.0 in	
	5:53 AM	72 F	69 F	91 %	SSE	9 mph	0 mph	29.90 in	0.0 in	
	6:50 AM	72 F	68 F	88 %	SSE	8 mph	0 mph	29.90 in	0.0 in	
	6:53 AM	72 F	68 F	87 %	S	7 mph	0 mph	29.91 in	0.0 in	
	7:39 AM	72 F	69 F	91 %	S	9 mph	0 mph	29.90 in	0.0 in	
	7:53 AM	72 F	69 F	91 %	S	9 mph	0 mph	29.90 in	0.0 in	
4/20/2021	7:53 PM	76 F	69 F	79 %	WSW	8 mph	0 mph	29.88 in	0.0 in	
	8:53 PM	75 F	69 F	82 %	WSW	6 mph	0 mph	29.91 in	0.0 in	
	9:53 PM	75 F	68 F	79 %	W	6 mph	0 mph	29.94 in	0.0 in	
	10:53 PM	72 F	68 F	87 %	SW	3 mph	0 mph	29.94 in	0.0 in	
	11:53 PM	73 F	69 F	87 %	SSW	6 mph	0 mph	29.95 in	0.0 in	
4/21/2021	12:53 AM	71 F	68 F	90 %	SSW	3 mph	0 mph	29.95 in	0.0 in	
	1:53 AM	72 F	69 F	91 %	CALM	0 mph	0 mph	29.93 in	0.0 in	Night 5, Stations 12, 13, 16-20.
	2:53 AM	71 F	68 F	90 %	S	5 mph	0 mph	29.92 in	0.0 in	
	3:13 AM	71 F	69 F	93 %	CALM	0 mph	0 mph	29.93 in	0.0 in	
	3:37 AM	72 F	69 F	91 %	CALM	0 mph	0 mph	29.93 in	0.0 in	
	3:53 AM	72 F	70 F	93 %	CALM	0 mph	0 mph	29.93 in	0.0 in	
	4:48 AM	73 F	70 F	88 %	CALM	0 mph	0 mph	29.93 in	0.0 in	

Appendix B. NOAA National Weather Service Data

Date	Time	Temperature	Dew Point	Humidity	Wind	Wind Speed	Wind Gust	Pressure	Precipitation	Description
	4:53 AM	73 F	70 F	90 %	SSE	5 mph	0 mph	29.93 in	0.0 in	
	5:53 AM	72 F	69 F	91 %	CALM	0 mph	0 mph	29.93 in	0.0 in	
	6:53 AM	72 F	70 F	93 %	CALM	0 mph	0 mph	29.93 in	0.0 in	Night 5, Stations 12, 13, 16-20.
	7:07 AM	72 F	70 F	93 %	S	6 mph	0 mph	29.93 in	0.0 in	
	7:19 AM	73 F	70 F	90 %	CALM	0 mph	0 mph	29.94 in	0.0 in	
	7:27 AM	72 F	70 F	93 %	N	8 mph	0 mph	29.95 in	0.0 in	
4/21/2021	7:53 PM	75 F	64 F	69 %	WNW	8 mph	0 mph	29.96 in	0.0 in	
	8:53 PM	75 F	63 F	66 %	NW	8 mph	0 mph	29.97 in	0.0 in	
	9:53 PM	73 F	63 F	71 %	NNW	5 mph	0 mph	29.97 in	0.0 in	
	10:53 PM	73 F	61 F	66 %	CALM	0 mph	0 mph	30.00 in	0.0 in	
	11:53 PM	71 F	61 F	70 %	NW	3 mph	0 mph	30.01 in	0.0 in	
4/22/2021	12:53 AM	70 F	61 F	73 %	NW	3 mph	0 mph	30.00 in	0.0 in	
	1:53 AM	69 F	58 F	68 %	NNW	3 mph	0 mph	30.00 in	0.0 in	Night 6, Stations 12, 13, 16-20.
	2:53 AM	68 F	58 F	70 %	NNW	6 mph	0 mph	29.99 in	0.0 in	
	3:53 AM	68 F	58 F	70 %	NNW	3 mph	0 mph	29.98 in	0.0 in	
	4:53 AM	67 F	58 F	73 %	NNW	7 mph	0 mph	29.99 in	0.0 in	
	5:53 AM	67 F	58 F	73 %	N	6 mph	0 mph	30.00 in	0.0 in	
	6:53 AM	66 F	58 F	75 %	N	7 mph	0 mph	30.01 in	0.0 in	
	7:53 AM	67 F	59 F	76 %	N	5 mph	0 mph	30.03 in	0.0 in	
4/22/2021	7:53 PM	79 F	60 F	52 %	NNW	6 mph	0 mph	29.99 in	0.0 in	
	8:33 PM	77 F	62 F	60 %	NE	5 mph	0 mph	30.00 in	0.0 in	
	8:53 PM	77 F	62 F	60 %	VAR	5 mph	0 mph	30.01 in	0.0 in	
	9:53 PM	74 F	63 F	68 %	E	7 mph	0 mph	30.04 in	0.0 in	
	10:53 PM	72 F	63 F	73 %	ENE	9 mph	0 mph	30.06 in	0.0 in	
	11:53 PM	70 F	64 F	81 %	E	10 mph	0 mph	30.05 in	0.0 in	
4/23/2021	12:53 AM	69 F	64 F	84 %	ENE	10 mph	0 mph	30.04 in	0.0 in	
	1:53 AM	67 F	62 F	84 %	ENE	8 mph	0 mph	30.04 in	0.0 in	
	2:53 AM	66 F	61 F	84 %	ENE	7 mph	0 mph	30.02 in	0.0 in	
	3:53 AM	65 F	61 F	87 %	ENE	9 mph	0 mph	30.01 in	0.0 in	Evening doesn't meet weather conditions, Station 22.
	4:44 AM	64 F	61 F	90 %	NE	7 mph	0 mph	30.01 in	0.0 in	
	4:53 AM	64 F	61 F	90 %	NE	7 mph	0 mph	30.01 in	0.0 in	
	5:36 AM	65 F	62 F	90 %	NE	10 mph	0 mph	30.02 in	0.0 in	
	5:53 AM	65 F	62 F	90 %	NE	8 mph	0 mph	30.03 in	0.0 in	
	6:53 AM	64 F	62 F	93 %	NE	8 mph	0 mph	30.05 in	0.0 in	
	7:19 AM	64 F	61 F	90 %	NE	6 mph	0 mph	30.06 in	0.0 in	
	7:43 AM	65 F	62 F	90 %	ENE	7 mph	0 mph	30.06 in	0.0 in	
	7:53 AM	65 F	62 F	90 %	ENE	7 mph	0 mph	30.07 in	0.0 in	
4/23/2021	7:53 PM	80 F	64 F	58 %	E	9 mph	0 mph	29.99 in	0.0 in	
	8:53 PM	78 F	65 F	64 %	E	13 mph	0 mph	30.01 in	0.0 in	
	9:53 PM	76 F	65 F	69 %	E	12 mph	0 mph	30.02 in	0.0 in	
	10:53 PM	74 F	65 F	73 %	E	14 mph	0 mph	30.03 in	0.0 in	
	11:53 PM	73 F	65 F	76 %	E	12 mph	0 mph	30.03 in	0.0 in	
4/24/2021	12:53 AM	72 F	65 F	78 %	E	9 mph	0 mph	30.01 in	0.0 in	
	1:53 AM	71 F	66 F	84 %	E	9 mph	0 mph	30.00 in	0.0 in	Evening doesn't meet weather conditions, Station 22.
	2:53 AM	71 F	66 F	84 %	E	8 mph	0 mph	29.97 in	0.0 in	
	3:53 AM	70 F	66 F	87 %	E	7 mph	0 mph	29.96 in	0.0 in	
	4:53 AM	70 F	66 F	87 %	ESE	8 mph	0 mph	29.95 in	0.0 in	
	5:53 AM	70 F	66 F	87 %	ESE	8 mph	0 mph	29.94 in	0.0 in	
	6:53 AM	71 F	67 F	87 %	SE	9 mph	0 mph	29.95 in	0.0 in	
	7:53 AM	71 F	67 F	87 %	SE	8 mph	0 mph	29.96 in	0.0 in	
4/24/2021	7:53 PM	80 F	71 F	74 %	SW	9 mph	0 mph	29.90 in	0.0 in	
	7:56 PM	80 F	71 F	74 %	SW	12 mph	0 mph	29.90 in	0.0 in	
	8:53 PM	78 F	71 F	79 %	SW	7 mph	0 mph	29.90 in	0.0 in	
	9:53 PM	77 F	71 F	82 %	SSW	5 mph	0 mph	29.91 in	0.0 in	
	10:53 PM	77 F	71 F	82 %	S	6 mph	0 mph	29.91 in	0.0 in	
	11:53 PM	76 F	71 F	85 %	SSW	8 mph	0 mph	29.91 in	0.0 in	
4/25/2021	12:53 AM	76 F	70 F	82 %	SSW	6 mph	0 mph	29.90 in	0.0 in	
	1:53 AM	75 F	70 F	84 %	SSW	5 mph	0 mph	29.89 in	0.0 in	Evening doesn't meet weather conditions, Station 22.
	2:53 AM	75 F	71 F	87 %	SSW	6 mph	0 mph	29.87 in	0.0 in	
	3:53 AM	75 F	72 F	90 %	SSW	6 mph	0 mph	29.86 in	0.0 in	
	4:53 AM	74 F	72 F	93 %	SW	3 mph	0 mph	29.86 in	0.0 in	
	5:53 AM	74 F	72 F	93 %	SW	3 mph	0 mph	29.87 in	0.0 in	
	6:53 AM	75 F	73 F	94 %	WSW	7 mph	0 mph	29.88 in	0.0 in	
	7:44 AM	77 F	74 F	90 %	WSW	6 mph	0 mph	29.90 in	0.0 in	
	7:53 AM	77 F	74 F	90 %	WSW	7 mph	0 mph	29.90 in	0.0 in	
4/25/2021	7:53 PM	80 F	71 F	74 %	W	7 mph	0 mph	29.89 in	0.0 in	
	8:53 PM	79 F	72 F	79 %	WNW	3 mph	0 mph	29.90 in	0.0 in	
	9:53 PM	78 F	72 F	81 %	W	5 mph	0 mph	29.92 in	0.0 in	
	10:53 PM	77 F	72 F	84 %	WNW	3 mph	0 mph	29.94 in	0.0 in	
	11:53 PM	76 F	72 F	87 %	CALM	0 mph	0 mph	29.94 in	0.0 in	
4/26/2021	12:53 AM	76 F	71 F	85 %	WNW	3 mph	0 mph	29.94 in	0.0 in	
	1:53 AM	74 F	71 F	91 %	NNW	6 mph	0 mph	29.92 in	0.0 in	Night 1, Station 22.
	2:53 AM	73 F	67 F	81 %	N	6 mph	0 mph	29.92 in	0.0 in	
	3:53 AM	71 F	64 F	78 %	N	8 mph	0 mph	29.92 in	0.0 in	
	4:53 AM	68 F	60 F	76 %	NNE	12 mph	18 mph	29.93 in	0.0 in	
	5:53 AM	67 F	60 F	79 %	NNE	5 mph	0 mph	29.93 in	0.0 in	
	6:53 AM	65 F	60 F	84 %	NNE	6 mph	0 mph	29.96 in	0.0 in	
	7:53 AM	67 F	60 F	79 %	NE	7 mph	0 mph	29.97 in	0.0 in	
4/26/2021	7:53 PM	80 F	58 F	47 %	E	13 mph	24 mph	29.99 in	0.0 in	
	8:53 PM	77 F	59 F	54 %	E	12 mph	0 mph	30.01 in	0.0 in	
	9:53 PM	75 F	60 F	60 %	E	8 mph	0 mph	30.03 in	0.0 in	
	10:53 PM	72 F	60 F	66 %	E	7 mph	0 mph	30.04 in	0.0 in	
	11:53 PM	70 F	60 F	71 %	E	6 mph	0 mph	30.05 in	0.0 in	
4/27/2021	12:53 AM	70 F	60 F	71 %	E	7 mph	0 mph	30.04 in	0.0 in	
	1:53 AM	69 F	61 F	75 %	E	7 mph	0 mph	30.03 in	0.0 in	Evening doesn't meet weather conditions, Station 22.
	2:53 AM	68 F	62 F	81 %	ENE	6 mph	0 mph	30.02 in	0.0 in	
	3:53 AM	67 F	62 F	84 %	ENE	5 mph	0 mph	30.02 in	0.0 in	
	4:53 AM	65 F	61 F	87 %	ENE	5 mph	0 mph	30.02 in	0.0 in	
	5:53 AM	66 F	61 F	84 %	NE	6 mph	0 mph	30.03 in	0.0 in	
	6:53 AM	64 F	61 F	90 %	E	7 mph	0 mph	30.04 in	0.0 in	
	7:53 AM	69 F	63 F	81 %	ENE	8 mph	0 mph	30.07 in	0.0 in	
4/27/2021	7:53 PM	80 F	60 F	50 %	ENE	14 mph	0 mph	30.01 in	0.0 in	
	8:53 PM	77 F	61 F	58 %	E	12 mph	0 mph	30.03 in	0.0 in	Evening doesn't meet weather conditions, Station 22.

Appendix B. NOAA National Weather Service Data

Date	Time	Temperature	Dew Point	Humidity	Wind	Wind Speed	Wind Gust	Pressure	Precipitation	Description
	9:53 PM	75 F	59 F	57 %	E	8 mph	0 mph	30.05 in	0.0 in	
	10:53 PM	72 F	58 F	61 %	E	10 mph	0 mph	30.06 in	0.0 in	
	11:53 PM	70 F	58 F	65 %	E	8 mph	0 mph	30.07 in	0.0 in	
4/28/2021	12:53 AM	68 F	60 F	76 %	E	6 mph	0 mph	30.07 in	0.0 in	
	1:53 AM	68 F	61 F	78 %	E	7 mph	0 mph	30.06 in	0.0 in	
	2:53 AM	67 F	61 F	81 %	E	8 mph	0 mph	30.04 in	0.0 in	Evening doesn't meet weather conditions, Station 22.
	3:53 AM	67 F	62 F	84 %	ENE	8 mph	0 mph	30.04 in	0.0 in	
	4:53 AM	66 F	62 F	87 %	ENE	7 mph	0 mph	30.04 in	0.0 in	
	5:53 AM	66 F	62 F	87 %	E	5 mph	0 mph	30.04 in	0.0 in	
	6:53 AM	67 F	62 F	84 %	E	7 mph	0 mph	30.05 in	0.0 in	
	7:53 AM	70 F	62 F	76 %	E	9 mph	0 mph	30.07 in	0.0 in	
4/28/2021	7:53 PM	82 F	63 F	52 %	W	5 mph	0 mph	29.99 in	0.0 in	
	8:53 PM	80 F	63 F	56 %	S	6 mph	0 mph	30.00 in	0.0 in	
	9:53 PM	78 F	60 F	54 %	ESE	10 mph	0 mph	30.02 in	0.0 in	
	10:53 PM	75 F	61 F	62 %	SE	7 mph	0 mph	30.03 in	0.0 in	
	11:53 PM	73 F	61 F	66 %	ESE	6 mph	0 mph	30.03 in	0.0 in	
4/29/2021	12:53 AM	71 F	62 F	73 %	E	6 mph	0 mph	30.03 in	0.0 in	
	1:53 AM	70 F	62 F	76 %		0 mph	0 mph	30.01 in	0.0 in	Evening doesn't meet weather conditions, Station 22.
	2:53 AM	69 F	62 F	78 %	SE	3 mph	0 mph	30.00 in	0.0 in	
	3:53 AM	67 F	62 F	84 %	E	5 mph	0 mph	29.99 in	0.0 in	
	4:53 AM	67 F	63 F	87 %	E	5 mph	0 mph	29.99 in	0.0 in	
	5:53 AM	67 F	63 F	87 %	ENE	3 mph	0 mph	29.99 in	0.0 in	
	6:53 AM	66 F	63 F	90 %	CALM	0 mph	0 mph	30.00 in	0.0 in	
	7:53 AM	69 F	66 F	90 %	ESE	3 mph	0 mph	30.01 in	0.0 in	
4/29/2021	7:53 PM	80 F	70 F	71 %	WSW	12 mph	0 mph	29.98 in	0.0 in	
	8:53 PM	80 F	72 F	76 %	WNW	3 mph	0 mph	30.00 in	0.0 in	
	9:53 PM	79 F	72 F	79 %	W	3 mph	0 mph	30.03 in	0.0 in	
	10:53 PM	79 F	72 F	79 %	WNW	3 mph	0 mph	30.04 in	0.0 in	
	11:53 PM	79 F	72 F	79 %	CALM	0 mph	0 mph	30.04 in	0.0 in	
4/30/2021	12:53 AM	77 F	71 F	82 %	CALM	0 mph	0 mph	30.03 in	0.0 in	
	1:53 AM	76 F	71 F	85 %	SE	3 mph	0 mph	30.01 in	0.0 in	Evening doesn't meet weather conditions, Station 22. Station 12
	2:53 AM	75 F	71 F	87 %	E	5 mph	0 mph	30.01 in	0.0 in	redeployed on this date.
	3:53 AM	75 F	70 F	84 %	CALM	0 mph	0 mph	30.00 in	0.0 in	
	4:49 AM	73 F	70 F	88 %	CALM	0 mph	0 mph	29.99 in	0.0 in	
	4:53 AM	74 F	70 F	87 %	CALM	0 mph	0 mph	29.99 in	0.0 in	
	5:53 AM	73 F	70 F	90 %	CALM	0 mph	0 mph	29.99 in	0.0 in	
	6:53 AM	73 F	70 F	90 %	CALM	0 mph	0 mph	30.01 in	0.0 in	
	7:53 AM	75 F	71 F	87 %	CALM	0 mph	0 mph	30.02 in	0.0 in	
4/30/2021	7:53 PM	80 F	70 F	71 %	NW	6 mph	0 mph	29.97 in	0.0 in	
	8:53 PM	78 F	68 F	71 %	NW	6 mph	0 mph	29.98 in	0.0 in	
	9:53 PM	77 F	67 F	71 %	NW	5 mph	0 mph	29.99 in	0.0 in	
	10:53 PM	76 F	66 F	71 %	CALM	0 mph	0 mph	29.99 in	0.0 in	
	11:53 PM	74 F	64 F	71 %	NNW	6 mph	0 mph	29.99 in	0.0 in	
5/1/2021	12:53 AM	73 F	64 F	73 %	NNW	3 mph	0 mph	29.99 in	0.0 in	
	1:53 AM	72 F	65 F	78 %	N	5 mph	0 mph	29.97 in	0.0 in	Night 2, Station 22 and night 1 Station 12.
	2:53 AM	71 F	65 F	81 %	NNW	3 mph	0 mph	29.95 in	0.0 in	
	3:53 AM	70 F	65 F	84 %	CALM	0 mph	0 mph	29.94 in	0.0 in	
	4:53 AM	68 F	65 F	90 %	CALM	0 mph	0 mph	29.95 in	0.0 in	
	5:53 AM	66 F	63 F	90 %	CALM	0 mph	0 mph	29.96 in	0.0 in	
	6:53 AM	66 F	62 F	87 %	CALM	0 mph	0 mph	29.98 in	0.0 in	
	7:53 AM	72 F	67 F	84 %	CALM	0 mph	0 mph	30.00 in	0.0 in	
5/1/2021	7:53 PM	81 F	68 F	65 %	W	7 mph	0 mph	29.92 in	0.0 in	
	8:53 PM	78 F	70 F	76 %	W	3 mph	0 mph	29.93 in	0.0 in	
	9:53 PM	77 F	69 F	76 %	WNW	3 mph	0 mph	29.95 in	0.0 in	
	10:53 PM	77 F	70 F	79 %	WNW	3 mph	0 mph	29.95 in	0.0 in	
	11:53 PM	76 F	70 F	82 %	CALM	0 mph	0 mph	29.95 in	0.0 in	
5/2/2021	12:53 AM	74 F	69 F	85 %	SE	3 mph	0 mph	29.95 in	0.0 in	Night 3, Station 22 and night 2 Station 12.
	1:53 AM	74 F	69 F	85 %	CALM	0 mph	0 mph	29.93 in	0.0 in	
	2:53 AM	72 F	69 F	91 %	CALM	0 mph	0 mph	29.91 in	0.0 in	
	3:53 AM	73 F	69 F	87 %	CALM	0 mph	0 mph	29.92 in	0.0 in	
	4:53 AM	71 F	68 F	90 %	CALM	0 mph	0 mph	29.93 in	0.0 in	
	5:53 AM	70 F	68 F	93 %	CALM	0 mph	0 mph	29.93 in	0.0 in	
	6:53 AM	69 F	67 F	93 %	E	3 mph	0 mph	29.95 in	0.0 in	
	7:53 AM	72 F	70 F	93 %	SE	5 mph	0 mph	29.96 in	0.0 in	
5/2/2021	7:53 PM	80 F	71 F	74 %	SW	9 mph	0 mph	29.90 in	0.0 in	
	8:53 PM	78 F	70 F	76 %	SW	7 mph	0 mph	29.91 in	0.0 in	
	9:53 PM	78 F	71 F	79 %	WSW	6 mph	0 mph	29.93 in	0.0 in	
	10:53 PM	78 F	71 F	79 %	SW	3 mph	0 mph	29.94 in	0.0 in	
	11:53 PM	75 F	70 F	84 %	E	3 mph	0 mph	29.94 in	0.0 in	
5/3/2021	12:53 AM	75 F	71 F	87 %	SE	5 mph	0 mph	29.93 in	0.0 in	
	1:53 AM	74 F	70 F	87 %	SSE	6 mph	0 mph	29.93 in	0.0 in	Night 4, Station 22 and night 3 Station 12.
	2:53 AM	74 F	68 F	82 %	SSE	10 mph	0 mph	29.93 in	0.0 in	
	3:53 AM	74 F	68 F	82 %	SSE	7 mph	0 mph	29.93 in	0.0 in	
	4:53 AM	73 F	68 F	84 %	SE	7 mph	0 mph	29.92 in	0.0 in	
	5:53 AM	73 F	68 F	84 %	SE	7 mph	0 mph	29.93 in	0.0 in	
	6:53 AM	72 F	69 F	91 %	SSE	6 mph	0 mph	29.94 in	0.0 in	
	7:53 AM	74 F	69 F	85 %	SE	6 mph	0 mph	29.95 in	0.0 in	
5/3/2021	7:53 PM	82 F	72 F	71 %	WSW	9 mph	0 mph	29.91 in	0.0 in	
	8:53 PM	81 F	72 F	74 %	SW	9 mph	0 mph	29.94 in	0.0 in	
	9:53 PM	79 F	73 F	82 %	SW	5 mph	0 mph	29.96 in	0.0 in	
	10:53 PM	78 F	73 F	84 %	ENE	5 mph	0 mph	29.98 in	0.0 in	
	11:53 PM	77 F	72 F	84 %	CALM	0 mph	0 mph	29.98 in	0.0 in	
	12:53 AM	77 F	72 F	84 %	SSE	6 mph	0 mph	29.97 in	0.0 in	
	1:53 AM	76 F	72 F	87 %	SE	7 mph	0 mph	29.97 in	0.0 in	Night 5, Station 22 and night 4 Station 12.
	2:53 AM	75 F	71 F	87 %	SE	7 mph	0 mph	29.95 in	0.0 in	
	3:53 AM	75 F	72 F	90 %	SSE	7 mph	0 mph	29.95 in	0.0 in	
	4:53 AM	75 F	72 F	90 %	SE	5 mph	0 mph	29.96 in	0.0 in	
	5:55 AM	75 F	72 F	90 %	SE	3 mph	0 mph	29.97 in	0.0 in	
	6:53 AM	75 F	72 F	90 %	CALM	0 mph	0 mph	29.99 in	0.0 in	

