AGENDA
AIRPORT ADVISORY COMMISSION
REGULAR MEETING
DECEMBER 13, 2018
6:00 PM
CITY HALL COMMISSION CHAMBERS
204 ASH STREET
FERNANDINA BEACH, FL 32034

1. CALL TO ORDER

2. ROLL CALL

3. APPROVAL OF MINUTES

3.1 Consider approval of the Minutes from November 8, 2018 Regular AAC Meeting

4. PUBLIC COMMENT REGARDING ITEMS NOT ON THE AGENDA

5. OLD BUSINESS

5.1 Observation Deck - Educational Component Discussion Continued

5.2 GPS Approach Procedure Development Update

5.3 AAC Vice Chairperson Appointment

5.4 Airport Financial Report

6. NEW BUSINESS

6.1 Bonhams & Butterfields Auctioneer Corporation Facility Use Agreement Review

6.2 Private Hangar Development Proposals - Discuss Airport's Architectural Standards

6.3 RFQ for Consultant Services Follow-up Discussion

7. AIRPORT DIRECTOR AND STAFF REPORTS

7.1 Airport Director Report

8. COMMISSION MEMBER REPORTS/COMMENTS

9. NEXT MEETING DATE

10. ADJOURNMENT

All members of the public are invited to be present and be heard. Persons with disabilities requiring accommodations in order to participate in this program or activity should contact the City Clerk at (904) 310-3115 or TTY/TDD 711 (for the hearing or speech impaired). All interested parties may appear at said meeting and be heard as to the advisability of any action, which may be considered with respect to such matter. For information regarding this matter, please contact the Airport Manager.

1. **Call to Order:** Chairperson Chuck Colcord called the meeting to order at 6:00 pm.

2. **Members Present:** Chuck Colcord (Chair), Don Edlin, Prudence Hostetter, Tom Piscitello, Kent McKee, and Dave Austin
Members Absent: Paul Behan and Ward Gill

   Others Present: Commissioner Len Kreger, Brian Echard, Kathryn Echard, Brad Wente (Passero Associates), Andrew Curtin, Clint Smith, Blake Swafford, Art Waczkowski.

3. **Approval of Minutes:** The minutes of the September 13, 2018 regular meeting were presented for approval.

   A motion was made by Member McKee, seconded by Member Austin, to approve the minutes. A vote upon passage of the motion was taken by ayes and nays and being all ayes, carried.

4. **Public Comment Regarding Items Not On The Agenda:** Mr. Andrew Curtin, representing the airport's tenant association, asked for updates related to the ongoing ad valorem tax discussion and the potential transaction occurring at the Amelia River Golf Course.

   Airport Manager Coyle stated that the airport has engaged the services of Benjamin Phipps, an aviation attorney in Tallahassee who has strong experience related to aviation taxes and the ad valorem tax discussion, to provide an opinion letter to the attorney general's office with a request for an opinion on the matter. Mr. Coyle also stated that the property appraiser office would provide a similar letter from its counsel, and that both parties agreed to follow the guidance received from that opinion, when issued.

   Mr. Coyle stated that he had been contacted by the developers interested in purchase of the Amelia River Golf Course business, but that he was awaiting a formal submittal of a proposal for use of the property moving forward. Mr. Coyle stated that he would share this proposal with the group when it is available, and that he had contacted the FAA/Orlando ADO for a meeting to review such a proposal for land use compatibility adjacent to the airport once it has been received. Mr. Coyle stated that the discussion with the proposers was for use of the property under assignment of the existing lease or through establishment of a new ground lease on the property. This would sustain the continued lease revenue the airport receives for use of this property moving forward.

5. **Old Business:**

   5.1 Airport Terminal Facility Construction Project – Final Update

   Airport Manager Coyle stated that the terminal facility project had been completed, and that airport staff is awaiting receipt of the final pay application for the project. Mr. Coyle stated that he was aware of a dispute between F&G Construction and one of its subcontractors

which is preventing receipt of a lien release on the project, and that the City would hold the final pay application (with retainage) until the dispute is resolved and all lien releases are in hand. Mr. Coyle stated that once the final pay application is paid, remaining grant funds would be drawn on the project.

5.2 Observation Deck – Educational Component Discussion Continued

Airport Manager Coyle mentioned Member Edlin's recommendation to establish a committee to review options for proposing options for use of the deck. Member Edlin stated that he thinks somebody from the EAA should be involved on the committee. Member Colcord mentioned that he thought FOFA and CAP would also most likely be interested in being a part of the process.

Member Hostetter asked if any feedback for use of the space had been received to date. Mr. Coyle stated that the group had received positive feedback by Mercedes Benz from use of the entire facility which included conference room/observation deck and FBO leased space.

Mr. Coyle stated that he would plan to put a call out for volunteers to join this planning committee from the individuals/groups mentioned during the discussion.

5.3 AWOS Replacement Project Update

Airport Manager Coyle provided an update stating that the AWOS replacement project commenced in early October with all components being installed through the course of the month. Mr. Coyle stated that an FAA inspector certified the new system on October 31, 2018, and that the system went into service on that same day. Finally, Mr. Coyle stated that he would be coordinating project closeout and grant funding drawdown in the upcoming month once final project documents had been received.

5.4 GPS Approach Procedure Development Update

Airport Manager Coyle stated that he had been corresponding with the FAA regarding existing survey data for the airport. When initially reviewing a project with flight procedures, Mr. Coyle stated that he could see that survey data for Rwy 4/22 had been completed under a previous project and he was hopeful that this information was usable in developing the procedure for Rwy 4 for which Jacksonville ATC recently provided concurrence. Mr. Coyle stated that he reviewed the date of this survey data with the FAA/ADO office and that the survey was completed in 2009. The FAA stated that a new survey would need to be conducted. A full survey for Rwy 4/22 could cost approximately $40,000. Mr. Coyle stated that the ADO office identified that the previous work was completed under an AIP project for the runway, and that AIP funds were only available for complete the survey one time. Mr. Coyle stated that he would bring additional information back to the next meeting.

5.5 Airport Financial Report

Airport Manager Coyle presented the airport financial report to the AAC. There was no discussion on the financial report.

6. New Business:

6.1 RFQ for Consultant Services – Rank Consultant Agencies

Airport Manager Coyle introduced this subject stating that the scoring committee for the RFQ of airport engineering services produced a tie score during the first scoring of submittals. Mr. Coyle stated that he conferred with City Manager Martin and City Attorney Bach following that meeting in an attempt to define a way forward and that the recommended way forward was to present the matter again to the AAC and change the scoring from a weighted score to simple ranking of the two submittals. Mr. Coyle asked the group to provide this ranking to him, and stated that he had received the rankings from Paul Behan and Ward Gill prior to the meeting. The group completed the ranking and Mr. Coyle tallied the totals and stated that six members scored Passero as the #1 agency and three members scored Hansen as the #2 agency.

Vice Mayor Kreger provided comment stating that he believes the airport should consider using both agencies on a qualified list of consultants in lieu of selecting a single consultant agency as other City department are now using this structure. Mr. Coyle stated that he believed it might be worthwhile to discuss the considerations related to this proposal.

Member Edlin made a motion for the City Commission to place both agencies on a continuing services agreement as qualified firms to support the airport. Member Austin stated that there may be value in discussing this further with input from the airport manager. Member Colcord stated that he believed the AAC had voted on the matter and that the City Commission should consider the option when provided the results of the scoring process. The group agreed that the City Commission should consider this during their discussion on selection of an agency.

6.2 AAC Chairperson Appointment

AAC Members discussed selection and appointment of a Chairperson to serve on the AAC for the upcoming calendar year, to commence in January of 2019. Member McKee stated that he though Chairperson Colcord did a great job serving as the chairperson and that he would make a great fit serving in this role again. Member Colcord agreed that he would be willing to serve in the term for another year. The group agreed that Member Colcord would serve in the role for another year, commencing on January 1, 2019. There was no opposition heard from the commission on this matter.

6.3 AAC Vice Chairperson Appointment

AAC members recommended deferring this discussion to the next AAC meeting when all members could be present for the discussion.

7. **Airport Manager and Staff Reports:**

   Airport Manager Coyle provided an update regarding a submittal to the FAA for consideration to place dredge spoils at the airport, and stated that a submittal should be provided to the FAA in November with the items previously discussed by the group.

8. **Commission Member Reports and Comments:**

   Member McKee provided a thank you to airport staff for diligently working to secure funding and a project to replace the airport's failing AWOS.

9. **Next Meeting Date:** The group agreed that the December meeting would be scheduled on its regular date of Thursday/December 13, 2018.

10. **Adjournment:** There being no further business to come before the Airport Advisory Commission, the meeting was adjourned at 7:13 p.m.

_____ _____

Secretary Chuck Colcord, Chairperson

GPS Procedure Discussion

Purpose – Discuss obstacle survey for Runway 4 GPS procedure. Consider completing survey work in this fiscal year or wait until the next fiscal year to budget this work. Estimated cost of obstacle survey is ~$40K.

Current FY Capital Improvements Line Projects and Status (Total Budgeted in Current FY - $583,950)

- Airport East Driveway Project - $75,000 budgeted last fiscal year; project came in under budget at $35,000 in expense however ~$4,600 crossed into the current FY for this project (was not anticipated). Project was completed in October. A budget amendment could shift funds to accommodate for this expense in the current FY.

- AWOS Replacement – Project completed on budget. Expenses budgeted in this FY at $147,000 as it was anticipated that the project would start in September however the project started in the first week of the new fiscal year. Therefore, expenses in this FY will be ~$170,000.

- Hangar B Repairs – Budgeted $140,000 in repairs and upgrades. Some work was completed in the last FY (replaced HVAC systems and lighting in hangar), and staff is coordinating work for this fiscal year. Expenses under this project can be controlled.

- Re-marking Runway 13/31 - $40,000 budgeted for expense. Grant agreement with FDOT executed in November and awaiting proposals for this work from painting crews. Expected to come in on budget.

- Fuel Farm Design – Grant agreement executed with FDOT. Next step is to coordinate work order for design. $56,250 budgeted for project cost in this FY. Expected to be on budget.

- Runway 4/22 Rehabilitation Design – pre-application submitted to the FAA in November. Budgeted $200,000 in expense but actual expense in this FY may be closer to $165,000 based on recent discussions with the FAA about scoping of design/bidding between design phase and construction phase of the project.

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	BUDGET 2018-2019	YTD	Percentage
REVENUES			
33120 FEMA GRANT			
33220 FAA GRANT	293,000	0.00	0.0%
33323 FDOT GRANT	87,000	0.00	0.0%
33420 FEMA STATE GRANT	-		0.0%
33440 OTHER GRANT	-		0.0%
34970 FUEL SALES	20,000	1,891.04	9.5%
34971 LEASE PAYMENTS - LAND LEASE	68,439	26,340.33	38.5%
34972 LEASE PAYMENTS - BUILDING LEASE		357.23	0.0%
34973 LAND LEASE - AMELIA RIVER	205,960	16,834.97	8.2%
34974 LAND LEASE PAYMENTS - NON-TAXABLE	37,105	6,596.27	17.8%
34975 RENT/LEASE PAYMENTS - City Built	321,192	44,965.85	14.0%
34976 8 FLAGS RENT (TAXABLE)	67,017	9,374.92	14.0%
34978 8 FLAGS RENT - NON-TAXABLE	50,266	9,374.92	18.7%
36110 INTEREST			
36420 INSURANCE PROCEEDS		0.00	
36800 CAPITAL CONTRIBUTION		0.00	
38410 LOAN PROCEEDS		0.00	
36990 OTHER REVENUE	95,700	6,365.00	6.7%
36991 PARKING REVENUE	2,004	0.00	0.0%
36995 LATE FEES	-	233.83	
36992 GAIN ON SALE OF ASSETS			
38101 TRANSFERS IN GENERAL FUND		0.00	
38910 CASH BALANCE FORWARD	40,900	0.00	0.0%
TOTAL	1,288,583	121,977.13	9.5%

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		BUDGET 2018-2019	YTD	Percentage
PERSONNEL SERVICES				
51200	SALARIES	122,210	21,006.60	17.19%
51300	TEMPORARY	-	0.00	
51350	PART TIME	-	0.00	
51400	OVERTIME	-	0.00	
52100	FICA	9,349	1,441.31	15.42%
52200	RETIREMENT	36,594	9,148.50	25.00%
52300	HEALTH	29,701	7,416.74	24.97%
52301	LIFE	605	174.84	28.90%
52350	OPEB COSTS	1,756	438.99	25.00%
52400	WORKERS' COMP	2,150	537.51	25.00%
52500	UNEMPLOYMENT			
	TOTAL	202,365	40,164.49	19.85%
OPERATING EXPENSES				
53100	PROFESSIONAL SERVICES	25,000	234.44	0.94%
53200	AUDIT	6,795	1,698.75	25.00%
53400	CONTRACTUAL	47,440	6,643.12	14.00%
53900	AUTO ALLOWANCE		0.00	
53910	HOUSING ALLOWANCE	-	0.00	
54000	TRAINING/TRAVEL	3,000	351.86	11.73%
54100	COMMUNICATIONS	1,920	151.63	7.90%
54101	COMMUNICATIONS - CELL	2,000	365.96	18.30%
54103	COMMUNICATIONS - INTERNET	5,750	1,035.50	18.01%
54200	POSTAGE	150	0.00	0.00%
54300	UTILITIES - ELECTRIC	45,000	2,899.69	6.44%
54310	UTILITIES - WATER & SEWER	14,504	1,128.32	7.78%
54500	INSURANCE	45,052	11,262.99	25.00%
54610	R/M GROUNDS	108,000	7,901.48	7.32%
54620	R/M EQUIPMENT	1,500	0.00	0.00%
54630	R/M VEHICLES-LABOR	4,000	565.00	14.13%
54640	R/M VEHICLES-MATERIALS	4,000	1,575.54	39.39%
54700	PRINTING	2,350	0.00	0.00%
54800	PROMOTIONAL	2,000	687.93	34.40%
54902	BAD DEBT EXPENSE		0.00	
54910	BILLING COST	7,300	1,824.99	25.00%
55100	OFFICE SUPPLIES	6,300	179.55	2.85%
55200	OPERATING SUPPLIES	735	258.05	35.11%
55210	UNIFORMS	400	0.00	0.00%
55230	FUEL	8,000	546.86	6.84%

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	BUDGET 2018-2019	YTD	Percentage
55400 BOOKS/SUBS/DUES	725	330.00	45.52%
TOTAL	341,921	39,641.66	11.59%
CAPITAL OUTLAY			
56200 BUILDINGS	-	0.0	
56300 IMPROVEMENTS	583,950	164,674.6	28.20%
56400 MACH./EQUIP.	-	0.0	
56401 MACH./EQUIP. Non-CAP	1,000	0.0	0.00%
TOTAL	584,950	164,674.6	28.15%
57000 SETTLEMENT EXP		0.0	
57100 PRINCIPAL	77,000	0.0	
57200 INTEREST	37,832	0.0	
57300 FINANCING COSTS	-	0.0	
TOTAL	114,832	0.0	
DEPARTMENT TOTAL	1,288,583	244,480.8	18.97%

CITY OF FERNANDINA BEACH
FACILITIES USE AGREEMENT

This FACILITIES USE AGREEMENT (herein after called the AGREEMENT) is made and entered into this 9th day of **November**, 2018, by and between the CITY OF FERNANDINA BEACH, a Florida municipal corporation, whose address is 204 Ash Street, Fernandina Beach, FL 32034 (herein called "CITY"), and **Bonhams & Butterfields Auctioneer Corporation** whose address is **220 San Bruno Avenue, San Francisco, CA 94103** (herein called "USER").

WHEREAS, CITY owns, controls and operates that certain public facility known as the Fernandina Beach Municipal Airport (herein called "FACILITY); and

WHEREAS, USER has expressed a desire to use said FACILITY to **park vehicles on airport property within the parking area at the approach end of Runway 27 on March 6 and 7, 2019.**

NOW, THEREFORE, the parties agree as follows:

1. USER shall be permitted to use the FACILITY described above for the purpose of parking vehicles within the prescribed area east of the approach end of Runway 27.

2. USER will set up and use the FACILITY on a continuous basis during this period on the grass area east of the approach end of Runway 27 as shown on sketch at Exhibit 1.

3. USER shall pay CITY the sum of **$10,000.00** for use of FACILITY during the period designated, payable with returning this signed AGREEMENT.

4. As condition to USER's right to use the facilities herein, USER agrees to and shall comply with the following:
   a. USER shall not exclude any person from its services because of race, sex, age, religion, disability, national origin or other prohibited discrimination.
   b. USER shall have competent, responsible, and able supervision on the premises at all times that its service is operational.
   c. USER shall not interfere with emergency operations of CITY or other authorized users of the FACILITY.
   d. USER shall keep premises in a clean and sanitary condition and be responsible for cleanup on a daily basis and removal of temporary structures at the site upon completion of the event and returning property to same condition as when received.
   e. CITY shall have the right, acting through its agents or employees, to enter upon the premise at reasonable hours and times for the purpose of making inspections.
   f. USER will obtain all required Federal, State, County and City permits including any applicable fees.
   g. USER shall not undertake any alterations or changes in the construction of the facility premises, without prior written consent of CITY.
   h. USER agrees to assume liability for and indemnify, hold harmless, and defend the CITY, its commissioners, mayor, officers, employees, agents, and attorneys of, from, and against all liability and expense, including reasonable attorney's fees, in connection with any and all claims, demands, damages, actions, causes of action, and suits in equity of whatever kind or nature, including claims for personal injury, property damage, equitable relief, or loss of use, arising directly or indirectly out of or in connection with any negligent and/or deliberate act or omission of USER, its officers, employees, agents, and representatives. USER's liability hereunder shall include all attorney's fees and costs incurred by the CITY in the enforcement of this indemnification provision. This includes claims made by the employees of USER against

the CITY and USER hereby waives its entitlement, if any, to immunity under Section 440.11, Florida Statutes. The obligations contained in this provision shall survive termination of this Agreement and shall not be limited by the amount of any insurance required to be obtained or maintained under this Agreement. Nothing contained in the foregoing indemnification shall be construed to be a waiver of any immunity or limitation of liability the CITY may have under the doctrine of sovereign immunity or Section 768.28, Florida Statutes.

i. USER shall not rent, sublet, or assign space in the FACILITY premises without the prior written consent of CITY.
j. USER has priority over the portion of the FACILITY as described during the time agreed upon in this AGREEMENT, and can use specified areas during the time of this AGREEMENT.
k. CITY reserves the right to cancel this AGREEMENT at any time, without cause, by giving USER 30 days notice of such cancellation.
l. USER shall maintain liability insurance, in amounts as deemed necessary and appropriate by the City Attorney, show the CITY as additional insured thereon, and shall provide proof of it to CITY, upon commencement of this AGREEMENT, and thereafter, as required by CITY. USER will provide insurance on all their equipment being used in the FACILITY.
m. USER shall, at all times, abide by Federal, State, and local laws, in the operation of its programs or services at the FACILITY. Sale and/or consumption of alcohol not allowed on Airport property unless properly permitted by the City.

5. Term of Agreement: The term of the AGREEMENT is as noted in paragraphs 1 and 2 above, unless terminated sooner.

6. The addresses for giving notices are as follows:

USER: Bonhams & Butterfields Auctioneer Corp
220 San Bruno Avenue
San Francisco, CA 94103
ATTN: CHRISTI OSBORNE

CITY: City of Fernandina Beach
204 Ash Street
Fernandina Beach, FL 32034
Attn: City Manager

IN WITNESS WHEREOF, the parties have hereunto set their hands and seals this day and year first above written.

USER: **Bonhams & Butterfields Auctioneer Corp**
220 San Bruno Avenue
San Francisco, CA 94103

By: Christi Osborne
Christi Osborne
Its: Vice President of Operations

CITY OF FERNANDINA BEACH

By: _____
Dale L. Martin
Its: City Manager

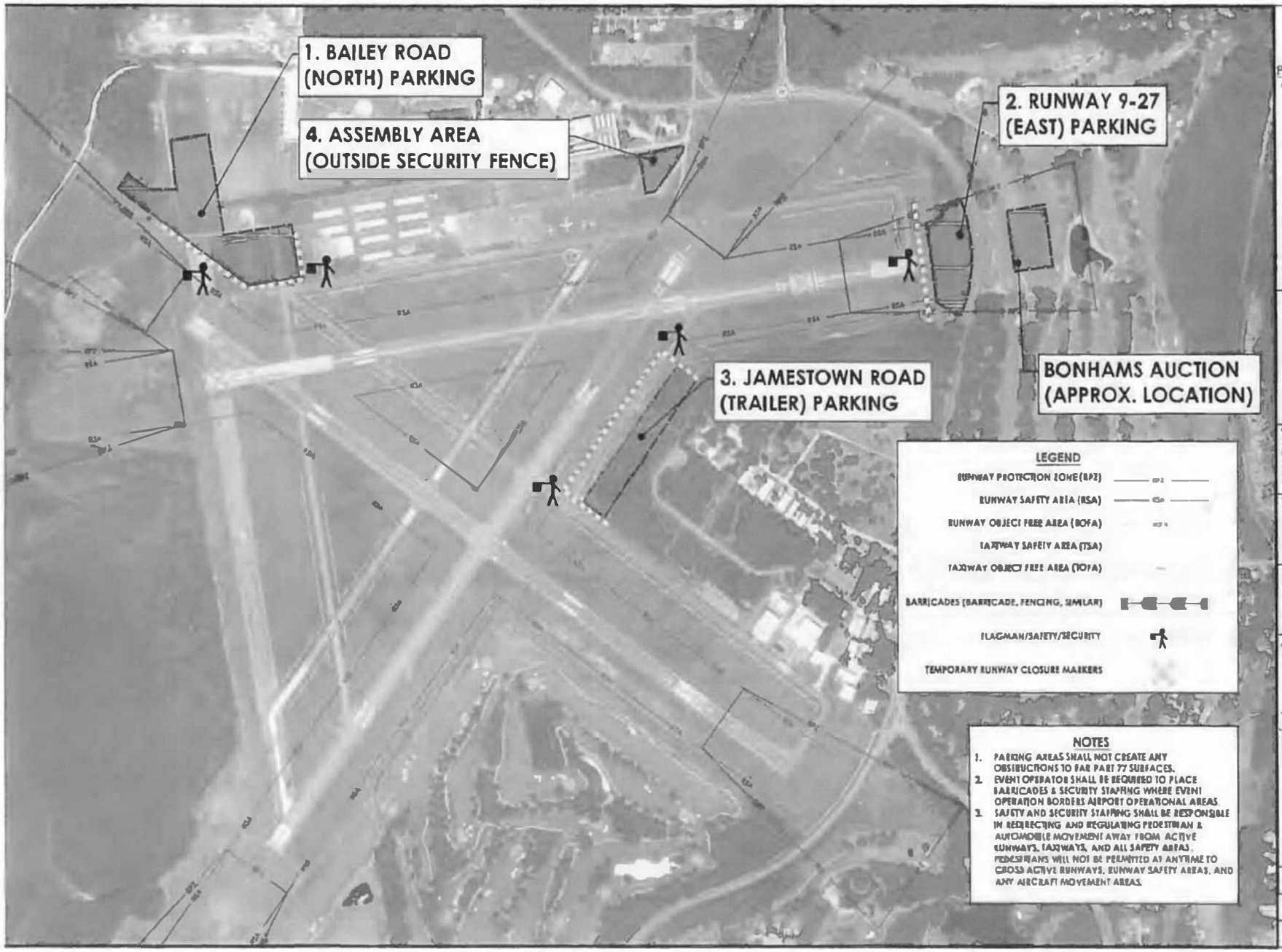
By: _____
Caroline Best
Its: City Clerk

WITNESS:

_____
Print Name: Mark Osborne

APPROVED AS TO FORM AND LEGALITY:

_____
Tammi E. Bach
Its: City Attorney


1. BAILEY ROAD (NORTH) PARKING
4. ASSEMBLY AREA (OUTSIDE SECURITY FENCE)
2. RUNWAY 9-27 (EAST) PARKING
3. JAMESTOWN ROAD (TRAILER) PARKING
BONHAMS AUCTION (APPROX. LOCATION)
LEGEND
RUNWAY PROTECTION ZONE (RPZ)
RUNWAY SAFETY AREA (RSA)
RUNWAY OBJECT FREE AREA (ROFA)
TAXIWAY SAFETY AREA (TSA)
TAXIWAY OBJECT FREE AREA (TOFA)
BARRICADES (BARRICADE, FENCING, SIMILAR)
FLAGMAN/SAFETY/SECURITY
TEMPORARY RUNWAY CLOSURE MARKERS
NOTES
1. PARKING AREAS SHALL NOT CREATE ANY OBSTRUCTIONS TO FAR PART 77 SURFACES.
2. EVENT OPERATOR SHALL BE REQUIRED TO PLACE BARRICADES & SECURITY STAFFING WHERE EVENT OPERATION BORDERS AIRPORT OPERATIONAL AREAS.
3. SAFETY AND SECURITY STAFFING SHALL BE RESPONSIBLE IN REDIRECTING AND REGULATING PEDESTRIAN & AUTOMOBILE MOVEMENT AWAY FROM ACTIVE RUNWAYS, TAXIWAYS, AND ALL SAFETY AREAS. PEDESTRIANS WILL NOT BE PERMITTED AT ANYTIME TO CROSS ACTIVE RUNWAYS, RUNWAY SAFETY AREAS, AND ANY AIRCRAFT MOVEMENT AREAS.
PA
PASSERO ASSOCIATES
300' 0 300'
City of Fernandina Beach
Fernandina Beach Municipal Airport
700 Airport Road
Fernandina Beach, Florida 32034
Passero Associates
AREAS
Amelia Island Vintage Gran Prix
99047.0066P1
1
2018 Parking Plan

Architecture and Building
Design Standards for Development on the Airport
(Included within Land Development Code by Reference)

These architecture and building design standards shall be applied to airport construction or improvement on or within Fernandina Beach Municipal Airport boundaries. These design standards have been incorporated by reference into the Airport Overlay section of the City of Fernandina Beach Land Development Code. The City of Fernandina Beach Land Development Code applies to all tenant and lessee construction on the Airport. These design standards are used by the City's Technical Review Committee (TRC) as its basis for beginning the approval process for any construction on the Airport. All construction must meet current adopted Florida Building Codes, City Building Ordinances, and National Fire Prevention Association (NFPA) requirements. In cases of conflict with other City codes or regulations, the more stringent provisions shall apply unless specifically addressed within the terms of any written agreement with the City.