Appendix C
Acoustic Data Summary

Appendix C. Acoustic Data Summary

	Kaleidoscope Pro Auto ID'd WAV Files														Manually Verified WAV
	Total number of WAV files recorded	*Number of WAV files classifed as noise*	*Number of WAV files not assigned auto ID*	*Number of WAV files auto ID'd to species level*	Big brown bat	Eastern red bat	Hoary bat	Northern yellow bat	Seminole bat	Southeastern myotis	Evening bat	Tricolored bat	Brazilian free-tailed bat	Florida bonneted bat	**Florida bonneted bat**
Station 1	*9,098*	*996*	*1,977*	*6,125*	1,484	5	621	1,234	40	0	145	225	2,345	26	**4**
Station 2	*11,147*	*1,213*	*2,618*	*7,316*	2,091	12	583	1,258	32	0	83	83	3,151	23	**7**
Station 3	*16,720*	*2,327*	*3,641*	*10,752*	2,379	14	1,004	3,309	36	0	108	59	3,811	32	**4**
Station 4	*12,447*	*4,198*	*2,283*	*5,966*	1,226	10	401	1,376	85	0	320	54	2,437	57	**6**
Station 5	*11,427*	*1,890*	*2,258*	*7,279*	1,610	22	420	1,730	50	0	290	156	2,980	21	**9**
Station 6	*8,745*	*895*	*2,271*	*5,579*	879	12	874	909	101	0	263	99	2,432	10	**1**
Station 7	*10,513*	*7,524*	*819*	*2,170*	135	5	296	268	30	0	72	52	1,310	2	**1**
Station 8	*21,153*	*7,145*	*3,694*	*10,314*	1,289	28	660	1,353	46	0	120	52	6,757	9	**3**
Station 9	*10,651*	*471*	*2,693*	*7,487*	2,514	12	795	350	31	0	128	55	3,592	10	**5**
Station 10	*5,567*	*810*	*1,207*	*3,550*	287	7	379	378	74	0	86	255	2,074	10	**2**
Station 11	*5,527*	*944*	*1,232*	*3,351*	357	9	337	245	48	0	179	140	2,000	36	**2**
Station 12	*5,833*	*433*	*1,249*	*4,151*	175	3	845	227	158	0	87	46	2,604	6	**0**
Station 13	*41*	*5*	*18*	*18*	4	0	0	0	1	0	10	3	0	0	**0**
Station 14	*7,222*	*1,057*	*1,691*	*4,474*	322	6	909	202	77	0	96	29	2,776	57	**0**
Station 15	*7,030*	*987*	*1,522*	*4,521*	285	5	769	244	157	0	146	93	2,819	3	**0**
Station 16	*8,338*	*977*	*1,040*	*6,321*	49	1	681	94	5	0	3	1	5,462	25	**0**
Station 17	*9,291*	*992*	*2,101*	*6,198*	198	20	463	756	178	0	465	8	4,109	1	**0**
Station 18	*8,586*	*2,781*	*924*	*4,881*	51	1	415	168	26	0	43	0	4,164	13	**0**
Station 19	*7,993*	*381*	*1,431*	*6,181*	169	6	586	370	81	0	53	4	4,867	45	**0**
Station 20	*5,801*	*829*	*1,093*	*3,879*	92	18	389	222	161	0	106	1	2,860	30	**0**
Station 21	*6,051*	*528*	*1,518*	*4,005*	552	26	610	282	140	0	73	9	2,288	26	**0**
Station 22	*540*	*12*	*161*	*367*	59	5	0	202	17	0	81	0	3	0	**0**
Station 23	*7,065*	*420*	*1,421*	*5,224*	321	40	626	365	128	0	113	14	3,567	50	**0**
Station 24	*6,859*	*1,449*	*1,218*	*4,192*	296	0	521	392	45	0	56	12	2,852	18	**0**
Station 25	*1,960*	*54*	*501*	*1,405*	367	8	58	735	24	0	143	0	70	0	**0**

Note: The following species were not to included in Kaleidoscope Pro analysis due to rarity in Floria: Silver haired bat, Fringed myotis, Palla's mastiff bat, gray myotis, and little brown myotis.

Appendix G-2
Florida Bonneted Bat Consultation Key

United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960
October 22, 2019

Shawn Zinszer
U.S. Army Corps of Engineers
Post Office Box 4970
Jacksonville, Florida 32232-0019

Subject: Consultation Key for the Florida bonneted bat; 04EF2000-2014-I-0320-R001

Dear Mr. Zinszer:

This letter replaces the December 2013, Florida bonneted bat guidelines provided to the U.S. Army Corps of Engineers (Corps) to assist your agency with effect determinations within the range of the Florida bonneted bat (*Eumops floridanus*). This October 2019 revision supersedes all prior versions. The enclosed *Florida Bonneted Bat Consultation Guidelines* and incorporated *Florida Bonneted Bat Consultation Key* (Key) are provided pursuant to the U.S. Fish and Wildlife Service's (Service) authorities under the Endangered Species Act of 1973, as amended (Act) (87 Stat. 884; 16 U.S.C.1531 *et seq.*). This letter, guidelines, and Key have been assigned Service Consultation Code: 41420- 04EF2000-2014-I-0320-R001.

The purpose of the guidelines and Key is to aid the Corps (or other Federal action agency) in making appropriate effect determinations for the Florida bonneted bat under section 7 of the Act, and streamline informal consultation with the Service for the Florida bonneted bat when the proposed action is consistent with the Key. There is no requirement to use the Key. There will be cases when the use of the Key is not appropriate. These include, but are not limited to: where project specific information is outside of the scope of the Key, applicants do not wish to implement the identified survey or best management practices, or if there is new biological information about the species. In these cases, we recommend the Corps (or other Federal action agency) initiate traditional consultation pursuant to section 7 of the Act, and identify that consultation is being requested outside of the Key.

This Key uses type of habitat (*i.e*, roosting or foraging), survey results, and project size as the basis for making determinations of "may affect, but is not likely to adversely affect" (MANLAA) and "may affect, and is likely to adversely affect" (LAA). The Key is structured to focus on the type(s) of habitat that will be affected by a project. When proposed project areas provide features that could support roosting of Florida bonneted bats, it is considered roosting habitat. If evaluation of roosting habitat determines that roosting is not likely, then the area is subsequently evaluated for its value to the species as foraging habitat.

Roosting habitat

The guidelines describe the features of roosting habitat. When a project is proposed in roosting habitat, the likelihood that roosting is occurring is evaluated through surveys (*i.e.*, full acoustic or limited roost). When a roost is expected and the proposed activity will affect that roost, formal consultation is required. This is because the proposed activity is expected to take individuals through the destruction of the roost and the appropriate determination is that the project may affect, and is likely to adversely affect (LAA) the species. When roosting is expected, but all impacts to the roost can be avoided, and only foraging habitat (without roost structure) will be affected, the Service finds that it is reasonable to conclude that the proposed action is not likely to impair feeding, breeding, or sheltering. Thus, the proposed project may affect, but is not likely to affect the Florida bonneted bat (MANLAA).

The exception to this logic path is if the proposed action will affect more than 50 acres of foraging habitat in proximity to the roost. Under this scenario, we anticipate that the loss of the larger amount of foraging habitat near the roost could significantly impair feeding of young and overall breeding (*i.e.*, LAA). Consequently, these projects would require formal consultation to analyze the effect of the incidental take.

If the roost surveys demonstrate that roosting is not likely, the project is then evaluated for its effects to foraging habitat. Our evaluation of these actions is described below. The exception is for projects less than or equal to 5 acres if a limited roost survey is conducted. Limited roost surveys rely on peeping and visual surveys to determine whether roosting is likely. On these small projects, this survey strategy is believed to be more economical and is considered a reasonable effort to evaluate the potential for roosting. The Service acknowledges that this approach is less reliable in evaluating the likelihood of roosting when it is not combined with acoustic surveys. Therefore, when limited roost surveys are conducted for projects that are less than or equal to 5 acres in size and the determination is that roosting is not likely, we conclude that the proposed project may affect, but is not likely to adversely affect the species (MANLAA).

Foraging habitat

The guidelines describe the features of foraging habitat. Data informing the home range size of the Florida bonneted bats is limited. Global Positioning System (GPS) and radio-telemetry data for Florida bonneted bats documents that they move large distances and likely have large home ranges. Data from recovered GPS satellite tags on Florida bonneted bats tagged at Babcock-Webb Wildlife Management Area (BWWMA) found the maximum distance detected from a capture site was 24.2 mi (38.9 km); the greatest path length travelled in a single night was 56.3 mi (90.6 km) (Ober 2016; Webb 2018a-b). At BWWMA, researchers found that most individual locations were within one mile of the roost (point of capture) (Ober 2015). Additional data collected during the month of December documented the mean maximum distance Florida bonneted bats (n=8) with tags traveled from the roost was 9.5 mi (Webb 2018b).

The Service recognizes that the movement information comes from only one site (BWWMA and vicinity), and data are from small numbers (n=20) of tagged individuals for only short periods of time (Webb 2018a-b). We expect that across the Florida bonneted bat's range differences in

habitat quality, prey availability, and other factors will result in variable habitat use and home range sizes between locations. Foraging distances and home range sizes in high quality habitats are expected to be smaller while foraging distances and home range sizes in low quality habitat would be expected to be larger. Regardless, we use these studies as our best available information to evaluate when changes to foraging habitat may have an effect on the species ability to feed, breed, and shelter and subsequently result in incidental take. When considering where most of the nightly activity was observed, we calculate a foraging area centered on a roost with a 1 mile radius would include approximately 2,000 acres, and a foraging area centered on a 9.5 mile radius would encompass approximately 181,000 acres, on any given night.

Given the Service's limited understanding of how the Florida bonneted bat moves throughout its home range and selects foraging areas, we choose to use 50 acres of habitat as a conservative estimate to when loss of foraging habitat may affect the fitness of an individual to the extent that it would impair feeding and breeding. Projects that would remove, destroy or convert less than 50 acres of Florida bonneted bat foraging habitat are expected to result in a loss of foraging opportunities; however, this decrease is not expected to significantly impair the ability of the individual to feed and breed. Consequently, projects impacting less than 50 acres of foraging habitat that implement the identified best management practices in the Key would be expected to avoid take, and the appropriate determination is that the project may affect, but is not likely to adversely affect the species (MANLAA).

Next, the Service incorporated the level of bat activity into our Key to evaluate when a foraging area may have greater value to the species. When surveys document high bat activity, we deduce that this area has increased value and importance to the species. Thus, when high bat activity is detected in parcels with greater than 50 acres of foraging habitat, we anticipate that the loss, destruction, or conversion of this habitat could significantly impair the ability of an individual to feed and breed (*i.e.*, LAA); thus formal consultation is warranted.

If surveys do not indicate high bat activity, we anticipate that loss of this additional foraging habitat may affect, but is not likely to adversely affect the species (MANLAA). This is because although the acreage is large, the area does not appear to be important at the landscape scale of nightly foraging. Therefore, its loss is not anticipated to significantly impair the ability of an individual to feed or breed.

The exception to this approach is for projects greater than 50 acres when they occur in potential roosting habitat that is not found to support roosting or high bat activity. Under this scenario, the Service concludes that the loss of the large acreage of suitable roosting habitat has the potential to significantly impair the ability of an individual to breed or shelter (*i.e.*, LAA) because the species is cavities for roosting are expected to be limited range wide and the project will impair these limited opportunities for roosting.

Determinations

The Corps (or other Federal action agency) may reach one of several determinations when using this Key. Regardless of the determination, when acoustic bat surveys have been conducted, the Service requests that these survey results are provided to our office to increase our knowledge of

the species and improve our consultation process. Surveys results and reports should be transmitted to the Service at FBBsurveyreport@fws.gov or mail electronic file to U.S. Fish and Wildlife Service, Attention Florida bonneted bat surveys, 1339 20th Street, Vero Beach, Florida 32960. When formal consultation is requested, survey results and reports should be submitted with the consultation request to verobeach@fws.gov.

No effect: If the use of the Key results in a determination of "no effect," no further consultation is necessary with the Service. The Service recommends that the Corps (or other Federal action agency) documents the pathway used to reach the determination in the project record and proceeds with other species analyses as warranted.

May Affect, Not Likely to Adversely Affect (MANLAA): In this Key we have identified two ways that consultation can conclude informally, MANLAA-P and MANLAA-C.

> **MANLAA-P**: If the use of the Key results in a determination of "MANLAA- P," the Service concurs with this determination based on the rationale provide above, and no further consultation is necessary for the effects of the proposed action on the Florida bonneted bat. The Service recommends that the Corps (or other Federal action agency) documents the pathway used to reach the determination in the project record and proceeds with other species analyses as warranted.
>
> **MANLAA-C**: If the use of the Key results in a determination of MANLAA-C, further consultation with the Service is required to confirm that the Key has been used properly, and the Service concurs with the evaluation of the survey results. Survey results should be submitted with the consultation request.

May Affect, Likely to Adversely Affect (LAA) - When the determination in the Key is "LAA" technical assistance with the Service and modifications to the proposed action may enable the project to be reevaluated and conclude with a MANLAA-C determination. Under other circumstance, "LAA" determinations will require formal consultation.

Working with the Fish and Wildlife Foundation of Florida, the Service has established a fund to support conservation and recovery for the Florida bonneted bat. Any project that has the potential to affect the Florida bonneted bat and/or its habitat is encouraged to make a voluntary contribution to this fund. If you would like additional information about how to make a contribution and how these monies are used to support Florida bonneted bat recovery please contact Ashleigh Blackford, Connie Cassler, or José Rivera at 772-562-3909.

This revised Key is effective immediately upon receipt by the Corps. Should circumstances change or new information become available regarding the Florida bonneted bat and/or implementation of the Key, the determinations herein may be reconsidered and this Key further revised or amended. We have established an email address to collect comments on the Key and the survey protocols at: FBBguidelines@fws.gov.

Thank you for your continued cooperation in the effort to conserve fish and wildlife resources. If you have any questions regarding this Key, please contact the South Florida Ecological Services Office at 772-562-3909.

Sincerely,

Roxanna Hinzman
Field Supervisor
South Florida Ecological Services

Enclosure

Cc: electronic only
Corps, Jacksonville, Florida (Dale Beter, Muriel Blaisdell, Ingrid Gilbert, Alisa Zarbo, Melinda Charles-Hogan, Susan Kaynor, Krista Sabin, John Fellows)

LITERATURE CITED

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Webb, E.N. 2018a. Email to Paula Halupa *et al.* University of Florida, Department of Wildlife Ecology and Conservation. Gainesville, Florida. April 1, 2018.

Webb, E.N. 2018b. Presentation given at Florida bonneted bat working group meeting at The Conservancy of Southwest Florida. University of Florida, Department of Wildlife Ecology and Conservation. Gainesville, Florida. May 24, 2016.

Florida Bonneted Bat Consultation Key[#]

Use the following key to evaluate potential effects to the Florida bonneted bat (FBB) from the proposed project. Refer to the Glossary as needed.