Hangar/Building on any Area of the Airport:

1. A primary building is an aircraft hangar with use as addressed in the lease.
2. Stand alone non hangar buildings are not permitted within the airport perimeter fence unless for aeronautical use and/or approved by City.
3. Outbuildings may be permitted as an ancillary to the primary building. An outbuilding must be attached or in near proximity to the primary building. Such outbuildings must be directly related to the operation of the primary building and limited to office(s), storage area, or related work area.
4. The location of the hangar door designates the front of the building.
5. Minimum bulk hangar size is 40 x 40 feet (1,600 square feet) and may be private or City construction; t-hangar construction permitted only by City.
6. Any hangar must have a concrete floor; any building must have finished flooring.
7. Any hangar constructed, unless an individual hangar or separated hangar units within a structural building and built for non-commercial use only and not exceeding 2,000 square feet per unit or individual hangar, requires an oil/water separator to discharge water and oil by-products, as appropriate, into either a sanitary sewer or into a holding tank.
8. Hangars/buildings shall meet all appropriate fire codes for the proposed use of building.
9. No residential occupancy is permitted.
10. Maximum building height is 45 feet. New construction may require a Form 7460 be submitted to FAA for review.
11. Since roofs are highly visible from aircraft using the Airport, roofs shall be attractively designed and constructed. Signs, lettering, designs, or other graphics shall not be placed, painted or otherwise located on roofs.
12. Roof materials shall be non-reflective, not create glare, and be of a neutral color.

Aprons/Pavement:

1. Taxi lanes within hangar areas provided by the City are generally designed to accommodate an aircraft with a wing span no greater than 49 feet. Facilities designed for larger wingspan aircraft shall have direct access to taxiways.
2. Pavement, at a minimum, is required from the hangar door to the taxi lane or taxiway and shall be at least 20 feet wide.
3. Under no circumstances shall required apron/ramp areas encroach into the taxi lane or taxiway objective free area (TOFA) except for the entrance pavement.
4. Any individual hangar having less than 3,000 square feet shall have an area available for an apron between the hangar door and the taxi lane or taxiway object free area (TOFA), at a minimum, equal to the distance of the depth of its hangar floor area.
5. Any hangar having 3,000 square feet or greater but not more than 7,999 square feet of hangar floor space shall have an area available for an apron between the hangar door and the taxi lane or taxiway object free area (TOFA), at a minimum, of a size at least 50% of its hangar floor area.
6. Any hangar with 8,000 square feet or greater of hangar floor space shall have an area available for an apron between the hangar door and the taxi lane or taxiway object free area (TOFA), at a minimum, of a size at least 75% of its hangar floor area.
7. Sidewalks are permitted only to provide for internal circulation on leasehold property.
8. Airside pavement shall have a compatible look and performance as to any airport taxi lanes/taxiways/apron to which it may abut. All leasehold pavement must be of sufficient quality and weight bearing capacity for the aircraft to be parked on the leasehold.
9. Landside pavement shall have a compatible look and performance as to any street/driveway pavement it shall abut.
10. All pavements shall be designed for a minimum 20 year life using the following guidelines – airside to meet FAA standards for the aircraft to be parked and landside to meet equivalent axel load projections.
11. Any permitted airside access routes are to be a minimum of 12 feet wide.

Leasehold Size:

1. Parcel length is determined from edge of taxi lane or taxiway object free area (TOFA) to edge of roadway or established property line unless parcel already plotted.
2. Minimum parcel width is determined by width of hangar/out buildings coupled with required setbacks unless parcel already plotted.
3. Should a hangar back up to another hangar or building there are minimum separation requirements set forth by NFPA 409 standards irrespective of lease line location from back of hangar or outbuilding (from whichever structure may extend out furthest).
4. Individually built hangars shall have a minimum 25 foot setback on each side or side of outbuilding (from whichever structure may extend out furthest) to establish the side yard and minimum leasehold area unless one side abuts the runway restriction line.
5. Adjoining hangars sharing a common center wall shall be built by the same lessee. Such hangars shall have a minimum 25 foot side setback on the unattached opposite side from parcel property line. Adjoining hangar aprons may or may not abut to each other.

Hangar/Building Characteristics:

1. At least one toilet is required for any stand alone hangar/outbuilding development whether personal or commercial use. Any commercial use of building will require the toilet to be American Disabilities Act (ADA) compliant as required by local building code.
2. Hangar/building materials shall be a metal building or concrete block or related material. No wood or aluminum. The roof may be aluminum.
3. Hangar/building materials that produce glare or other effects that are hazardous to aircraft operation shall not be permitted.
4. Hangar/building colors shall be neutral tones.
5. The location of outside storage areas and materials used for screening shall be a part of the site plan submitted by lessee. All materials used for screening shall be opaque and the same as or similar to the main or primary building or by installation of berms and landscaping acceptable to the City.
6. All electrical wiring shall be in conduit and placed underground from the electrical power source to the hangar/building.
7. Any hangar over 10,000 square feet will require an approved NFPA sprinkler system.
8. All mechanical equipment shall be housed within the building when possible. When roof mounted equipment is required, it must be concealed by parapet walls sufficient to screen the equipment but no more than 42". Such parapet does not count against building height restriction. Plumbing vents are the only non-screened roof penetrations allowed.
9. Any exterior equipment shall be enclosed or screened so as to be an integral part of the architectural design and not in public view. Large pieces of equipment shall be located at ground level.
10. Any hangar or building abutting or a part of the Airport Operation Area (AOA) is also considered part of the security fence system. Such hangar or building shall provide the only entrance through the security fencing unless approved by the City. In addition lessee shall provide a chain link fence without gates separating the airside and the landside with not less than 6 feet chain link vinyl encased black between buildings to the property line to establish a security perimeter. If landscaping screening is provided, it shall be located on the landside and no closer than 6 feet from the fence and maintained in a manner to preclude overgrowth of the security fence.
11. The outside storage of hazardous materials or hazardous waste shall be prohibited as identified in the Airport Rules and Regulations.
12. Adequate lighting required for both airside and landside and in general shall be uniform style as determined by the City.

Landscaping:

1. Landscaping within the Air Operations Area for non-building and non-pavement areas shall have as a minimum natural ground covering and is limited to grass or very low lying vegetation for unpaved areas. For safety reasons no trees or shrubbery shall be permitted within the air operations area (within the airport security or perimeter fence.)
2. At least 20% of the total gross land area of a development site shall be landscaped and can include grass or ground cover for the calculation. The landscaped areas shall be located on

the site in such manner as to maximize preservation of existing trees with priority given to specimen trees. Such landscaping should not be on the airfield side of any hangar or building construction that is not accessible by the public.

3. Landscaping shall not block sight distance or pose a traffic hazard.
4. Any free standing signage shall not exceed a height of 5 feet from the ground, shall be monument style, and constructed per city code.

Parking:

1. Parking shall not be established or designated along the front of building.
2. All parking must be identified in site plan.
3. Spaces shall be sized by city code (currently 10 x 20 feet) and may be marked.
4. Commercial use of hangar must meet city code as to number and shall meet the dimensions and the number required under ADA requirements and to be located in areas convenient to building entrances.
5. Stand alone private non-commercial use hangar parking requires a minimum of two spaces for any total gross floor area (including any outbuilding floor area) not exceeding 2,000 square feet and a minimum of four spaces for a building exceeding 2,000 square feet up to 3,500 square feet. One additional parking space shall be required for each additional 1,500 square feet of gross floor area above 3,500 square feet. Such number of spaces shall be rounded up or down to the nearest 1,000 square feet.
6. Non-commercial use of hangar exempt from ADA requirements.
7. Any parking area next to a hangar or building shall have car stops or curbs placed at least five feet from the hangar or building.
8. All parking areas shall be setback at least 10 feet from other lessee lease lines.

East Area:

1. Stand alone non-hangar buildings are permitted on the non airfield side of Jamestown Road and must be an approved commercial only use.
2. A commercial building not attached to a hangar shall provide its parking behind the building. Such a building may not be located on the airfield side of Jamestown Road unless as part of a hangar development and then parking may be between the building and Jamestown Road.
3. For non hangar buildings the front yard is considered Jamestown Road.
4. Non-hangar buildings or hangars fronting Jamestown Road must have set back of at least 25 feet from the street.
5. Internal driveways off Jamestown Road shall be 20 feet wide.
6. Minimum curb cuts off Jamestown Road – in general use of joint-use driveway to serve several buildings will be required to provide access to a public street. Only in exceptional circumstances is more than one (1) curb cut permitted.
7. No parking permitted along Jamestown Road.
8. Common use driveways along Jamestown Road shall be used as much as possible.

MEMORANDUM

TO: AIRPORT ADVISORY COMMISSION

FROM: AIRPORT MANAGER

DATE: December 13, 2018

RE: MONTHLY REPORT

- Airport staff received an update that all lien releases for the terminal facility have been issued and that the final pay application for the terminal facility will be received, and processed, in the coming days. Once the final pay application has been processed for payment, airport staff will then coordinate project closeout and final grant drawdowns.

- Installation of the airport's new AWOS III P/T occurred in early October and the FAA certified the new system on October 31, 2018. Airport staff has received project closeout documents and completed final payment for this project. Project closeout documents will be submitted in December and grant withdraw from the FAA is expected to be completed shortly thereafter.

- Airport staff submitted a report to the FAA at the end of November for consideration to place dredge spoils on airport property related to the City's marina reconstruction project. This report and associated document included the following items:

  1. A report outlining the composition and quantity of material.
  2. A wildlife assessment to consider any potential wildlife impacts from placement of the material.
  3. A proposed benefit/value to the airport for placement of the material.

  The professional services rendered to complete these reports were funded by the City's marina department. A copy of this submittal is included with this report.

- The AAC recently viewed a lease application and proposal from South Shore CRE (Harry Giltz) for potential development of hangars West of Hangar B. I plan to discuss

the tentative conceptual design for this development with the AAC during the AAC meeting.

- Passero is currently completing site drawings and assisting in drafting of bid specifications for demolition of Hangar D office space (pre-existing FBO office space). I am awaiting completion of these drawings for release of an invitation to bid for this project.

- Airport staff has executed the planned/budgeted grant agreement with FDOT for remarking of Runway 13/31. Proposals for this work are being sought, and the remarking project will be planned and communicated with tenants once scheduled. Airport staff plans to integrate other minor marking work on the airport while painters are mobilized to re-stripe Runway 13/31.

- Airport staff is coordinating a project to line/repair a section of storm water pipe along T-Hangar Building 7 (just North of Twy A). A recent analysis completed by Passero indicated failure of this stormwater pipe joints within a 220' section of stormwater pipe and staff has noted erosion of earth/asphalt adjacent to this building. I am awaiting a proposal to line/repair this pipe and will coordinate for asphalt repair in conjunction with the repair work.

- The City Attorney met with Ben Phipps and the Department of Revenue (DOR) in Tallahassee in late November to discuss submittal of opinion letters for legal counsel representing the Airport and a separate legal opinion letter from counsel representing the Property Appraiser's office. These opinion letters are due for submittal to DOR by the second week of December. DOR is then expected to render an opinion on the matter. It was decided that an opinion from DOR would be acceptable by both parties as this opinion should be completed and available much quicker than seeking out the attorney general opinion previously discussed.

City of Fernandina Beach **Nathan Coyle**

Office of the Airport Manager ncoyle@fbfl.org

November 20, 2018

Mr. Richard Owen, Program Manager
FAA – Orlando ADO
8427 SouthPark Circle, Suite 524
Orlando, FL 32819

Subject: Fernandina Beach Municipal Airport, Request for Concurrence to Place Dredge Material on Airport Property

Mr. Owen,

The City of Fernandina Beach is currently planning a project to dredge and reconstruct its marina located within the City's downtown core. When seeking options for disposal of dredge material, the City has encountered a potential significant cost for hauling and disposing of dredge material in locations off of Amelia Island, and the potential for negative impact to primary roadways from the hauling of this material off the island. The City is therefore interested in placing dredge spoils, removed from the marina, on airport property which would provide significant cost savings, prevent impact to primary roadways leading to and from the island, and would result in great benefit to the community.

To allow for consideration of this request, I have provided the following documents to accompany this cover letter:

1. A wildlife hazard site visit – This report was conducted by Environmental Resource Solutions by a qualified wildlife biologist who reviewed existing wildlife conditions and threats at FHB, and who also provided a professional opinion related to any potential increase in wildlife activity at the airport related to the potential placement of dredge spoils on airport property.

2. A Geotechnical Evaluation of material to be removed from the marina and ultimately placed on airport property. This report was conducted by ECS Florida, LLC and provides an overview of composition for material proposed for placement at the airport. This testing was completed to confirm that hazardous material does not exist within the material to be dredged from the marina. This report is included in the aforementioned wildlife hazard report as Attachment C.

3. A site plan for proposed placement of material is provided showing three locations that were evaluated during the wildlife hazard visit. Of note, Sites 1 and 2 referenced on this site plan are estimated to be sufficient for placement of material and are intended to be the primary locations for placement of material.

City of Fernandina Beach **Nathan Coyle**

Office of the Airport Manager ncoyle@fbfl.org

This same site plan is utilized and referenced within the wildlife hazard report found at Attachment 1 to this letter.

4. A methodology for proposed value provided to the Airport Enterprise for placement and storage of material on the airport.

5. Information regarding the process to place material and historical comparison of the outcome of material previously placed on the airport in 2012.

Please let me know what further information I may be able to provide to assist your review on this matter.

Respectfully,

Nathan Coyle
Airport Manager

Cc:

Dale Martin, City Manager
Andrew Holesko, Passero Associates
Brad Wente, Passero Associates

Attachment 1 - Wildlife Assessment

WILDLIFE HAZARD SITE VISIT
FERNANDINA BEACH MUNICIPAL AIRPORT

Prepared for:

FERNANDINA BEACH MUNICIPAL AIRPORT
700 AIRPORT ROAD
FERNANDINA BEACH, FLORIDA 32034

Prepared By:

ENVIRONMENTAL RESOURCE SOLUTIONS, INC.
8711 PERIMETER PARK BOULEVARD, SUITE 1
JACKSONVILLE, FLORIDA 32216

OCTOBER 2018

TABLE OF CONTENTS

ATTACHMENTS

1.0 INTRODUCTION

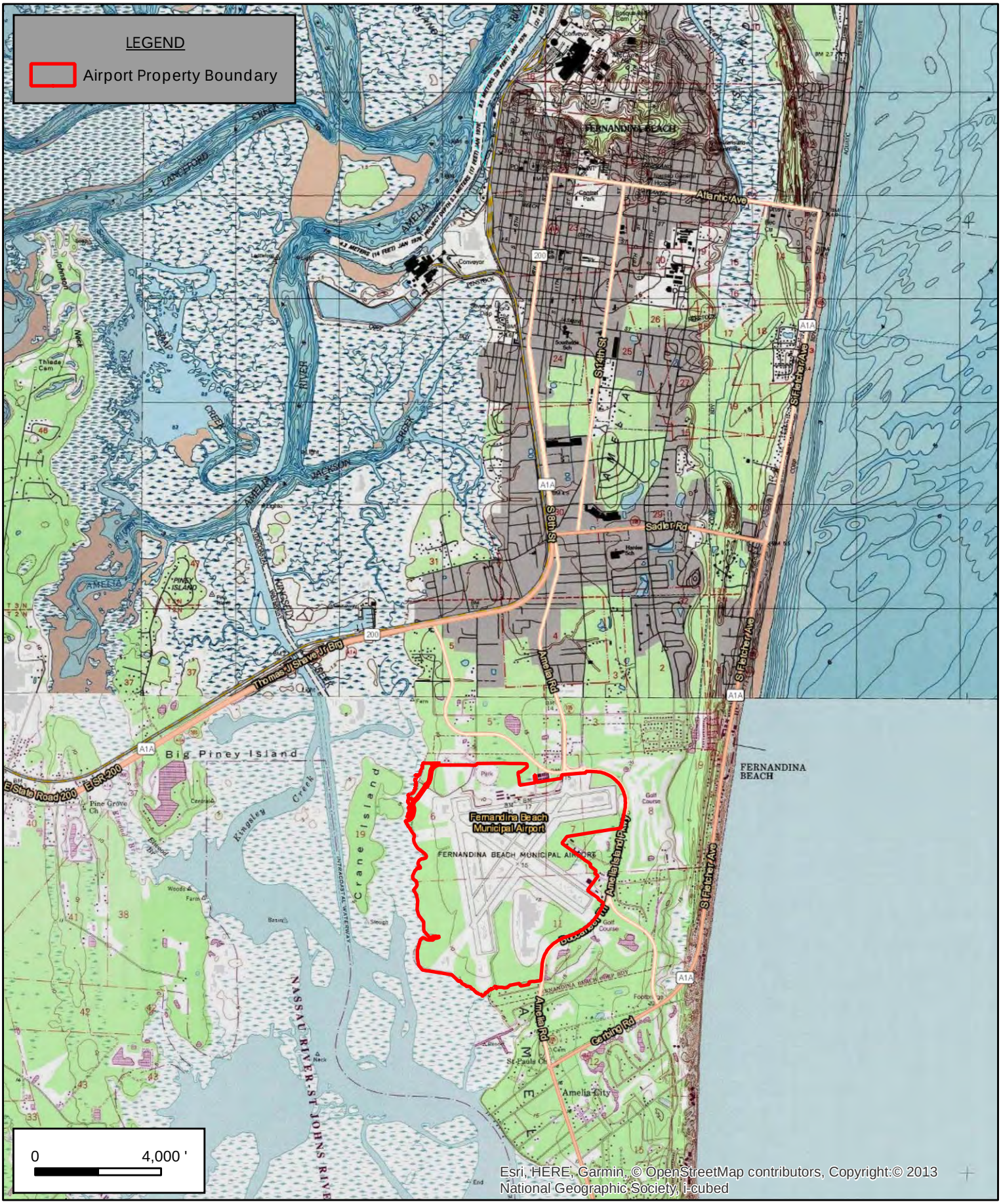
Environmental Resource Solutions, Inc. (ERS), conducted a Wildlife Hazard Site Visit (WHSV) at the Fernandina Beach Municipal Airport (FHB) on 19 through 21 September 2018. The WHSV was conducted to assess potential hazardous wildlife attractants on and near the airport, and specifically to determine the potential for dredge spoil material to attract hazardous wildlife. The WHSV methodology outlined in Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5200-38 *Protocol for the Conduct and Review of Wildlife Hazard Site Visits, Wildlife Hazard Assessments, and Wildlife Hazard Management Plans*[1] was used to conduct the visit and prepare this report.

1.1 Airport Setting

FHB is a public use facility owned by the City of Fernandina Beach, FL. The airport is located between FL SR-A1A and SR-200 approximately three (3) miles south of the central business district of Fernandina Beach. To the west of the airport is the Intracoastal Waterway and to the east is the Atlantic Ocean (see Exhibit 1). The airport is included in the National Plan of Integrated Airport Systems (2019-2023) and categorized as a general aviation facility[2]. The airport has three runways, Runway 4/22 is 5,301 x 100 ft., Runway 9/27 is 5,000 x 100 ft., and Runway 13/31 is 5,152 x 100 ft. The airport infrastructure includes a general aviation terminal with fixed base operator and several hangars for small aircraft storage and maintenance (see Exhibit 2). Operations at FHB average 129 per day and include a variety of aircraft including single-engine fixed-wing, twin-engine fixed wing, corporate jet, helicopter, and military[3].

Separation criteria for hazardous wildlife attractants on or near airports are described in AC 150/5200-33B *Hazardous Wildlife Attractants On or Near Airports*[1] which recommends a separation distance of 5,000 feet for airports serving piston-powered aircraft, 10,000 feet for airports serving turbine-powered aircraft, and 5-miles to protect the approach, departure, and circling airspace. Exhibits 3 and 4 depict the airport property and the two applicable separation distances. Major land uses or natural features that have the potential to be wildlife attractants and/or may create movement corridors across the airport or arrival/departure flight paths are labeled on Exhibits 3 and 4. Potential attractants within the separation distances are discussed further in Section 5.0.

[1] Source: https://www.faa.gov/airports/airport_safety/wildlife/resources/ accessed 9/27/18
[2] Source: https://www.faa.gov/airports/planning_capacity/npias/reports/ accessed 10/17/18
[3] Source: https://www.airnav.com/airport/KFHB accessed 9/27/18



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Fernandina Beach Municipal Airport (FHB)
USGS Topographic Quadrangle Map

By: DF

Project No.:	18151
Exhibit No.:	1
Date:	10-3-18
Rev. Date:	

N W E S

Source: 7.5' USGS Amelia City, Fernandina Beach, Hedges, & Saint Marys, FL Topographic Quadrangles; ArcGIS Online (USA Topo Maps)

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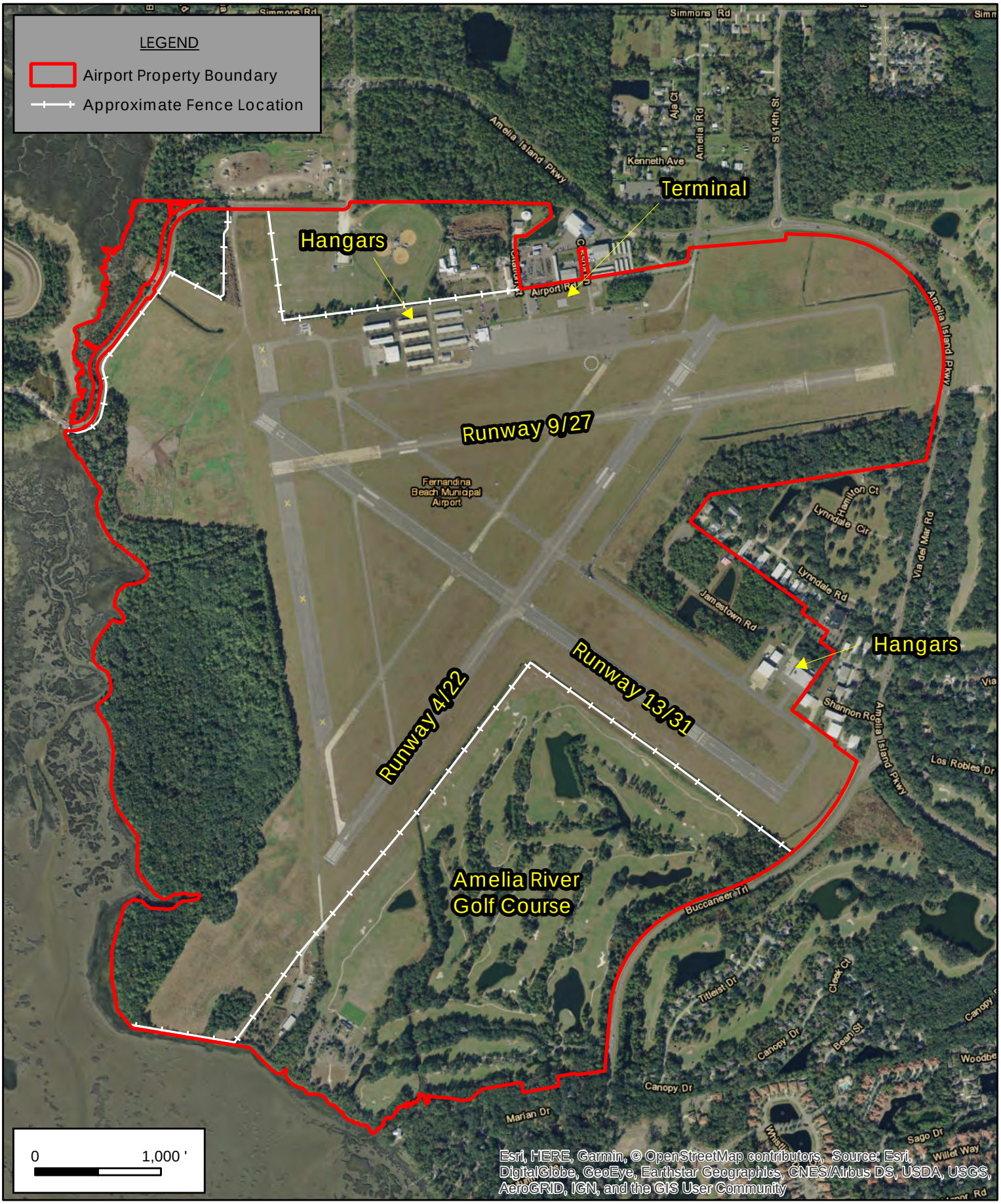

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Fernandina Beach
Municipal Airport (FHB)
Airport Facilities

Project No.:	18151
Exhibit No.:	2
Date:	10-3-18
By: DF	
Rev. Date:	

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Source: ArcGIS Online Imagery

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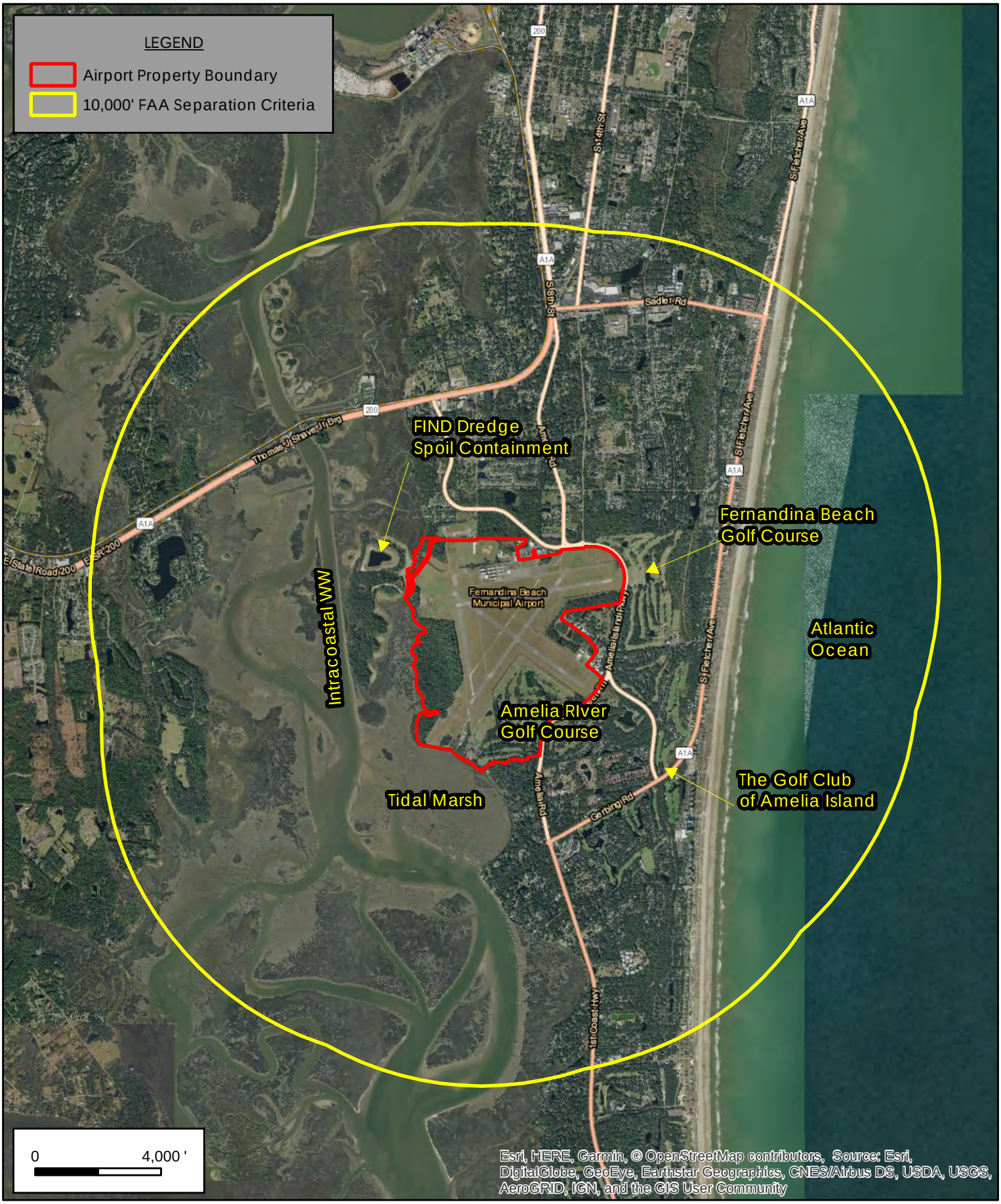

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Fernandina Beach
Municipal Airport (FHB)
10,000' Separation Criteria Area

Project No.:	18151
Exhibit No.:	3
Date:	10-3-18
By: DF	
Rev. Date:	

N W E S

Source: ArcGIS Online Imagery

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Fernandina Beach
Municipal Airport (FHB)
5 Mile Separation Criteria Area

Project No.:	18151
Exhibit No.:	4
Date:	10-3-18
By: DF	
Rev. Date:	

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Source: ArcGIS Online Imagery

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2.0 FAA NATIONAL WILDLIFE STRIKE DATABASE

The FAA National Wildlife Strike Database includes all reported civilian aircraft-wildlife strike records since 1990. At the time of this WHSV, the database was current through 31 May 2018. FHB has five (5) reported strikes between 1 January 1990 and 31 May 2018 in the FAA database. Table 1 lists the dates and primary information regarding those strike reports. Strike reporting is an important tool for wildlife management at any airport, but at general aviation airports like FHB, it is even more imperative to ensure the best information is collected due to the lower number of operations.