1a. Proposed project or land use change is partially or wholly within the Consultation Area (Figure 1).....**Go to 2**
1b. Proposed project or land use change is wholly outside of the Consultation Area (Figure 1).....**No Effect**

2a. Potential FBB roosting habitat exists within the project area.....**Go to 3**
2b. No potential FBB roosting habitat exists within the project area.....**Go to 13**

3a. Project size/footprint* ≤ 5 acres (2 hectares)..... **Conduct Limited Roost Survey (Appendix C)** then **Go to 4**
3b. Project size/footprint* > 5 acres (2 hectares).....**Conduct Full Acoustic/Roost Surveys (Appendix B)** then **Go to 6**

4a. Results show FBB roosting is likely .....**Go to 5**
4b. Results do not show FBB roosting is likely.....**MANLAA-P if BMPs (Appendix D) used and survey reports are submitted. Programmatic concurrence.**

5a. Project will affect roosting habitat.....**LAA[+] Further consultation with the Service required.**
5b. Project will not affect roosting habitat..... **MANLAA-C with required BMPs (Appendix D). Further consultation with the Service required.**

6a. Results show some FBB activity.....**Go to 7**
6b. Results show no FBB activity.....**No Effect**

7a. Results show FBB roosting is likely.....**Go to 8**
7b. Results do not show FBB roosting is likely.....**Go to 10**

8a. Project will not affect roosting habitat.....**Go to 9**
8b. Project will affect roosting habitat.....**LAA[+] Further consultation with the Service required.**

9a. Project will affect* > 50 acres (20 hectares) (wetlands and uplands) of foraging habitat.....**LAA[+] Further consultation with the Service required.**
9b. Project will affect* ≤ 50 acres (20 hectares) (wetlands and uplands) of foraging habitat..... **MANLAA-C with required BMPs (Appendix D). Further consultation with the Service required.**

10a. Results show high FBB activity/use.....**Go to 11**
10b. Results do not show high FBB activity/use.....**Go to 12**

11a. Project will affect* > 50 acres (20 hectares) (wetlands and uplands) of FBB habitat (roosting and/or foraging).....**LAA[+] Further consultation with the Service required.**
11b. Project will affect* ≤ 50 acres (20 hectares) (wetlands and uplands) of FBB habitat (roosting and/or foraging)..... **MANLAA-C with required BMPs (Appendix D). Further consultation with the Service required.**

12a. Project will affect* > 50 acres (20 hectares) (wetlands and uplands) of FBB habitat.....**LAA[+] Further consultation with the Service required.**
12b. Project will affect* ≤ 50 acres (20 hectares) (wetlands and uplands) of FBB habitat..... **MANLAA-P if BMPs (Appendix D) used and survey reports are submitted. Programmatic concurrence.**

13a. FBB foraging habitat exists within the project area and foraging habitat will be affected…..……..**Go to 14**

13b. FBB foraging habitat exists within the project area and foraging habitat will not be affected **OR** no FBB foraging habitat exists within the project area…..……..**No Effect**

14a. Project size* > 50 acres (20 hectares) (wetlands and uplands) ……..…….....**Go to 15**

14b. Project size* ≤ 50 acres (20 hectares) (wetlands and uplands) ……...….. **MANLAA-P if BMPs (Appendix D) used. Programmatic concurrence.**

15a. Project is within 8 miles (12.9 kilometers) of high quality potential roosting areas^……..……**Conduct Full Acoustic Survey (Appendix B) and Go to 16**

15b. Project is not within 8 miles (12.9 kilometers) of high quality potential roosting area^…….....….**MANLAA-P if BMPs (Appendix D) used. Programmatic concurrence.**

16a. Results show some FBB activity……...…….....**Go to 17**

16b. Results show no FBB activity……..…….…....**No Effect**

17a. Results show high FBB activity/use……...…...…....**LAA[+] Further consultation with the Service required.**

17b. Results do not show high FBB activity/use……..……... **MANLAA-P if BMPs (Appendix D) used and survey reports submitted. Programmatic concurrence.**

[#] If you are within the urban environment and you are renovating an existing artificial structure (with or without additional ground disturbing activities), these Guidelines do not apply. The Service is developing separate guidelines for consultation in these situations. Until the urban guidelines are complete, please contact the Service for additional guidance

*****Includes wetlands and uplands that are going to be altered along with a 250- foot (76.2- meter) buffer around these areas if the parcel is larger than the altered area.

[+]Project modifications could change the **LAA** determinations in numbers 5, 8, 9, 11, 12, and 17 to **MANLAA** determinations.

^Determining if **high quality potential roosting areas** are within 8 mi (12.9 km) of a project is intended to be a desk-top exercise looking at most recent aerial imagery, not a field exercise.

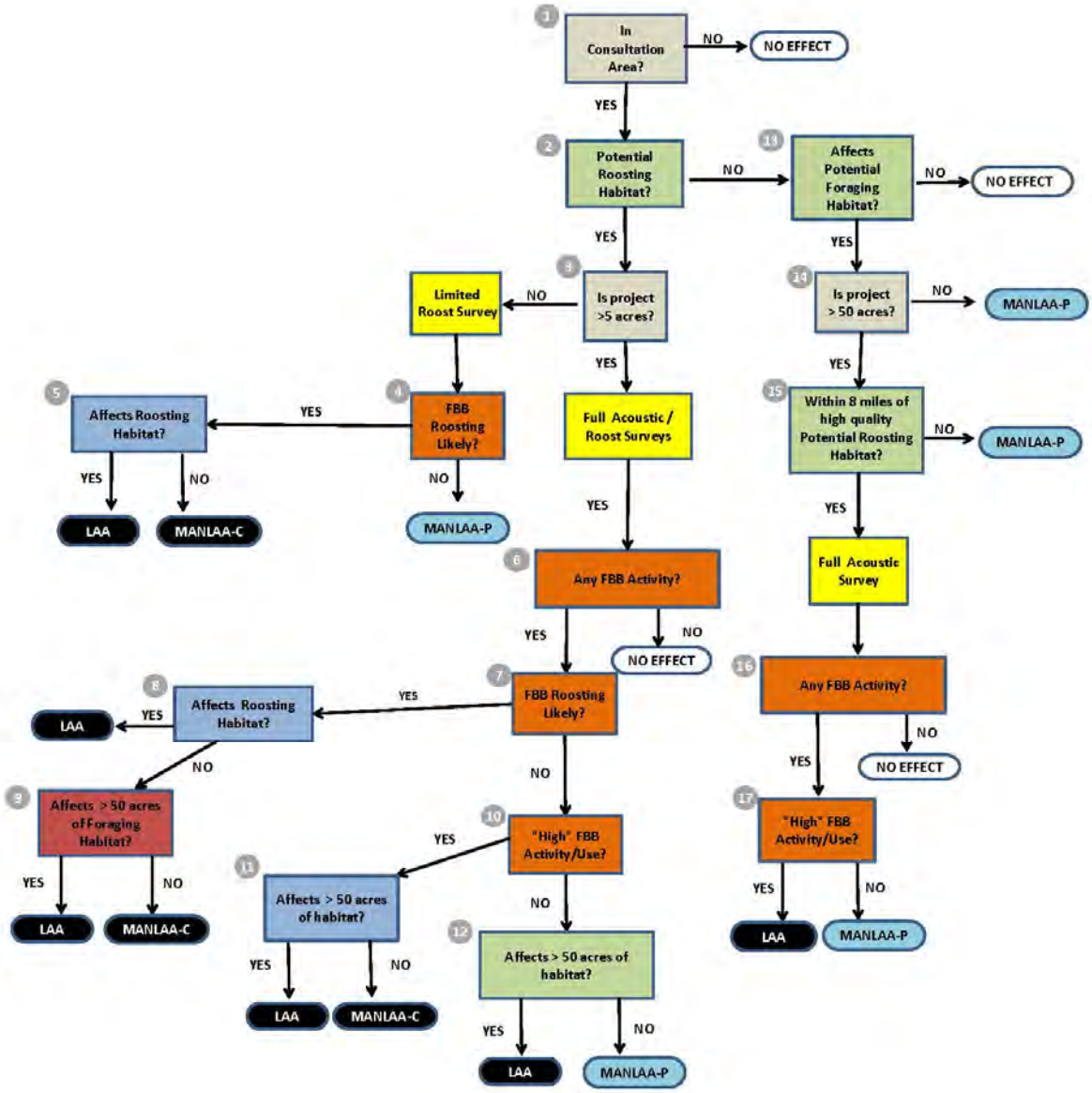


Figure 3. Florida bonneted bat Consultation Flowchart. "**No effect**" determinations do not need Service concurrence. "May affect, but not likely to adversely affect", **MANLAA-P,** in blue have programmatic concurrence through the transmittal letter of these Guidelines, and therefore no further consultation with the Service is necessary unless assistance is needed in interpreting survey results. **MANLAA-C** determinations in black require further consultation with the Service. Applicants are expected to incorporate the appropriate **BMPs** to reach a **MANLAA** determination. "May affect, and is likely to adversely affect", **LAA, (**also in black) determinations require consultation with the Service. Further consultation with the Service may identify project modifications that could change the **LAA** determinations in numbers 5, 8, 9, 11, 12, and 17 to **MANLAA** determinations. The Service requests Florida bonneted bat survey reports for all determinations.

Appendix D: Best Management Practices (BMPs) for Development Projects

Ongoing research and monitoring will continue to increase the understanding of the Florida bonneted bat and its habitat needs and will continue to inform habitat and species management recommendations. These BMPs incorporate what is known about the species and also include recommendations that are beneficial to all bat species in Florida. These BMPs are intended to provide recommendations for improving conditions for use by Florida bonneted bats, and to help conserve Florida bonneted bats that may be foraging or roosting in an area.

The BMPs required to reach a "may affect, but is not likely to adversely affect" (MANLAA) determination vary depending on the couplet from the Consultation Key used to reach that particular MANLAA. The requirements for each couplet are provided below followed by the list of BMPs. If the applicant is unable or does not want to do the required BMPs, then the Corps (or other Action Agency) will not be able to use this Guidance and formal consultation with the Service is required.

Couplet Number for MANLAA from Consultation Key	Required BMPs
4b	BMP number 1 if more than 3 months has occurred between the survey and start of the project, and any 3 BMPs out of BMPs 4 through 13
5b	BMP number 2, and any 3 BMPs out of BMPs 3 through 13
9b	BMPs number 2 and 3, and any 4 BMPs out of BMPs 5 through 13
11b	BMPs number 1 and 4, and any 4 BMPs out of BMPs 5 through 13
12b	BMP number 1, and any 3 BMPs out of BMPs 3 through 13
14b	Any 2 BMPs out of BMPs 3 through 13
15b	Any 3 BMPs out of BMPs 3 through 13
17b	Any 4 BMPs out of BMPs 3 through 13

BMPs for development, construction, and other general activities:

1. If potential roost trees or structures need to be removed, check cavities for bats within 30 days prior to removal of trees, snags, or structures. When possible, remove structure outside of breeding season (*e.g.*, January 1 – April 15). If evidence of use by any bat species is observed, discontinue removal efforts in that area and coordinate with the Service on how to proceed.
2. When using heavy equipment, establish a 250 foot (76 m) buffer around known or suspected roosts to limit disturbance to roosting bats.
3. For every 5 acres of impact, retain a minimum of 1.0 acre of native vegetation. If upland habitat is impacted, then upland habitat with native vegetation should be retained.
4. For every 5 acres of impact, retain a minimum of 0.25 acre of native vegetation. If upland habitat is impacted, then upland habitat with native vegetation should be retained..
5. Conserve open freshwater and wetland habitats to promote foraging opportunities and avoid impacting water quality. Created/restored habitat should be designed to replace the function of native habitat.

6. Conserve and/or enhance riparian habitat. A 50-ft (15.2 m) buffer is recommended around water bodies and stream edges. In cases where artificial water bodies (*i.e.,* stormwater ponds) are created, enhance edges with native plantings especially in cases in which wetland habitat was affected.
7. Avoid or limit widespread application of insecticides (*e.g.,* mosquito control, agricultural pest control) in areas where Florida bonneted bats are known or expected to forage or roost.
8. Conserve natural vegetation to promote insect diversity, availability, and abundance. For example, retain or restore 25% of the parcel in native contiguous vegetation.
9. Retain mature trees and snags that could provide roosting habitat. These may include live trees of various sizes and dead or dying trees with cavities, hollows, crevices, and loose bark. See "Roosting Habitat" in "Background" above.
10. Protect known Florida bonneted bat roost trees, snags or structures and trees or snags that have been historically used by Florida bonneted bats for roosting, even if not currently occupied, by retaining a 250 foot (76 m) disturbance buffer around the roost tree, snag, or structure to ensure that roost sites remain suitable for use in the future.
11. Avoid and minimize the use of artificial lighting, retain natural light conditions, and install wildlife friendly lighting (*i.e*., downward facing and lowest lumens possible). Avoid permanent night-time lighting to the greatest extent practicable.
12. Incorporate engineering designs that discourage bats from using buildings or structures. If Florida bonneted bats take residence within a structure, contact the Service and Florida Fish and Wildlife Conservation Commission prior to attempting removal or when conducting maintenance activities on the structure.
13. Use or allow prescribed fire to promote foraging habitat.

Appendix E: Additional Best Management Practices (BMPs) for Land Management Projects

Ecological Land Management

The Service reviews and develops Ecological Land Management projects that use land management activities to restore and maintain native, natural communities that are beneficial to bats. These activities include prescribed fire, mechanical treatments to reduce vegetation densities, timber thinning to promote forest health, trail maintenance, and the treatment of exotic vegetation. The following BMPs provide recommendations for conserving Florida bonneted bat roosting and foraging habitat during ecological land management activities. The Service recommends incorporating these BMP into ecological land management plans.

If potential roost trees need to be removed, check cavities for bats prior to removal of trees or snags. If evidence of use by any bat species is observed, discontinue removal efforts in that area and coordinate with the Service on how to proceed.

Ecological Land Management BMPs:

- Protect potential roosting habitat during ecological land management activities, if feasible. Avoid removing trees or snags with cavities.
- Rake and/or manually clear vegetation around the base of known or suspected roost trees to remove fuel prior to prescribed burning.
- If possible, use ignition techniques such as spot fires or backing fire to limit the intensity of fire around the base of the tree or snag containing the roost. The purpose of this action is to prevent the known or suspected roost tree or snag from catching fire and also to attempt to limit the exposure of the roosting bats to heat and smoke. A 250-ft (76 m) buffer is recommended.
- If prescribed fire is being implemented to benefit Florida bonneted bats, Braun de Torrez et al. (2018) noted that fire in the dry/spring season could be most beneficial.
- When creating firebreaks or conducting fire-related mechanical treatment, mark and avoid any known or suspected bat roosts.
- When using heavy equipment, establish a buffer of 250 feet (76 m) around known roosts to limit disturbance to roosting bats.
- Establish forest management efforts to maintain tree species and size class diversity to ensure long-term supply of potential roost sites.
- For every 5 acres (2 hectares) of timber that is harvested, retain a clump of trees 1-2 acres (0.4 - 0.8 hectare) in size containing potential roost trees, especially pines and royal palms (live or dead). Additionally, large snags in open canopy should be preserved.

Literature Cited – Appendix E

Braun de Torrez, E.C., H.K. Ober, and R.A. McCleery. 2018. Activity of an Endangered Bat Increases Immediately Following Prescribed Fire. The Journal of Wildlife Management.

Appendix H
Panther Documentation

Appendix H-1
Florida Panther Effect Determination Key

United States Department of the Interior

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

February 19, 2007

David S. Hobbie
Chief, Regulatory Division
U.S. Army Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019

Dear Mr. Hobbie:

The Fish and Wildlife Service (Service) has reviewed your letter dated December 20, 2006, referencing the development of a revised Panther Key, which will assist the Corps project managers in their effect determinations as prescribed under Section 7(a) (2) of the Endangered Species Act of 1973 as amended (Act) (87 Stat 884 16 U S C 1531 *et seq*) and its implementing regulations at 50 CFR Section 402. The original Panther Key has been used since August 8, 2003, by the Corps to evaluate all applications for a Department of Army permit under Section 404 of the Clean Water Act for projects in the consultation area. The Florida panther consultation area was depicted in the Service's interim Standard Local Operating Procedures for Endangered Species (SLOPES) for the Florida Panther (Service 2000).

In our original 2000 evaluation we provided a consultation area map (MAP) to assist the Corps in determining which projects may have an effect of the Florida panther. The MAP was generated by the Service by overlaying existing and historical panther telemetry data on a profile of Florida and providing a connecting boundary surrounding most of these points. Since the development of the MAP, we have received more accurate and up-to-date information on Florida panther habitat usage. Specifically we have received two documents that the Service believes reflect the common panther habitat usage profiles. These documents are the publications by Kautz et al. (2006) and Thatcher et al. (2006). Based on the information in these documents, we changed the boundaries of the MAP to better reflect areas where we believe project may have an effect on the Florida panther and provided this map to you in correspondence dated December 8, 2006. Upon receipt of this information, you provided a revised Panther Key and Rationale, dated December 20, 2006, and labeled as Panther Key and Rationale-January 2007. You also requested concurrence from the Service that the utilization of the Panther Key-January 2007 may affect but is not likely to adversely affect the Florida panther.

To assist the Corps in developing a Panther Key that fully reflects the Service's desire to identify those projects that may have an effect on the Florida panther and the need for consultation with the Service, we are providing a revised Panther Key and Rationale – February 19, 2007, that we believe meets this objective (enclosed).

We have used Kautz et al. (2006) and Thatcher et al. (2006) to outline a Panther Focus Area, where we believe sufficient data are present that, in most cases, warrants consultation with the Service. In addition, panther research data, including scientific publications, telemetry, photographs, tracks, prey kills, and other verifiable evidence, provide direct evidence of the presence of, and use of areas by panthers, in locations that may or may not be within the Panther Focus Area or original MAP. For example, panther mortality by vehicle interactions is a significant threat; although a proposed project may not be within the Panther Focus Area, traffic generated by the project in or adjacent to the Panther Focus Area may increase risk of panther-vehicle mortality, warranting consultation with the Service.

The key and rationale provide guidelines to help us identify when proposals may affect the panther. As always, information obtained in the future will help us refine these guidelines further, or possibly identify additional issues for consideration. As an important partner in our program to conserve and the Florida panther, your cooperation and assistance are greatly appreciated. Again, thank you for your cooperation and effort in protecting federally listed species. If you have any questions, please do not hesitate to contact either myself or Allen Webb at 772-562-3909.

Sincerely yours,

Paul Souza
Field Supervisor
South Florida Ecological Services Office

Enclosure

cc: Noreen Walsh, ARD-Ecological Services, U.S. FWS

Kautz, R., R. Kawula, T. Hoctor, J. Comiskey, D. Jansen, D. Jennings, J. Kasbohm, F. Mazzotti, R. McBride, L. Richardson, and K. Root. 2006. How Much Is Enough? Landscape-scale Conservation for the Florida Panther. Biological Conservation.

Thatcher, C., F.T. van Manen, and J.D. Clark. 2006. An assessment of habitat north of the Calssoahatchee River for Florida panthers. Final Report to U.S. Fish and Wildlife Service. University of Tennessee; Knoxville, Tennessee.

U.S. Fish and Wildlife Service (Service). 2000. Florida panther final interim standard local operating procedures (SLOPES) for endangered species. Fish and Wildlife Service; Vero Beach, Florida.

Enclosure

Florida Panther Effect Determination Key
February 19, 2007

A. Project is not within Panther Focus Area ..... B

Project is within Panther Focus Area..... C

B. Project will have no increase and/or change in vehicle traffic patterns or other identifiable effects to panthers or their habitat..... *No effect*

Project is greater than 1 acre in size and will have a net increase and/or change in vehicle traffic patterns or other identifiable effects to panthers or their habitat ..... *May affect*
Consultation with the Service is requested[1]

C. Project is less than 1 acre.....*May affect, not likely to adversely affect*

Project is greater than 1 acre.....*May affect*
Consultation with the Service is requested[1]

1 Consultation may be concluded informally or formally depending on project effects.

Rationale for the
Florida Panther Effect Determination Key
February 19, 2007

The following discussion provides background for terms used in the key and areas delineated on the accompanying map.

Panther Focus Area (see accompanying map)

The Panther Focus Area was based on results from recent panther habitat models south of the Caloosahatchee River and north of the Caloosahatchee River (Kautz et al. 2006 and Thatcher et al. 2006). In addition, marked panthers have been found throughout the delineated area.

The Kautz et al. (2006) model of landscape components important to Florida panther habitat conservation was based on an analysis of panther habitat use and forest patch size south of the Caloosahatchee River. This model was used in combination with radio-telemetry records, home range overlaps, land use/land cover data, and satellite imagery to delineate primary and secondary areas that would comprise a landscape mosaic of cover types that are especially important to support the current panther breeding population south of the Caloosahatchee River.

Thatcher et al. (2006) developed a habitat model using Florida panther home ranges in south Florida to identified landscape conditions (land-cover types, habitat patch size and configuration, road density and other human development activities, and other similar metrics) north of the Caloosahatchee River that were similar to those associated with the current panther breeding population south of the Caloosahatchee River.

The Panther Focus Area south of the Caloosahatchee River is divided into Primary, Secondary, and Dispersal Zones. North of the Caloosahatchee River it is named the Primary Dispersal/Expansion Area.

Primary Zone is currently occupied and supports the only known breeding population of Florida panthers in the world. These lands are important to the long-term viability and persistence of the panther in the wild.

Secondary Zone lands are contiguous with the Primary Zone and although these lands are used to a lesser extent by panthers, they are important to the long-term viability and persistence of the panther in the wild. Panthers use these lands in a much lower density than in the Primary Zone.

Dispersal Zone is a known corridor between the Panther Focus Area south of the

Caloosahatchee River to the Panther Focus Area north of the Caloosahatchee River. This zone is necessary to facilitate the dispersal of panthers and future panther population expansion to areas north of the Caloosahatchee River. Marked panthers have been known to use this zone.

Primary Dispersal/Expansion Area is the Fisheating Creek/Babcock-Webb Wildlife Management Area region. These are lands identified by Thatcher et al. (2006) as potential panther habitat with the shortest habitat connection to the Panther Focus Area in south Florida. Several collared and uncollared male panthers have been documented in this area since 1973, and the last female documented north of the Caloosahatchee River was found in this area.

In addition, the Thatcher Model Dispersal Pathways delineate model locations that show some areas where panthers have historically moved to areas further north.

Thatcher Model Dispersal Pathways are the most likely dispersal routes, based on Thatcher's (2006) least-cost pathways model, to potential habitats to the north. Panthers have historically been documented in this area.

Project Analysis

Projects within the Panther Focus Area can negatively affect panthers in different ways, such as loss and fragmentation of habitat, loss of available prey, increase potential for traffic related mortalities, and increase potential for human/panther interactions.

In addition, projects outside the Panther Focus Area, depending on type and size, can affect panthers and habitat used by panthers in different ways such as increasing traffic within or adjacent to the Panther Focus Area, changing hydrological conditions that affect the habitats that support panther or panther prey in the Panther Focus Area, increasing potential for human/panther interactions, and modifying habitat that provides some functional value for panthers.

Net Increase in Traffic

A net increase in traffic in or adjacent to the Panther Focus Area such as an increase in the number of trips per day averaged over a week is considered a traffic increase that may lead to adverse effects for purposes of this key.

Other Identifiable Effects

Dispersing panthers are known to occur outside of the Panther Focus Area. South of the Caloosahatchee River, where the only breeding population of panthers is known to exist, a project is considered to potentially have an effect on panthers if it occurs in

non-urbanized lands in areas adjacent to the Panther Focus Area (e.g., agricultural lands) where panthers have been documented.

Although non-urban lands outside of the Panther Focus Area do not provide the same habitat value as natural lands within the Panther Focus Area, they do provide important buffers between urban developments and the Panther Focus Area, dispersal and travel routes between higher quality habitats, refugia areas for sub-adult males, and foraging habitat for panther prey species. Generally, areas adjacent to the Panther Focus Area are defined as areas within the Service's 2000 consultation boundary (Service 2000) where urbanization has not replaced lower intensity land uses. Areas that have become urbanized no longer have habitat that can sustain panthers, although additional traffic generated in or adjacent to the Panther Focus Area from development in these locations may affect panthers.

Two-Mile Radius Buffer

A project is also considered to potentially have an effect on panthers if there has been documented physical evidence of panther occurrence within a two-mile radius of a project within the past two years. Documented physical evidence of panther occurrence includes telemetry locations, as well as photographs, tracks, prey kills, and other verifiable evidence that may be available.

Comiskey et al (2000) in the article "Panthers and Forests in South Florida: an Ecological Perspective" referenced that the mean movement distance between sequential telemetry locations was 6.6 km (4.1 miles) for males and 3.2 km (1.99 miles) for females. If flights to monitor panther telemetry are normally three times a week, generally every other day, the travel distance between two points per day would be roughly half the distance between the two points, roughly 2 miles for the male panther. In their habitat analysis, Comiskey et al (2000) considered lands within a circle where the radius is equal to the mean movement distance between sequential telemetry locations, as panther habitat. Following this approach, we believe land alterations within a two-mile radius of a verified panther occurrence, both north and south of the Caloosahatchee River, may potentially have an effect on the panther.

Projects Less than One Acre

On an individual basis, single-family residential developments on lots no larger than one acre will not have a measurable effect on panthers. Panthers are a wide ranging species, and individually, a one acre habitat change is not likely to adversely affect panthers. However, collectively they may have an effect and therefore regular monitoring and reporting of these effects are important.

Monitoring and Reporting Effects

For the Service to monitor effects, it is important for the Corps to monitor the number of permits and provide information to the Service regarding the number of permits issued that were determined "may affect, not likely to adversely affect." It is requested that information on date, Corps identification number, project acreage, project wetland acreage, latitude and longitude in decimal degrees, and county parcel identification number of these projects be sent to the Service quarterly.

Determination

With a determination of "no effect" or "may affect, not likely to adversely affect" ("NLAA") as outlined in this key, the requirements of section 7 of the Endangered Species Act are fulfilled and no further action is required.

A determination of "may affect" in the key may be concluded in either a "may affect, not likely to adversely affect" and written concurrence or "may adversely affect" and formal consultation with the Service is requested.

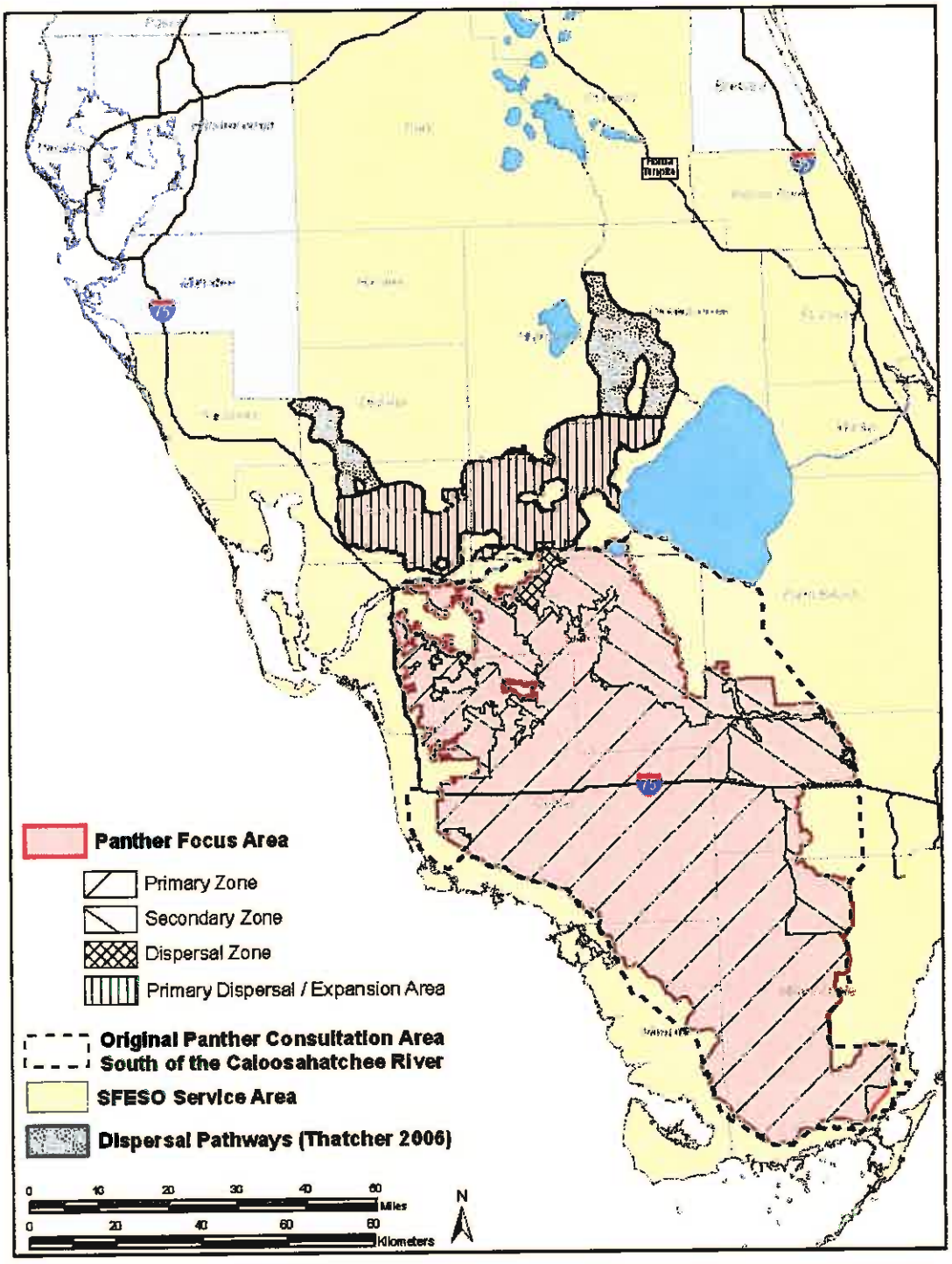
Literature Cited

Comiskey, E. J., O. L. Bass, Jr., L. J. Gross, R. T. McBride, and R. Salinas. 2002. Panthers and forests in south Florida: an ecological perspective. Conservation Ecology 6:18.

Kautz, R., R. Kawula, T. Hoctor, J. Comiskey, D. Jansen, D. Jennings, J. Kasbohm, F. Mazzotti, R. McBride, L. Richardson, and K. Root. 2006. How much is enough? Landscape-scale conservation for the Florida panther. Biological Conservation 130:118-133.

Thatcher, C. A., F. T. van Manen, and J. D. Clark. 2006. An assessment of habitat north of the Caloosahatchee River for Florida panthers. Leetown Science Center, Southern Appalachian Research Branch, U.S. Geological survey, Knoxville, Tennessee, USA.

U.S. Fish and Wildlife Service (Service). 2000. Florida panther final interim standard local operating procedures (SLOPES) for endangered species. Fish and Wildlife Service; Vero Beach, Florida.


Panther Focus Area
Primary Zone
Secondary Zone
Dispersal Zone
Primary Dispersal / Expansion Area
Original Panther Consultation Area South of the Caloosahatchee River
SFESO Service Area
Dispersal Pathways (Thatcher 2006)
0 10 20 30 40 60 Miles
0 20 40 60 80 Kilometers
N

Appendix H-2
Florida Panther Telemetry Data within the Action Area

PANTHER ID	NUMBER OF TELEMETRY POINTS	DATE FIRST TELEMETRY LOCATION WAS TAKEN	DATE LAST TELEMETRY LOCATION WAS TAKEN	LENGTH OF TIME TELEMETRY DATA COLLECTED	LENGTH OF TIME TELEMETRY DATA COLLECTED (YEARS)
1	46	2/23/1981	8/4/1981	6 months	0.50
2	580	2/24/1981	11/29/1984	3 years 9 months	3.75
3	186	2/1/1982	1/17/1983	11 months	0.91
4	478	2/7/1982	11/14/1985	3 years 9 months	3.58
5	324	3/23/1982	11/12/1983	1 year 8 months	1.66
7	32	1/27/1985	5/24/1985	4 months	0.33
8	337	3/26/1984	4/13/1987	3 years 1 month	3.08
9	1842	1/27/1985	8/8/1997	12 years 7 months	0.66
10	207	1/16/1986	1/27/1987	1 year	1.00
11	2282	1/21/1986	2/26/2001	15 years 1 month	15.08
12	1406	1/29/1986	11/9/1994	8 years 10 months	8.83
13	313	3/2/1986	12/14/1987	1 year 9 months	1.75
16	8	1/28/1993	2/12/1993	1 month	0.08
17	553	1/21/1987	7/23/1990	3 years 6 months	3.50
18	595	1/23/1987	10/3/1990	3 years 9 months	3.75
19	1645	2/10/1987	12/3/1997	10 years 10 months	10.83
20	215	3/11/1987	8/23/1988	1 year 5 months	1.41
23	94	2/7/1992	11/24/2000	8 years 9 months	8.75
25	87	2/17/1988	8/24/1988	6 months	0.50
26	760	3/2/1988	7/13/1994	6 years 4 months	6.33
28	522	3/15/1989	9/23/1992	3 years 6 months	3.50
29	509	1/4/1989	5/27/1992	3 years 4 months	3.33
30	199	1/6/1989	1/29/1990	1 year	1.00
31	804	1/12/1989	3/4/1994	5 years 2 months	5.16
32	2058	2/3/1989	9/13/2002	13 years 7 months	13.58
33	118	7/23/1989	11/23/1989	4 months	0.33
34	560	1/9/1990	11/15/1993	3 years 10 months	3.83
36	1075	1/29/1990	9/23/1998	8 years 8 months	8.66
37	125	1/31/1990	11/26/1990	10 months	0.83
38	12	5/22/1990	4/27/1994	3 years 11 months	3.92
40	844	2/27/1990	2/2/1998	8 years	8.00
41	89	3/1/1990	9/26/1990	6 months	0.50
42	118	12/26/1991	6/23/1995	4 years 6 months	4.50
43	127	5/2/1990	11/1/1991	1 year 6 months	1.50
44	232	5/1/1991	2/1/1993	1 year 9 months	1.75
45	1055	5/10/1991	8/3/1998	7 years 3 months	7.25
46	1039	1/31/1992	2/3/1999	7 years	7.00
47	150	2/24/1992	2/19/1993	1 year	1.00
48	1442	2/25/1992	10/30/2006	14 years 8 months	14.66
49	796	2/26/1992	1/4/2002	10 years	10.00
50	256	3/6/1992	12/6/1993	1 year 9 months	1.75
51	891	3/27/1992	7/17/1998	6 years 4 months	6.33
52	393	5/6/1992	1/13/1995	2 years 8 months	2.66

PANTHER ID	NUMBER OF TELEMETRY POINTS	DATE FIRST TELEMETRY LOCATION WAS TAKEN	DATE LAST TELEMETRY LOCATION WAS TAKEN	LENGTH OF TIME TELEMETRY DATA COLLECTED	LENGTH OF TIME TELEMETRY DATA COLLECTED (YEARS)
53	7	2/12/1993	2/26/1993	1 month	0.08
54	1141	2/12/1993	10/20/2000	7 years 8 months	7.66
55	1225	1/30/1994	7/9/2004	10 years 6 months	10.50
56	598	2/4/1994	2/20/1998	4 years	4.00
57	784	2/1/1995	4/5/2000	5 years 2 months	5.16
58	326	2/10/1995	3/31/1997	2 years 1 month	2.08
59	1316	1/5/1996	11/22/2004	8 years 10 months	8.83
60	1208	3/7/1996	5/14/2004	8 years 2 months	8.16
62	167	3/19/1997	7/14/2000	3 years 4 months	3.33
63	416	4/14/1997	1/17/2000	2 years 9 months	2.75
64	280	5/26/1997	3/26/1999	1 year 10 months	1.83
65	1380	11/21/1997	11/17/2010	13 years	13.00
66	354	12/10/1997	4/28/2000	2 years 5 months	2.42
67	725	1/21/1998	1/15/2003	5 years	5.00
68	315	1/26/1998	3/3/2000	2 years 2 months	2.16
69	439	8/20/1998	9/14/2005	7 years 1 month	7.08
70	208	5/6/1998	12/30/2005	7 years 8 months	7.66
71	327	5/6/1998	7/22/2005	7 years 2 months	7.16
72	93	4/27/1998	12/23/1998	8 months	0.66
73	589	11/13/1998	7/2/2003	4 years 9 months	4.75
74	68	11/13/1998	5/7/1999	6 months	0.50
75	1017	1/13/1999	4/5/2006	7 years 3 months	7.25
76	113	1/15/1999	11/15/1999	10 months	0.83
77	351	1/25/1999	10/8/2001	2 years 9 months	2.75
78	535	2/17/1999	10/18/2002	3 years 9 months	3.75
79	324	3/15/1999	2/14/2006	5 years 11 months	5.91
80	11	1/17/2000	2/9/2000	1 month	0.08
81	380	1/17/2000	9/16/2002	2 years 8 months	2.66
82	445	1/26/2000	5/13/2003	3 years 4 months	3.33
83	801	2/9/2000	7/17/2006	6 years 5 months	6.41
84	10	2/28/2000	4/7/2000	2 months	0.16
86	48	2/24/2000	9/5/2000	7 months	0.58
87	39	2/28/2000	3/8/2002	2 years	2.00
88	26	3/5/2000	11/17/2000	8 months	0.66
89	92	3/2/2000	11/10/2000	8 months	0.66
90	75	3/10/2000	3/2/2001	1 year	1.00
91	141	3/26/2000	11/28/2003	3 years 8 months	3.66
92	148	4/7/2000	9/21/2001	1 year 5 months	1.41
93	490	4/15/2000	12/7/2007	7 years 8 months	7.66
96	144	1/8/2001	1/18/2002	1 year	1.00
97	122	1/22/2001	12/3/2001	11 months	0.91
98	204	1/26/2001	7/1/2002	1 year 6 months	1.50
99	260	1/29/2001	11/27/2002	1 year 10 months	1.83

PANTHER ID	NUMBER OF TELEMETRY POINTS	DATE FIRST TELEMETRY LOCATION WAS TAKEN	DATE LAST TELEMETRY LOCATION WAS TAKEN	LENGTH OF TIME TELEMETRY DATA COLLECTED	LENGTH OF TIME TELEMETRY DATA COLLECTED (YEARS)
100	361	2/2/2001	12/13/2006	5 years 10 months	5.83
101	385	2/7/2001	10/17/2003	2 years 8 months	2.66
102	18	4/8/2002	11/23/2009	7 years 7 months	7.58
103	4	5/21/2001	3/20/2002	10 months	0.83
104	23	11/29/2001	10/11/2002	11 months	0.91
105	103	4/13/2001	1/16/2002	9 months	0.75
106	260	4/13/2001	2/17/2003	1 year 9 months	1.75
107	970	11/2/2001	8/6/2008	6 years 10 months	6.83
108	9	11/21/2001	12/26/2001	1 month	0.08
109	67	2/11/2002	2/26/2003	1 year	1.00
110	1462	2/15/2002	6/30/2014	12 years 4 months	12.33
111	82	2/15/2002	9/6/2002	7 months	0.58
112	83	2/27/2002	9/13/2002	7 months	0.58
113	1305	8/21/2003	10/19/2012	9 years 2 months	9.16
114	27	8/21/2003	11/5/2003	3 months	0.25
115	64	11/27/2002	5/16/2003	6 months	0.50
116	463	8/21/2003	1/10/2007	3 years 5 months	3.41
117	197	2/26/2003	7/28/2004	1 year 5 months	1.41
118	12	3/7/2003	4/4/2003	1 month	0.08
119	920	4/3/2003	2/9/2011	7 years 10 months	7.83
120	3	8/6/2003	8/29/2003	1 month	0.08
121	259	12/3/2003	8/2/2006	2 years 8 months	2.66
122	6	2/2/2004	2/13/2004	1 month	0.08
123	15	2/4/2004	3/17/2004	1 month	0.08
126	86	5/29/2004	1/3/2005	6 months	0.50
127	44	2/17/2004	10/18/2006	2 years 8 months	2.66
128	218	3/1/2004	9/26/2007	3 years 6 months	3.50
129	1	3/24/2004	3/24/2004	1 day	0.00
130	80	3/5/2004	8/2/2006	2 years 5 months	2.41
131	517	3/12/2004	4/16/2008	4 years 1 month	4.08
132	54	3/19/2004	7/22/2004	4 months	0.33
133	887	11/19/2004	3/12/2012	7 years 4 months	7.33
134	253	12/15/2004	1/31/2007	2 years 11 months	2.91
135	229	12/20/2004	10/23/2006	1 year 10 months	1.83
136	24	1/17/2005	5/23/2005	4 months	0.33
137	388	1/26/2005	9/4/2009	4 years 8 months	4.66
138	185	2/7/2005	4/30/2008	3 years 2 months	3.16
139	50	4/1/2005	8/24/2005	4 months	0.33
140	515	11/16/2005	6/12/2009	3 years 7 months	3.58
141	668	12/2/2005	1/5/2011	5 years 1 month	5.08
143	209	1/11/2006	7/30/2007	1 year 6 months	1.50
144	222	2/10/2006	6/18/2010	4 years 4 months	4.33
145	583	2/17/2006	5/25/2012	6 years 3 months	6.25