Table 1: FHB Wildlife Strike Data Summary from the FAA National Wildlife Strike Database (1/1/1990-5/31/2018)

Incident Date	Aircraft Type	Species	No. Struck	Damage[1]	Height	Phase of Flight	Effect
11/22/2016	Cirrus SR 20/22	Coyote	1	N	0	Landing Roll	None
11/04/2016	C-172	Unknown bird – medium	1	M?	900	Approach	None
10/25/2014	Hawker 800	Unknown bird	1	N	0	Take-off Run	None
12/18/2009	Pilatus PC12	Unknown bird – small	2 – 10	N	7	Approach	None
10/18/1990	PA-38 Tomahawk	Unknown bird – large	1	M	500	Approach	Unknown

Note 1: M= Minor, M?=Uncertain, N= None (damage reported)

Source: FAA Wildlife Strike Database http://wildlife.faa.gov/database.aspx (downloaded on 9/27/18)

3.0 METHODOLOGY

ERS developed a project methodology consistent with the WHSV outlined in FAA AC 150/5200-38. The primary objectives of conducting the WHSV at FHB are as follows:

- Identify the wildlife species observed, and their numbers, locations and local movements.
- Identify and locate features on and near the airport that attract wildlife.
- Provide a description of the wildlife hazards to aircraft operations.
- Recommend actions for reducing identified wildlife hazards to aircraft operations.
- Assess dredge spoil as a potential attractant

Prior to conducting the WHSV, ERS reviewed pertinent background information to gain familiarity with the natural surroundings that might imply the types of wildlife expected to occur, including reviewing true color aerial photography (source: ArcGIS Online Data/Imagery). The current aerial photographs provided an overall view of the airport property in relation to its natural surroundings and manmade facilities that may constitute wildlife attractants. ERS also reviewed historic wildlife strike data to assess potential hazardous species in the area. This information was used as reference material during airport personnel interviews and field assessments.

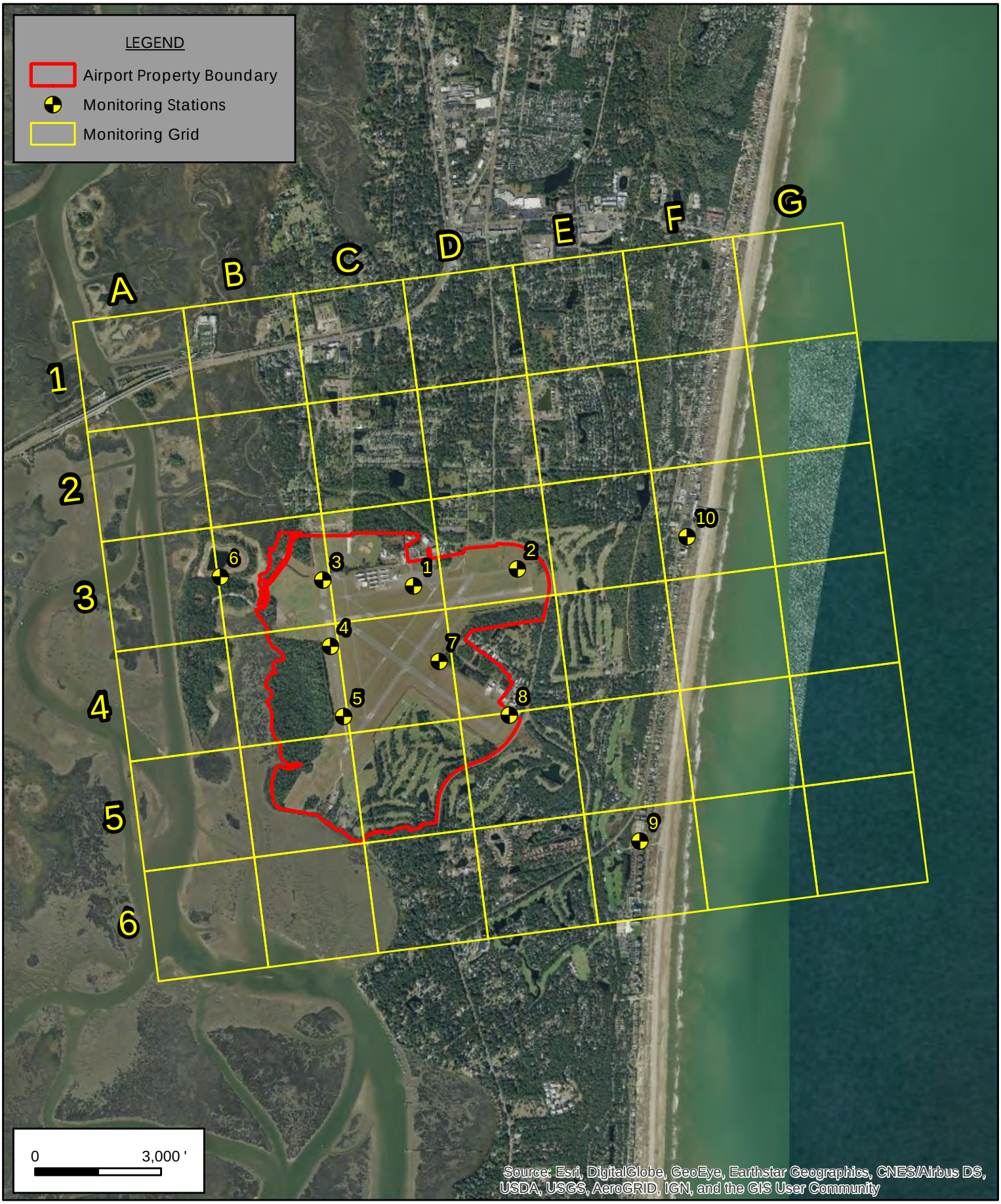
ERS conducted interviews with Nathan Coyle, Airport Manager, and Robert Kozakoff, Airport Operations Manager, to collate information regarding previous and current wildlife observations, wildlife strikes, and current passive and/or active management techniques.

The WHSV encompassed the airport property and surrounding area. Over a 3-day period, biologists conducted a combination of fixed-point surveys, spotlight surveys, and general observations to document wildlife on and near the airport. The following subsections detail the methodology employed during the WHSV.

3.1 Wildlife Survey Methods – Fixed Point Surveys

Johnathan Walls, FAA Qualified Airport Wildlife Biologist, conducted fixed-point surveys over a 3-day period (19 through 21 September 2018) at 10 pre-determined "Monitoring Stations". The monitoring stations are located along a survey circuit on and near FHB. A 0.5-mile x 0.5-mile grid set was superimposed over the monitoring station viewing areas and used for collecting location data (see Exhibit 5).

Six separate surveys (two each at dawn, midday, and dusk) were conducted over the 3-day period. Morning surveys began at dawn (approximately 15 minutes before sunrise) and dusk surveys started approximately 2 hours prior to sunset. Midday surveys were initiated between 11:30 am and 12:00 pm. The starting points for each survey circuit were chosen randomly. Wildlife observations and bird counts during each survey iteration took approximately 1.5 hours to complete. The biologist recorded all species observations within a 5-minute interval at each observation station.



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Fernandina Beach
Municipal Airport (FHB)
Fixed-Point Monitoring Stations

Project No.:	18151
Exhibit No.:	5
Date:	10-3-18
By: DF	
Rev. Date:	

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Source: ArcGIS Online Imagery

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All observations were recorded on a "Field Data Sheet" (Attachment A). One survey iteration is defined as a visit to each observation station on the survey circuit for the designated time interval. Binoculars were used to observe and identify species.

3.2 Wildlife Survey Methods – General Observations

General observations included any incidental wildlife observations made when not conducting a fixed-point survey at a station, e.g., observations made while traveling between stations. General observation data was recorded during fixed-point surveys and is presented in the results section with the fixed-point survey results.

3.3 Wildlife Survey Methods - Spotlight Surveys

Spotlight surveys were conducted approximately 30 minutes to one hour after sunset. A predetermined route was driven around the AOA via runways, taxiways, and ramps in order to view 100% of the airfield within the perimeter fence (Exhibit 6). A spotlight and binoculars were used to conduct the survey. All wildlife observations were recorded on the Field Data Sheet.

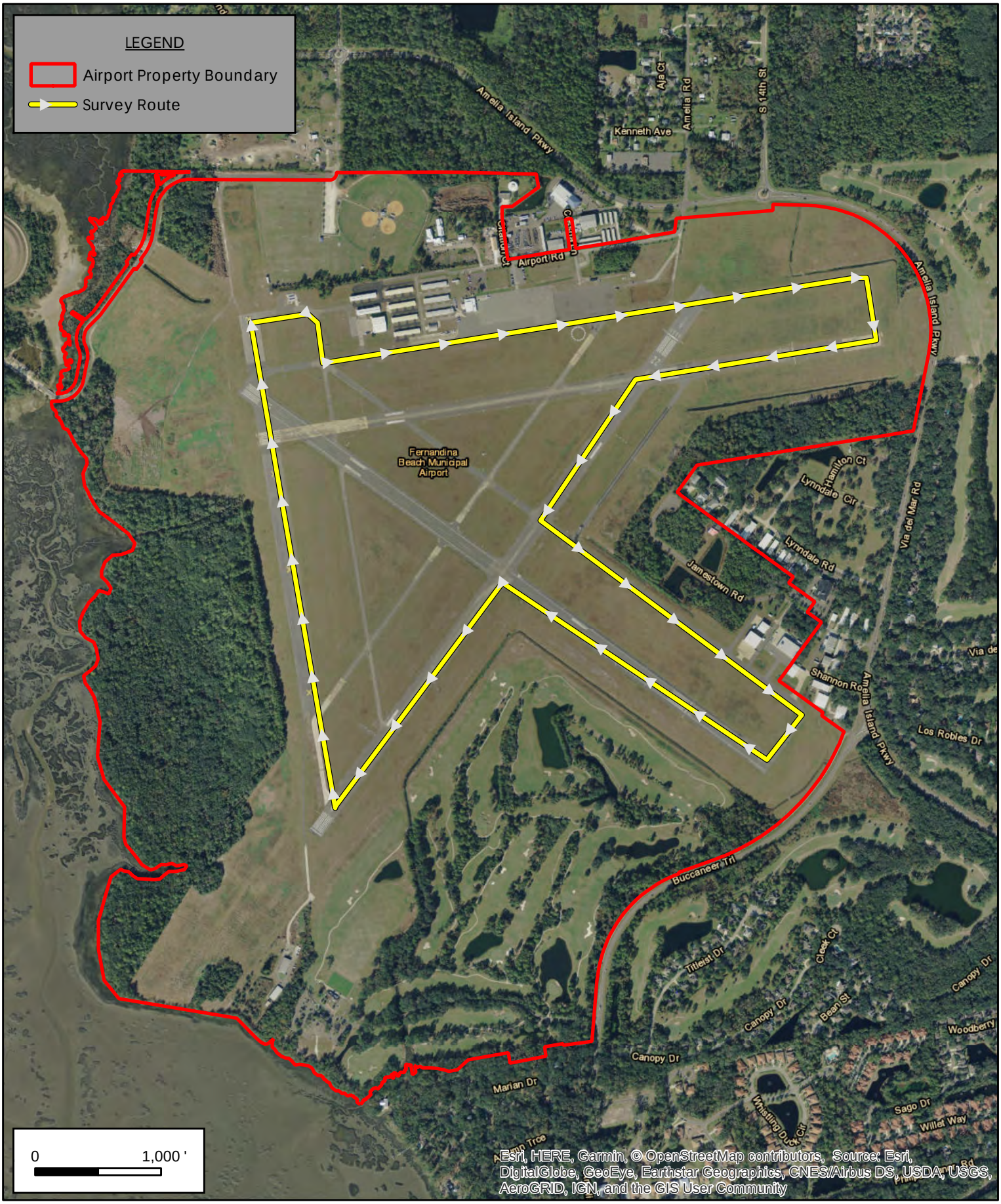
3.4 Additional Data Collection

In addition to individual species, habitat types, and human activities, other environmental factors influence the occurrence of potentially hazardous wildlife at FHB. FAA AC 150/5200-33B *Hazardous Wildlife Attractants On or Near Airports* provides guidance to help identify potential attractants on-site. To identify these wildlife attractants and their locations, ERS also utilized the following data sources and on-site reconnaissance:

- Recent aerial photographs: ERS reviewed aerial photographs of FHB and the surrounding area to gain information regarding the location of on-site and nearby wetlands and surface waters, as well as the location of other potential wildlife attracting features in the surrounding areas.

- Interviews with airport personnel: Johnathan Walls conducted brief meetings with FHB personnel to become more familiar with specific wildlife issues and obtain a general idea of any daily and/or seasonal patterns that FHB personnel have had the opportunity to observe.

- Habitat observations during the fixed-point surveys: While conducting the fixed-point surveys and traveling between the monitoring stations, biologists took note of wetlands, ditches, overgrown vegetation, fencing, trees (also towers and signs) suitable for nesting or roosting on or near the airfield, and food sources (small mammals, aquatic vegetation, berries, etc.) that could potentially attract wildlife.



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Fernandina Beach Municipal Airport (FHB) Spotlight Survey Route

Project No.:	18151
Exhibit No.:	6
Date:	10-3-18
By: DF	
Rev. Date:	

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Source: ArcGIS Online Imagery

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4.0 RESULTS

During the WHSV, a total of 23 species of birds and 2 species of mammals were observed and identified on or adjacent to the airfield. Although data is limited to a three-day period, species observed appear to be representative of the region during the fall. Additional species typical of the region, but not observed during the WHSV, or that are anticipated to be present in summer, winter, or spring are discussed qualitatively in the sections below.

4.1 Fixed Point Surveys - Birds

A total of 1,957 individual birds comprised of 22 species were observed during the fixed point surveys at FHB. Table 2 provides a complete list of bird species (common and scientific name), alpha code, guild (species group), and total number observed of each species. The top three most abundant species observed were the western sandpiper (554), white ibis (335), and mourning dove (299).

Table 2: Bird species observed during Fixed Point Surveys at FHB (September 2018)

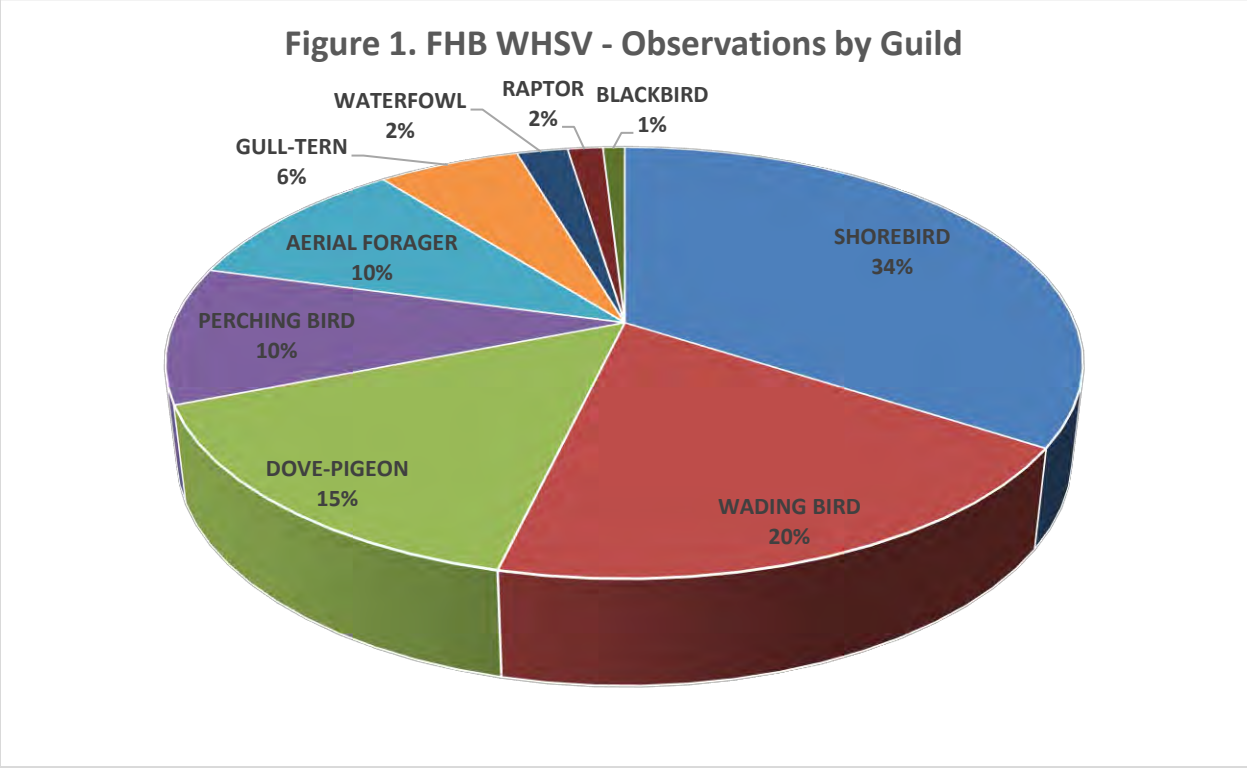
Common Name	Scientific Name	Alpha Code	Guild	Number Observed	Legal Status	
					FWS	FWC[1]
black skimmer	*Rynchops niger*	BLSK	Shorebird	58		ST
black vulture	*Coragyps atratus*	BLVU	Raptor	7		
boat-tailed grackle	*Quiscalus major*	BTGR	Blackbird	18		
blue-winged teal	*Spatula discors*	BWTE	Waterfowl	14		
Canada goose	*Branta canadensis*	CAGO	Waterfowl	28		
Cooper's hawk	*Accipiter cooperii*	COHA	Raptor	2		
great blue heron	*Ardea herodius*	GBHE	Wading Bird	11		
great egret	*Ardea alba*	GREG	Wading Bird	11		
killdeer	*Charadrius vociferus*	KILL	Shorebird	27		
laughing gull	*Leucophaeus atricilla*	LAGU	Gull-Tern	117		
lesser yellowlegs	*Tringa flavipes*	LEYE	Shorebird	13		
mourning dove	*Zenaida macroura*	MODO	Dove-Pigeon	299		
northern mockingbird	*Mimus polyglottos*	NOMO	Perching	1		
osprey	*Pandion haliaetus*	OSPR	Raptor	3		SSC
red-tailed hawk	*Buteo jamaicensis*	RTHA	Raptor	9		
snowy egret	*Egretta thula*	SNEG	Wading Bird	26		
tree swallow	*Tachycineta bicolor*	TRES	Aerial Forager	200		
turkey vulture	*Cathartes aura*	TUVU	Raptor	8		
unidentified warblers	*Setophaga spp.*	UNWA	Perching	200		
western sandpiper	*Calidris mauri*	WESA	Shorebird	554		
white ibis	*Eudocimus albus*	WHIB	Wading Bird	335		

Note 1: ST=state-listed threatened, SSC=species of special concern (Monroe County population only)

Summary of Observations – Guild

To analyze the bird observation data, the various species were organized into guilds. The groupings were based on similar behavior and/or habitat preferences, and not necessarily species relationships. For example, hawks and vultures were grouped together as "Raptors" and the "Perching" group comprises mockingbirds and warblers. While some of these birds may be taxonomically different and have different diets, they typically behave in similar ways and are found in similar vegetative habitats or pose similar risks to aircraft. Tracking birds of similar behavioral characteristics was important in determining which species of birds were most likely to be involved in bird-aircraft strikes. Also, birds of similar behavior tend to respond to the same control methods such as habitat modification, hazing, or types of exclusion. Although the biologists attempted to identify all wildlife to the species level, this was not always possible.

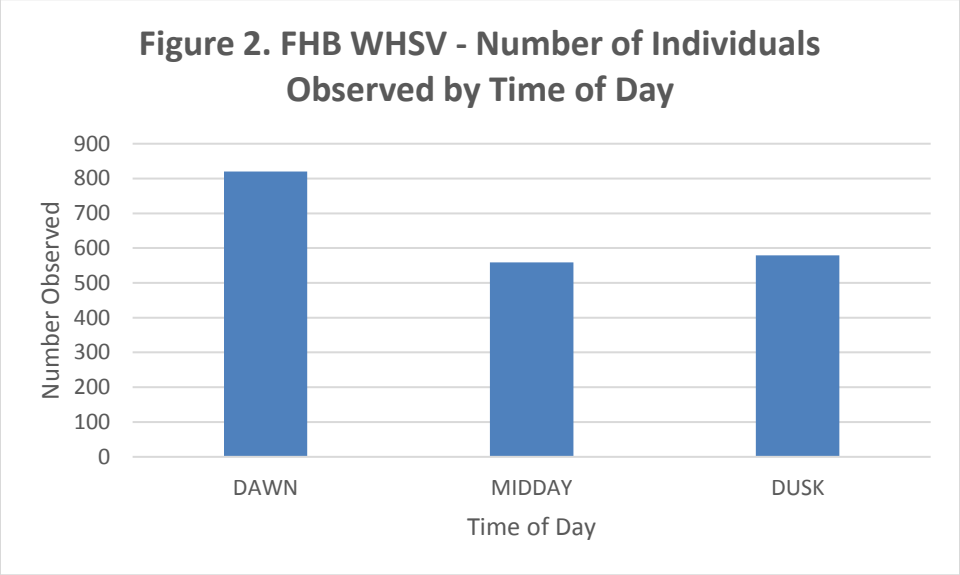
The species diversity observed at FHB was typical for the region. Most of the species recorded are common residents of, or migrants to, north Florida. The most commonly observed group of birds at FHB were shorebirds, followed by wading birds, dove-pigeons, perching birds, aerial foragers, gull-terns, waterfowl, raptors, and blackbirds (see Figure 1).



Summary of Observations – Time of Day

Figure 2 provides the fixed-point and general observation data sorted by observation period (dawn, midday, or dusk). Nighttime spotlight data is discussed in section 4.3 Spotlight Surveys below. Dawn was the most active period with 820 individuals observed. Dusk was the second most active period with 579 individuals

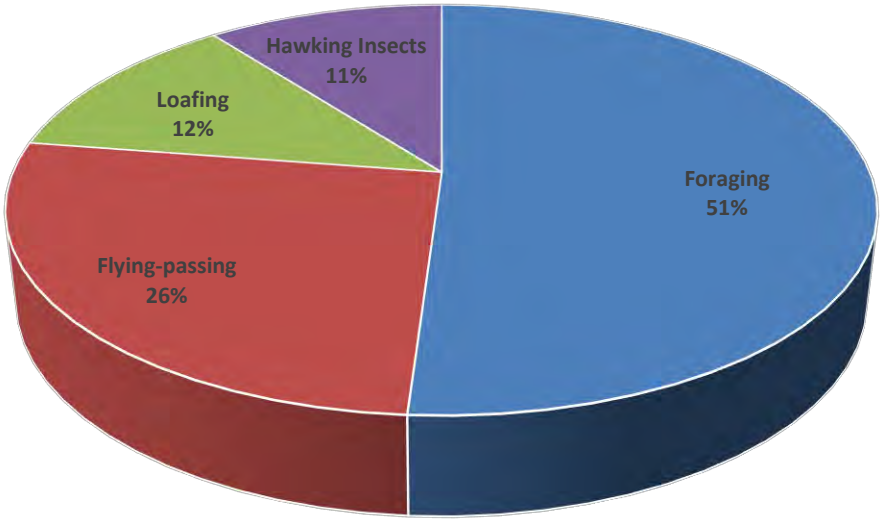
observed. This is typical of most wildlife surveys since birds tend to leave the roost at dawn and return to the roost at dusk, resulting in highest numbers at dawn and dusk when birds are easily observed moving between roosts and foraging sites. In the case of FHB, the numbers observed at dawn include flocks of doves and geese observed flying across the AOA, as well as, flocks of ibis flying into the nearby dredge spoil containment site.



Summary of Observations – Activity

A list of all activity codes can be found on the "Field Data Sheet" provided in Attachment A. The Biologist recorded the most dominant activity of the observed bird or birds for a single entry. Figure 3 provides the bird observation data sorted by activity (only activities that comprised ≥5% of the data are shown). Foraging was the highest percentage activity recorded (51%). Foraging was recorded when a bird or birds were observed actively searching for, or consuming, a food item. The second highest activity was flying-passing (26%) and was recorded when birds were observed flying, but entered and exited the view of the observer without landing. As opposed to flying-local, these birds were not necessarily utilizing the airport, but just passing by the AOA on their way somewhere else. The third highest activity was loafing (12%), which was documented when a bird or group of birds were observed in a relaxed condition and displayed no signs of another activity such as foraging or flying. Hawking (11%) was documented when birds, typically insectivorous birds (e.g. aerial foragers), were observed flying with an apparent effort to catch airborne insects. Remaining activities observed include: perching (1%), soaring (1%), flying-local (<1%), and running (<1%).

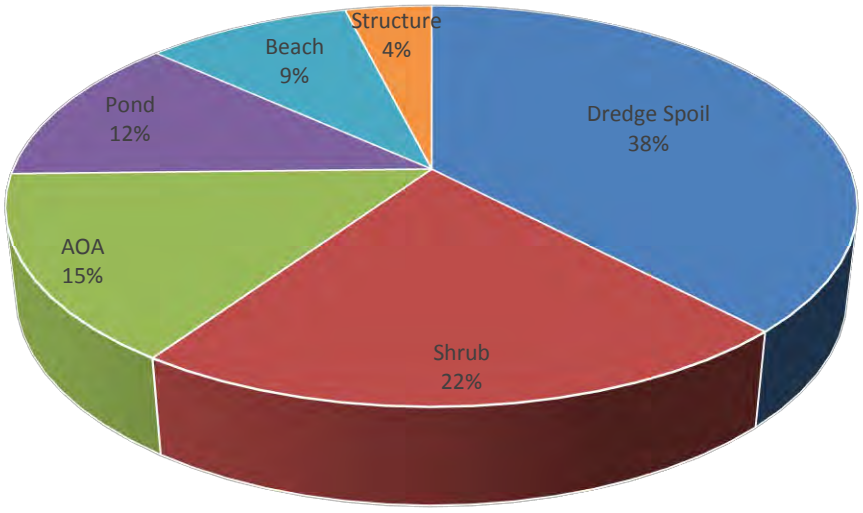
Figure 3. FHB WHSV - Observations by Activity (≥11% of observations)



Summary of Observations – Location (land use, habitat, structure)

Each observation recorded during the fixed-point surveys documented the habitat type, general land use, or structure where the wildlife was observed. The "Field Data Sheet" (Attachment A) includes a list of all location codes. Location could be determined by a bird perching, loafing, or roosting or it could be the general location of the bird's flight/soaring path. Figure 4 provides the percentages of each location type recorded for the six surveys conducted. The highest percentage (38%) of observations was recorded as dredge spoil, which consists of any observations contained within the existing dredge spoil containment site operated by the Florida Inland Navigation District (FIND). The second highest percentage (22%) of observations was recorded as shrub. This habitat consists of areas with mixed vegetation including small woody species that are typically less than 6 feet in height. Birds occupying the entire AOA (mostly flying past) were recorded 15% of the time. Birds were observed on a pond, small open water habitat, for 12% of observations. Birds using the nearby beach (off-airport) were observed 9% of the time and birds were observed utilizing structures 4% of the time. Birds were also observed using the nearby marsh, woodlands, taxiways, and other paved surfaces. However, these observations comprised less than 2%, each, of all observations and aren't discussed further.

Figure 4. FHB WHSV - Observations by Location (≥4% of observations)



Summary of Observations – Location Grid

As shown in Exhibit 5, 0.5-mile x 0.5-mile grids were superimposed over the monitoring station viewing areas. Each observation recorded during the fixed-point surveys (and general observations) included the dominant grid where the birds were observed. The three grids with the highest number of total observations are shown in Table 3. The total number of individuals observed in grids A3, B3, and C3 represents approximately 79% of all observed individuals during the fixed-point surveys. Grids A3 and B3 contain portions of the Intracoastal Waterway, its associated marshes, and the existing FIND site.

Table 3. Top 3 Grids for Number Individuals Observed

Grid	Number of Individual Birds Observed
A3	927
B3	437
C3	174

Source: ERS, 2018

Relative Risk to Aviation

DeVault, et al. (2011) ranked 77 bird and mammal species (1 being the most hazardous, 77 being the least hazardous) as to relative individual hazard to aircraft in airport environments (i.e. less than 500 feet AGL) and termed this as the composite rank (Attachment B). Composite rank was determined based on three variables: the percentage of total strikes for that species that caused damage; the percentage of total strikes that caused substantial damage; and the percentage of strikes that caused an effect on flight for strikes that occurred in the United States from 1990 to 2009. From these ranks, a Relative Hazard Score (RHS) was calculated by summing the scores of the three hazard criteria (% of strikes with damage, % of strikes with substantial damage, and % of strikes with a negative effect on flight) for each species (or species-group) and scaling to a maximum of 100. Mule deer were determined the most hazardous wildlife species in the U.S. and therefore given the highest score, 100. All other wildlife are ranked in relation to the mule deer.

Table 4 provides a list of the top six (6) species observed by ERS during the WHSV and the number of individuals counted for each category, in order of corresponding RHS. The top six (6) species listed in this table accounted for approximately 87% of all individuals counted at FHB. Although not observed in large numbers, it is worth noting that species with higher relative hazard scores (e.g. Canada goose, turkey vulture, and red-tailed hawk) may pose a greater hazard to aviation at FHB.

Table 4. Species observed in the greatest number (Top 6) at FHB organized by Relative Hazard Score

Species	Alpha Code	Number of Individuals	Relative Hazard Score[1]
laughing gull	LAGU	117	18
mourning dove	MODO	299	10
western sandpiper	WESA	554	3
unidentified warbler	UNWA	200	2
tree swallow	TRES	200	1
white ibis	WHIB	335	No score

Note 1: RHS based on "Interspecific Variation in Wildlife Hazards to Aircraft: Implications for Airport Wildlife Management." DeVault et.al. (2011)

Source: ERS, 2018

4.2 Fixed-Point Surveys - Mammals

In addition to birds, a single coyote (*Canis latrans*) was observed during fixed-point surveys. Coyotes have a RHS of 22 based on DeVault et al. (2011). This individual was observed walking in tall grass (>12 inches), between TWY B and RWY 13/31 in monitoring grid D4.

4.3 Spotlight Surveys

During spotlight surveys, there were four (4) white-tailed deer along with four (4) coyotes and one (1) great-horned owl observed. The deer were observed in monitoring grids D4, and B4, all inside the AOA. Two individuals were observed foraging in tall grass (>12 inches) on the airfield. The other two were observed using the edge habitat where the airfield turf meets woodlands, along the western portion of the AOA. The coyotes were observed entering the AOA through a gate in monitoring grid C4. All four coyotes entered the AOA together and proceeded southwest along RWY 4/22. The great-horned owl was observed loafing on an airfield sign along TWY A.

4.4 Listed Species – Regulation Overview

Federal Regulations

The majority of birds observed at FHB are protected by the United States Fish and Wildlife Service (USFWS) Migratory Bird Treaty Act of 1918 (MBTA). A migratory bird is defined as any species of bird that lives, reproduces, or migrates within or across international borders at some point during their life cycle. The MBTA makes it illegal for people to "take" migratory birds, their eggs, feathers, or nests without necessary permits. "Take" is defined as any attempt at hunting, pursuing/harassing, wounding, killing, possessing, or transporting any migratory bird, nest, egg, or part thereof. In total, over 800 bird species are protected by the MBTA, including western sandpipers, killdeer, white ibis, great egrets, Canada geese, red-tailed hawks, and vultures. While there is no permit necessary to harass birds protected under the MBTA, the USFWS does issue a Migratory Bird Depredation Permit to allow for the lethal take of migratory birds that pose a threat to human safety. FHB does not currently possess a USFWS Migratory Bird Depredation Permit.

The Endangered Species Act of 1973 (ESA) also protects over 1,800 species of flora and fauna throughout the United States. Although Incidental Take Permits (ITP) can be issued by USFWS allowing for the taking of federally endangered and threatened species, these permits are often difficult to obtain. Killing of endangered species should be avoided; however, public safety is still paramount.

USFWS has signed a Memorandum of Agreement (MOA) with FAA, and other federal agencies, acknowledging the risk that wildlife strikes pose to safe aviation and agreeing to coordinate their missions to more effectively address environmental conditions contributing to aircraft-wildlife strikes. To date, no federally-endangered (FE) or threatened (FT) species have been struck at FHB and FHB does not currently possess a USFWS ITP. Federally-listed bird species protected by the ESA that have the potential to be observed at FHB include: wood stork (*Mycteria americana*) and red knot (*Calidris canutus rufa*).

The Bald and Golden Eagle Protection Act of 1940 (BGEPA) adds an additional layer of protection to native eagles. Although the bald eagle (*Haliaeetus leucocephalus*) is no longer listed as an endangered species, and therefore not protected by the ESA, they are still afforded protection under MBTA and BGEPA. BGEPA prohibits anyone (without a permit) from taking, possessing, selling, purchasing, bartering, offering to sell, purchase, or barter, transporting, exporting or importing eagles, alive or dead, including their parts, nests, or eggs. BGEPA defines "take" as "to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest,

or disturb" an eagle. Furthermore, "disturb" is defined as "to agitate or bother an eagle to a degree that causes, or is likely to cause, based on the best scientific information available, (1) injury to an eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior." Bald eagles were not observed during the WHSV, however they are common in north Florida and may be present in the local area. FHB does not currently possess an Eagle Depredation Permit for eagle harassment.

State Regulations

The Florida Fish and Wildlife Conservation Commission (FWC) is the state agency involved with regulating Florida's wildlife. FWC Rule 68A-9.012 *Take of Wildlife on Airport Property* took effect on July 27, 2010 and allows for the harassment of state-listed threatened and endangered species and species of special concern, on airports, without a permit. In addition, this state rule allows for the take of state-listed species in emergency situations or after persistent harassment has failed when an airport has already obtained a USFWS Migratory Bird Depredation Permit. Persistent harassment must be documented to justify taking of a protected species. The only state-listed species observed during the WHSV was the black skimmer. Osprey were also observed during the WHSV, however, only the Monroe County (Everglades) population is protected. They are not a state-listed species in Nassau County. While gopher tortoises were not observed during the WHSV, it should be noted that the take of the state-listed gopher tortoise (*Gopherus polyphemus*) is prohibited under any circumstance.

5.0 WILDLIFE ATTRACTANTS

The attractants described in this section were identified during the WHSV conducted from 19 through 21 September 2018. Both airports and wildlife are dynamic and attractants may change over time. This information is merely a snapshot of a much larger picture. Therefore, this should not be viewed as a final evaluation of the wildlife situation at FHB, but rather serve as supplemental information to daily observations and any future wildlife survey projects. Major construction projects, changes to natural areas, and/or modifications to stormwater facilities on airport property should take into consideration the effects that these changes may have on wildlife.

The identified wildlife attractants are divided into on-site and off-site (off airport property). These groupings are likely to fall in-line with areas where the airport has the responsibility and capability of directing change to modify attractants versus those areas where the airport has little or no control over management of the attractant. Additionally, there is a section which describes and assesses the potential for future land uses (e.g. dredge spoil disposal on the AOA) to become a wildlife attractant.

5.1 On-site Attractants

Photo 1. FHB airfield turf looking from Taxiway A toward Runway 4/44 and the southwest.

Airfield Turf - Various grass and weedy species comprise the airfield turf within the AOA at FHB, which is regularly maintained by mowing. Guidance on mowing heights for airfield turf is found within the FAA/USDA document titled, "Wildlife Hazard Management at Airports: A Manual for Airport Personnel" (2005). Typically, the FAA recommends a thick monoculture of grass managed between 6-12 inches. Photo 1 provides a picture across the airfield showing the typical turf at FHB. Generally the airfield turf was healthy and well maintained. Recent rain events have limited access to low-lying areas, therefore, some maintenance is required to reduce turf heights and control broad leaved weeds. Intermediate grass height (6-12 inches) disrupts or blocks the ability of small flocking birds (such as blackbirds and doves) to visually communicate, therefore, they are less likely to flock in large numbers in these areas. In addition, a dense monoculture of grass will decrease the presence of broad leaved weeds and bare areas, which can create an attractant to birds. Fertilization and selective herbicide use could help to strengthen the existing stand of grass and reduce broad leaved weeds.

Photo 2A. Typical drainage ditch on FHB. Maintained with limited vegetation and standing water.

Photo 2B. Drainage ditch on FHB. Lacking proper maintenance with ample vegetation to provide cover.

Surface Waters & Ditches - Surface waters include man-made stormwater ponds and ditches or areas of temporary standing water. These areas are attractive to many species of wildlife, including wading birds and waterfowl that depend on wetlands and surface waters for nesting, roosting, and foraging opportunities. Small mammals and mesomammals (e.g. raccoons and opossums) also use these areas for fresh water sources, thereby attracting larger predators, such as hawks and coyotes. Ditches and ponds can provide preferable conditions for nesting waterfowl, especially if the vegetation along the water source is allowed to grow and become dense. In addition, vegetation along ditches slows drainage of the site by blocking culverts and ditches.

The ditches at FHB contained overgrown vegetation and standing water, but did not appear to attract wildlife (Photos 2A and 2B). No wildlife were observed using the ditches throughout the WHSV. There were several dry retention ponds observed on the airfield and additional ponds immediately outside of the AOA, however, no wildlife were observed using these areas during the WHSV either. Retention ponds should be maintained similar to surrounding turf.

It is possible that the abundance of available pond sites in the local area provide ample foraging opportunities, limiting the need for wildlife to use resources on the airfield. Nonetheless, improved maintenance would further reduce the likelihood of ditches attracting wildlife.

Photo 3. Abandoned runway with deteriorating surface.

Bare Areas - Bare areas of concern may include abandoned or poorly maintained hard surfaces or turf with exposed soil. At FHB, bare areas were limited, however, the abandoned runway on the west side of the AOA was an exception (Photo 3). These areas can provide ideal nesting habitat for killdeer and attract doves/pigeons that must ingest grit to aid in digestion. Hard surface areas can be swept to minimize available grit and adhesives may be used to reduce future deterioration. The area is currently being maintained with crack sealant which can reduce availability of grit. Bare patches in turf are minimized through proper mowing and fertilization, if needed. Maintaining an intermediate grass height (6-12 inches) throughout the AOA and reducing mowing where it may be too wet are common strategies to avoid bare areas in the turf.

Wooded Areas – Wooded areas provide cover and, when adjacent to open fields (i.e. airport turf), they create an edge effect where wildlife can find both food and cover. At FHB there are several wooded areas inside the AOA. White-tailed deer were observed in multiple locations on the AOA during the WHSV. At night, deer were observed along the wooded areas. In addition to deer, several other wildlife groups may use the wooded areas including: coyotes and raptors.

Temporary Standing Water – Depressional areas within the AOA are routinely mowed as part of the regular turf maintenance activities when ground conditions allow. Wet depressions may attract wading birds or waterfowl when they hold ponded water or due to ground saturation.

Prey Base on the Airfield – Insects and Small Mammals - Insect and invertebrate populations on the airfield attract a variety of bird species including aerial foragers (swallows, nighthawks, and kites) and wading birds (cattle egrets, great egrets, and white ibis). Populations of insects are cyclical throughout the year and different life-stages attract different species of birds. If an increase in birds are observed preying upon insects and invertebrates at FHB, managing the invertebrate populations with insecticides may be an option (long-term management strategy). However, prior to these steps, harassment measures may first be established to determine if the birds can be quickly discouraged from the airfield (short-term management strategy).

Small mammals, including rats, mice, and rabbits, are not generally considered wildlife hazards, but rather are wildlife attractants. Large birds of prey (hawks, eagles, owls, falcons, etc.), which are potential strike hazards, are highly attracted to small mammals as prey. If there is an abundance of small mammals in a particular area, a significant number of predators are likely to be in the area as well. Small mammals make up the majority of most predator birds' diets. Although not many small mammals were observed during the WHSV, raptors actively foraging on the airfield were observed and suggest small mammal presence (Photo 4). If birds of prey are observed in the future and are unable to be controlled using harassment measures (short-term management strategy), the use of rodenticides to reduce available prey may be considered as an option (long-term management strategy).

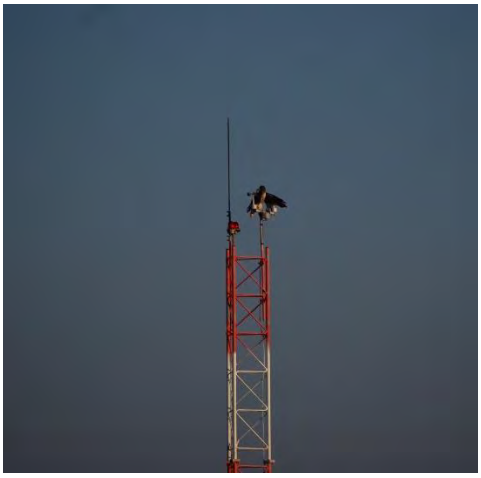


Photo 4. Two red-tailed hawks perched on navigational aid at FHB.

5.2 Off-site Attractants

Wildlife hazards at airports frequently are attributable to off-site attractants, such as wetlands, restaurants, golf courses, parks/recreational facilities, and landfills. Birds and other wildlife will cross the airfield en route to these off-site attractants, causing a hazard within the AOA. FAA issued AC 150/5200-33B *Hazardous Wildlife Attractants on or Near Airports* on August 28, 2007 to identify land use practices that commonly attract or sustain hazardous wildlife and recommend minimum separation criteria for those land uses to the vicinity of airports. FAA recommends a separation distance of at least 5,000 feet between hazardous wildlife attractants and airports serving piston-powered aircraft, at least 10,000 feet between attractants and airports serving turbine-powered aircraft, and five (5) miles between any airport's AOA and the hazardous wildlife attractant if the attractant could cause wildlife movement into or across the approach space (see Exhibits 3 and 4 for separation distances at FHB).

10,000-foot Separation Distance

Within the 10,000-foot separation distance, there are a variety of habitats: woodland areas are generally prevalent throughout the area surrounding the airport. Much of the barrier island on which the airport lies, is residential with associated golf courses and natural woodlands. To the immediate west is the Intracoastal Waterway and corresponding tidal marshes. To the east is the Atlantic Ocean (see Exhibit 3). The central business district of Fernandina Beach is located to the north and includes city parks, restaurants, hotels, etc. However, the greatest potential wildlife attractants are the numerous surrounding waterbodies being co-located with golf courses and woodland areas. These attractants in close proximity can cause wildlife to cross the airfield when moving between the various sites.

Most notably there is a dredge spoil containment area which is owned by the FIND and is used to hold dredge spoil from the Intracoastal Waterway. This site is routinely used to hold dredge spoil material until a suitable location is found for its disposal. At the time of the WHSV there was little dredge spoil in the containment area, however there was a depressional area with ponded water which attracted wading birds (e.g. white ibis, Photo 5), shorebirds (e.g. western sandpipers, lesser yellowlegs, and killdeer), and waterfowl (e.g. blue-winged teal). There is also a bald eagle nest located adjacent to the FIND site. The nest was last surveyed and last known active in 2013 (Photo 6). This is notable as FHB does not currently possess a BGEPA Depredation Permit from the USFWS.

Photo 5. White ibis foraging in ponded water at FIND dredge spoil site.

Photo 6. Bald eagle nest location. Last known active 2013.

5-Mile Separation Distance

Within the 5-mile separation distance, the majority of the land use is similar to that within the 10,000-foot separation criteria (see Exhibit 4). The City of Fernandina Beach lies to the north, the Intracoastal Waterway and tidal marshes are to the immediate west and south, and the Atlantic Ocean is to the east. In any direction there are residential developments and golf courses.

5.3 Potential Future Attractants

Dredge Spoil Material Disposal

The proposal to dredge the city-owned marina includes an option to dispose of the dredge spoil on airport property. Three potential disposal locations have been discussed with ERS and assessments will be based on these three sites (Exhibit 7). The proposed locations are not likely to differ in terms of risk or attractiveness to wildlife, therefore the following assessment will apply to all disposal locations. ERS' conclusions and recommendations regarding the dredge spoil were based on several key factors (1) the species observed on or near the airport; (2) anecdotal observations following the previous placement of dredge material at the airport; (3) observations of bird activity on the parent dredge material during low-tide; (4) birds observed at the nearby FIND site; (5) review of the *Data Report of Geotechnical Exploration* of the parent dredge material (Attachment C).

In AC 150/5200-33B *Hazardous Wildlife Attractants On or Near Airports*, the FAA explicitly lists "Dredge Spoil Containment Areas" as a potential attractant and recommends against locating dredge spoil within any of the

separation distances previously discussed above (5,000 ft, 10,000 ft, or 5 miles from the AOA). It should be noted that a draft update to this AC has been released (150/5200-33C) and the language regarding dredge spoil has not been changed. Although the FAA recommends against it, each site should be evaluated on a case by case basis, using local data and observations (if available).

In 2011, dredge spoil was placed in the approach to RWY 09 on the airport by the City. Prior to that event, the airport was evaluated to determine if placing the dredge spoil material on the airport would increase the risk of a wildlife strike at FHB. The evaluation was conducted by a Qualified Airport Wildlife Biologist working for Aerostar Environmental Services, Inc. (Attachment D). At that time, it was determined that the dredge spoil material would not create a hazardous wildlife attractant at FHB. ERS interviewed FHB staff to gather their anecdotal wildlife observation data following the placement of the dredged material. Airport staff reported that no increase in wildlife activity was observed, but that the dredge spoil was hard to maintain. The spoil was poorly graded and collected standing water in some locations, making it difficult to establish suitable turf and, subsequently, difficult to maintain turf/weeds that became established. This area was not noted as attractive to wildlife during the ERS WHSV, but establishing a dense monoculture of true grass is recommended throughout the AOA, including any previous or future spoils sites. A dense, intermediate turf is least attractive to hazardous wildlife.

Observations were conducted at the nearby Fernandina Beach Marina (Exhibit 4) to determine bird activity when the mudflats were exposed at low-tide, assuming that the mud flats are comprised of the same components as the materials that will be dredged. Based on low-tide observations of the parent material, there was no increase in use by hazardous birds. Subsequently, a review of the *Data Report of Geotechnical Exploration* (Attachment C), which identified the parent dredge material as dark gray silt with organic fines, (organic content ranging from 11.84-12.63%) did not raise any further concern.

The current FIND spoil containment area was observed as part of the point count survey route followed during this WHSV. The area was being used by a variety of birds, including white ibis and blue-winged teal. During the WHSV, the grid squares containing the FIND site resulted in the most observations throughout the surveyed area. For all species observed, use of the dredge spoil was limited to a depressional area which was holding ponded water. It is unlikely that the birds would have been attracted to the area without the ponded water, therefore, any dredge spoil placed on the airport must be graded such that no ponding will occur following rain events. As previously discussed, prior dredge disposal on-airport was poorly graded, preventing proper maintenance and possibly leading to isolated areas of standing water.

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Fernandina Beach
Municipal Airport (FHB)
Proposed Dredge Spoil Sites

Project No.:	18151
Exhibit No.:	7
Date:	10-26-18
By: MEF	Rev. Date:

N W E S

Source: ArcGIS Online Imagery

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6.0 RECOMMENDATIONS

Summary List of Recommendations

Passive Management Actions

- Maintain a consistent grass height of 6 to 12 inches throughout the AOA.
- Maintain drainage ditch vegetation.
- Remove existing trees inside AOA.
- Install wildlife exclusion fence around AOA (see Attachment E).
- Remove carrion from AOA and surrounding roadways (see Attachment F).
- Ensure proper grading and maintenance of any future dredge spoil.

Active Management Actions

- Harass high priority species within the AOA including, but not limited to: geese, gulls, raptors (vultures, hawks, osprey), ibis, deer, and coyotes.
- Remove nest materials whenever found (inactive nests only).
- Remove wildlife when necessary.

Administrative Recommendations

- FHB staff should complete annual wildlife hazard management training per FAA AC 150/5200-36A, Appendix D (see Attachment G).
- Report all wildlife strikes and document all wildlife management actions.
- Consult a qualified airport wildlife biologist when addressing concerns regarding future environmental permitting efforts and planning activities.
- Obtain USFWS permits (Migratory Bird Depredation Permit and Eagle Depredation Permit).
- Consider developing a Wildlife Hazard Management Plan.

6.1 Passive Management Actions

6.1.1 Maintain a consistent grass height of 6 to 12 inches throughout the AOA

Current grass height appeared to be within the recommended height of 6 to 12 inches in areas where mowing had recently occurred. Several areas had been neglected due to access issues following recent rain, including previous dredge spoil disposal sites. It is recommended that grass height always be kept between 6 and 12 inches. This is key to a successful wildlife strike reduction program and most wildlife programs start with grass management as the foundation. There are several benefits to maintaining an intermediate grass height: it disrupts visual inter-flock communication, obscures insect food sources, limits predator protection, impedes the ease at which wildlife can move, and taller grass out-competes edible, weedy vegetation and it has a slower growth rate, which in turn requires less frequent mowing. True grasses (without seed heads) are indigestible to most birds. Birds are only attracted to "weedy" and seed-producing vegetation. When mowing, it is recommended to mow in several directions and only when the ground is dry. This will help to avoid ruts, bare areas, and standing water from tractor tires. The recommended height is to be applied to the entire property. Maintaining an intermediate grass height will be effective against mourning doves, killdeer, and Canada geese. It will also help to reduce the amount of carrion caused by mowing (primary vulture attractant).