PANTHER ID	NUMBER OF TELEMETRY POINTS	DATE FIRST TELEMETRY LOCATION WAS TAKEN	DATE LAST TELEMETRY LOCATION WAS TAKEN	LENGTH OF TIME TELEMETRY DATA COLLECTED	LENGTH OF TIME TELEMETRY DATA COLLECTED (YEARS)
146	263	3/1/2006	7/16/2008	2 years 4 months	2.33
147	94	4/7/2006	8/17/2007	1 year 4 months	1.33
148	715	3/27/2006	6/30/2014	8 years 3 months	8.25
149	59	1/19/2007	6/11/2007	5 months	0.41
150	193	2/9/2007	6/6/2008	1 year 4 months	1.33
151	511	2/12/2007	6/25/2013	6 years 4 months	6.33
153	511	2/22/2007	4/21/2014	7 years 2 months	7.16
154	157	2/23/2007	4/2/2008	1 year 2 months	1.16
155	18	11/30/2007	9/15/2008	10 months	0.83
156	270	12/10/2007	7/29/2011	3 years 7 months	3.58
157	8	12/21/2007	4/14/2008	5 months	0.41
158	129	2/18/2008	5/21/2010	2 years 3 months	2.25
159	338	1/30/2008	6/30/2014	6 years 5 months	6.41
160	104	2/6/2008	11/12/2008	9 months	0.75
161	359	2/22/2008	6/25/2013	5 years 4 months	5.33
162	229	2/22/2008	2/8/2013	5 years	5.00
163	472	2/22/2008	4/25/2014	6 years 2 months	6.16
164	25	2/25/2008	6/23/2008	4 months	0.33
165	82	11/26/2008	9/14/2009	10 months	0.83
166	100	2/2/2009	10/5/2009	8 months	0.66
167	99	2/9/2009	11/25/2009	9 months	0.75
168	242	2/11/2009	10/15/2010	1 year 8 months	1.66
169	25	6/24/2009	5/10/2010	11 months	0.91
170	283	2/27/2009	3/2/2011	2 years 1 month	2.08
171	309	3/2/2009	7/18/2011	2 years 4 months	2.33
172	45	11/20/2009	3/22/2010	4 months	0.33
173	121	1/25/2010	12/22/2010	11 months	0.91
174	17	1/27/2010	3/15/2010	2 months	0.16
175	503	2/8/2010	1/24/2014	3 years 11 months	3.91
176	111	2/10/2010	11/17/2010	9 months	0.75
177	580	2/10/2010	6/30/2014	4 years 4 months	4.33
178	590	2/12/2010	6/30/2014	4 years 4 months	4.33
180	425	2/22/2010	5/7/2014	4 years 3 months	4.25
181	39	3/1/2010	8/2/2010	5 months	0.41
182	70	3/3/2010	10/22/2012	2 years 7 months	2.58
183	467	11/5/2010	6/30/2014	3 years 7 months	3.58
184	337	11/10/2010	4/26/2013	2 years 5 months	2.41
185	118	11/17/2010	10/17/2011	11 months	0.91
186	51	1/12/2011	6/1/2011	5 months	0.41
187	250	2/7/2011	6/25/2013	2 years 4 months	2.33
188	85	2/9/2011	9/14/2011	7 months	0.58
189	105	2/16/2011	1/4/2012	11 months	0.91
191	95	2/28/2011	2/21/2013	2 years	2.00

PANTHER ID	NUMBER OF TELEMETRY POINTS	DATE FIRST TELEMETRY LOCATION WAS TAKEN	DATE LAST TELEMETRY LOCATION WAS TAKEN	LENGTH OF TIME TELEMETRY DATA COLLECTED	LENGTH OF TIME TELEMETRY DATA COLLECTED (YEARS)
192	1	1/6/2012	1/6/2012	1 day	0.00
193	223	3/11/2011	6/30/2014	3 years 3 months	3.25
195	361	12/2/2011	6/30/2014	2 years 6 months	2.50
196	101	1/23/2012	10/5/2012	9 months	0.75
197	65	1/27/2012	7/18/2012	6 months	0.50
198	303	2/10/2012	6/30/2014	2 years 4 months	2.33
199	313	2/10/2012	6/30/2014	2 years 4 months	2.33
201	6	2/2/1997	2/28/1997	1 month	0.08
203	1	2/16/1997	2/16/1997	1 day	0.00
211	39	2/13/2012	5/21/2012	3 months	0.25
212	37	2/15/2012	5/18/2012	3 months	0.25
213	308	2/17/2012	6/30/2014	2 years 4 months	2.33
214	124	2/24/2012	6/25/2013	1 year 4 months	1.33
215	303	2/24/2012	6/30/2014	2 years 4 months	2.33
216	224	3/12/2012	2/10/2014	11 months	0.91
217	187	1/9/2013	6/30/2014	1 year 5 months	1.41
218	33	1/25/2013	1/15/2014	1 year	1.00
219	168	2/1/2013	6/30/2014	1 year 4 months	1.33
220	13	2/6/2013	6/25/2013	4 months	0.33
221	8	3/4/2013	6/25/2013	3 months	0.25
222	187	2/27/2013	6/30/2014	1 year 4 months	1.33
223	16	5/8/2013	1/3/2014	8 months	0.66
224	39	3/12/2014	6/30/2014	3 months	0.25
225	39	1/17/2014	6/30/2014	5 months	0.41
226	57	1/17/2014	6/30/2014	5 months	0.41
227	31	2/26/2014	6/30/2014	4 months	0.33
228	1	3/7/2014	3/7/2014	1 day	0.00
229	3	3/7/2014	3/28/2014	1 month	0.08
231	25	3/26/2014	6/30/2014	3 months	0.25
FP093	14	2/25/2015	8/4/2015	6 months	0.50
FP110	40	7/7/2014	10/8/2014	3 months	0.25
FP148	97	7/2/2014	3/20/2015	8 months	0.66
FP151	38	10/21/2014	5/15/2016	1 year 7 months	1.58
FP153	63	7/1/2014	6/16/2015	11 months	0.91
FP159	110	7/7/2014	4/27/2015	9 months	0.75
FP162	34	7/1/2014	2/12/2016	1 year 7 months	1.58
FP177	7	7/2/2014	7/16/2014	1 month	0.08
FP178	1	7/2/2014	7/2/2014	1 day	0.00
FP180	61	7/1/2014	8/5/2016	2 years 1 month	2.08
FP183	107	7/7/2014	2/25/2015	7 months	0.58
FP185	175	1/20/2016	9/25/2017	1 year 8 months	1.66
FP187	40	7/1/2014	2/27/2015	7 months	0.58
FP191	8	7/29/2014	1/27/2015	6 months	0.50

PANTHER ID	NUMBER OF TELEMETRY POINTS	DATE FIRST TELEMETRY LOCATION WAS TAKEN	DATE LAST TELEMETRY LOCATION WAS TAKEN	LENGTH OF TIME TELEMETRY DATA COLLECTED	LENGTH OF TIME TELEMETRY DATA COLLECTED (YEARS)
FP192	1	1/6/2015	1/6/2015	1 day	0.00
FP193	468	7/16/2014	6/26/2019	4 years 11 months	4.91
FP195	294	7/2/2014	8/29/2016	2 years 1 month	2.08
FP198	350	7/7/2014	3/22/2017	2 years 8 months	2.66
FP199	459	7/2/2014	1/17/2018	3 years 6 months	3.50
FP213	71	7/7/2014	12/31/2014	5 months	0.41
FP214	302	7/1/2014	2/7/2019	4 years 7 months	4.58
FP215	263	7/2/2014	6/22/2016	1 year 11 months	1.91
FP217	385	7/7/2014	6/12/2017	2 years 11 months	2.91
FP219	27	7/2/2014	8/28/2015	1 year 1 month	1.08
FP220	198	7/1/2014	2/11/2019	4 years 7 months	4.58
FP221	35	7/1/2014	5/13/2016	1 year 10 months	1.83
FP222	178	7/2/2014	10/19/2015	1 year 3 months	1.25
FP224	565	7/2/2014	6/29/2020	5 years 11 months	5.91
FP225	94	7/2/2014	3/13/2015	8 months	0.66
FP226	54	7/2/2014	11/12/2014	4 months	0.33
FP227	70	7/2/2014	12/24/2014	5 months	0.41
FP229	25	8/11/2014	11/14/2014	3 months	0.25
FP230	1	7/22/2014	7/22/2014	1 day	0.00
FP231	13	7/2/2014	8/4/2014	1 month	0.08
FP233	7	1/7/2015	7/15/2015	6 months	0.50
FP234	315	1/9/2015	7/26/2017	2 years 6 months	2.50
FP235	65	1/9/2015	8/3/2015	7 months	0.58
FP236	6	1/19/2015	6/15/2015	5 months	0.41
FP237	20	1/21/2015	3/18/2015	2 months	0.16
FP238	2	2/4/2015	2/6/2015	2 days	0.00
FP239	270	2/19/2015	4/25/2019	4 years 2 months	4.16
FP240	1	2/19/2015	2/19/2015	1 day	0.00
FP241	119	1/13/2016	10/9/2017	1 year 9 months	1.75
FP242	58	1/25/2016	8/5/2016	7 months	0.58
FP244	91	12/9/2016	8/28/2017	8 months	0.66
FP245	121	1/20/2017	3/14/2018	1 year 2 months	1.16
FP246	425	2/10/2017	6/29/2020	3 years 4 months	3.33
FP247	423	2/15/2017	6/15/2020	3 years 4 months	3.33
FP249	43	6/2/2017	11/6/2017	5 months	0.41
FP250	70	2/19/2018	11/5/2018	9 months	0.75
FP251	94	4/11/2018	12/7/2018	8 months	0.66
FP252	34	4/11/2018	7/2/2018	3 months	0.25
FP253	29	7/13/2018	9/19/2018	2 months	0.16
FP254	116	1/23/2019	11/15/2019	10 months	0.83
FP255	30	2/6/2019	7/12/2019	5 months	0.41
FP256	93	2/15/2019	10/7/2019	8 months	0.66
FP257	152	3/4/2019	6/29/2020	1 year 3 months	1.25

PANTHER ID	NUMBER OF TELEMETRY POINTS	DATE FIRST TELEMETRY LOCATION WAS TAKEN	DATE LAST TELEMETRY LOCATION WAS TAKEN	LENGTH OF TIME TELEMETRY DATA COLLECTED	LENGTH OF TIME TELEMETRY DATA COLLECTED (YEARS)
FP258	6	2/21/2019	5/6/2019	3 months	0.25
FP259	100	4/19/2019	12/30/2019	8 months	0.66
TX101	702	4/7/1995	3/31/2000	4 years 11 months	4.91
TX102	75	4/7/1995	9/22/1995	5 months	0.41
TX104	474	3/31/1995	4/20/1998	3 years 1 month	3.08
TX106	1158	4/10/1995	1/8/2003	7 years 9 months	7.75
TX107	161	5/7/1995	4/21/2000	4 years 11 months	4.91

Appendix H-3
Florida Panther Mortality Data within the Action Area

PANTHER ID	SEX	AGE	LOCATION	CAUSE	MORTALITY DATE
UCFP004 (G80-4)	F	8 to 10	SR 84 (now I-75)	VEHICLE	12/23/1979
UCFP005 (G80-15)	F	1.5 to 2	SR 84 (now I-75)	VEHICLE	2/7/1980
UCFP006 (G81-19)	F	4 to 5	SR 84 (now I-75)	VEHICLE	4/19/1981
FP003	F	9 yrs	FSSP	OTHER	1/17/1983
FP005	F	8 to 9	FPNWR	UNKNOWN	11/18/1983
FP001	M	12 to 14	SR 84 (now I-75)	VEHICLE	12/14/1983
UCFP012 (G84-26)	M	3	CR 850, 1.5 miles S of SR 82	VEHICLE	11/12/1984
FP002	M	14 yrs	FSSP	ISA - INTRASPECIFIC AGGRESSION	11/28/1984
UCFP013 (G85-BNZ)	M	10 mos.	CR 835, 1 mile SE of CR 833	VEHICLE	1/8/1985
FP004	M	12 yrs	SR 84 (now I-75)	VEHICLE	4/18/1985
FP007	M	10 yrs	SR 29, 4 miles S of SR 84 (now I-75)	VEHICLE	10/26/1985
UCFP015	F	9 mos.	SR 29, at Pistol Pond	VEHICLE	11/15/1986
FP010	M	16 to 20 mos.	Mud Lake Strand, now FPNWR	ISA - INTRASPECIFIC AGGRESSION	1/27/1987
FP013	M	6 to 8	SR 29 Sunniland	VEHICLE	12/14/1987
FP020	M	4 to 5	Bear Island	DISEASE	8/24/1988
FP025	M	4 to 5	FPNWR	ISA - INTRASPECIFIC AGGRESSION	8/26/1988
UCFP018	F	7 mos.	SR 29, Sunniland	VEHICLE	1/25/1989
FP033	M	3	2 miles NW of Hendry Prison	DISEASE	11/25/1989
FP030	M	22 mos.	FSSP	ISA - INTRASPECIFIC AGGRESSION	1/29/1990
UCFP019	M	8 mos.	County Line Rd, 3 miles N of CR 858	VEHICLE	6/18/1990
FP017	M	9	NBCNP, near Tangerine Camp	UNKNOWN	7/23/1990
FP041	F	2	W of BCSIR, Hendry County	ISA - INTRASPECIFIC AGGRESSION	9/26/1990
FP018	F	9	S of CR 846 near Rocky Lake, Hendry County	ISA - INTRASPECIFIC AGGRESSION	10/3/1990
FP037	M	4 to 5	SR 29, 0.5 miles N of I-75	VEHICLE	11/26/1990
UCFP020	F	1.5 to 2 weeks	FPNWR	VEHICLE	2/4/1991
FP043	M	2	BCSIR, Hendry County	ISA - INTRASPECIFIC AGGRESSION	11/1/1991
FP029	M	4	Hendry County, Gum Swamp	DISEASE	5/27/1992
FP028	M	5.5	BCSIR, Hendry County	ISA - INTRASPECIFIC AGGRESSION	9/25/1992
UCF9021	F	1.5 to 2.5 yrs	SR 29, just N SR 84 (now I-75)	VEHICLE	11/9/1992
FP047	M	18 mos.	FSSP	ISA - INTRASPECIFIC AGGRESSION	2/19/1993
FP053	M	11 mos.	Private lands N of FPNWR	ISA - INTRASPECIFIC AGGRESSION	2/26/1993
FP034	M	5	SE Hendry County near L28 W Feeder Canal	OTHER	11/15/1993
FP050	M	3	CR 846, 5 miles E of Immokalee	VEHICLE	12/3/1993
UCF9023	M	1.5 to 2.5 yrs	SR 29, Sunniland	VEHICLE	2/28/1994
FP031	F	12 to 14	SR 29, Sunniland	VEHICLE	3/3/1994
FP026	M	11 to 12	4 miles E of Hendry Prison	ISA - INTRASPECIFIC AGGRESSION	7/8/1994
FP012	M	13 to 14	Private Lands, Hendry County	ISA - INTRASPECIFIC AGGRESSION	11/8/1994
FP052	F	3 to 4	CR 846 Near Dupree Road	VEHICLE	1/14/1995
FP042	M	6	SBCNP	UNKNOWN	6/22/1995
TX102	F	4	CR 833, N of CR 835	VEHICLE	9/21/1995
UCF9024	F	2 to 3	SR 29, near Copeland	UNKNOWN	3/18/1996
UCFP029	M	3 to 5	CR 832, 5.5 miles E of SR 29	VEHICLE	4/24/1996
FP058	M	3	Sadie Cypress, Collier County	ISA - INTRASPECIFIC AGGRESSION	3/30/1997
UCFP031	UNKNOWN	UNKNOWN	CR 846, 1.5 miles W of CR 858	VEHICLE	7/13/1997
FP019	F	11.5	FPNWR	DISEASE	12/2/1997
FP040	F	10 yrs	NBCNP	ISA - INTRASPECIFIC AGGRESSION	2/2/1998
TX104	F	6 to 7	S of Sabal Palm Rd in citrus grove	OTHER	4/18/1998

PANTHER ID	SEX	AGE	LOCATION	CAUSE	MORTALITY DATE
UCFP025	F	2	CR 846, 3 miles E of CR 858	VEHICLE	6/13/1998
FP051	M	9	SR 29, Bear Island Grade	VEHICLE	7/17/1998
FP045	M	7.5	BCSIR, Hendry County	ISA - INTRASPECIFIC AGGRESSION	8/2/1998
FP072	M	3 to 4 mos.	BCSIR, Hendry County	ISA - INTRASPECIFIC AGGRESSION	12/23/1998
FP046	M	9 to 9.5	Private land S CR 846, Hendry County	ISA - INTRASPECIFIC AGGRESSION	2/3/1999
FP064	M	2.5 yrs	Audubon's Corkscrew Sanctuary	ISA - INTRASPECIFIC AGGRESSION	3/26/1999
UCFP027	F	2	Farm Road, E of Hendry Prison	VEHICLE	7/8/1999
UCFP33	M	11 mos.	CR 833, 2 miles N of BCSIR	VEHICLE	10/29/1999
FP076	M	2.5 to 3	FSSP, 1.9 miles W of SR 29 off of Lancaster Grade	ISA - INTRASPECIFIC AGGRESSION	11/13/1999
FP063	M	5	SR 29, N of Pistol Pond	VEHICLE	1/15/2000
FP080	F	4 to 5	W Boundary Road, BCSIR	VEHICLE	2/10/2000
K076	M	3 mos.	CR 858, 1 mile W of SR 29	VEHICLE	2/28/2000
FP068	M	5 to 7	NBCNP, W of Tangerine tram	ISA - INTRASPECIFIC AGGRESSION	3/1/2000
UCFP034	M	1.5 to 2 yrs	CR 846, 2 miles E of Collier/Hendry line	VEHICLE	3/23/2000
TX101	F	UNKNOWN	BCSIR	UNKNOWN	3/29/2000
UCFP035	M	1.5 to 2	CR 846, 2 miles E of Immokalee	VEHICLE	6/23/2000
UCFP036	F	1.5 to 2 yrs	CR 846, near power line	VEHICLE	8/13/2000
FP089	M	3 to 4 yrs	BCNP, 2 miles NW of Mud Lake	ISA - INTRASPECIFIC AGGRESSION	11/10/2000
FP023	F	14	BCNP, 2 miles E of Turkey Foot	UNKNOWN	12/1/2000
UCFP037	F	5	CR 846, 4.5 miles E of SR 29	VEHICLE	12/29/2000
FP011	F	19 to 20	Private land, 200 yards S of CR 846, 1 mile E of Dupree Rd	ISA - INTRASPECIFIC AGGRESSION	2/27/2001
UCFP038	F	2	CR 833, 1 mile N of BCSIR, Hendry County	VEHICLE	4/14/2001
UCFP039	F	10 mos.	SR 29, 0.5 mile N of Jerome	VEHICLE	5/7/2001
UCFP040	M	10 mos.	SR 29, 0.5 mile N of Jerome	VEHICLE	5/7/2001
UCFP041	M	2 to 3	SR 29, Sunniland, near mine entrance	VEHICLE	5/22/2001
UCFP042	F	3 to 4 mos.	CR 846, 1 mile E of power line	VEHICLE	6/14/2001
UCFP043	M	2 to 3	CR 846, 1 mile E of power line	VEHICLE	8/17/2001
FP092	M	2.5 yrs	CREW, N Flint Pen Strand	UNKNOWN	9/1/2001
FP097	M	2	Private land, E of Gopher Ridge Grove, N of Immokalee	ISA - INTRASPECIFIC AGGRESSION	12/2/2001
FP049	F	12	BCNP Addition Lands, Collier County	ISA - INTRASPECIFIC AGGRESSION	1/3/2002
FP096	M	1.5 to 2 yrs	Private land, Hogan Island, Collier County	ISA - INTRASPECIFIC AGGRESSION	1/15/2002
FP105	F	7	FPNWR, SW corner of clearcut	UNKNOWN	1/16/2002
UCFP046	M	6 mos.	SR 29, 0.5 mile N of Deep Lake, Collier County	VEHICLE	4/10/2002
FP098	M	4 to 5	SR 29, 0.6 miles N of Pistol Pond	VEHICLE	7/1/2002
FP111	M	9 to 10	OSSF, N of CR 832	ISA - INTRASPECIFIC AGGRESSION	9/5/2002
FP112	F	4	BCNP, Bear Island	ISA - INTRASPECIFIC AGGRESSION	9/11/2002
FP032	F	15	FPNWR, Rock Island	OTHER	9/12/2002
FP078	F	6	FPNWR, Fire Tower	ISA - INTRASPECIFIC AGGRESSION	10/16/2002
UCFP048	F	8 to 9 mos.	CR 846, 5 miles E of Immokalee	VEHICLE	11/10/2002
UCFP049 (K098)	F	19 mos.	CR 846, 3 miles E of Immokalee	VEHICLE	11/25/2002
FP099	M	33 mos.	CR 846, 0.25 mile N of Collier Fairgrounds	VEHICLE	11/28/2002
FP067	F	5.5	Private land, Gum Slough, Hendry County	ISA - INTRASPECIFIC AGGRESSION	1/15/2003
UCFP050 (K033)	M	6.4	CR 846, 3.4 miles E of Everglades Blvd	VEHICLE	1/26/2003
FP106	F	3	SR 29, entrance to Sunniland Mine	VEHICLE	2/20/2003
FP109	M	10 yrs	OSSF, N of CR 832	ISA - INTRASPECIFIC AGGRESSION	2/22/2003
UCFP052	M	2 to 3	CR 833, 2 miles S of CR 832, Hendry County	VEHICLE	3/20/2003
FP118	F	1 yr	BCSIR, Game Pen	DISEASE	4/4/2003