6.1.2 Maintain drainage ditch vegetation

Current maintenance of drainage ditches is good, but could be improved. Vegetation appears to be under control and flow appears to be adequate, but there were several areas with ample cover to provide security for foraging or nesting birds. Generally, it is best to eliminate all vegetation from ponds, ditches, and culverts. Vegetation may be maintained through chemical or mechanical means. Avoid allowing dead vegetation to remain in place because the buildup of dead vegetation may create an additional wildlife attractant. When possible, remove vegetation and use herbicide to prevent re-growth. Do not allow woody vegetation to persist in drainage ditches.

6.1.3 Remove existing trees inside the AOA

Several stands of trees currently exist within the AOA, these should be removed to limit available edge habitat. Edge habitat is that which exists where there is a change from one community type to another. In this case, it is changing from grassland to woodland. Woodland areas provide cover to a multitude of wildlife including those that pose significant hazards to aviation: white-tailed deer, coyote, and several raptor species. The grasslands then provide the foraging opportunity. Based on observations during the WHSV, white-tailed deer, and likely coyotes, are using the current woodland stands as cover and foraging on the AOA. The patches of woodland areas currently inside the AOA also promote the movement of hazardous wildlife throughout the airfield, possibly across active runways.

6.1.4 Install wildlife exclusion fence around AOA

Currently the AOA is partially enclosed by a 6 foot chain link fence. Sections along the western boundary have no perimeter fencing due to the close proximity to the Intracoastal Waterway and tidal marshes. To

prevent access to the AOA by mammals, specifically white-tailed deer, a complete wildlife exclusion fence should be installed. At a minimum this should be an 8 foot chain link fence with 3 strand barbed wire outrigger at the top. Ideally, a buried skirt would also be installed to prevent mammals from digging under the fence. AOA perimeter fence gates should also be adjusted and maintained with gaps no larger than 6 inches to prevent entry by mammals. Gates should be checked regularly to ensure complete closure (see Attachment D).

6.1.5 Remove carrion promptly from AOA and surrounding roadways.

Many potentially hazardous wildlife species, including vultures and eagles, scavenge carrion (i.e. roadkill) as a primary food source. Any carcass (small or large) found on the airfield, or on nearby roadways, should be removed immediately and disposed of properly (buried). Any carcass suspected to be involved in a wildlife strike should be reported as such to the FAA Wildlife Strike Database and remains should be forwarded to the Smithsonian Institute for identification (see Attachment E).

6.1.6 Ensure proper grading and maintenance of any future dredge spoil

Observations of the dredge spoil parent material and of current dredge spoil disposal areas suggest that the introduction of dredge spoil onto the AOA will not necessarily create a hazardous wildlife attractant. It is imperative that dredge spoil placed on the AOA be graded to prevent ponding of water and to allow for future maintenance of the area. Ideally the area should be seeded or sodded with an appropriate turf grass species (e.g. bahia) to minimize the amount of time that the dredge spoil remains as a bare area.

6.2 Active Management Actions

6.2.1 Harass high priority species within the AOA including, but not limited to: geese, gulls, raptors (vultures, hawks, osprey), ibis, deer, and coyotes.

Non-lethal harassment measures such as the use of pyrotechnics, vehicles, sirens, horns, sound cannons, effigies, trained canines, and falconry can successfully deter many wildlife from the AOA. A variety of harassment measures should be used to minimize wildlife from becoming habituated to a single method. FHB staff should continue the use of pyrotechnics and should be trained annually in the safe use of pyrotechnics on the airfield. Species protected under the ESA and BGEPA are not permitted to be harassed. Federally listed bird species under the ESA and BGEPA that may by observed at FHB include wood storks, red knots, and bald eagles. FHB staff should be trained in the identification of these species prior to initiating a harassment program. The majority of birds observed at FHB are protected by the USFWS MBTA of 1918. While there is no permit necessary to harass birds protected under the MBTA, the USFWS can issue a Migratory Bird Depredation Permit to allow for the lethal take of migratory birds that pose a threat to human safety. FHB currently does not possess a USFWS Migratory Bird Depredation Permit, but should consider obtaining a permit if lethal control is anticipated or necessary. State-listed species may be harassed without an additional state permit, as long as federal permits have been obtained.

6.2.2 Remove nest materials whenever found

Mourning doves, northern mockingbirds, killdeer, and other birds are likely nesting on airport property. The airfield should be monitored for nesting and all nests should be removed and eggs destroyed (with appropriate permits, if needed). Hangars, parked aircraft, and bare areas are of particular concern for nesting activities. A USFWS Migratory Bird Depredation Permit is required to remove active nests of species protected under the MBTA. Bald Eagle nests may only be removed with a permit issued by USFWS. No nests of federally-listed species under the ESA can be removed.

6.2.3 Remove wildlife when necessary

Removal of wildlife should be considered when necessary to protect human health and safety. Due to FHB's limited staff, the airport may consider working with a contractor to assist in the removal of mammals and high risk bird species. Either FHB or the contractor must have all applicable permits prior to initiating removal of wildlife. Removal may include trapping and/or lethal control. Additional coordination with an FAA Qualified Airport Wildlife Biologist is recommended if removal of wildlife is deemed necessary.

6.3 Administrative Recommendations

6.3.1 FHB staff should complete annual wildlife hazard management training per FAA AC 150/5200-36A, Appendix D (see Attachment F)

FHB staff should be trained to recognize and respond to potential wildlife hazards in an appropriate manner. They should be familiar with the damage caused by wildlife and how to respond to potentially hazardous situations. Responding may require active harassment or simply that the employee documents the attractant or hazard. Additional recommended attendees include maintenance personnel from tenants and the personnel that conduct mowing operations on the airfield.

6.3.2 Report all wildlife strikes and document all wildlife management actions

FHB staff, pilots, airport tenants and anyone else who has knowledge of a wildlife strike should continue to report strikes. FHB may want to provide educational outreach to the airport community on how to properly report a bird strike, collect snarge, the importance of this information, and how it is used to help reduce risks to aviation. When reporting a bird strike, it is important to include as much information as possible such as species, location of observation, the time of day, the date, and what, if any, action was taken. The identification of the species is particularly important and identification guides should be available to assist personnel with this task. Remains found should be forwarded to the Smithsonian Institution, Feather Identification Lab for further analysis and identification.

FHB staff should log and record all wildlife hazard management activities (i.e. harassment or lethal control) on a data sheet. The type of action, target species, and number involved should be recorded. In addition, FHB staff could use this log sheet to record observed wildlife on the AOA even when deterrent techniques are not deployed. This information should be reviewed on an annual basis to evaluate efforts, discuss high risk species, and determine if additional measures need to be implemented at the airport. Data sheets should be kept on file with the Airport Manager.

6.3.3 Consult a qualified airport wildlife biologist when addressing concerns regarding future environmental permitting efforts and planning activities

If large projects or changes to the landscape are being considered at FHB, a qualified airport wildlife biologist should be contracted for input on the changes' impact on wildlife at the airport. Airport expansion projects can help to eliminate natural habitats viewed as wildlife attractants. However, it is important to not replace these natural habitats with man-made ones, e.g. open stormwater ponds, flat roofs, nesting structures, etc. A multi-disciplinary approach encourages pre-planning, which can prevent problems and lead to cost savings in the future.

6.3.4 Obtain USFWS permits (Migratory Bird Depredation Permit and Eagle Depredation Permit)

FHB staff should apply for USFWS Migratory Bird Depredation Permit and Eagle Depredation Permit. In the event that non-lethal measures are inadequate, a USFWS Migratory Bird Depredation Permit will allow FHB staff or designated sub-permittees to legally take most bird species (excluding threatened and endangered species and eagles). Without this permit, lethal control and removal of active nests are prohibited. The USFWS Eagle Depredation Permit will allow FHB staff or designated sub-permittees to legally harass bald eagles, without this permit, harassment of bald eagles is prohibited. Permits should be renewed as required.

6.3.5 Consider developing a Wildlife Hazard Management Plan

FHB staff should consider developing a Wildlife Hazard Management Plan (WHMP) to address current and future wildlife management needs. A WHMP is a living document which is used to identify, prioritize, and direct wildlife management needs on the airfield. The goal of an airport's WHMP is to minimize risk to aviation posed by hazardous wildlife.

7.0 CONCLUSION

Managing wildlife hazards on and around airports is essential for maintaining safe and timely airport operations. The goal of this WHSV was to help FHB prevent wildlife strikes before they occur and provide baseline information on the wildlife present on or near the airfield. Wildlife surveys were conducted for the purpose of determining the types of wildlife hazards/attractants that are present on and near the airfield and what measures should be taken to reduce risks to aviation. Surveys took place during dawn, midday, and dusk at several established monitoring stations over a three-day period in September 2018. Wildlife, signs of wildlife activity, and potential attractants of wildlife were observed and documented. While the site visit is limited to three days of wildlife observations, biologists considered potential seasonal occurrences typical to the region, reviewed the FAA National Wildlife Strike Data and interviewed airport staff to gather a more complete picture of the potential wildlife hazards on or near the airport.

This particular WHSV was also conducted to evaluate dredge spoil disposal on the airport as a potential hazardous wildlife attractant. Wildlife surveys conducted on and around FHB revealed several species of birds were attracted to dredge spoil in the FIND spoil containment area (survey point 6) near the airport. However, a survey of the area to be dredged, the Fernandina Beach Marina, revealed no birds utilizing the parent material when exposed at low-tide. Western sandpipers and white ibis were observed in the greatest numbers at the FIND spoil containment area. All species observed at the FIND site were foraging within a small area of ponded water. It is the opinion of ERS that these birds were only attracted to the dredge spoil material due to the presence of the ponded water. Airport staff should require that dredge spoil material placed on the airfield is appropriately graded to allow for proper maintenance of the area. Ideally the dredge spoil will be seeded or sodded with an appropriate turf grass in order to conceal the exposed material.

The passive, active, and administrative recommendations provided in Section 6.0 are intended to outline measures to reduce the wildlife strike risks to aviation at FHB. Current strike records do not indicate that there are a high number of strikes or damaging strikes at FHB. Through the implementation of the recommendations in this report it would be anticipated that wildlife strike risks would be further reduced. If in the future more frequent or damaging strikes are documented, additional investigation may be required.

8.0 LITERATURE CITED

DeVault, Travis L., Jerrold L. Belant, Bradley F. Blackwell, and Thomas W. Seamans. "Interspecific Variation in Wildlife Hazards to Aircraft: Implications for Airport Wildlife Management." *Wildlife Society Bulletin* 35(4) (2011): 394-402. Print.

United States. Federal Aviation Administration & U.S. Department of Agriculture. Office of Airport Safety and Standards & Wildlife Services. *Wildlife Hazard Management at Airports*. By Edward C. Cleary and Richard A. Dolbeer. Second ed. July 2005. Print.

ATTACHMENT A

WILDLIFE HAZARDS - SURVEY FIELD DATA SHEET

PAGE OF

AIRPORT NAME	OBSERVER(S) :	DATE (MM/DD/YY)	SURVEY PERIOD
FERNANDINA BEACH MUNICIPAL AIRPORT (FHB)			

TEMPERATURE (^{o}F)	WIND DIRECTION/SPEED (d/mph)	WEATHER CONDITION

TIME (local/24hr)	STATION	GRID SQUARE	SPECIES	NUMBER OF ANIMALS	ACTIVITY (See codes below)	LOCATION (See codes below)	COMMENTS

WEATHER

CL = cloudy
FG = fog
PC = partly cloudy
RN = rain
SN = snow/sleet
SU = sunny

ACTIVITY

BD = bedded down
FL = flying/localized
FO = foraging
FP = flying/passing
HO = hovering
HW = hawking insects
LF = loafing
PE = perching
RS = roosting
RN = running
SO = soaring
NS = nesting
VO = vocalizing

LOCATION

AOA = Airport OPS Area
ASP = asphalt/concrete
BCH = beach
DRG = dredge spoil
DTC = ditch
EXP = exposed mud
GLG = grass, long
GSH = grass, short
MAR = marsh/wetland
PND = pond
RMP = ramp
RWY = runway
SHR = shrubs
STR = structure
URB = urban area
TRE = tree
BARE = bare area/grit/dirt
TSW = temporary standing water
TWY = taxiway
UNP = unpaved road
WDL = woodland

ATTACHMENT B

Wildlife Society Bulletin 35(4):394–402; 2011; DOI: 10.1002/wsb.75

Original Article

Interspecific Variation in Wildlife Hazards to Aircraft: Implications for Airport Wildlife Management

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ABSTRACT Understanding the relative hazards of wildlife to aircraft is important for developing effective management programs. We used Federal Aviation Administration National Wildlife Strike Database records from 1990 to 2009 in the United States to rank the relative hazard of wildlife to aircraft. We summarized data for 77 species or species groups with ≥20 records where collisions occurred ≤500 ft (152 m) above ground level. We also assessed the effects of avian body mass, body density, and group size on relative hazard scores. The 3 most hazardous species or species groups were mule deer (*Odocoileus hemionus*), white-tailed deer (*O. virginianus*), and domestic dogs. "Other geese" (snow goose [*Chen caerulescens*], brant [*Branta bernicla*], and greater white-fronted goose [*Anser albifrons*]) was the most hazardous bird group. Ten of the 15 most hazardous bird species or species groups are strongly associated with water. Avian body mass was strongly associated with percentage of all strikes that caused damage, but not for species exceeding median body mass (1,125 g) of birds in damaging strikes. In contrast, percentage of damaging strikes increased when multiple birds were involved, but only for those species with body mass ≥1,125 g. Managers should prioritize efforts that will reduce habitat suitability for those species most hazardous to aircraft. We recommend use of exclusion (e.g., fences) for managing large mammals and habitat modifications (e.g., reductions in standing water) accompanied by hazing for reducing bird use of airports. We also recommend that evaluations of jet turbine engine performance following bird ingestions consider using multiple birds with body mass >1,000 g. © 2011 The Wildlife Society.

KEY WORDS airport, airport management, aviation hazard, bird strike, body mass, wildlife–aircraft collision, wildlife hazard score, wildlife strike.

Wildlife collisions with aircraft (wildlife strikes) pose increasing risks and economic losses to the aviation industry worldwide. Annual economic losses from wildlife strikes with civil aircraft are conservatively estimated to exceed US$ 1.2 billion worldwide (Allan 2002) and US$ 600 million in the United States alone (Dolbeer et al. 2009). Wildlife strikes have resulted in the loss of >219 human lives and >200 military and civil aircraft since 1988 (Richardson and West 2000, Dolbeer and Wright 2008, Thorpe 2010). Public awareness of wildlife collisions with aircraft is presently at an all-time high following the highly publicized ditching of US Airways Flight 1549 in the Hudson River in January 2009 (Marra et al. 2009).

Numerous efforts are currently employed to mitigate wildlife-strike hazards at airports (Washburn et al. 2007; Blackwell et al. 2008, 2009*a*; DeVault et al. 2008) and at higher altitudes (DeVault et al. 2005, Van Belle et al. 2007, Blackwell et al. 2009*b*). Airport biologists have made considerable progress in reducing the overall number of damaging strikes (Dolbeer et al. 2010) and strikes in the airport environment (Dolbeer 2011) during the past decade. Nonetheless, most damaging strikes still occur at low altitudes in the airport environment (Dolbeer 2006). Consequently, efforts to reduce strikes should be concentrated at airports. To better prioritize airport wildlife-hazard management, particularly habitat management (Washburn et al. 2007), land-use planning (Blackwell et al. 2009*a*), and nonlethal dispersal (i.e., frightening techniques), an improved understanding of which species are most hazardous is necessary. At least 415 bird and 35 nonvolant mammal species were struck by aircraft from 1990 to 2009 (Dolbeer et al. 2010). Overall, 14% of all strikes with birds and 61% of all strikes with mammals caused some damage (Dolbeer et al. 2010). However, the severity and probability of damage is

Received: 13 May 2011; Accepted: 20 August 2011;
Published: 17 October 2011

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species-specific (Dolbeer et al. 2000, 2010; Dolbeer and Wright 2009).

Dolbeer et al. (2000) provided an initial ranking of wildlife species by relative hazard level to aircraft. However, at that time (May 1998) the Federal Aviation Administration (FAA) National Wildlife Strike Database for Civil Aviation in the United States contained only 18,038 records. Because of limited data, Dolbeer et al. (2000) was able to rank relative hazard levels for only 21 wildlife species or groups. The annual reporting rate of wildlife strikes has increased markedly (currently >7,500 reports/yr) and now represents about 39% of all strikes at airports certificated for passenger travel by the FAA (i.e., 61% of all strikes are never reported; Dolbeer 2009). Consequently, this database contained 99,411 strikes through 2009, warranting a reassessment of wildlife hazard rankings.

More recently, Dolbeer and Wright (2009) provided hazard rankings and classified species into several hazard-level categories using the percentages of strikes that caused damage. However, they did not use a composite hazard score that incorporated damage level (e.g., substantial damage; see Dolbeer et al. 2000) and effect on flight. Zakrajsek and Bissonette (2005) ranked wildlife strike hazards for military aircraft with species–group hazard rankings that differed from Dolbeer et al. (2000). This disparity was likely due to differences in flight characteristics and procedures between military and civil aircraft (e.g., serious strikes to military aircraft are often incurred during low-altitude, high-speed training flights), but also because Zakrajsek and Bissonette (2005) used the number of damaging strikes and the cost of such strikes as their primary criteria for hazard ranking, whereas Dolbeer et al. (2000) used percentages of strikes that caused some type of damage.

We emphasize "Which species are the most hazardous if struck?" as a question different than "Which species cause the most damage?" The former question addresses the proportion of strikes by a species that causes damage to aircraft in relation to the total number of strikes involving that species. The latter question is, in part, a consequence of overall species abundance and current management at airports. There are numerous additional factors that limit our ability to assess which species cause the most damage to aircraft, including multiscale patterns of species distributions, airport locations, and timing and frequency of aircraft arrivals and departures at airports. Consequently, we addressed only the first question, as did Dolbeer et al. (2000) and Dolbeer and Wright (2009), whereas Zakrajsek and Bissonette (2005) and the annual FAA wildlife strike report summaries (e.g., Dolbeer et al. 2010) addressed the second question.

Because our goal was to provide an assessment of wildlife hazards relevant to management of the airport and its immediate vicinity, we used only strikes ≤500 ft (152 m) above ground level (AGL) in our analyses. Previous wildlife hazard rankings for civil aircraft (Dolbeer et al. 2000, Dolbeer and Wright 2009) used wildlife strike data from all altitudes due to limited sample sizes. Use of all strike data is likely biased because species vary in strike frequency across altitude bands (Dolbeer 2006) and strikes at different altitudes occur at various aircraft velocities. For example, Dolbeer et al. (2000) reported that vultures (turkey vultures [*Cathartes aura*] and black vultures [*Coragyps atratus*]) and osprey (*Pandion haliaetus*) had higher hazard scores than predicted by average body masses. These differences were attributed to these species soaring at high altitudes, increasing their vulnerability to being struck by aircraft traveling at greater velocities. We considered mammals in our hazard rankings, but not when investigating factors that contribute to hazard level. Although mammals can be extremely hazardous to aircraft, particularly large mammals (e.g., white-tailed deer [*Odocoileus virginianus*]; Biondi et al. 2011), they can be managed effectively with appropriate exclusion and deterrents (e.g., DeVault et al. 2008, VerCauteren et al. 2010).

In addition to providing an updated hazard ranking to assist airport wildlife management, we also sought to understand why bird species differ in hazard level. Previous studies have identified avian body mass (Dolbeer et al. 2000, Dolbeer and Eschenfelder 2003), body density (Seamans et al. 1995), and flocking behavior (Dolbeer and Eschenfelder 2003) as potential contributors to hazard level; however, no formal analyses on body density and flocking behavior have been conducted. Consequently, we investigated these factors to determine which attributes influenced hazard level.

METHODS

For the 20-yr period (1990–2009), 99,411 strikes were reported to the FAA (Dolbeer et al. 2010). We used FAA National Wildlife Strike Database records for the United States from 1990 through 2009 that included identified species and were ≤500 ft AGL (thus, in the airport environment; Dolbeer 2006), which represented 23,503 reports. Only species–groups with ≥20 total strikes were used in our analyses. We combined some similar species into groups to increase sample size to ≥20 (e.g., "sparrows"), or because similarities in form and behavior facilitated pooling data (e.g., western meadowlark [*Sturnella neglecta*] and eastern meadowlark [*S. magna*] were combined into a "meadowlark" group), which resulted in 77 species–groups for analyses.

We calculated rankings for birds and mammals combined and for birds only. We provided the former ranking to demonstrate the relative hazards of mammal species and the latter ranking because bird management at airports is more complex and often considered separately from mammals. We used the database to calculate the percentage of total strikes for each species or group that 1) resulted in any level of damage to the aircraft (ranging from minor repairs to aircraft destroyed); 2) resulted in substantial damage to the aircraft (adversely affecting structural strength, performance, or flight characteristics and which generally requires major repair or replacement of the aircraft component struck); and 3) caused an effect on flight (e.g., aborted take-off or emergency landing; see table 1 in Dolbeer et al. [2000] for detailed definitions of damage categories and effect on flight). Damaging strikes differed from nondamaging strikes in that the former required some level of repair or replacement of an aircraft component, whereas the latter

Table 1. Ranking of 77 bird and mammal species or groups (1 = most hazardous) as to relative hazard to aircraft in airport environments (i.e., ≤500 ft [152 m] above ground level), based on a composite rank. The composite rank reflects 3 variables: the percentage of total strikes (for that species–group) that caused any level of damage to the aircraft, the percentage of total strikes that caused substantial damage to the aircraft, and the percentage of total strikes that caused an effect on flight (EOF). See Dolbeer et al. (2000) for detailed definitions of damage and EOF. Strike data are from the Federal Aviation Administration National Wildlife Strike Database, for strikes that occurred in the United States from 1990 to 2009.

Species[a]	Total strikes reported	% With damage	% With substantial damage	% With EOF	Damage rank	Substantial damage rank	EOF rank	Composite rank	Relative hazard score
Mule deer (*Odocoileus hemionus*)	47	96	38	83	1	1	1	1	100
White-tailed deer (*Odocoileus virginianus*)	814	87	36	68	2	2	3	2	88
Domestic dog	21	53	26	75	4	4	2	3	71
Other geese	20	68	32	32	3	3	8	4	61
Canada goose (*Branta canadensis*)	776	51	16	34	7	9	7	5	46
Turkey vulture (*Cathartes aura*)	159	46	16	34	10	7	6	5	44
Other ducks	77	49	24	30	8	5	11	7	48
Great horned owl (*Bubo virginianus*)	29	52	16	27	6	8	17	8	44
Double-crested cormorant (*Phalacrocorax auritis*)	24	52	13	29	5	13	13	8	43
Brown pelican (*Pelecanus occidentalis*)	31	35	13	38	14	14	5	10	40
Wild turkey (*Meleagris gallopavo*)	38	37	6	43	13	28	4	11	40
Sandhill crane (*Grus canadensis*)	66	43	10	28	11	19	15	11	37
Glaucous-winged gull (*Larus glaucescens*)	27	48	9	28	9	21	16	13	39
Bald eagle (*Haliaeetus leucocephalus*)	74	40	7	30	12	25	10	14	36
Great black-backed gull (*Larus marinus*)	20	26	21	22	18	6	23	14	32
Osprey (*Pandion haliaetus*)	77	32	12	26	16	15	19	16	32
Great blue heron (*Ardea herodius*)	132	32	8	28	15	23	14	17	31
Ring-necked pheasant (*Phasianus colchicus*)	45	26	14	22	20	10	26	18	29
Herring gull (*Larus argentatus*)	291	25	13	24	23	12	21	18	29
Snowy owl (*Bubo scandiacus*)	28	23	12	26	24	17	20	20	28
Mallard (*Anas platyrhynchos*)	221	31	11	21	17	18	28	21	29
Great egret (*Ardea alba*)	24	26	4	29	21	32	12	22	28
Red-tailed hawk (*Buteo jamaicensis*)	534	26	8	21	19	24	27	23	25
California gull (*Larus californicus*)	23	14	14	20	33	11	30	24	22
Cattle egret (*Bubulcus ibis*)	112	17	6	27	32	27	18	25	23
Ring-billed gull (*Larus delawarensis*)	362	21	8	20	26	22	33	26	23
Franklin's gull (*Larus pipixcan*)	26	9	9	23	41	20	22	27	19
Raccoon (*Procyon lotor*)	23	18	12	14	28	16	40	28	20
Coyote (*Canis latrans*)	231	14	3	31	36	41	9	29	22
Rock dove (*Columba livia*)	1,035	18	6	19	29	26	34	30	20
Swainson's hawk (*Buteo swainsoni*)	24	17	4	20	31	33	31	31	19
Other hawks	34	14	4	22	34	37	25	32	18
Laughing gull (*Larus atricilla*)	106	14	4	21	35	34	29	33	18
Mew gull (*Larus canus*)	21	25	0	16	22	52	37	34	19
Peregrine falcon (*Falco peregrinus*)	44	18	5	7	30	29	53	35	14
Laysan albatross (*Phoebastria immutabilis*)	29	22	0	17	25	53	35	36	18
Rabbits (Leporidae)	78	11	3	15	37	39	39	37	13
Upland sandpiper (*Bartramia longicauda*)	32	8	4	16	43	36	36	37	13
Short-eared owl (*Asio flammeus*)	58	10	4	11	39	35	43	39	12
Black-bellied plover (*Pluvialis squatarola*)	20	18	0	16	27	54	38	40	15
Red fox (*Vulpes vulpes*)	31	8	0	22	42	55	24	41	14
American crow (*Corvus brachyrhynchos*)	141	10	3	13	40	40	41	41	12
Spotted dove (*Streptopelia chinensis*)	46	7	4	10	48	31	45	43	10
Barn owl (*Tyto alba*)	174	11	3	9	38	38	49	44	11
Mourning dove (*Zenaida macroura*)	1,313	7	3	13	45	42	42	45	10
Blackbirds	976	7	2	10	44	46	44	46	9
European starling (*Sturnus vulgaris*)	1,408	7	2	10	47	43	46	47	9
Bats (Chiroptera)	44	5	5	8	55	30	51	47	8
Killdeer (*Charadrius vociferus*)	553	6	1	7	51	48	52	49	7
American kestrel (*Falco sparverius*)	536	4	1	7	57	47	55	50	6
Zebra dove (*Geopelia striata*)	54	4	2	6	56	44	59	50	5
Snow bunting (*Plectrophenax nivalis*)	84	1	0	20	66	66	32	52	10
Common myna (*Acridotheres tristis*)	21	6	0	6	50	58	56	52	6
Bank swallow (*Riparia riparia*)	49	5	0	9	54	61	50	54	6
Meadowlarks	361	3	2	6	61	45	60	55	5
Woodchuck (*Marmota monax*)	41	7	0	3	46	56	68	56	5
Horned lark (*Eremophila alpestris*)	372	3	1	6	60	49	61	56	4
Sparrows	1,799	3	0	6	62	51	58	58	4
Northern harrier (*Circus cyaneus*)	24	5	0	5	52	59	62	59	5
American robin (*Turdus migratorius*)	159	2	0	10	64	65	47	60	5
Burrowing owl (*Athene cunicularia*)	20	6	0	0	49	57	73	61	3
Barn swallow (*Hirundo rustica*)	486	2	0	3	65	50	69	62	2
Wrens	28	4	0	4	58	62	66	63	3
Terns	45	5	0	0	53	60	74	64	2

Table 1. (*continued*)

Species[a]	Total strikes reported	% With damage	% With substantial damage	% With EOF	Damage rank	Substantial damage rank	EOF rank	Composite rank	Relative hazard score
Finches	55	0	0	10	71	71	48	65	4
Chimney swift (*Chaetura pelagica*)	34	0	0	6	70	70	57	66	3
Common nighthawk (*Chordeiles minor*)	38	3	0	0	59	63	75	66	1
Pacific golden-plover (*Pluvialis apricaria*)	204	1	0	4	67	67	64	68	2
Purple martin (*Progne subis*)	57	2	0	2	63	64	72	69	2
Western sandpiper (*Calidris mauri*)	31	0	0	7	76	76	54	70	3
Cliff swallow (*Petrochelidon pyrrhonota*)	164	1	0	2	68	68	71	71	1
Skunks (Mephitidae)	30	0	0	4	74	74	63	72	2
Nutmeg mannikin (*Lonchura punctulata*)	26	0	0	4	72	72	67	72	2
Chestnut manikin (*Lonchura malacca*)	28	0	0	0	69	69	76	74	0
Wood warblers	30	0	0	4	77	77	65	75	2
Tree swallow (*Tachycineta bicolor*)	109	0	0	2	75	75	70	76	1
Opossum (*Didelphis virginiana*)	25	0	0	0	73	73	77	77	0

[a] Other geese = snow goose (*Chen caerulescens*), brant (*Branta bernicla*), greater white-fronted goose (*Anser albifrons*); other ducks = 23 species in the family Anatidae; other hawks = Cooper's hawk (*Accipter cooperii*), sharp-shinned hawk (*A. striatus*), rough-legged hawk (*Buteo lagopus*), red-shouldered hawk (*B. lineatus*), broad-winged hawk (*B. platypterus*), ferruginous hawk (*B. regalis*); blackbirds = red-winged blackbird (*Agelaius phoeniceus*), brown-headed cowbird (*Molothrus ater*), common grackle (*Quiscalus quiscula*); meadowlarks = eastern meadowlark (*Sturnella magna*), western meadowlark (*S. neglecta*); sparrows = 19 species in the family Emberizidae; wrens = house wren (*Troglodytes aedon*), Carolina wren (*Thryothorus ludovicianus*), marsh wren (*Cistothorus palustris*); terns = common tern (*Sterna hirundo*), arctic tern (*S. vittata*), Caspian tern (*S. caspia*), least tern (*S. antillarum*), fairy tern (*S. nereis*); finches = house finch (*Carpodacus mexicanus*), American goldfinch (*Carduelis tristis*); wood warblers = 13 species in the family Parulidae.

necessitated no repair or replacement of components (although some costs might have been incurred due to delay or aircraft inspection after landing). Also, by definition, strikes resulting in substantial damage also are included in the calculation for any level of damage, but not all strikes resulting in an effect on flight caused damage. Following Dolbeer et al. (2000), we ranked the 77 species–groups for each of the 3 hazard criteria (i.e., percentage of strikes with damage, percentage of strikes with substantial damage, and percentage of strikes with an effect on flight) from 1 (most hazardous) to 77 (least hazardous). We created a composite rank by summing those category ranks and then ordered species or groups from most to least hazardous, including tied ranks. We then calculated a relative hazard score (Dolbeer et al. 2000) by summing the scores of the 3 hazard criteria for each species–group, and scaling to a maximum of 100.

We assessed hazard scores in relation to avian body mass, body density, and group size. We obtained body mass data from Dunning (1993). When body mass estimates were provided for both sexes, we averaged them. For body masses of "groups" we calculated a weighted average using the number of strikes for each species in that group. We obtained mean bird body densities for 14 species (Seamans et al. 1995; T. W. Seamans, unpublished data). Unpublished density estimates were for American white pelicans (*Pelecanus erythrorhynchos*), double-crested cormorants (*Phalacrocorax auritus*), horned larks (*Eremophila alpestris*), American kestrels (*Falco sparverius*), red-tailed hawks (*Buteo jamaicensis*), great black-backed gulls (*Larus marinus*), and common nighthawks (*Chordeiles minor*). For all species, we used "plucked" body density estimates (Seamans et al. 1995); methods used to estimate density were identical for published and unpublished species. Bird flock size is poorly reported in the FAA National Wildlife Strike Database (Dolbeer et al. 2000), although all strikes are reported as involving single or multiple birds. Consequently, we used the percentage of strikes in which multiple (>1) birds were struck as our group-size estimate.

We log-transformed bird body masses to normalize them before assessing possible autocorrelation among predictor variables. We used relative hazard score as the dependent variable in all analyses and species–group as the sample unit. We first examined bivariate scatterplots of relative hazard score against log body mass and relative hazard score against percentage of strikes involving multiple birds, then used either linear or quadratic regression (based on best model fit) to assess relationships between these variables.

RESULTS

Considering birds and mammals combined, the top 3 species in composite ranking were large mammals (mule deer [*O. hemionus*], white-tailed deer, and domestic dog; Table 1). The next most hazardous mammal species were raccoon (*Procyon lotor*) and coyote (*Canis latrans*), with composite rank scores of 28 and 29, respectively. Based on relative hazard score, the top bird species–group was other geese (snow goose [*Chen caerulescens*], brant [*Branta bernicla*], and greater white-fronted goose [*Anser albifrons*]), which was 61% as hazardous as mule deer. Percentage of strikes with damage ranged from 95.6% (mule deer) to 0% (9 species–groups), percentage with major damage ranged from 37.8% (mule deer) to 0% (28 species–groups), and percentage with effect on flight ranged from 83.3% (mule deer) to 0% (5 species–groups; Table 1).

Considering birds only, other geese was the most hazardous species–group, followed by a 3-way tie between Canada geese (*Branta canadensis*), other ducks (23 species in the family Anatidae), and turkey vultures (Table 2). These 3 species–groups were 73–78% as hazardous as other geese

Table 2. Ranking of 66 bird species or groups (1 = most hazardous) as to relative hazard to aircraft in airport environments (i.e., ≤500 ft [152 m] above ground level), based on a composite rank. The composite rank reflects 3 variables: the percentage of total strikes (for that species–group) that caused any level of damage to the aircraft, the percentage of total strikes that caused substantial damage to the aircraft, and the percentage of total strikes that caused an effect on flight (EOF). See Dolbeer et al. (2000) for detailed definitions of damage and EOF. Strike data are from the Federal Aviation Administration National Wildlife Strike Database, for strikes that occurred in the United States from 1990 to 2009.

Species[a]	Total strikes reported	Damage rank	Substantial damage rank	EOF rank	Composite rank	Relative hazard score	Body mass (g)	Body density (g/cm^3)	% of strikes with multiple birds
Other geese	20	1	1	5	1	100	2,290		60.0
Other ducks	77	5	2	7	2	78	916		46.8
Canada goose (*Branta canadensis*)	776	4	6	4	2	76	3,564	0.917	47.9
Turkey vulture (*Cathartes aura*)	159	7	4	3	2	73	1,467	0.916	9.0
Great horned owl (*Bubo virginianus*)	29	3	5	13	5	72	1,309		3.4
Double-crested cormorant (*Phalacrocorax auritis*)	24	2	10	9	5	71	1,674	0.994	16.7
Brown pelican (*Pelecanus occidentalis*)	31	11	11	2	7	66	3,348		9.7
Sandhill crane (*Grus canadensis*)	66	8	15	11	8	61	5,571		44.6
Wild turkey (*Meleagris gallopavo*)	38	10	24	1	9	65	5,811		23.7
Glaucous-winged gull (*Larus glaucescens*)	27	6	17	12	9	64	1,010		25.9
Bald eagle (*Haliaeetus leucocephalus*)	74	9	21	6	11	59	4,740		12.2
Great black-backed gull (*Larus marinus*)	20	15	3	19	12	53	1,659	0.914	15.0
Osprey (*Pandion haliaetus*)	77	13	12	15	13	53	1,485		2.6
Great blue heron (*Ardea herodius*)	132	12	19	10	14	51	2,390		2.3
Ring-necked pheasant (*Phasianus colchicus*)	45	17	7	21	15	47	1,135		8.9
Herring gull (*Larus argentatus*)	291	20	9	17	16	47	1,125	0.880	22.0
Snowy owl (*Bubo scandiacus*)	28	21	13	16	17	46	2,043		0.0
Mallard (*Anas platyrhynchos*)	221	14	14	23	18	47	1,082	0.959	24.4
Great egret (*Ardea alba*)	24	18	27	8	19	45	874		12.5
Red-tailed hawk (*Buteo jamaicensis*)	534	16	20	22	20	42	1,126	0.960	2.2
California gull (*Larus californicus*)	23	29	8	25	21	37	691		21.7
Cattle egret (*Bubulcus ibis*)	112	28	23	14	22	37	338		29.5
Ring-billed gull (*Larus delawarensis*)	362	23	18	28	23	37	519	0.928	29.6
Franklin's gull (*Larus pipixcan*)	26	35	16	18	23	31	280		48.0
Rock dove (*Columba livia*)	1,035	25	22	29	25	33	355	0.987	47.2
Swainson's hawk (*Buteo swainsoni*)	24	27	28	26	26	32	989		4.2
Other hawks	34	30	32	20	27	30	661		2.9
Laughing gull (*Larus atricilla*)	106	31	29	24	28	29	325	0.935	33.0
Mew gull (*Larus canus*)	21	19	45	32	29	31	403		28.6
Peregrine falcon (*Falco peregrinus*)	44	26	25	45	29	23	782		4.5
Laysan albatross (*Phoebastria immutabilis*)	29	22	46	30	31	30	3,042		0.0
Upland sandpiper (*Bartramia longicauda*)	32	36	31	31	31	21	151		25.0
Short-eared owl (*Asio flammeus*)	58	33	30	36	33	19	347		0.0
American crow (*Corvus brachyrhynchos*)	141	34	34	34	34	19	448		17.7
Black-bellied plover (*Pluvialis squatarola*)	20	24	47	33	35	25	220		30.0
Spotted dove (*Streptopelia chinensis*)	46	40	26	38	35	16	159		8.7
Barn owl (*Tyto alba*)	174	32	33	42	37	18	523		0.6
Mourning dove (*Zenaida macroura*)	1,313	38	35	35	38	17	119		35.0
Blackbirds	976	37	39	37	39	14	65		34.3
European starling (*Sturnus vulgaris*)	1,408	39	36	39	40	14	82	1.027	47.5
Killdeer (*Charadrius vociferus*)	553	43	41	44	41	11	97		19.9
American kestrel (*Falco sparverius*)	536	48	40	47	42	9	116	0.997	6.0
Zebra dove (*Geopelia striata*)	54	47	37	51	42	9	56		25.9
Common myna (*Acridotheres tristis*)	21	42	49	48	44	9	110		28.6
Snow bunting (*Plectrophenax nivalis*)	84	57	57	27	45	16	42		84.5
Bank swallow (*Riparia riparia*)	49	46	52	43	45	10	15		61.2
Meadowlarks	361	52	38	52	47	8	95		19.9
Horned lark (*Eremophila alpestris*)	372	51	42	53	48	7	31	1.055	38.7
Sparrows	1,799	53	44	50	49	7	25		28.9
Northern harrier (*Circus cyaneus*)	24	44	50	54	50	8	436		4.2
American robin (*Turdus migratorius*)	159	55	56	40	51	9	77		8.2
Burrowing owl (*Athene cunicularia*)	20	41	48	63	52	5	155		5.0
Barn swallow (*Hirundo rustica*)	486	56	43	59	53	3	16		21.2
Wrens	28	49	53	57	54	6	10		25.0
Terns	45	45	51	64	55	4	224		35.6
Finches	55	62	62	41	56	7	18		32.7
Common nighthawk (*Chordeiles minor*)	38	50	54	65	57	2	62	0.992	10.5
Chimney swift (*Chaetura pelagica*)	34	61	61	49	58	5	24		14.7
Pacific golden-plover (*Pluvialis apricaria*)	204	58	58	55	58	4	153		26.0
Purple martin (*Progne subis*)	57	54	55	62	58	3	49		33.3
Western sandpiper (*Calidris mauri*)	31	65	65	46	61	5	42		67.7
Cliff swallow (*Petrochelidon pyrrhonota*)	164	59	59	61	62	2	22		23.2
Nutmeg mannikin (*Lonchura punctulata*)	26	63	63	58	63	3	14		65.4
Chestnut manikin (*Lonchura malacca*)	28	60	60	66	64	0	16		50.0

Table 2. (*continued*)

Species[a]	Total strikes reported	Damage rank	Substantial damage rank	EOF rank	Composite rank	Relative hazard score	Body mass (g)	Body density (g/cm^3)	% of strikes with multiple birds
Wood warblers	30	66	66	56	65	3	12		10.0
Tree swallow (*Tachycineta bicolor*)	109	64	64	60	65	2	20		39.4

[a] Other geese = snow goose (*Chen caerulescens*), brant (*Branta bernicla*), greater white-fronted goose (*Anser albifrons*); other ducks = 23 species in the family Anatidae; other hawks = Cooper's hawk (*Accipter cooperii*), sharp-shinned hawk (*A. striatus*), rough-legged hawk (*Buteo lagopus*), red-shouldered hawk (*B. lineatus*), broad-winged hawk (*B. platypterus*), ferruginous hawk (*B. regalis*); blackbirds = red-winged blackbird (*Agelaius phoeniceus*), brown-headed cowbird (*Molothrus ater*), common grackle (*Quiscalus quiscula*); meadowlarks = eastern meadowlark (*Sturnella magna*), western meadowlark (*S. neglecta*); sparrows = 19 species in the family Emberizidae; wrens = house wren (*Troglodytes aedon*), Carolina wren (*Thryothorus ludovicianus*), marsh wren (*Cistothorus palustris*); terns = common tern (*Sterna hirundo*), arctic tern (*S. vittata*), Caspian tern (*S. caspia*), least tern (*S. antillarum*), fairy tern (*S. nereis*); finches = house finch (*Carpodacus mexicanus*), American goldfinch (*Carduelis tristis*); wood warblers = 13 species in the family Parulidae.

based on relative hazard scores. There were 23 bird species–groups with relative hazard scores <10; 17 of these (74%) have average body masses <100 g (Table 2).

Avian body density was strongly negatively associated with log body mass ($r = -0.77$; $P = 0.001$) and, consequently, excluded from analyses. Preliminary examination of the association between relative hazard score and log body mass suggested the relationship diminished once log body mass reached about 3.0 (1,000 g). Thus, we first examined data on body masses for all strikes in 2 groups—those that resulted in damage and those that resulted in no damage. Median body mass for birds involved in damaging strikes was 1,125 g; median body mass for birds involved in nondamaging strikes was 97 g (Fig. 1). We then used median body mass (log body mass = 3.05) for birds involved in damaging strikes as a cut-off point for further analyses. We subsequently examined relative hazard score versus log body mass and percentage of strikes with multiple birds involved for 2 groups separately (in addition to all birds combined): species–groups <1,125 g ($n = 49$), and species–groups ≥1,125 g ($n = 17$).

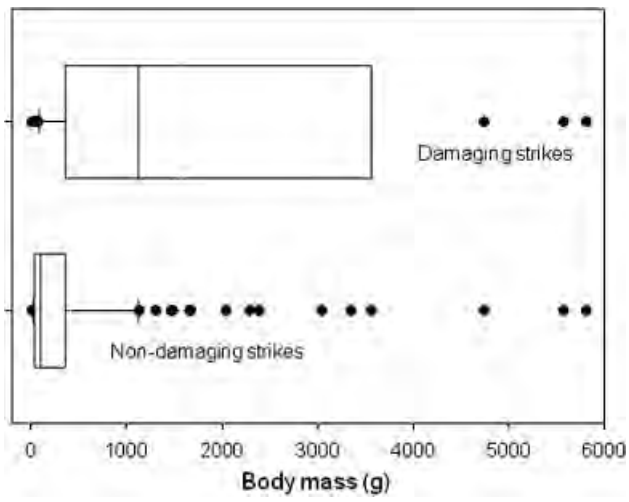

Figure 1. Frequency distribution of body masses for birds involved in damaging and nondamaging strikes with aircraft. Boxes outline the mid-range (25–75 percentiles), medians are indicated by the vertical lines within the boxes, whiskers mark the 10th and 90th percentiles, and outlying points are marked with solid circles. Only strikes in airport environments (i.e., ≤500 ft [152 m] above ground level) are included. Data are from the Federal Aviation Administration National Wildlife Strike Database, for strikes that occurred in the United States from 1990 to 2009.

For all bird species–groups, relative hazard score increased with body mass (Fig. 2). This relationship was similar for those species–groups with body mass <1,125 g; however, no relationship for species with body mass ≥1,125 g was observed. Although no relationship between relative hazard score and percentage of strikes involving multiple birds existed when considering all bird species–groups or those with body mass <1,125 g, relative hazard scores did increase with percentage of strikes involving multiple birds for species–groups ≥1,125 g (Fig. 3).

DISCUSSION

Understanding the relative hazards of wildlife to aircraft is critical for developing effective management programs. We encourage biologists and managers to prioritize efforts that reduce use of airport property for those species ranked most hazardous to aircraft; that is, those species with the greatest percentage of total strikes that cause some form of damage (either direct aircraft damage or an effect on flight) and are observed using the airspace and habitats in and around the airport in question (see also Dolbeer and Wright 2009). We emphasize that our composite rankings do not necessarily represent species that cause the most economic damage nor the relative frequency of species involved in damaging strikes; rather, our rankings reflect those species most likely to cause damage when struck by aircraft. Thus, prioritizations for managing hazardous wildlife species also should consider frequency of species occurrence on airports (Dolbeer and Wright 2009).

Large mammals, particularly deer, are clearly the most hazardous wildlife to aircraft (see also Biondi et al. 2011). Dolbeer et al. (2000) similarly reported deer as having the highest relative hazard score. Consequently, we recommend airports implement a no-tolerance policy for deer or other large-bodied mammals (e.g., dogs) on airfields. Exclusion devices are highly effective for deer and fencing should be a priority at all airports (DeVault et al. 2008, VerCauteren et al. 2010). Although less effective, lower cost alternatives to 2.3–3-m woven-wire or chain-link fencing are available (e.g., Seamans and VerCauteren 2006). It is critical that fences

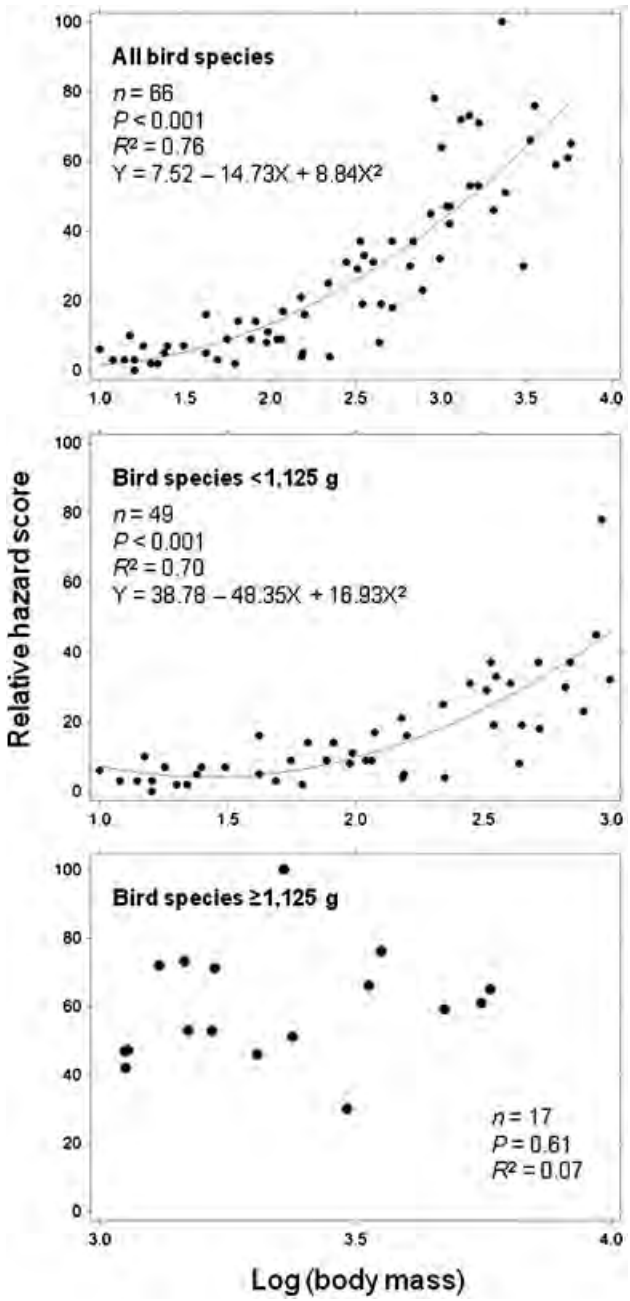

Figure 2. Relative hazard scores as predicted by body mass for 66 bird species–groups (top), for species–groups <1,125 g (middle), and for species–groups ≥1,125 g (bottom) with ≥20 strikes ≤500 ft (152 m) above ground level at airports in the United States, from 1990 to 2009.

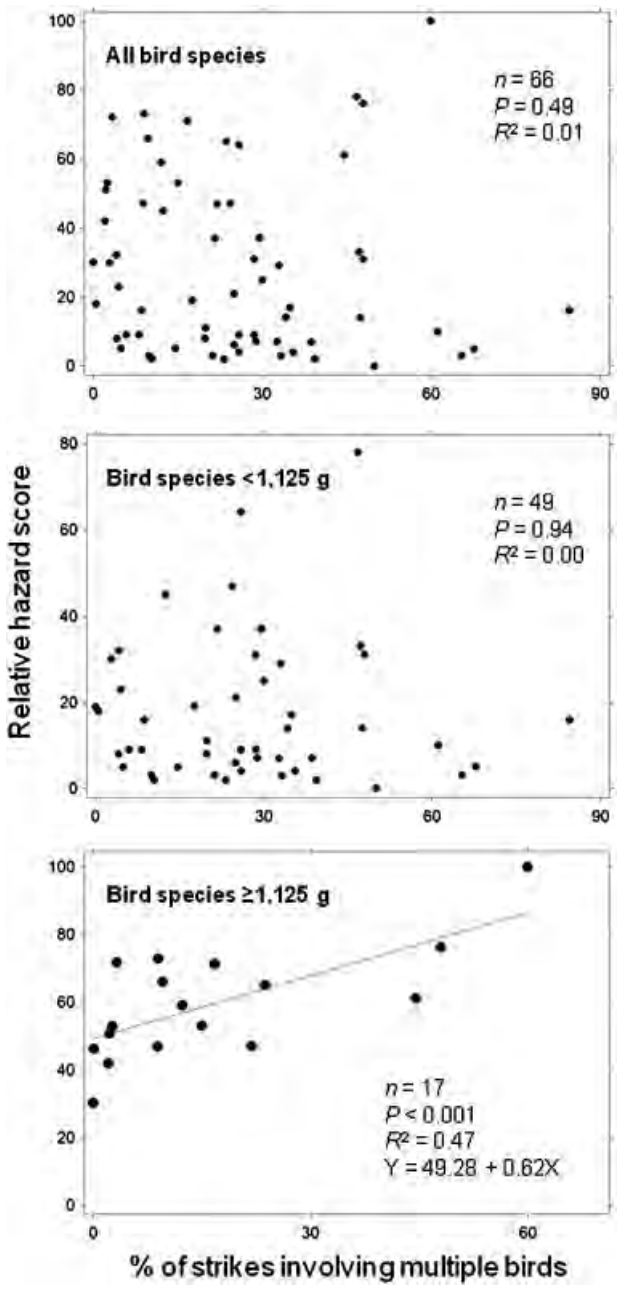

Figure 3. Relative hazard scores as predicted by the percentage of total strikes involving multiple birds for 66 bird species–groups (top), for species–groups <1,125 g (middle), and for species–groups ≥1,125 g (bottom) with ≥20 strikes ≤500 ft (152 m) above ground level at airports in the United States, from 1990 to 2009.

have no gaps or holes that would allow large mammals to cross (DeVault et al. 2008, VerCauteren et al. 2010); consequently, regular fence maintenance must be conducted.

Considering birds only, 10 of the 15 most hazardous bird species–groups are strongly associated with water (other geese, Canada goose, other ducks, double-crested cormorant, brown pelican [*Pelicanus occidentalis*], glaucous-winged gull [*Larus glaucescens*], bald eagle [*Haliaeetus lecucephalus*], great black-backed gull, osprey, and great blue heron [*Ardea herodias*]). Similarly, Dolbeer and Wright (2009) found 6 of 8 bird species (snow goose, northern pintail [*Anas acuta*], Canada goose, brown pelican, bald eagle, double-crested cormorant) in the highest hazard category ("extremely high"; >40% of all strikes causing damage) are commonly associated with water. Potential risk to aircraft has increased as populations of some species, such as Canada geese, have increased in recent years, especially resident populations (Sauer et al. 2008). Consequently, strategies with long-term effectiveness to reduce goose and other waterbird use at airports are imperative. Fresh water, including standing water following rainfall, is common at certificated airports (Gabrey and Dolbeer 1996, Brown et al. 2001) and at general

aviation facilities (DeVault et al. 2009). Proper storm-water and open-water management should be a high priority for airports (Barras and Seamans 2002, Blackwell et al. 2008).