PANTHER ID	SEX	AGE	LOCATION	CAUSE	MORTALITY DATE
FP082	F	6	OSSF	ISA - INTRASPECIFIC AGGRESSION	5/10/2003
FP115	F	4 to 5	OSSF, Sick Island	DISEASE	5/17/2003
UCFP053	F	2 to 3	SR 29, 1.4 miles N of CR 858, Collier County	VEHICLE	5/25/2003
UCFP054	M	8 to 10 mos.	SR 29, 1.7 miles N of CR 858, Collier County	VEHICLE	6/3/2003
UCFP055	M	1 to 1.5 yrs	BCSIR, Safari Pen	UNKNOWN	6/13/2003
UCFP056	M	1 to 1.5 yrs	BCSIR, Safari Pen	UNKNOWN	6/14/2003
UCFP057	F	4 to 6	BCSIR, Safari Pen	DISEASE	6/16/2003
FP073	F	7.8	BCSIR, Game Pen	UNKNOWN	6/28/2003
UCFP058	F	1 yr	CR 846, 0.75 miles E of Everglades Blvd	VEHICLE	6/30/2003
FP077	F	6	BCSIR, Game Pen	UNKNOWN	7/12/2003
FP114	M	1.5 yrs	FPNWR, S of Oil Pad Rd	ISA - INTRASPECIFIC AGGRESSION	10/17/2003
UCFP059	M	3 to 4 mos.	CR 858, 1.2 miles W of SR 29	VEHICLE	11/2/2003
FP091	F	4.5	BCNP, Turner River Unit	ISA - INTRASPECIFIC AGGRESSION	12/12/2003
UCFP061	F	2 to 3	CR 833, 1.7 miles N of CR 846 intersection	VEHICLE	12/25/2003
FP122	F	2 to 3	OSSF, NW Wild Cow Island	DISEASE	2/13/2004
UCFP063	M	3 to 4 yrs	I-75, Mile Marker 99, eastbound lane	VEHICLE	2/26/2004
FP123	M	3 to 4 yrs	OSSF	ISA - INTRASPECIFIC AGGRESSION	3/15/2004
UCFP065	M	2	SR 29, 200 yards N of Bear Island Grade	VEHICLE	4/6/2004
UCFP066	M	3	I-75, Mile Marker 93, 0.5 miles W of Everglades Blvd	VEHICLE	6/27/2004
FP055	F	11.5	BCNP	ISA - INTRASPECIFIC AGGRESSION	7/7/2004
FP132	M	3 to 3.5	OSSF	DISEASE	7/22/2004
FP117	M	27 mos.	OSSF	DISEASE	7/28/2004
K094	M	3 to 4 yrs	I-75, near Mile Marker 98, eastbound lane	VEHICLE	8/17/2004
UCFP67	F	< 7 days	FPNWR, Ridge Road	UNKNOWN	9/2/2004
UCFP069	F	2	SR 29, 2.5 miles N of CR 858	VEHICLE	10/25/2004
FP059	M	9.4	Private property, just E of Ford Test Track, Collier County	ISA - INTRASPECIFIC AGGRESSION	11/22/2004
UCFP070	F	1	SR 29, Owl Hammock Curve, Collier County	VEHICLE	12/1/2004
K128	M	2.5 yrs	CR 832, 1 mile E of RR grade	VEHICLE	12/6/2004
FP126	M	1.5 to 2	Private property, 0.5 mile S of CR 846, Sadie Cypress	ISA - INTRASPECIFIC AGGRESSION	1/1/2005
UCFP072	M	2	SR 29, near Jerome	VEHICLE	2/25/2005
UCFP075	M	2	SR 29, Owl Hammock Curve, Collier County	VEHICLE	6/19/2005
FP069	F	8.3	NBCNP, Addition Lands	UNKNOWN	9/12/2005
K049	F	7.8	SR 29,1 mile N of Wagon Wheel Rd	VEHICLE	12/2/2005
UCFP077	F	2 to 3	BCSIR, W of Swamp Safari	ISA - INTRASPECIFIC AGGRESSION	1/15/2006
UCFP078	M	9 mos.	CR 846, 1 miles W of CR 858	VEHICLE	1/25/2006
UCFP079	F	2	CR 846, 2 miles N of CR 858, near Collier fairgrounds	VEHICLE	1/26/2006
UCFP082	UNKNOWN	UNKNOWN	Private property, 0.2 miles W of SR 29 Hendry County	UNKNOWN	2/27/2006
UCFP083	M	3	CREW, 1 mile S of Corkscrew Rd, Flint Pen Strand	ISA - INTRASPECIFIC AGGRESSION	3/11/2006
K203	M	1 mo.	BCSIR	UNKNOWN	4/6/2006
UCFP085	M	3 to 4 mos.	CR 832, 3 miles E of OSSF SF	VEHICLE	6/5/2006
UCFP086	UNKNOWN	UNKNOWN	SR 29, 0.6 miles S of Sunniland	VEHICLE	7/6/2006
UCFP087	M	3	Corkscrew Rd, near Alico, Lee County	VEHICLE	8/24/2006
FP048	F	15	Sunniland, Collier County	UNKNOWN	10/23/2006
UCFP089	M	3 to 5	County Line Rd, Collier/Hendry County	VEHICLE	12/12/2006
FP116	F	4.5	Williams Ranch, Hendry County	ISA - INTRASPECIFIC AGGRESSION	1/10/2007
UCFP090	F	4 to 6 mos.	CR 832, 1 mile W of Forestry tower	VEHICLE	1/24/2007
FP134	M	5.5	NBCNP, W of L-28, S of pipeline	ISA - INTRASPECIFIC AGGRESSION	1/29/2007

PANTHER ID	SEX	AGE	LOCATION	CAUSE	MORTALITY DATE
UCFP091	M	5 mos.	CR 832, W of Keri tower, OSSF	VEHICLE	3/9/2007
UCFP094	M	2 to 3	I-75, 2 miles E of toll booth Mile Marker 98, Collier County	VEHICLE	4/3/2007
K249	F	10 to 12 days	FPNWR, Unit 12	DISEASE	4/27/2007
K247	F	16 to 18 days	FPNWR, Unit 12	DISEASE	5/3/2007
K248	M	16 to 18 days	FPNWR, Unit 12	UNKNOWN	5/3/2007
UCFP097	F	4 to 5	Corkscrew Rd, near Alico, Lee County	VEHICLE	5/14/2007
UCFP098	M	20 to 24 mos.	SR 29, at Jerome wildlife crossing	VEHICLE	6/11/2007
K199	F	20 mos.	CR 832, 0.6 miles W of Forestry tower	VEHICLE	6/23/2007
UCFP100	M	2 to 3	SR 29, 3 miles S of Immokalee	VEHICLE	6/23/2007
K259	M	3 weeks	SBCNP	OTHER	8/27/2007
K260	UNKNOWN	3 weeks	SBCNP	OTHER	8/27/2007
UCFP102	M	2	I-75, 1.5 miles E of SR 29	VEHICLE	9/12/2007
FP128	F	7.5	BCSIR, Game Pen	UNKNOWN	9/27/2007
FP157	M	3	CREW	ISA - INTRASPECIFIC AGGRESSION	4/9/2008
FP131	M	9	Horse Trial grounds, N of CR 858, W of SR 29	DISEASE	4/16/2008
UCFP105	F	5 to 6	FSSP, 0.24 miles W of Janes Scenic, N side of Mud Tram	UNKNOWN	4/23/2008
UCFP106	M	2	Leonard Boulevard, Lehigh Acres, Lee County	VEHICLE	5/4/2008
K268	F	2 weeks	SBCNP	UNKNOWN	5/23/2008
K269	M	2 weeks	SBCNP	UNKNOWN	5/23/2008
UCFP108	F	3 to 4 mos.	CR 846, 1.7 miles E of Oil Grade Rd	VEHICLE	7/28/2008
FP107	F	8	FPNWR	UNKNOWN	8/6/2008
FP155	M	3	Lee-Hendry Landfill, Hendry County	UNKNOWN	9/15/2008
UCFP109	M	8	Private Property (J. Ivey), 2 miles E of Corkscrew Sanctuary	UNKNOWN	9/15/2008
UCFP111	F	6 to 8 mos.	SR 29, 1.5 miles N of Oil Well Road	VEHICLE	10/24/2008
UCFP113	M	4 to 5	Alico Road, Lee County	VEHICLE	11/26/2008
UCFP114	F	4	CR 858, 1 mile E of Camp Keais Rd	VEHICLE	11/28/2008
UCFP115	M	4	CR 832, E of OSSF	VEHICLE	1/11/2009
K253	M	18 mos.	I-75, eastbound exit ramp for SR 29	VEHICLE	1/17/2009
UCFP116	F	4 to 5	SR 29, 3 miles S of Immokalee	VEHICLE	1/20/2009
UCFP117	M	3	BCSIR	ISA - INTRASPECIFIC AGGRESSION	2/2/2009
UCFP118	M	1.5 yrs	Treeline Ave, Lee County	VEHICLE	3/25/2009
UCFP120	F	2	Big Cypress Mitigation Bank	OTHER	4/21/2009
UCFP121	M	2	SR 29, 4 miles S of I-75	VEHICLE	5/14/2009
UCFP122	M	2	CR 846, near Camp Keais Rd	VEHICLE	5/25/2009
FP140	F	7	FPNWR, SE of Hog Pond	ISA - INTRASPECIFIC AGGRESSION	6/12/2009
UCFP124	M	1.5 yrs	I-75, Mile Marker 90, Collier County	VEHICLE	8/5/2009
UCFP125	F	2	I-75, Mile Marker 96.5, Collier County	VEHICLE	9/6/2009
UCFP126	M	2	E of Ave Maria, Ranch 1 Orange Grove	VEHICLE	9/15/2009
FP166	M	5 to 6	BCSIR, Safari Pen	ISA - INTRASPECIFIC AGGRESSION	10/5/2009
UCFP128	F	3	North Belle Meade	OTHER	10/10/2009
UCFP129	M	3 to 4 mos.	CR 846, 2 miles E of Immokalee	VEHICLE	10/19/2009
UCFP130	F	3 to 4 mos.	CR 846, 2 miles E of Immokalee	VEHICLE	10/21/2009
UCFP131	F	3 to 4 mos.	CR 833, N boundary of BCSIR	VEHICLE	11/1/2009
UCFP134	M	3	Corkscrew Rd, near CREW Gate 5	VEHICLE	12/23/2009
UCFP135	F	4	SR 29, 2 miles N of Jerome	VEHICLE	12/29/2009
UCFP137	M	2.5 yrs	1 mile S Corkscrew Rd, near Bella Terra	ISA - INTRASPECIFIC AGGRESSION	1/16/2010
UCFP139	F	3	Corkscrew Rd, CREW Marsh Trailhead 1	VEHICLE	3/12/2010

PANTHER ID	SEX	AGE	LOCATION	CAUSE	MORTALITY DATE
FP174	M	4 to 5	I-75 eastbound, Mile Marker 95, Collier County	VEHICLE	3/16/2010
FP172	F	5	NBCNP	ISA - INTRASPECIFIC AGGRESSION	3/22/2010
UCFP141	F	6 mos.	Church Rd, near Hendry County landfill	VEHICLE	4/29/2010
UCFP144	M	12 to 14 mos.	CR 833, 0.40 miles N of intersection with CR 832	VEHICLE	5/31/2010
UCFP145	M	16 to 18 mos.	SR 29, 2.3 miles S of Farm Workers Village	VEHICLE	6/24/2010
UCFP146	F	3 to 4 mos.	SR 29, 1 mile S of Owl Hammock, Collier County	VEHICLE	8/3/2010
FP168	F	8	CREW, Flint Pen Strand	ISA - INTRASPECIFIC AGGRESSION	10/15/2010
FP176	M	4 to 5	CR 832, OSSF	VEHICLE	11/17/2010
UCFP150	M	8 to 9 mos.	CR 846, 1.5 miles S of CR 833	VEHICLE	12/19/2010
FP173	M	5	Lee County Port Authority Mitigation Land	DISEASE	12/22/2010
UCFP151	F	10 to 18 mos.	Private property, Collier County	ISA - INTRASPECIFIC AGGRESSION	12/23/2010
FP141	M	8.5	Private property, Hendry County	UNKNOWN	1/5/2011
K284	M	1.5 yrs	SR 29, S of Sears Rd, Hendry County	VEHICLE	1/7/2011
UCFP152	F	3	I-75 eastbound, Mile Marker 98, Collier County	VEHICLE	1/13/2011
UCFP153	M	8 mos.	I-75 westbound, Mile Marker 98, Collier County	VEHICLE	1/21/2011
UCFP154	M	8 mos.	Orange grove N of Sears Rd, Hendry County	ISA - INTRASPECIFIC AGGRESSION	1/21/2011
FP170	F	4.5	PSSF, Swan Lake Prairie, Collier County	ISA - INTRASPECIFIC AGGRESSION	3/2/2011
UCFP159	F	4 to 5	SR 29, near Farmworkers Village	VEHICLE	3/25/2011
FP186	M	11.5 mos.	CREW, Bird Rookery Swamp, Collier County	ISA - INTRASPECIFIC AGGRESSION	6/1/2011
UCFP161	M	7 to 9	Silver Strand Grove, N of Immokalee, Collier County	ISA - INTRASPECIFIC AGGRESSION	7/6/2011
UCFP162	M	1 to 1.5	SR 29, Owl Hammock Curve, Collier County	VEHICLE	7/11/2011
FP156	M	6	PSSF, Belle Meade, Collier County	DISEASE	7/29/2011
UCFP163	M	3 to 4 mos.	Palmer Ranch, Hendry County	UNKNOWN	9/3/2011
FP188	F	3 to 4 yrs	Private Land, Collier County	UNKNOWN	9/14/2011
UCFP164	F	3 to 4	SR 29, Owl Hammock Curve, Collier County	VEHICLE	9/19/2011
UCFP165	F	3 to 4	SR 29, Collier/Hendry County Line	VEHICLE	10/30/2011
UCFP166	M	4 to 5	SR 82, 2.3 miles W of SR 29, Collier County	VEHICLE	1/2/2012
FP189	M	4	Tomato field S of Oil Well Rd, Collier County	ISA - INTRASPECIFIC AGGRESSION	1/5/2012
K351	M	12 days	SBCNP	OTHER	2/23/2012
FP133	M	12	FSSP	ISA - INTRASPECIFIC AGGRESSION	2/27/2012
UCFP169	M	9 weeks	Orange grove N of Church Rd, Hendry County	VEHICLE	4/7/2012
FP212	M	3	1.25 miles NW of CR 846 and County Line Rd Intersection	ISA - INTRASPECIFIC AGGRESSION	5/18/2012
FP211	M	2	Orange grove, 5.4 miles SE of prison, Hendry County	ISA - INTRASPECIFIC AGGRESSION	5/21/2012
UCFP172	M	4 mos.	Found injured on SR82, E of Church Rd, Lee County	VEHICLE	5/26/2012
UCFP173	F	7 mos.	CR 846, 1.5 miles E of Oil Well Grade Rd	VEHICLE	6/19/2012
FP197	M	4.5	Lee County Port Authority Mitigation Land	UNKNOWN	7/18/2012
UCFP174	M	10 mos.	Private property, 1.3 miles N of CR 832, E of OSSF	ISA - INTRASPECIFIC AGGRESSION	8/28/2012
UCFP176	F	3 mos.	Immokalee Rd, 2 miles N of fairgrounds, Collier County	VEHICLE	10/9/2012
UCFP177	F	4 mos.	18th Ave NE, Golden Gate Estates	VEHICLE	11/4/2012
UCFP178	F	1 yr	SR 29, 1.5 miles S of I-75, Collier County	VEHICLE	11/14/2012
UCFP179	M	3	SR 29, Owl Hammock Curve, Collier County	VEHICLE	11/19/2012
UCFP181	F	2 to 3 mos.	Immokalee Rd, 3.6 miles N of Oil Well Rd, Collier County	VEHICLE	11/26/2012
UCFP184	F	7 mos.	CR 833, 2 miles E CR 846, Hendry County	VEHICLE	1/1/2013
UCFP185	M	10 mos.	SR 29, 600 feet S Oil Well Rd, Collier County	VEHICLE	1/3/2013
UCFP186	M	2 to 4	Sadie Cypress, 2 miles S 846, Collier County	ISA - INTRASPECIFIC AGGRESSION	1/26/2013
UCFP188	M	2 to 3	OSSF, S of Dove Field Rd, Hendry County	ISA - INTRASPECIFIC AGGRESSION	2/1/2013
UCFP189	F	5 to 6 mos.	Everglades Blvd S, Golden Gate Estates, Collier County	VEHICLE	2/20/2013

PANTHER ID	SEX	AGE	LOCATION	CAUSE	MORTALITY DATE
FP184	F	5 to 6	NBCNP, Collier County	ISA - INTRASPECIFIC AGGRESSION	4/26/2013
UCFP192	F	10	CR 846, 2.3 miles W of County Line Road, Collier County	VEHICLE	4/28/2013
UCFP195	M	2 to 3	CR 846, 4.9 miles E of County Line Rd, Hendry County	VEHICLE	7/8/2013
UCFP196	M	2 to 3	I-75, Mile Marker 96.5, Collier County	VEHICLE	7/15/2013
UCFP198	F	3 yrs	I-75, Mile Marker 93 on Miller Canal Bridge, Collier County	VEHICLE	8/19/2013
UCFP201	M	1 yr	Northbound I-75, W of Faka Union Mile Marker 92, Collier County	VEHICLE	12/2/2013
UCFP202	UNKNOWN	9 mos.	FL Panther National Wildlife Refuge, Collier County	ISA - INTRASPECIFIC AGGRESSION	12/11/2013
FP223	M	2.5 yrs	Private Land, Hendry County	DISEASE	1/4/2014
UCFP204	M	2	SR 29, Owl Hammock Curve, Collier County	VEHICLE	1/22/2014
UCFP205	M	7 days	FPNWR, Collier County	OTHER	1/23/2014
FP175	F	6.5	BCNP Addition Lands, Collier County	DISEASE	1/24/2014
UCFP207	M	1.5 yrs	CR 833, Hendry County	VEHICLE	3/8/2014
UCFP208	UNKNOWN	2 yrs	Concho Billy Trail, SBCNP	ISA - INTRASPECIFIC AGGRESSION	3/29/2014
UCFP209	M	3 to 5 yrs	CR 833, just S of CR 832, Hendry County	VEHICLE	4/3/2014
UCFP210	M	2 to 3	CR 846, 6 miles E of Immokalee, Collier County	VEHICLE	4/8/2014
UCFP211	M	8 to 10 mos.	Belle Meade, PSSF, Collier County	ISA - INTRASPECIFIC AGGRESSION	4/11/2014
FP163	M	7	County Line Rd, Collier/Hendry County	VEHICLE	4/25/2014
UCFP214	M	14 mos.	Oil Well Rd, east of Pacific Grade, Collier County	VEHICLE	5/16/2014
UCFP216	F	1 yr	Corkscrew Rd, near CREW gate 5	VEHICLE	6/25/2014
FP177	M	7	BCNP Addition Lands, Collier County	ISA - INTRASPECIFIC AGGRESSION	7/16/2014
FP231	M	2.5 yrs	Golden Gate Estates, Collier County	UNKNOWN	8/4/2014
UCFP217	F	2	CR 833	VEHICLE	8/6/2014
UCFP218	F	4 mos.	Immokalee Rd/Wildwood Blvd (Bonita Bay Club East)	VEHICLE	8/24/2014
UCFP219	M	4 mos.	Immokalee Rd/Krape Rd	VEHICLE	8/24/2014
UCFP220	F	3 to 4 yrs	CR 833, N of BCSIR	VEHICLE	9/2/2014
UCFP223	F	3 to 4 yrs	County Line Rd, just south of CR 846, Collier County	VEHICLE	11/13/2014
FP229	F	4 to 5 yrs	Northern Addlands, BCNP, Collier County	UNKNOWN	11/14/2014
FP213	F	5.5	Dinner Island Ranch WMA, Hendry County	ISA - INTRASPECIFIC AGGRESSION	12/31/2014
UCFP230	F	1.5 yrs	I-75, 0.5 mile E of west toll booth, Collier County	VEHICLE	1/16/2015
UCFP231	F	2	Immokalee Rd, 0.15 miles S of Bethune Rd, Collier County	VEHICLE	1/20/2015
UCFP233	M	5 to 6 yrs	Mile Marker 95, I-75, Collier County	VEHICLE	1/25/2015
UCFP234	UNKNOWN	UNKNOWN	Corkscrew Swamp Sanctuary, Collier County	UNKNOWN	1/29/2015
UCFP236	M	1 yr	CR 846, 0.5 mile S of CR 833 intersection	VEHICLE	2/15/2015
FP183	M	9	SR 29, 2.75 miles S of I-75	VEHICLE	2/25/2015
K402	M	1.5 yrs	I-75, 0.5 mile S of Exit 123, Corkscrew Road	VEHICLE	3/7/2015
FP148	F	11.5	Picayune Strand State Forest, Collier County	ISA - INTRASPECIFIC AGGRESSION	3/20/2015
UCFP238	M	5	Immokalee Road, 2.1 miles W of Camp Keais Rd, Collier County	UNKNOWN	3/22/2015
FP237	M	1 yr	Audubon's Corkscrew Sanctuary	ISA - INTRASPECIFIC AGGRESSION	3/30/2015
UCFP239	M	3 to 4 yrs	I-75, 1.1 miles E of tollbooth, Collier County	VEHICLE	4/3/2015
UCFP240	F	1	SR 29, 1.3 miles N of CR 858	VEHICLE	4/13/2015
FP159	M	12 to 13 yrs	Private land, 2 miles north of Corkscrew Rd, Lee County	UNKNOWN	4/27/2015
UCFP241	M	2 to 3	I-75, 0.5 mile S of Exit 123, Corkscrew Road	VEHICLE	4/30/2015
UCFP242	F	3	CR 833, 0.25 mile S of CR 832	VEHICLE	5/19/2015
FP153	F	14	BCNP	UNKNOWN	6/16/2015
UCFP246	UNKNOWN	2 weeks	Lee County Port Authority Mitigation Land	UNKNOWN	7/1/2015
UCFP244	M	1.5 yrs	Immokalee Rd, 0.4 mile S of Wild Turkey Dr	VEHICLE	7/5/2015
UCFP245	M	10 to 11 mos.	Daniels Pkwy, 1 mile SW of SR 82	VEHICLE	7/8/2015

PANTHER ID	SEX	AGE	LOCATION	CAUSE	MORTALITY DATE
UCFP248	F	4 to 5 mos.	Golden Gate Blvd (2300 GG Blvd E), Collier County	VEHICLE	7/30/2015
FP240	F	2.5 yrs	Deep Lake Unit of Big Cypress NP, Collier County	ISA - INTRASPECIFIC AGGRESSION	8/9/2015
UCFP249	M	4 mos.	CR 858, 0.25 mile W of County Line Rd	VEHICLE	9/22/2015
FP222	F	10.5	I-75, Mile Marker 90, Collier County	VEHICLE	10/23/2015
UCFP254	M	8 to 10 mos.	CR 846, just W Everglades Blvd, Collier County	VEHICLE	11/23/2015
K387	M	2.5 yrs	SR 29 between Pollywog Rd and SR 78, Glades County	VEHICLE	11/25/2015
FP093	F	16 yrs	Turner River Unit, BCNP, Collier County	UNKNOWN	12/2/2015
UCFP255	F	1 yr	CR 832, Hendry County	VEHICLE	12/8/2015
UCFP256	F	2.5 yrs	Corkscrew Rd, Collier County	VEHICLE	12/15/2015
UCFP258	M	1	SR 29, Owl Hammock Curve, Collier County	VEHICLE	12/21/2015
UCFP259	F	7 mos.	CR 832, 3 miles W of CR 833, Hendry County	VEHICLE	12/30/2015
UCFP260	M	6 mos.	18th Ave SE, W of Desoto, Collier County	UNKNOWN	1/3/2016
UCFP261	M	3 mos.	Sakata Farms off SR 82, Lee County	OTHER	1/18/2016
UCFP262	F	7 to 9 mos.	Daniel's Parkway, 0.5 mile E of Treeline Avenue, Lee County	VEHICLE	1/20/2016
UCFP264	F	4	SR 82, 0.8 mile W of Church Rd, Hendry County	VEHICLE	1/30/2016
UCFP266	F	1.5 to 2 yrs	SR 82, near Sparta Avenue, Lee County	VEHICLE	2/12/2016
UCFP267	M	5 to 6 mos.	SR 82, just E of Hendry County line, Collier County	VEHICLE	2/15/2016
UCFP268	M	4	SR 82, 1.25 miles E of Corkscrew Rd, Collier County	VEHICLE	2/17/2016
UCFP273	M	1 yr	I-75, Alligator Alley near Mile Marker 96 bordering Belle Meade, Collier County	VEHICLE	4/1/2016
UCFP275	M	3	Immokalee Rd, 2.50 miles E of CR 951, Collier County	VEHICLE	4/6/2016
UCFP277	M	5 to 6 mos.	Golden Gate Blvd, just E of 22nd St NE, Collier County	VEHICLE	4/10/2016
UCFP278	M	16 to 18 mos.	Randall Blvd, 0.07 mile E of 16th St NE, Collier County	VEHICLE	4/15/2016
UCFP280	M	1 yr	CR 833, 0.07 mile N of the junction with CR 835, Hendry County	VEHICLE	4/26/2016
UCFP281	M	4	OK Slough, 3.5 miles N of Keri Rd, Twin Mills Grade, Hendry County	ISA - INTRASPECIFIC AGGRESSION	4/28/2016
K403	F	4	Daniel's Parkway junction with Commerce Lakes Drive, Lee County	VEHICLE	5/26/2016
UCFP284	F	6 mos.	CR 858 at Camp Keais Road, Collier County	VEHICLE	6/16/2016
FP215	F	11	Barron Collier, Collier County	UNKNOWN	6/22/2016
FP242	M	10 yrs	Immokalee Ranch, 0.41 mile S of CR 846, Hendry County	UNKNOWN	8/5/2016
UCFP285	F	4	SR 82, 0.5 mile W of Church Road, Collier County	VEHICLE	8/5/2016
FP171	M	9 to 10	SR 29, 2.6 miles N of I-75, Collier County	VEHICLE	8/14/2016
FP195	F	8.5	36th Avenue SE, Golden Gate Estates, Collier County	ISA - INTRASPECIFIC AGGRESSION	8/29/2016
K421	M	3	2685 Florida 29, Immokalee	VEHICLE	10/2/2016
UCFP288	M	6 mos.	Daniels Parkway, SW of SR 82, Lee County	VEHICLE	10/28/2016
UCFP289	F	3	Golden Gate Blvd, 0.6 miles W of Everglades Blvd	VEHICLE	10/31/2016
UCFP290	F	UNKNOWN	SR 29, 2.3 miles S of CR 858, Collier County	VEHICLE	11/16/2016
UCFP291	M	9 mos.	CR 832, 2 miles E of SR 29	VEHICLE	11/20/2016
UCFP292	F	2	SR 29, 2 miles N of CR 858, Collier County	VEHICLE	12/6/2016
UCFP295	F	4 to 5 mos.	Ben Hill Griffin Pkwy & FGCU Blvd	VEHICLE	12/10/2016
UCFP296	M	3 mos.	CR 832, 5 miles W of CR 833, Hendry County	VEHICLE	1/12/2017
UCFP299	UNKNOWN	UNKNOWN	2nd Ave NE, E of Desoto, GGE, Collier County	UNKNOWN	2/23/2017
UCFP300	M	5 to 6	SR 82, 0.5 mile E of CR 850	VEHICLE	2/27/2017
UCFP302	F	2	SR 82, 1.7 miles W of CR 850, Hendry County	VEHICLE	3/4/2017
UCFP303	F	2 mos.	SR 82, 1.4 miles E of CR 850, Collier County	VEHICLE	3/9/2017
UCFP304	F	4	CR 846, 2 miles E of Immokalee, Collier County	VEHICLE	3/14/2017
FP198	F	9	Consolidated Citrus, near CREW, Lee County	ISA - INTRASPECIFIC AGGRESSION	3/22/2017
UCFP307	F	4 to 5	CR 846, 2.6 miles W of County Line Rd, Collier County	VEHICLE	4/20/2017
UCFP308	F	3 to 4 yrs	CR 832, 5 miles E of OSSF, Hendry County	VEHICLE	5/8/2017

PANTHER ID	SEX	AGE	LOCATION	CAUSE	MORTALITY DATE
UCFP309	M	UNKNOWN	Keri Island Rd GGE, Collier County	UNKNOWN	6/11/2017
UCFP310	M	2 to 3	CR 846, 2 miles E of County Line Rd, Hendry County	VEHICLE	6/16/2017
K480	F	18 days	SBCNP, Turner River Unit, Collier County	OTHER	6/28/2017
UCFP311	M	5	Immokalee Rd, 2 miles E of CR 951, Collier County	VEHICLE	7/3/2017
UCFP313	M	2	CREW, Marsh Hiking Trails	ISA - INTRASPECIFIC AGGRESSION	8/14/2017
UCFP315	F	1 yr	CR 846, Robert's Ranch Rd (Duck Curve)	VEHICLE	8/24/2017
FP244	M	7	Dinner Island Ranch WMA, Hendry County	UNKNOWN	8/28/2017
K411	M	3 to 4 yrs	Immokalee Rd (near curve by Corkscrew Sanctuary)	VEHICLE	11/7/2017
UCFP318 (K364)	M	6	CR 833, 1 mile S of Hill Grade	VEHICLE	11/13/2017
FP249	M	2	CR 833, 2.2 miles S of junction with CR 835	VEHICLE	11/20/2017
UCFP319	M	2	Daniels Pkwy, E of I-75, Lee County	VEHICLE	11/23/2017
UCFP320	M	3 mos.	Desoto Blvd, near 24th Ave SE	VEHICLE	12/9/2017
UCFP321	M	2 to 3	North of SR 78, 5.5 miles E of junction with SR 29, Glades County	ISA - INTRASPECIFIC AGGRESSION	12/20/2017
UCFP323	M	1.5 yrs	Immokalee Road at Wildwood	VEHICLE	1/13/2018
UCFP327	M	4 mos.	Immokalee Rd S of Stockade St	VEHICLE	2/5/2018
UCFP328	F	5 to 6	Immokalee Rd, 5.5 miles E of junction with Everglades Blvd, Collier County	VEHICLE	2/19/2018
UCFP330	F	5 to 6	SR 29 in Jerome, Collier County	VEHICLE	2/28/2018
UCFP331	F	3	CR 846, 2.5 miles west of County Line Rd, Collier County	VEHICLE	2/28/2018
FP245	M	7	Immokalee Ranch, 2 miles ESE of the Bishop Pens, Hendry County	DISEASE	3/14/2018
FP236	M	9 to 10	Rock Rd, Golden Gate Estates, Collier County	UNKNOWN	3/21/2018
UCFP332	F	3	SR 82, 0.2 mile W of junction with Corkscrew Rd, Collier County	VEHICLE	4/3/2018
UCFP333	M	2.5 yrs	I-75, 1.2 miles E of SR 29	VEHICLE	5/18/2018
UCFP334	M	9 mos.	CR 833, 0.12 mile N of CR 832	VEHICLE	6/20/2018
UCFP335	M	2	SR 29, 1.86 miles S of CR 858	VEHICLE	6/25/2018
K430	M	4	PSSF, Stewart Blvd, 10.10 miles W of Miller Canal Bridge, Collier County	VEHICLE	7/21/2018
UCFP337	F	5	CR 832, 1.5 miles W of junction with CR 833, Hendry County	VEHICLE	8/25/2018
UCFP338	F	4	CR 846 at intersection with Wild Turkey Drive, Collier County	VEHICLE	9/10/2018
UCFP339	M	5	SR 29, north of Immokalee	VEHICLE	10/7/2018
UCFP340	F	4 mos.	CR 833, 0.33 miles E of CR 846, Hendry County	VEHICLE	10/10/2018
UCFP341	M	4 mos.	CR 833, 0.33 miles E of CR 846, Hendry County	VEHICLE	10/10/2018
UCFP342	M	4 mos.	CR 846, 3.16 miles W of Duck Curve, Hendry County	VEHICLE	10/17/2018
UCFP343	M	2	Daniels Parkway, 2.50 miles SW of SR 82, Lee County	VEHICLE	10/17/2018
FP250 (PC1095)	M	3	North Belle Meade, Collier County	ISA - INTRASPECIFIC AGGRESSION	11/5/2018
FP251	M	19 mos.	CR 846, 0.75 miles N of Jones Mining Rd	VEHICLE	12/7/2018
UCFP344	F	9	Church Rd, Felda	VEHICLE	12/8/2018
UCFP345	M	4 to 5 mos.	14th Ave NE, W of Everglades Blvd, Collier County	ISA - INTRASPECIFIC AGGRESSION	12/29/2018
UCFP346	M	3	SR 80, 1.1 miles E of junction with Wellington Pkwy, Hendry County	VEHICLE	1/29/2019
FP220	F	12	Turner River Unit, BCNP, Collier County	UNKNOWN	2/1/2019
UCFP347	F	8 mos.	DeSoto Blvd, between 4th and 6th Ave SE, Collier County	VEHICLE	2/8/2019
UCFP348	M	9 mos.	Duda Orange Grove, 4.2 miles N of Hendry County Landfill, Hendry County	ISA - INTRASPECIFIC AGGRESSION	2/11/2019
UCFP350	M	2	CR 846, 1.8 miles W of County Line Rd, Collier County	VEHICLE	3/8/2019
UCFP351	M	7 mos.	SR 82, 0.2 miles W of junction with Corkscrew Road, Collier County	VEHICLE	3/24/2019
UCFP353	F	1 yr	CR 846, west of County Line Rd, Collier County	VEHICLE	4/14/2019
UCFP354	M	5 to 6 mos.	CR 833, 3 miles E of CR 846, Hendry County	VEHICLE	4/30/2019
UCFP356	F	5	Citrus grove 3.7 miles E of Immokalee, Collier County	ISA - INTRASPECIFIC AGGRESSION	6/27/2019
UCFP361	F	11 mos.	SR 82, Homestead Rd S	VEHICLE	7/26/2019
UCFP362	UNKNOWN	UNKNOWN	CR 846, 3 miles W of Duck Curve, Hendry County	VEHICLE	8/15/2019

PANTHER ID	SEX	AGE	LOCATION	CAUSE	MORTALITY DATE
UCFP363	F	2	SR 80, 10.25 miles E of LaBelle	VEHICLE	9/2/2019
UCFP364	F	4 mos.	26th Ave SE and Everglades Blvd	VEHICLE	9/23/2019
UCFP365	M	2.5 yrs	I-75, Mile Marker 120	VEHICLE	10/4/2019
UCFP366	M	3 to 4	SR 29, Felda	VEHICLE	10/31/2019
UCFP367	F	4 to 5 mos.	PRIDE orange grove SE of Hendry County Prison, Hendry County	UNKNOWN	11/1/2019
UCFP369	F	2 to 3 mos.	SR 29, Owl Hammock Curve, Collier County	VEHICLE	11/6/2019
UCFP370	M	3 to 4 yrs	Church Rd, Felda	VEHICLE	11/13/2019
UCFP371	F	3 to 4 mos.	CR 832 1 mile E of Forestry Tower, OSSF	VEHICLE	11/14/2019
UCFP372	F	11	I-75 Mile Marker 82.5, Collier County	VEHICLE	12/30/2019
UCFP373	F	2	Church Rd, Felda	VEHICLE	1/2/2020

Appendix H-4
Florida Panther Telemetry Data within Five Miles of the Preferred Alternative

PANTHER ID	NUMBER OF TELEMETRY POINTS	DATE FIRST TELEMETRY LOCATION WAS TAKEN	DATE LAST TELEMETRY LOCATION WAS TAKEN	LENGTH OF TIME TELEMETRY DATA COLLECTED	LENGTH OF TIME TELEMETRY DATA COLLECTED (YEARS)
4	66	12/14/1982	2/25/1985	2 years 3 months	2.25
5	183	3/23/1982	10/12/1983	1 year 8 months	1.66
10	28	11/17/1986	1/27/1987	2 months	0.25
11	1424	2/8/1986	2/26/2001	15 years	15.00
12	292	2/8/1986	10/31/1994	8 years 8 months	8.66
13	161	3/9/1986	12/14/1987	1 year 9 months	1.75
17	49	1/25/1987	11/6/1989	2 years 10 months	2.83
18	301	2/3/1987	8/31/1990	3 years 6 months	3.50
19	1148	2/13/1987	12/3/1997	10 years 10 months	10.83
20	88	5/8/1987	8/19/1988	1 year 3 months	1.25
25	19	2/17/1988	7/27/1988	5 months	0.41
28	47	3/20/1989	3/29/1991	2 years	2.00
29	112	1/6/1989	4/6/1992	3 years 3 months	3.25
30	57	1/7/1989	9/27/1989	8 months	0.66
31	424	8/21/1989	3/4/1994	4 years 7 months	4.58
32	32	8/14/1989	8/14/2000	11 years	11.00
33	2	9/15/1989	10/28/1989	1 month	0.08
34	7	1/14/1990	5/16/1990	4 months	0.33
44	1	2/24/1992	2/24/1992	1 day	0.00
45	69	6/14/1991	1/13/1992	7 months	0.58
46	124	3/20/1992	11/28/1997	5 years 8 months	5.66
47	122	2/24/1992	12/18/1992	10 months	0.83
48	179	2/25/1992	10/30/2006	14 years 8 months	14.66
50	55	8/28/1992	12/6/1993	1 year 4 months	1.33
51	172	3/15/1995	7/17/1998	3 years 4 months	3.33
52	362	5/6/1992	1/13/1995	2 years 8 months	2.66
53	2	2/12/1993	2/17/1993	5 days	0.01
54	25	4/12/1993	3/17/1997	3 years 11 months	3.91
57	4	2/17/1995	10/7/1996	1 year 8 months	1.66
58	108	12/11/1995	3/31/1997	1 year 4 months	1.33
59	316	1/24/1996	10/29/2003	7 years 9 months	7.75
60	22	2/24/1997	9/3/1999	2 years 7 months	2.58
62	18	2/6/1998	4/3/1998	2 months	0.25
63	20	4/23/1999	1/17/2000	9 months	0.75
64	24	2/4/1998	3/22/1999	1 year 1 month	1.08
65	359	4/8/1998	9/17/2010	12 years 5 months	12.41

PANTHER ID	NUMBER OF TELEMETRY POINTS	DATE FIRST TELEMETRY LOCATION WAS TAKEN	DATE LAST TELEMETRY LOCATION WAS TAKEN	LENGTH OF TIME TELEMETRY DATA COLLECTED	LENGTH OF TIME TELEMETRY DATA COLLECTED (YEARS)
66	143	7/24/1998	4/28/2000	11 years 9 months	11.75
68	33	5/20/1998	5/26/1999	1 year	1.00
75	226	3/26/1999	12/14/2005	6 years 9 months	6.75
78	5	7/17/2000	1/16/2002	1 year 6 months	1.50
96	3	5/25/2001	7/13/2001	2 months	0.25
97	74	1/22/2001	12/3/2001	11 months	0.91
98	24	6/13/2001	7/1/2002	1 year 1 month	1.08
99	42	2/5/2001	11/21/2001	9 months	0.75
100	1	2/22/2002	2/22/2002	1 day	0.00
105	64	4/18/2001	1/11/2002	9 months	0.75
105	207	4/23/2001	2/17/2003	1 year 10 months	1.83
107	21	9/30/2005	7/18/2008	2 years 10 months	2.83
112	5	4/10/2002	5/10/2002	1 month	0.08
113	587	12/2/2003	10/19/2012	8 years 10 months	8.23
119	1	10/21/2005	10/21/2005	1 day	0.00
123	2	2/16/2004	2/25/2004	9 days	0.02
126	11	11/29/2004	1/3/2005	2 months	0.25
131	137	3/12/2004	4/16/2008	4 years 1 month	4.08
135	171	12/27/2004	10/23/2006	1 year 10 months	1.83
137	15	2/1/2006	7/31/2009	3 years 5 months	3.41
139	26	4/6/2005	8/12/2005	4 months	0.33
140	1	12/3/2008	12/3/2008	1 day	0.00
143	150	5/1/2006	7/30/2007	1 year 2 months	1.25
154	56	3/2/2007	11/21/2007	8 months	0.66
155	1	12/7/2007	12/7/2007	1 day	0.00
160	18	2/18/2008	8/22/2008	6 months	0.50
163	6	3/29/2013	4/25/2014	1 year 1 month	1.08
165	2	6/15/2009	6/26/2009	11 days	0.03
171	17	5/27/2009	7/18/2011	2 years 2 months	2.25
176	2	8/13/2010	8/23/2010	10 days	0.03
178	9	11/8/2010	3/30/2012	4 months	0.33
183	7	11/5/2010	10/30/2013	2 years 11 months	2.91
185	27	11/17/2010	6/1/2011	7 months	0.58
189	94	2/16/2011	1/4/2012	11 months	0.91
198	4	4/13/2012	4/20/2012	7 days	0.02
212	6	2/24/2012	4/4/2012	2 months	0.25

PANTHER ID	NUMBER OF TELEMETRY POINTS	DATE FIRST TELEMETRY LOCATION WAS TAKEN	DATE LAST TELEMETRY LOCATION WAS TAKEN	LENGTH OF TIME TELEMETRY DATA COLLECTED	LENGTH OF TIME TELEMETRY DATA COLLECTED (YEARS)
215	239	2/24/2012	6/25/2014	2 years 4 months	2.33
217	8	5/20/2013	2/26/2014	9 months	0.75
FP215	126	7/2/2014	2/19/2016	1 year 7 months	1.58
FP217	19	8/8/2014	6/24/2016	1 year 10 months	1.83
FP241	10	10/17/2016	10/9/2017	1 year	1.00
FP242	16	3/18/2016	7/1/2016	4 months	0.33
FP245	3	6/2/2017	6/12/2017	10 days	0.03
FP246	47	2/17/2017	2/19/2020	3 years	3.00
FP247	364	2/17/2017	6/8/2020	3 years	3.00
FP249	1	6/16/2017	6/16/2017	1 day	0.00
FP250	1	3/16/2018	3/16/2018	1 day	0.00
FP251	4	5/18/2018	5/25/2018	7 days	0.02
FP252	4	5/18/2018	5/25/2018	7 days	0.02
FP254	66	1/23/2019	11/15/2019	10 months	0.83
FP256	44	3/8/2019	10/4/2019	7 months	0.58
FP259	30	5/22/2019	12/27/2019	7 months	0.58
TX102	1	5/12/1995	5/12/1995	1 day	0.00

Appendix H-5

Florida Panther Mortality Data within Five Miles of the Preferred Alternative

PANTHER ID	SEX	AGE	LOCATION	CAUSE	MORTALITY DATE	DISTANCE TO PROJECT (MILES)
UCFP005-(G80-15)	M	1.5 to 2.5	SR 29 near Sunniland	VEHICLE	2/7/1980	0.89
FP010	M	16 to 20 mos.	FPNWR	ISA - INTRASPECIFIC AGGRESSION	1/27/1987	3.81
FP013	M	6 to 8	SR 29 Sunniland	VEHICLE	12/14/1987	2.36
UCFP020	F	9 mos.	SR 29, at Pistol Pond	VEHICLE	2/4/1991	3.52
UCFP021	F	7 mos.	SR 29, Sunniland	VEHICLE	11/9/1992	2.17
FP050	M	2.5	CR 846, 5 miles E of Immokalee, Collier County	VEHICLE	12/6/1993	3.96
UCFP023	M	8 mos.	County Line Road, 3 miles N of CR 858	VEHICLE	2/28/1994	4.74
FP031	F	12 to 14	SR 29 Sunniland	VEHICLE	3/3/1994	2.26
FP052	F	3 to 4	CR 846 near Dupree Road	VEHICLE	1/14/1995	2.65
FP058	M	3	Sadie Cypress, Collier County	ISA - INTRASPECIFIC AGGRESSION	3/30/1997	2.25
UCFP031	UNKNOWN	UNKNOWN	CR 846, 1.5 miles W of CR 858	VEHICLE	7/13/1997	4.25
FP019	F	11.5	FPNWR	DISEASE	12/2/1997	3.65
FP063	M	5	SR 29, N of Pistol Pond	VEHICLE	1/15/2000	2.76
K076	M	3 mos.	CR 858, 1 mile W of SR 29	VEHICLE	2/28/2000	1.34
UCFP035	M	1.5 to 2	CR 846, 2 miles E of Immokalee	VEHICLE	6/23/2000	1.22
UCFP037	F	5	CR 846, 4.5 miles E of SR 29	VEHICLE	12/29/2000	3.14
FP011	F	19 to 20	Private land, 200 yards S of CR 846, 1 mile E of Dupree Rd	ISA - INTRASPECIFIC AGGRESSION	2/27/2001	2.96
UCFP041	M	2 to 3	SR 29, Sunniland, near mine entrance	VEHICLE	5/22/2001	1.92
FP097	M	2	Private land, E of Gopher Ridge Grove, N of Immokalee	ISA - INTRASPECIFIC AGGRESSION	12/2/2001	4.36
FP098	M	4 to 5	SR 29, 0.6 miles N of Pistol Pond	VEHICLE	7/1/2002	2.76
UCFP048	F	8 to 9 mos.	CR 846, 5 miles E of Immokalee	VEHICLE	11/10/2002	4.18
UCFP049 (K098)	F	19 mos.	CR 846, 3 miles E of Immokalee	VEHICLE	11/25/2002	1.93
FP106	F	3	SR 29, entrance to Sunniland Mine	VEHICLE	2/20/2003	2.00
UCFP053	F	2 to 3	SR 29, 1.4 miles N of CR 858, Collier County	VEHICLE	5/25/2003	Within project area
UCFP054	M	8 to 10 mos.	SR 29, 1.7 miles N of CR 858, Collier County	VEHICLE	6/3/2003	Within project area
UCFP059	M	3 to 4 mos.	CR 858, 1.2 miles W of SR 29	VEHICLE	11/2/2003	1.15
UCFP069	F	2	SR 29 2.5 miles N of CR 858	VEHICLE	10/25/2004	Within project area
UCFP070	F	1	SR 29, Owl Hammock Curve	VEHICLE	12/1/2004	Within project area
FP126	M	1.5 to 2	Private property, 0.5 mile S of CR 846, Sadie Cypress	ISA - INTRASPECIFIC AGGRESSION	1/1/2005	4.45
UCFP075	M	2	SR 29, Owl Hammock Curve	VEHICLE	6/19/2005	Within project area
UCFP086	UNKNOWN	UNKNOWN	SR 29, 0.6 miles S of Sunniland	VEHICLE	7/6/2006	2.50
FP048	F	15	Sunniland, Collier County	UNKNOWN	10/23/2006	2.31
UCFP100	M	2 to 3	SR 29, 3 miles S of Immokalee	VEHICLE	6/23/2007	0.03
FP131	M	9	Horse Trial grounds, N of CR 858, W of SR 29	DISEASE	4/16/2008	0.57
UCFP111	F	6 to 8 mos.	SR 29, 1.5 miles N of Oil Well Road	VEHICLE	10/24/2008	Within project area
UCFP114	F	4	CR 858, 1 miles E of Camp Keais Rd	VEHICLE	11/28/2008	3.54
UCFP116	F	4 to 5	SR 29, 3 miles S of Immokalee	VEHICLE	1/20/2009	Within project area
UCFP122	M	2	CR 846, near Camp Keais Rd	VEHICLE	5/25/2009	2.84
UCFP126	M	2	E of Ave Maria, Ranch 1 Orange Grove	VEHICLE	9/15/2009	2.55
UCFP129	M	3 to 4 mos.	CR 846, 2 miles E of Immokalee, Collier County	VEHICLE	10/19/2009	1.47
UCFP130	F	3 to 4	CR 846, 2 miles E of Immokalee, Collier County	VEHICLE	10/21/2009	1.50
UCFP145	M	16 to 18 mos.	SR 29, 3.7 km S of Farm Workers Village	VEHICLE	6/24/2010	Within project area
UCFP146	F	3 to 4	SR 29, 1 miles S of Owl Hammock, Collier County	VEHICLE	8/3/2010	Within project area
UCFP159	F	4 to 5	SR 29, near Farmworkers Village	VEHICLE	3/25/2011	Within project area
UCFP161	M	7 to 9	Silver Strand Grove, N of Immokalee, Collier County	ISA - INTRASPECIFIC AGGRESSION	7/6/2011	1.31
UCFP162	M	1 to 1.5	SR 29, Owl Hammock Curve	VEHICLE	7/11/2011	Within project area
UCFP164	F	3 to 4	SR 29, Owl Hammock Curve	VEHICLE	9/19/2011	Within project area
UCFP165	F	3 to 4	SR 29, Collier/Hendry County Line	VEHICLE	10/30/2011	1.76
UCFP166	M	4 to 5	SR 82, 2.3 miles W of SR 29, Collier County	VEHICLE	1/2/2012	Within project area
FP189	M	3.5	Tomato field S of Oil Well Rd, Collier County	ISA - INTRASPECIFIC AGGRESSION	1/5/2012	2.17
UCFP179	M	3	SR 29, Owl Hammock Curve	VEHICLE	11/19/2012	Within project area
UCFP185	M	10 mos.	SR 29, 600 feet S Oil Well Rd, Collier County	VEHICLE	1/3/2013	Within project area
UCFP186	M	2 to 4	Sadie Cypress, 2 miles S CR 846, Collier County	ISA - INTRASPECIFIC AGGRESSION	1/26/2013	3.86

PANTHER ID	SEX	AGE	LOCATION	CAUSE	MORTALITY DATE	DISTANCE TO PROJECT (MILES)
UCFP192	F	10	CR 846, 2.3 miles W of County Line Road, Collier County	VEHICLE	4/28/2013	4.51
UCFP202	UNKNOWN	9 mos.	FPNWR	ISA - INTRASPECIFIC AGGRESSION	12/11/2013	3.17
UCFP204	M	1.5	SR 29, Owl Hammock Curve, Collier County	VEHICLE	1/22/2014	Within project area
UCFP210	M	2 to 3	CR 846, 6 miles E of Immokalee, Collier County	VEHICLE	4/8/2014	4.71
FP163	M	7	Co Line Rd, Collier/Hendry County Line	VEHICLE	4/25/2014	4.70
UCFP214	M	14 mos.	Oil Well Rd, E of Pacific Grade, Collier County	VEHICLE	5/16/2014	3.55
UCFP231	F	1.5	Immokalee Rd, 0.15 miles S of Bethune Rd, Collier County	VEHICLE	1/20/2015	1.13
UCFP238	M	5	Immokalee Road, 2.1 miles W of Camp Keais Rd, Collier County	UNKNOWN	3/22/2015	4.12
UCFP240	F	1	SR 29, 1.3 mi N of CR 858	VEHICLE	4/13/2015	Within project area
UCFP249	M	4 mos.	CR 858, 0.25 miles W of County Line Rd	VEHICLE	9/22/2015	4.16
UCFP258	M	1	SR 29, Owl Hammock Curve, Collier County	VEHICLE	12/21/2015	Within project area
UCFP268	M	4	SR 82, 1.25 miles E of Corkscrew Road, Collier County	VEHICLE	2/17/2016	4.09
UCFP284	F	6 mos.	CR 858 at Camp Keais Road, Collier County	VEHICLE	6/16/2016	4.46
K421	M	3	2685 Florida 29, Immokalee, 34142	VEHICLE	10/2/2016	Within project area
UCFP290	F	UNKNOWN	SR 29, 2.3 miles S of CR 858, Collier County	VEHICLE	11/16/2016	1.92
UCFP292	F	2	SR 29 2 miles N of CR 858, Collier County	VEHICLE	12/6/2016	Within project area
UCFP300	M	5 to 6	SR 82, 0.5 mile E of CR 850	VEHICLE	2/27/2017	4.77
UCFP303	F	2 mos.	SR 82, 1.4 miles E of CR 850, Collier County	VEHICLE	3/9/2017	4.00
UCFP304	F	4	CR 846, 2 miles E of Immokalee, Collier County	VEHICLE	3/14/2017	1.46
UCFP307	F	4 to 5	CR 846, 2.6 miles W of County Line Rd, Collier County	VEHICLE	4/20/2017	4.21
UCFP327	M	4 mos.	Immokalee Rd S of Stockade St	VEHICLE	2/5/2018	1.62
UCFP328	F	5 to 6	Immokalee Rd, 5.5 miles E of junction with Everglades Blvd, Collier County	VEHICLE	2/19/2018	4.65
UCFP331	F	3	CR 846, 2.5 miles W of County Line Rd, Collier County	VEHICLE	2/28/2018	4.30
UCFP335	M	2	SR 29, 1.86 miles S of CR 858	VEHICLE	6/25/2018	1.85
UCFP339	M	5	SR 29, north of Immokalee	VEHICLE	10/7/2018	Within project area
UCFP350	M	2	CR 846, 1.8 miles W of County Line Rd, Collier County	VEHICLE	3/8/2019	4.68
UCFP353	F	1	CR 846, W of County Line Rd, Collier County	VEHICLE	4/14/2019	4.55
UCFP356	F	5	Citrus grove 3.7 miles E of Immokalee, Collier County	ISA - INTRASPECIFIC AGGRESSION	6/27/2019	3.48
UCFP366	M	3.5	SR 29, Felda	VEHICLE	10/31/2019	3.67
UCFP369	F	2 to 3 mos.	SR 29, Owl Hammock Curve, Collier County	VEHICLE	11/6/2019	Within project area
Panther ID	Denotes Panther Mortality Within One Mile of the Project Area					

Appendix H-6
Florida Panther Habitat Unit Assessment Summary Table

FDOT D1 - SR 29 PD&E Study from Oil Well Road To SR 82
NRE Addendum #3
Collier County
FPID 417540-1-22-01

Florida Panther Habitat Unit Assessment Summary Table

Panther Zone	Impact Type	Land Cover	Acres	Score	Value	Rate	Multiplier	Required
Primary	Roadway	111 - Fixed single family units	0.91	0	0.00	1.98	1.00	0.00
Primary	Roadway	171 - Educational facilities	0.02	0	0.00	1.98	1.00	0.00
Primary	Roadway	211 - Improved pasture	2.30	5.2	11.96	1.98	1.00	23.68
Primary	Roadway	212 - Unimproved Pasture	1.29	5.7	7.35	1.98	1.00	14.56
Primary	Roadway	310 - Herbaceous dry prairie	0.32	6.3	2.02	1.98	1.00	3.99
Primary	Roadway	320 - Shrub and brushland	33.17	5.5	182.44	1.98	1.00	361.22
Primary	Roadway	330 - Mixed rangeland	0.12	5.7	0.68	1.98	1.00	1.35
Primary	Roadway	411 - Pine flatwoods	12.32	9.5	117.04	1.98	1.00	231.74
Primary	Roadway	434 - Hardwood conifer mixed	0.27	9.5	2.57	1.98	1.00	5.08
Primary	Roadway	437 - Australian pine	0.20	3	0.60	1.98	1.00	1.19
Primary	Roadway	510 - Streams and waterways	0.37	0	0.00	1.98	1.00	0.00
Primary	Roadway	617 - Mixed wetland hardwoods	1.98	9.2	18.22	1.98	1.00	36.07
Primary	Roadway	621 - Cypress	0.56	9.2	5.15	1.98	1.00	10.20
Primary	Roadway	630 - Wetland forested mixed	8.12	9.3	75.52	1.98	1.00	149.52
Primary	Roadway	641 - Freshwater marsh	1.38	4.7	6.49	1.98	1.00	12.84
Primary	Roadway	814 - Roads and highways	128.92	0	0.00	1.98	1.00	0.00
		Totals:	**192.25**		**430.02**			**851.45**
Secondary	Roadway	111 - Fixed single family units	0.73	0	0.00	1.98	0.69	0.00
Secondary	Roadway	171 - Educational facilities	0.66	0	0.00	1.98	0.69	0.00
Secondary	Roadway	211 - Improved pasture	15.50	5.2	80.60	1.98	0.69	110.12
Secondary	Roadway	213 - Woodland pasture	1.56	5.7	8.89	1.98	0.69	12.15
Secondary	Roadway	221 - Citrus groves	2.70	4.7	12.69	1.98	0.69	17.34
Secondary	Roadway	320 - Shrub and brushland	1.86	5.5	10.23	1.98	0.69	13.98
Secondary	Roadway	411 - Pine flatwoods	0.26	9.5	2.47	1.98	0.69	3.37
Secondary	Roadway	434 - Hardwood conifer mixed	0.59	9.3	5.49	1.98	0.69	7.50
Secondary	Roadway	510 - Streams and waterways	11.04	0	0.00	1.98	0.69	0.00
Secondary	Roadway	534 - Reservoirs	0.64	0	0.00	1.98	0.69	0.00
Secondary	Roadway	641 - Freshwater marsh	1.56	4.7	7.33	1.98	0.69	10.02
Secondary	Roadway	814 - Roads and highways	40.30	0	0.00	1.98	0.69	0.00
Secondary	Roadway	832 - Electrical power transmission lines	0.23	3	0.69	1.98	0.69	0.94
		Totals:	**77.63**		**128.39**			**175.41**
							Total Mitigation PHUs:	**1026.85**
		Total Acres in Primary Zone	**192.25**					
		Total Impact Habitat Value in Primary Zone	**62.03**					
		Total Acres in Secondary Zone	**77.63**					
		Total Impact Habitat Value in Secondary Zone	**24.26**					
		Total Acres	**269.88**					
		Total Impact Habitat Value	**86.29**					