Other bird species with high composite rank scores are typically associated with specific cover types (e.g., great-horned owl [*Bubo virginianus*] and wild turkey [*Meleagris gallopavo*]—forest; sandhill crane [*Grus canadensis*]—cropland; ring-necked pheasant [*Phasianus colchicus*]—grassland and cropland). In cases of multiple hazardous bird species using several cover types at airports, we recommend managers consider the most hazardous species and manage for cover type that is least attractive overall. The importance of management programs that consider multiple components of wildlife habitat or resource use (e.g., roosts and food) is recognized (e.g., Blackwell and Wright 2006). However, the feasibility for reducing the amount of resources selected by hazardous species on airports will vary. For example, it is often necessary to maintain grasslands, including short grass near taxiways and runways, which are often used for loafing or foraging by several species. In these situations, modifying vegetation height and planting less palatable plant species may reduce habitat suitability for some species (Pochop et al. 1999, Sheffield et al. 2001, Washburn et al. 2007, Whittingham and Devereux 2008). Also, agriculture is a surprisingly common land use at airports (Blackwell et al. 2009*a*, DeVault et al. 2009); avoiding production of small grains and corn exploited by many species will almost certainly reduce overall wildlife use.

Populations of most large birds hazardous to aircraft are increasing in the United States (Dolbeer and Eschenfelder 2003). Overall, body mass was clearly the primary determinant of hazard level to aircraft, and flocking behavior was secondary (see also Dolbeer et al. 2000, Dolbeer and Eschenfelder 2003). However, we note the relationship between body mass and hazard level held only for birds with body mass less than about 1 kg; relative hazard did not increase for species exceeding about 1 kg body mass. This concept also was demonstrated by Dolbeer and Eschenfelder (2003), who found that 50% of strikes with birds >1.8 kg caused damage and 51% of strikes with birds >3.6 kg caused damage.

According to Dolbeer and Eschenfelder (2003), 67% of the 36 bird species in North America >1.8 kg exhibit strong flocking behavior and 25% exhibit limited flocking behavior. We demonstrated that strikes involving multiple birds were a contributing factor to damaging strikes for large bird species. We were surprised to find, however, that the percentage of strikes involving multiple birds was not an important predictor of damaging strikes for smaller birds. Some of the most devastating strikes (in terms of loss of human life) were caused by large flocks of European starlings (*Sturnus vulgaris*) and rock doves (*Columba livia*; Thorpe 2005). However, we lacked consistent data on flock size for analyses; our binary measure of single or multiple birds involved in strikes may have masked an effect of flock size for small species. It is possible that for small bird species, only large flocks are particularly hazardous. Thus, airport managers and biologists should not ignore the potential threat posed by large flocks of small birds. Even so, the greatest avian strike hazards to aircraft are clearly large (>1 kg) flocking species.

MANAGEMENT IMPLICATIONS

Our recommendations target airport wildlife managers and engine manufacturers, respectively. First, although numerous hazing and exclusion techniques have been demonstrated to reduce wildlife use of airports, we encourage airport managers to concurrently implement programs that reduce wildlife habitat suitability whenever feasible. Creating habitat less suitable for hazardous wildlife should reduce their overall use of airport environments and also may enhance effectiveness of hazing techniques. We recommend management programs first prioritize local wildlife species by hazard level, and then emphasize reducing habitat suitability for the most hazardous species. Certainly, perimeter fences to exclude large mammals and reductions in standing water to reduce use by many of the most hazardous bird species should be priorities for airports.

Current FAA design standards require jet turbine engines to sustain ingestions of 8 675-g birds or 1 1.8-kg bird without catching fire, bursting, increasing load beyond maximum design load, or losing the ability to be shut down (Eschenfelder 2000). In addition, engines tested using 675-g birds also must maintain ≥75% power or thrust and not fail within 5 min of bird ingestion (Eschenfelder 2000). Our results suggest consideration for using multiple birds exceeding 1-kg body mass for jet turbine engine testing, rather than multiple birds <1 kg or a single bird >1.8 kg, as is currently required.

ACKNOWLEDGMENTS

Our work was supported by the United States Department of Agriculture, Mississippi State University, and the FAA under agreement DTFACT-04-X-90003. We thank P. M. Schmidt, B. E. Washburn, J. A. Schmidt, M. J. Begier, and 3 anonymous reviewers for providing constructive comments on this manuscript. Opinions expressed in this study do not necessarily reflect current FAA policy decisions regarding the control of wildlife on or near airports.

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Associate Editor: Breck.

ATTACHMENT C

October 22, 2018

Mr. Bradley Wente, P.E.
Passero Associates, LLC
13453 North Main Street, Suite 106
Jacksonville, Florida 32218

Reference: Data Report of Geotechnical Exploration
Fernandina Marina Dredge Material
Nassau County, Florida
ECS Project No.: 35-27881
Client ID: MK04

Dear Mr. Wente:

As requested, ECS Florida, LLC (ECS) has completed the exploration of the subject site. This letter briefly describes the field exploration and laboratory testing performed, and presents the data obtained.

The purpose of this exploration was to determine the composition of the materials encountered in the proposed dredge area. This report does not address the strength and load carrying capability of the materials.

SITE LOCATION AND PROJECT DESCRIPTION

The site for the subject project is located at the Fernandina Harbor Marina in Fernandina Beach, Florida. The general site location is shown on the Site Location Plan, Figure 1.

Based on the information provided by your office, we understand that the bathymetry of the site generally slopes downward to the west from EL. 2 to EL. -24 at the central portion of the river. The portion near the southern floating docks of the marina will be dredged and the material will be transported offsite to stockpile and store.

FIELD EXPLORATION

The exploration consisted of collecting five bulk samples within the proposed dredging area to depths of approximately 3 feet to 4 feet below the mudline existing at the time of our field exploration. Note we were able to push the sampler to depths of approximately 10 feet below mudline with very little resistance. The sampling was performed on October 18, 2018.

A copy of the plan provided to us, which shows the approximate sample locations, is included as the Field Exploration Plan in Figure 2. The approximate locations were determined in the field by our personnel using taped measurements from existing site features and survey controls adjacent to the site, and should be considered accurate only to the degree implied by the method of measurement used.

LABORATORY TESTING

Representative soil samples obtained during our field exploration were visually classified, in general accordance with ASTM D 2488. Quantitative laboratory testing was performed on selected samples of the soils encountered during the field exploration. The laboratory testing determined the gradation and percent organic contents of selected soil samples. These results are included on the Laboratory Testing Summary and Particle Size Distribution Reports in Appendix A of this report.

GENERAL SUBSURFACE CONDITIONS

In general, the material sampled consisted of Silt (ML) with many organic fines to the termination depths of our sampling methods at approximately 3 feet to 4 feet below existing mudline.

CLOSURE

We appreciate this opportunity to be of service as your geotechnical consultant on this phase of the project, and look forward to providing the materials testing and inspection that will be required during the construction phase. If you have any questions concerning this report, or if we may be of any further service, please contact us.

Very truly yours,

ECS FLORIDA, LLC

Chris M. Egan, P.E. Project Engineer Registered, Florida No. 79645	David W. Spangler, P.E. Geotechnical Department Manager Registered, Florida No. 58770

Distribution: Mr. Bradley Wente, P.E. – Passero Associates, LLC 1 pdf

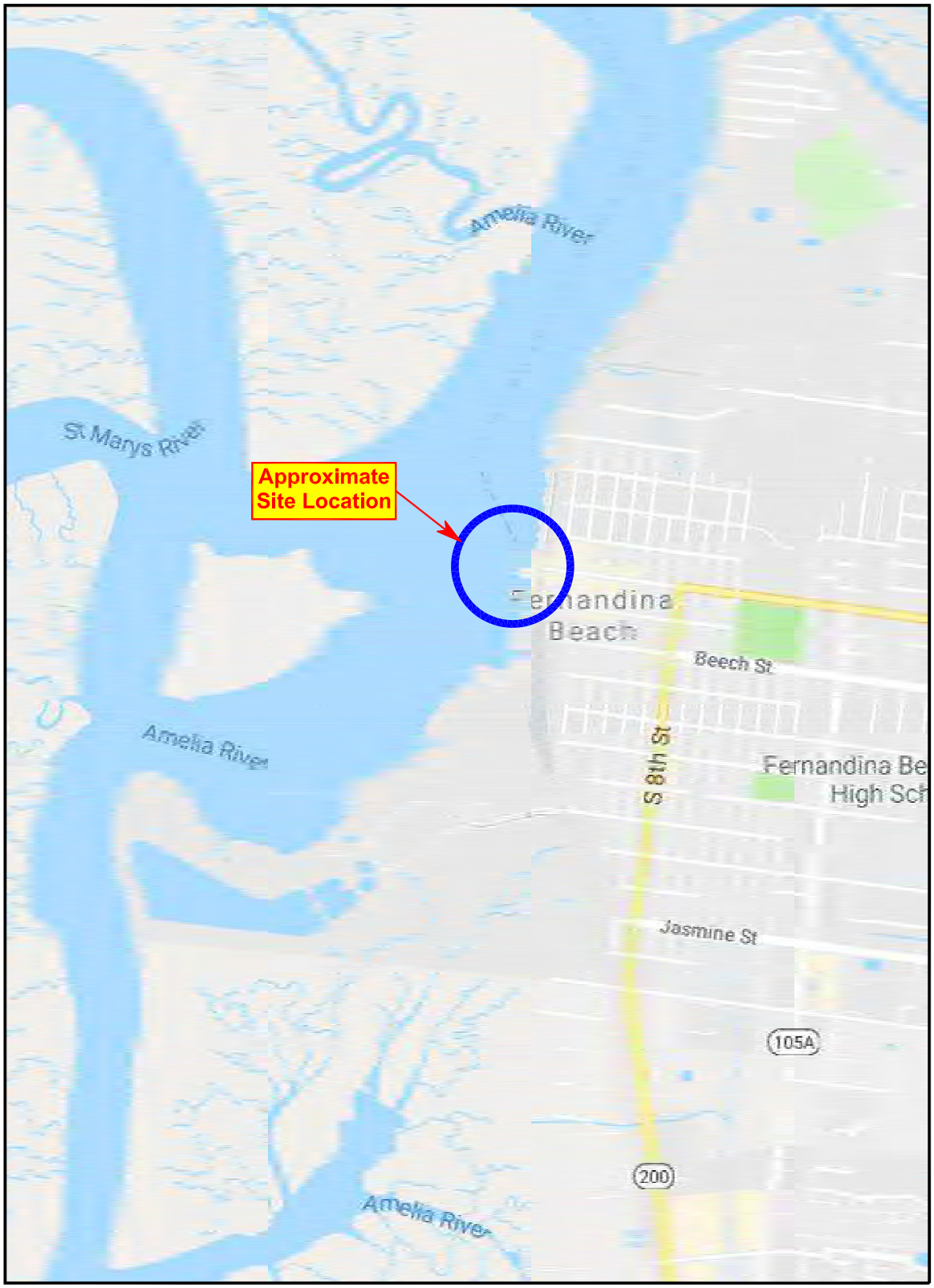
FIGURES

Figure 1	Site Location Plan
Figure 2	Field Exploration Plan

APPENDIX

Appendix A	Laboratory Testing Summary Particle Size Distribution Reports

FIGURES



ECS Florida, LLC
Geotechnical ▪ Construction Materials ▪ Environmental ▪ Facilities
7064 Davis Creek Road, Jacksonville, FL 32256
T: (904) 880-0960 ▪ F: (904) 880-0970
www.ecslimited.com

Site Location Plan

Fenandina Marina Dredge Material

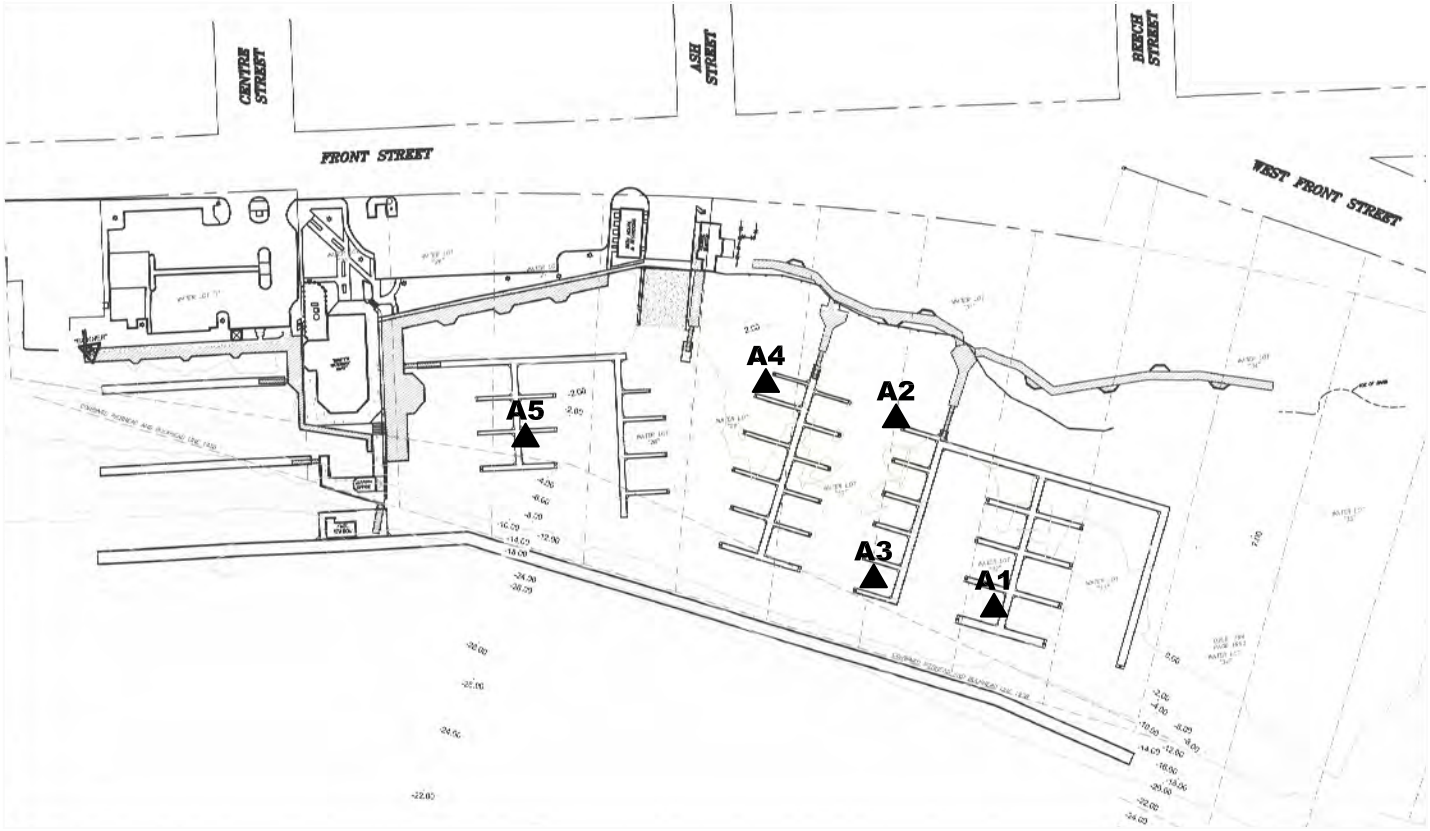
Fernandina Marina, Florida

Date: 10/22/18	Project No.: 35-27881	Figure 1

JAS - 35-27881

Graphical Scale

0' 200' 400'



LEGEND

▲ Approximate Location of Bulk Sample

ECS Florida, LLC

Geotechnical ▪ Construction Materials ▪ Environmental ▪ Facilities
7064 Davis Creek Road, Jacksonville, FL 32256
T: (904) 880-0960 • F: (904) 880-0970
www.ecslimited.com

Field Exploration Plan

Fenandina Marina Dredge Material

Fernandina Marina, Florida

Date: 10/22/18	Project No.: 35-27881	Figure 2

JAS - 35-27881

APPENDIX A

LABORATORY TESTING SUMMARY
PARTICLE SIZE DISTRIBUTION REPORTS

Laboratory Testing Summary

Sample Source	Sample Number	Depth (feet)	MC[1] (%)	Soil Type[2]	Atterberg Limits[3]			Percent Passing No. 200 Sieve[4]	Moisture - Density (Corr.)[5]		CBR Value[6]	Other
					LL	PL	PI		Maximum Density (pcf)	Optimum Moisture (%)		
A-1												
	1	3.00 - 4.00	265.6	ML				96.5				OC=11.84
A-2												
	2	3.00 - 4.00	374.5	ML				97.6				
A-3												
	3	3.00 - 4.00	298.5	ML				97.2				OC=12.35
A-4												
	4	3.00 - 4.00	250.2	ML				98.1				
A-5												
	5	3.00 - 4.00	254.0	ML				98.9				OC=12.63

Notes: 1. ASTM D 2216, 2. ASTM D 2487, 3. ASTM D 4318, 4. ASTM D 1140, 5. See test reports for test method, 6. See test reports for test method

Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content (ASTM D 2974)

Project No.

Project Name: Fernandina Marina Dredge Material

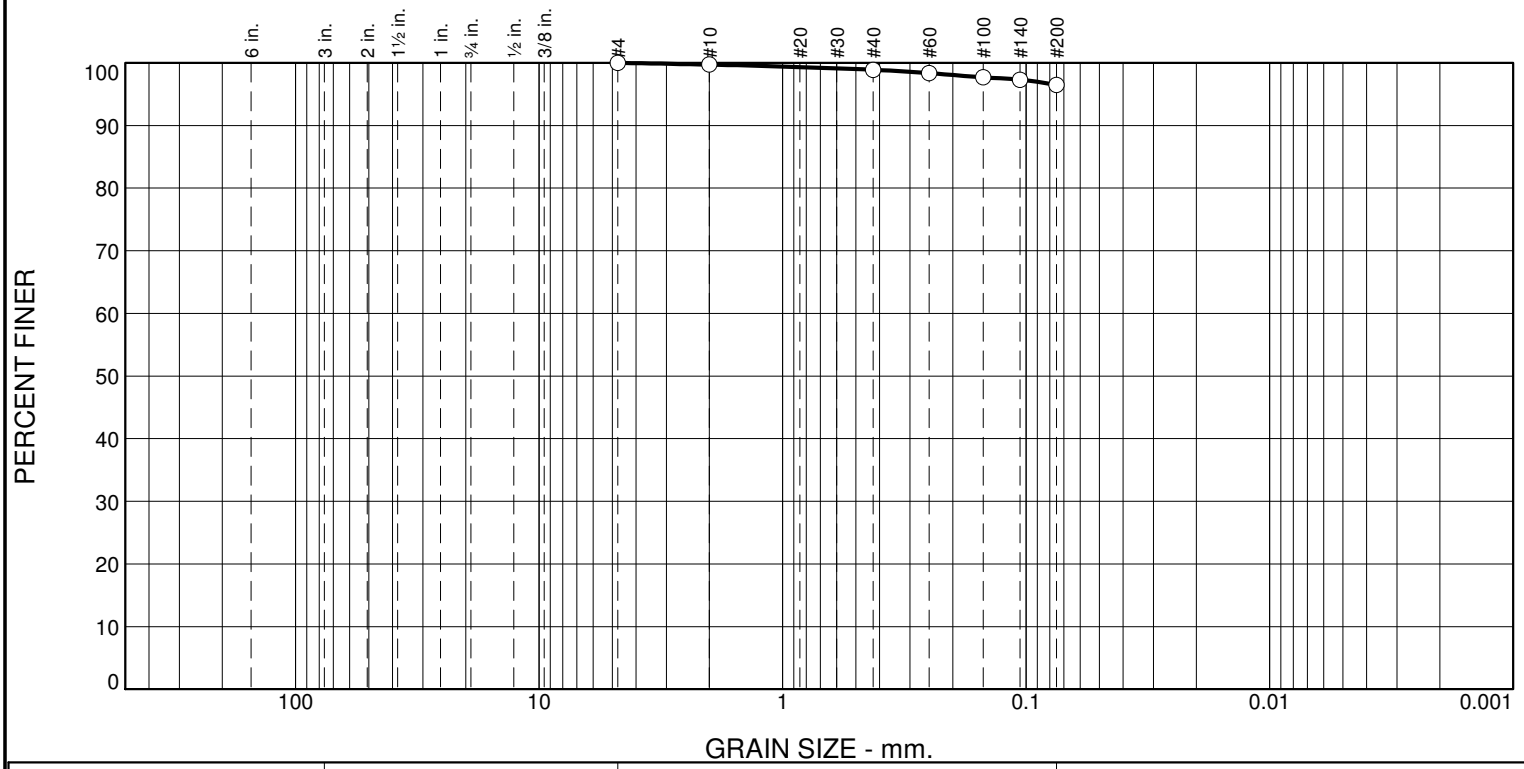
PM:

PE:

Printed On: Monday, October 22, 2018

ECS FLORIDA, LLC
7064 Davis Creek Road
Jacksonville, Florida 32256
Phone: (904) 880-0960
Fax: (904) 880-0970

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.3	0.8	2.4	96.5	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	99.7		
#40	98.9		
#60	98.4		
#100	97.7		
#140	97.3		
#200	96.5		

* (no specification provided)

Material Description

Dark Brown Silt, Many Organic Fines

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= ML AASHTO (M 145)=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: 10.17.2018 **Date Tested:** 10.22.2018

Tested By: HBN

Checked By: HBN

Title:

Source of Sample: A-1 **Date Sampled:** 10.22.2018

Sample Number: 1

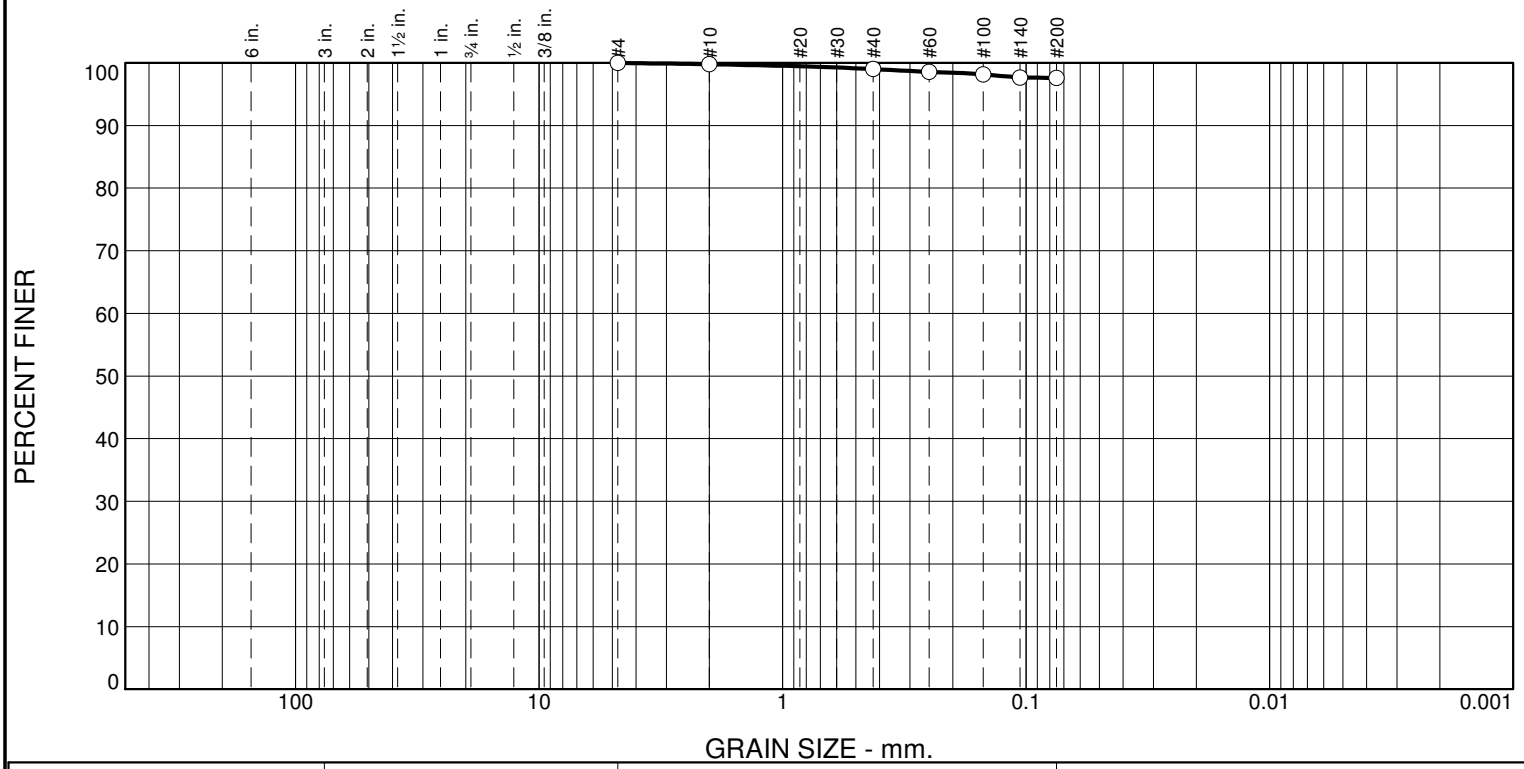
ECS FLORIDA, LLC
7064 Davis Creek Road
Jacksonville, Florida 32256
Phone: (904) 880-0960
Fax: (904) 880-0970

Client: Passero Associates

Project: Fernandina Marina Dredge Material

Project No: 35:27881 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.2	0.8	1.4	97.6	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	99.8		
#40	99.0		
#60	98.6		
#100	98.2		
#140	97.7		
#200	97.6		

* (no specification provided)

Material Description

Dark Gray Silt, Many Organic Fines

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= ML AASHTO (M 145)=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: 10.17.2018 **Date Tested:** 10.22.2018

Tested By: HBN

Checked By: HBN

Title:

Source of Sample: A-2 **Date Sampled:**

Sample Number: 2

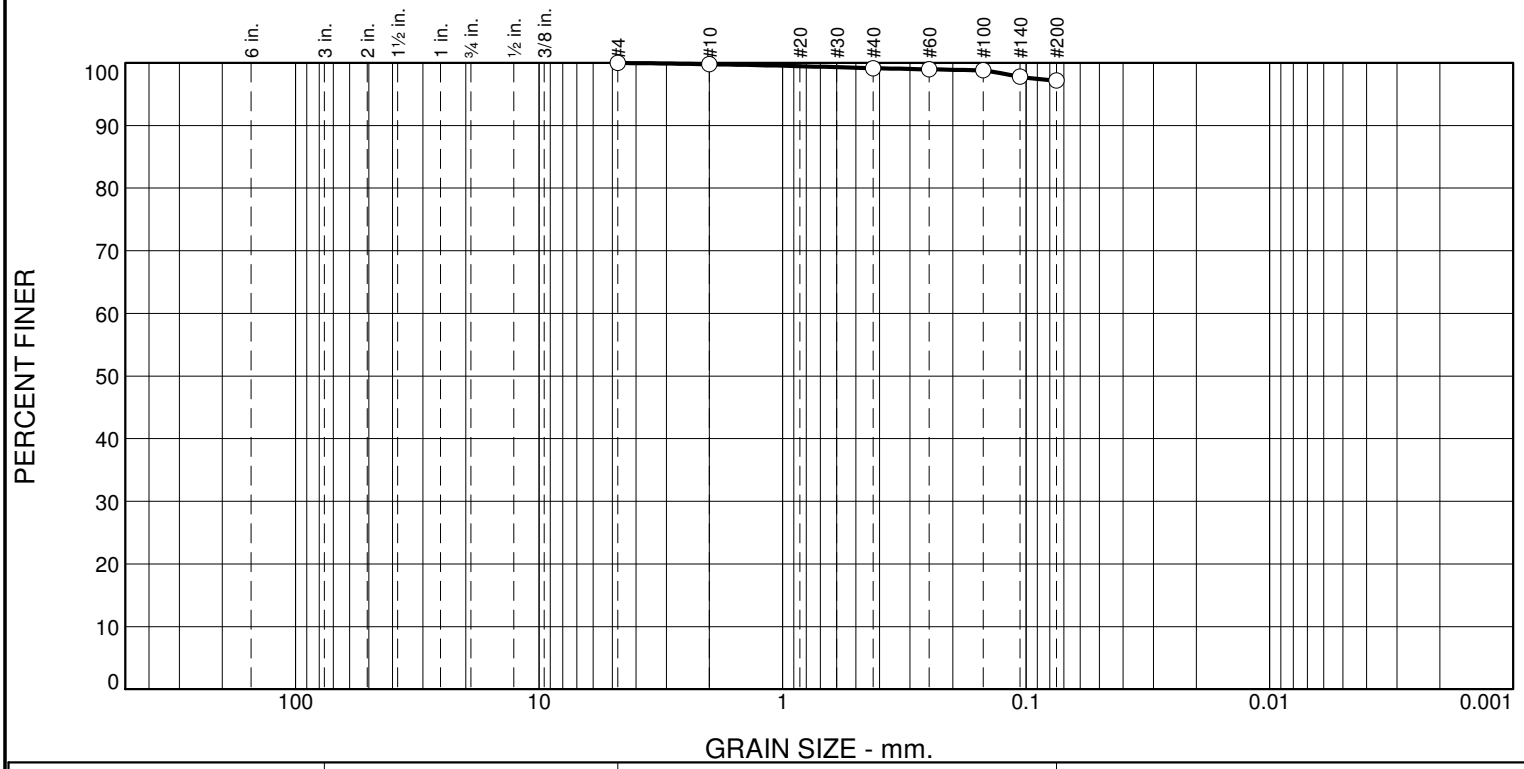
ECS FLORIDA, LLC
7064 Davis Creek Road
Jacksonville, Florida 32256
Phone: (904) 880-0960
Fax: (904) 880-0970

Client: Passero Associates

Project: Fernandina Marina Dredge Material

Project No: 35:27881 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.2	0.7	1.9	97.2	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	99.8		
#40	99.1		
#60	99.0		
#100	98.8		
#140	97.8		
#200	97.2		

* (no specification provided)

Material Description

Dark Gray Silt, Many Organic Fines

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= ML AASHTO (M 145)=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: 10.17.2018 **Date Tested:** 10.22.2018

Tested By: HBN

Checked By: HBN

Title:

Source of Sample: A-3 **Date Sampled:**

Sample Number: 3

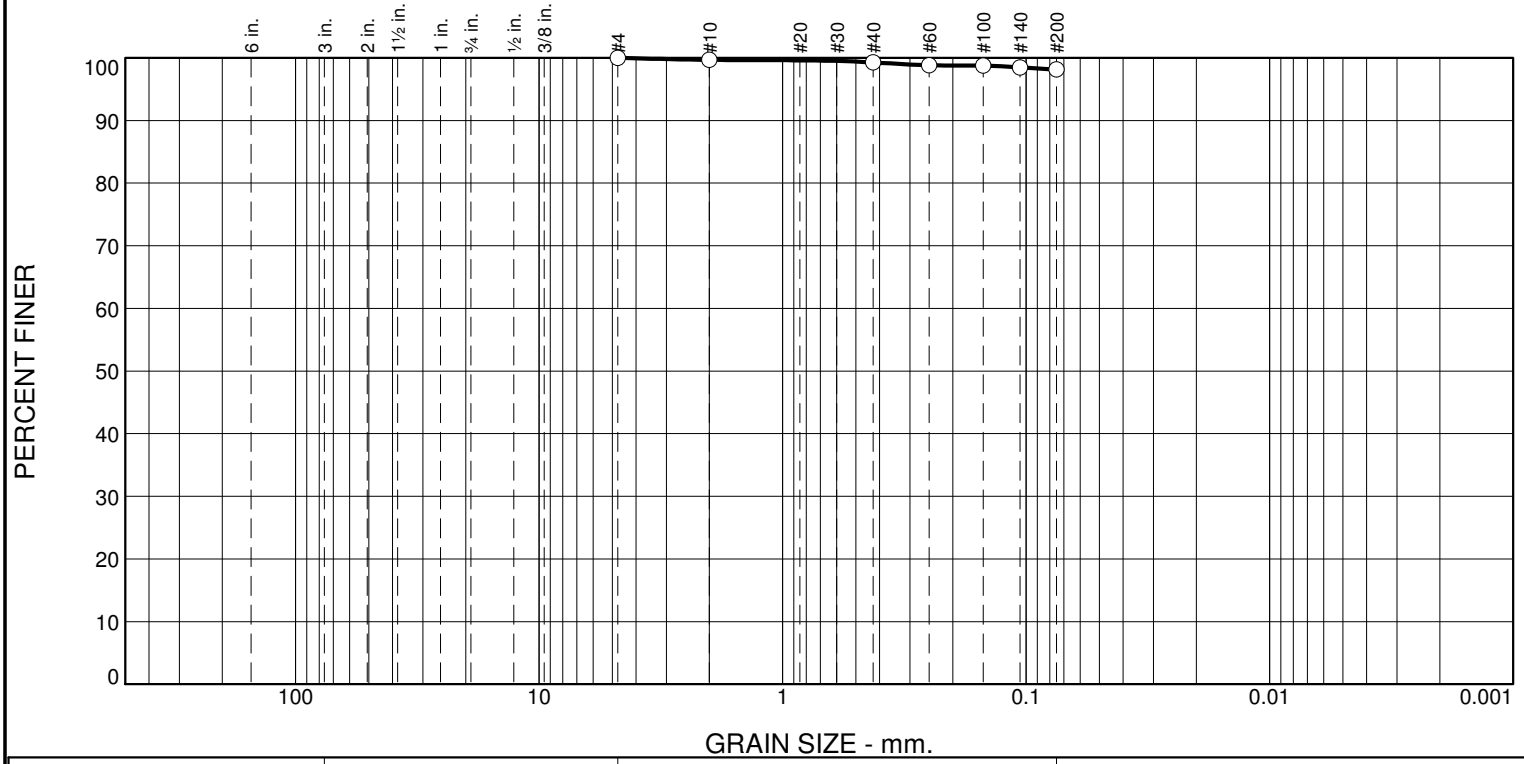
ECS FLORIDA, LLC
7064 Davis Creek Road
Jacksonville, Florida 32256
Phone: (904) 880-0960
Fax: (904) 880-0970

Client: Passero Associates

Project: Fernandina Marina Dredge Material

Project No: 35:27881 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.3	0.4	1.2	98.1	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	99.7		
#40	99.3		
#60	98.8		
#100	98.8		
#140	98.5		
#200	98.1		

* (no specification provided)

Material Description

Dark Gray Silt, Many Organic Fines

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= ML AASHTO (M 145)=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: 10.17.2018 **Date Tested:** 10.22.2018

Tested By: HBN

Checked By: HBN

Title:

Source of Sample: A-4
Sample Number: 4

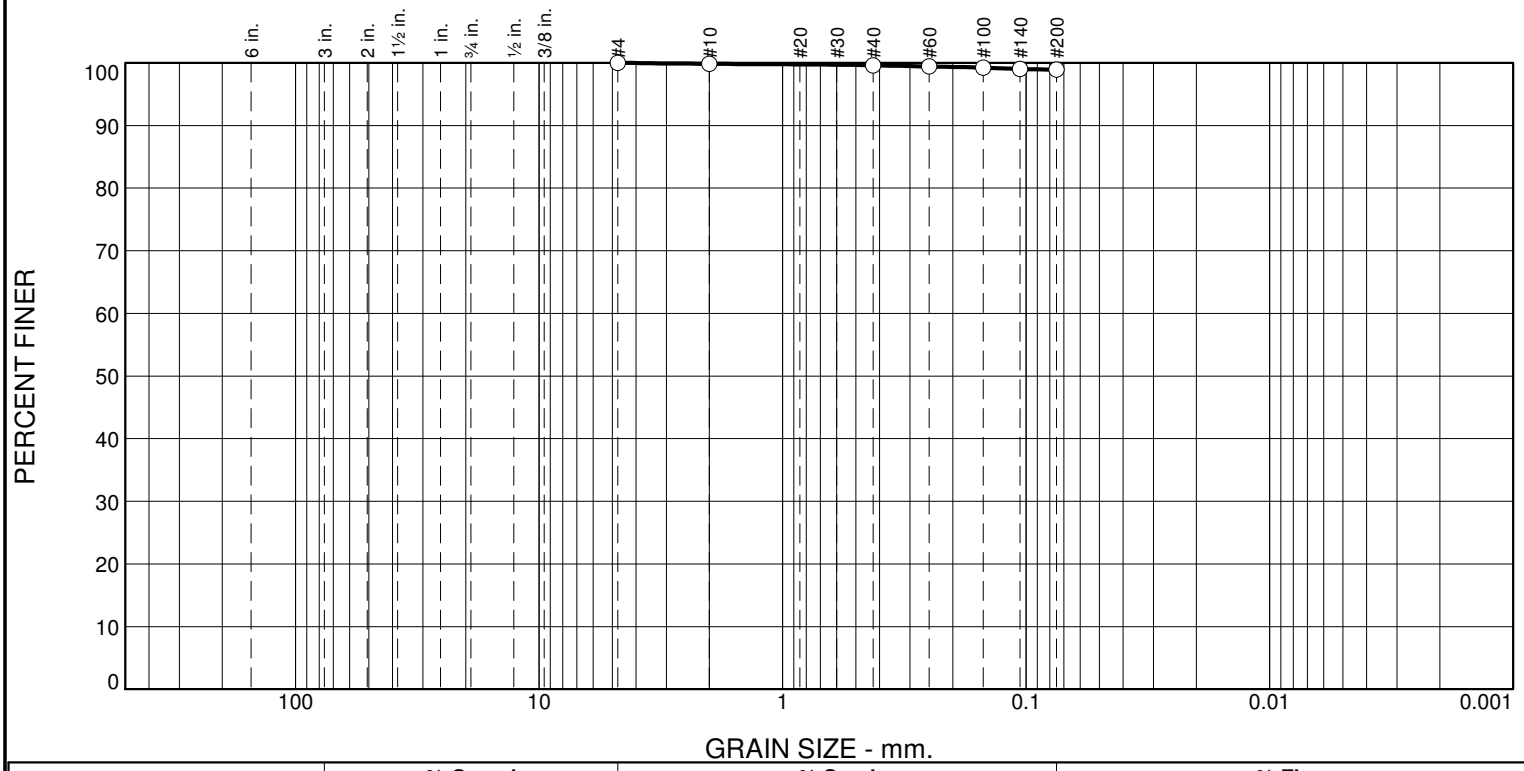
Date Sampled:

ECS FLORIDA, LLC
7064 Davis Creek Road
Jacksonville, Florida 32256
Phone: (904) 880-0960
Fax: (904) 880-0970

Client: Passero Associates
Project: Fernandina Marina Dredge Material

Project No: 35:27881 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.2	0.2	0.7	98.9	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#4	100.0		
#10	99.8		
#40	99.6		
#60	99.4		
#100	99.2		
#140	99.0		
#200	98.9		

* (no specification provided)

Material Description

Dark Gray Silt, Many Organic Fines

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= ML AASHTO (M 145)=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: _____ **Date Tested:** _____

Tested By: _____

Checked By: _____

Title: _____

Source of Sample: A-5
Sample Number: 5

Date Sampled:

ECS FLORIDA, LLC
7064 Davis Creek Road
Jacksonville, Florida 32256
Phone: (904) 880-0960
Fax: (904) 880-0970

Client: Passero Associates
Project: Fernandina Marina Dredge Material

Project No: 35:27881 **Figure**

ATTACHMENT D

AEROSTAR
ENVIRONMENTAL SERVICES, INC.

July 29, 2011

Mr. Richard Johnson
Airport Director
Fernandina Beach Airport
700 Airport Road
Fernandina Beach, Florida 32034

Re: Wildlife Hazard Survey
Fernandina Beach Airport
Fernandina Beach, Florida
AES Project Number 0811-344-19

Dear Mr. Johnson:

Federal Aviation Administration (FAA) Advisory Circular 5200-33B lists Dredge Spoil piles as a potential hazardous wildlife attractant. The FAA recommends dredge spoil containment areas (also known as Confined Disposal Facilities) not be located within the five-mile separation zone if the containment area or the spoils contain material that would attract hazardous wildlife (**AC 5200-33B Section 2-5**).

An Aerostar Environmental Services, Inc. (AEROSTAR) FAA-Qualified Wildlife Biologist conducted wildlife and land use surveys of the areas within airport operations area (AOA) and the five-mile separation zone around Fernandina Beach Airport (FHB). The wildlife surveys were used to establish a baseline wildlife population at FHB. The land use surveys were used to identify if the proposed dredge fill material project will increase the amount of wildlife known to be hazardous to aviation at and within the five-mile separation zone around FHB. The synergistic effects of the adjacent land uses and the proposed project were taken into consideration when determining if the proposed project would be conducive to increasing the presence of wildlife known to be hazardous to aviation at FHB.

The wildlife surveys were conducted on July 26 and 27, 2011 within the AOA and at land uses within the five-mile separation zone around FHB identified by the FAA Advisory Circular 5200-33B to attract wildlife known to be hazardous to aviation. Two existing dredge spoil piles near FHB, along with the dredge parent material to be disposed of at FHB, were surveyed as reference sites for wildlife attractiveness. Wildlife surveys were conducted in order to establish a pre-project baseline wildlife population at and around FHB.

The numbers of wildlife observed during these two days of surveying were minimal. The most common avian species observed, in order of abundance, was vultures, mourning doves, and hawks. The vultures were observed riding mid to high altitude in thermal winds. The hawks were observed foraging over the wooded areas around the AOA. The mourning doves were observed foraging for grit around the T-hangars. The current dredge spoil piles surveyed showed no sign of wildlife attractiveness, with no species observed utilizing them as food sources. The marina area from which the dredge material will be obtained from was surveyed at low tide while the parent material was exposed above the water line. Gulls were observed in the immediate area; however, they were not observed foraging on the exposed parent material.

11181 St. John's Industrial Parkway N. • Jacksonville, Florida 32246 • 904-565-2820 • Fax 904-565-2830

Based on the results of the wildlife surveys conducted at the two current dredge material spoil piles within five miles of the airport, areas within the marina where the dredge material will be excavated, and within the AOA at FHB, the proposed project should not attract large numbers of avian species known to be hazardous to aviation. Due to the low numbers of avian species observed at these locations and the minimum wildlife strikes noted (two since 1990) at FHB, it is unlikely that a dredge spoil material staging area as well as the casting of the dredge spoil material within the AOA would greatly increase the number of wildlife known to be hazardous to aviation. More frequent mowing may have to occur if the nutrients in the casting of the spoil material increases the rate of vegetation growth within the casting areas.

If for unforeseen reasons substantial numbers of wildlife known to be hazardous to aviation is observed within the staging area, the project manager on-site should notify airport management immediately so that wildlife hazard mitigation procedures can be implemented. The airport administration should then notify AEROSTAR immediately so wildlife hazard mitigation efforts can be administered.

Sincerely,

AEROSTAR ENVIRONMENTAL SERVICES, INC.

Zachary Lissard
FAA Qualified Biologist

Attachments

cc. Dawn Blackledge

FIGURES


AMELIA YACHT BASIN
SPOIL SITE
F.I.N.D DREDGE
SPOIL SITE
FHB
AERIAL PHOTOGRAPH
Provided by Fernandina Beach

APPENDIX A

PHOTOS

1) View of the existing dredge spoils material pile located near FHB (July 26, 2011).

2) View of the marina that will be dredged (July 26, 2011).

ATTACHMENT E

Federal Aviation Administration

National Part 139 CertAlert

AdvisoryCautionary**Non-Directive**Advisory**Cautionary**Non-Directive**Advisory**Cautionary**Non-Directive**

Date: **08/03/2016** **No. 16-03**

To: **Airport Operators and FAA Airport Certification Safety Inspectors (ACSIs)**

Subject: **Recommended Wildlife Exclusion Fencing**

Point of Contact: Amy Anderson, AAS-300, (202) 267-7205
Email: amy.anderson@faa.gov

1. Purpose.

This CertAlert contains airfield exclusion methods for deer and other large mammals.

2. Cancellation.

This CertAlert cancels Certalert 01-01, Deer Aircraft Hazard, dated February 1, 2001; CertAlert 02-09, Alternative Deer Fencing, dated December 12, 2002; and CertAlert 04-16, Deer Hazard to Aircraft and Deer Fencing, dated December 13, 2004.

3. Background.

Elevated deer and coyote populations in the United States represent an increasingly serious threat to both Commercial and General Aviation Aircraft. According to the National Wildlife Strike Database, deer and coyote are the most frequently struck terrestrial mammals (37 and 34 percent, respectively). Deer are responsible for 92 percent of the mammal strikes that resulted in damage. From 1990 to 2015, over 1,107 deer-aircraft collisions and 487 coyote-aircraft collisions were reported to the Federal Aviation Administration (FAA). Of these reports, 932 of the deer strikes (84%) and 43 of the coyote strikes (9%) indicated the aircraft was damaged as a result of the collision.

The FAA reminds airport operators that controlling deer and other medium to large terrestrial mammals on and around airfields is very important. Two recent incidents include a Cessna 195B sustaining significant damage on landing as a result of veering off the runway to avoid striking white-tailed deer in Virginia and a Cessna 310 that was destroyed on approach to an airport in Michigan when it collided with a white-tailed deer.

4. Recommendations.

Proper fencing is the best way of keeping deer and coyotes off aircraft movement areas. In some cases, deer have been observed jumping over 8-foot fencing and coyotes have been observed scaling 6-foot fencing. Deer and coyotes can fit through very small gaps between

gates and under fencing. Deer have been observed squeezing through a 7.5-inch gap at the bottom of a fence. Coyotes can fit through 6 inch x 4 inch gaps under a fence and they will also dig under the fence to access the airfield.

The FAA recommends a 10-foot fence[1] with 3-strand barbed wire outriggers. In some cases, an airport may be able to use an 8-foot fence with 3-strand barbed-wire outriggers, depending on the amount of deer activity in a local area.

A 4- to 5-foot skirt of fencing material, attached to the bottom of the fence and buried at a 45-degree angle on the outside of the fence, is ideal to prevent animals from digging under the fence and reduce the chance of washouts. If the fence skirting cannot be installed at a 45-degree angle, then it is acceptable to install it horizontally underground several inches beneath the surface. This type of fencing also greatly increases airport security and safety. A concrete base[2] along the bottom of the fence is also an option to prevent burrowing or digging under the fence. Airport Operators should keep the fence line right-of-way free of excess vegetation. The fence line should be inspected daily, and a fence inspection schedule should be included in an airport's Wildlife Hazard Management Plan (WHMP). If the proposed inspection schedule is less than daily, it should be approved by an ACSI for Part 139 certificated airports. Washouts, breaks, or other holes in the fence need to be repaired as soon as they are discovered.

Gates should close with less than 6-inch gaps to prevent entry by deer or coyotes. If the gates have gaps along the bottom, installation of concrete "speed bumps" under the gate can be a solution. If the gaps are between the gates or the poles, a heavy brush material or interlocking metal bars can also be installed to preclude entry by deer or coyote. In some cases, a single strand of barbed wire strung between the bottom of the fence and the ground where there are gaps will minimize the potential for wildlife access.

Chain link fencing is a type of wire-mesh fencing. Other types of wire-mesh fencing that are suitable for exclusion of wildlife at airports include woven-wire and v-mesh fencing. Also, high tensile welded-wire fencing has been used successfully at different airports to exclude deer and coyotes. However, these types of fencing must be researched thoroughly when choosing an adequate fencing material for an airport due to the variability in durability, life span, and the spacing of mesh and welded wire.

In some cases, electric fencing or matting may offer a suitable alternative. Recent improvements in fencing components and design have greatly increased the effectiveness and ease of installation of electric fences. Tests by the U.S. Department of Agriculture (USDA), National Wildlife Research Center, have shown that some 4- to 6-foot, 5- to 9-strand electric fences designs can be 99% effective at stopping deer. Installation of some of the newer electric fences requires neither specialized equipment nor training; however, they may require more maintenance than other types of fence and must be consistently electrified. Airport sponsors must contact their local Airport District Office (ADO) to

[1] AC No: 150/5370-10G, *Standards for Specifying Construction of Airports* (Part 8 – Fencing), provides details on different fencing and post materials (e.g., chain link, welded and woven wire mesh, galvanized or pvc coating, etc.).

[2] Additional information regarding underground skirting, fence base materials, vegetation clearance recommendations, and installation procedures can be found in AC 150/5370-10G.

discuss eligibility for AIP funding or requirements for a Modification to Standards (MOS).

In limited situations, the use of non-conductive, composite, frangible electric fence posts and fence conductors may allow the installation of electric fence closer to the aircraft movement area than would normally be allowed with standard link fencing material. Please note that electric fencing may produce radio frequency interference that could be disruptive to NAVAIDS and airport communications and should be considered when determining types of fencing.

The key for excluding deer and coyotes is the proper installation and maintenance of a fence that is:

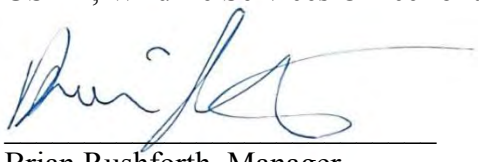
- Of sufficient height to deter jumping and scaling
- Constructed of a material that is difficult to penetrate
- Constructed fully around the airfield without gaps below the fence or at the gates or that mitigates the gaps with other exclusionary materials
- Constructed to deter digging or burrowing under the fence

The most suitable fence for an airport depends on many factors, including the observed wildlife hazards, the potential impacts of certain types of fencing, seasonality of hazards, costs (both for construction and maintenance), and adjacent habitat types. Airport sponsors must contact their local ADO to discuss what types of fencing are eligible for AIP funding.

For proposed fencing that will intersect wetlands or surface waters (streams, rivers, etc.), the airport sponsor should determine what state and federal permits will be required prior to installation. Fencing that is located in wetlands or over surface waters typically requires additional maintenance and/or cleaning due to debris getting caught and potentially damaging the fence. If a culvert is located along the perimeter fence, grates or some other barrier should be placed over the culvert to ensure wildlife cannot access the airfield through the culvert. The barrier should allow for water movement and should be inspected and cleared of debris regularly to ensure water is flowing efficiently.

Airport sponsors should include new and/or improved wildlife fencing in their WHMP as a prioritized action item. If deer are observed on or near the aircraft movement area, immediate action must be taken to remove them.

Airport operators can contact the State Wildlife Management Agency or the nearest USDA, Wildlife Services Office for assistance with deer problems.



Brian Rushforth, Manager
Airport Safety and Operations Division, AAS-300

ATTACHMENT F

U.S. Department
of Transportation
Federal Aviation
Administration

Advisory Circular

Subject: Reporting Wildlife Aircraft Strikes | **Date:** 5/31/2013 | **AC No:** 150/5200-32B
Initiated by: AAS-300 | **Change:**

1. Purpose.

This Advisory Circular (AC) explains the importance of reporting collisions between aircraft and wildlife, more commonly referred to as wildlife strikes. It also explains recent improvements in the Federal Aviation Administration's (FAA's) Bird/Other Wildlife Strike Reporting system, how to report a wildlife strike, what happens to the wildlife strike report data, how to access the FAA National Wildlife Strike Database (NWSD), and the FAA's Feather Identification program.

2. Applicability.

The FAA provides the standards and practices in this AC as guidance for all public-use airports, aviation industry personnel (e.g., Air Traffic Control, pilots and airline personnel, and engine manufacturers), and others who possess strike information. The FAA strongly recommends that the above aviation representatives and others possessing strike information participate in reporting.

3. Cancellation.

This AC cancels AC 150/5200-32A, Reporting Wildlife Aircraft Strikes, dated December 22, 2004.

4. Background.

The FAA has long recognized the threat to aviation safety posed by wildlife strikes. Each year in the United States, wildlife strikes to U.S. civil aircraft cause about $718 million in damage to aircraft and about 567,000 hours of civil aircraft down time. For the period 1990 to 2011, over 115,000 wildlife strikes were reported to the FAA. About 97 percent of all wildlife strikes reported to the FAA involved birds, about 2 percent involved terrestrial mammals, and less than 1 percent involved flying mammals (bats) and reptiles. Waterfowl (ducks and geese), gulls, and raptors (mainly hawks and vultures) are the bird species that cause the most damage to civil aircraft in the United States, while European starlings are responsible for the greatest loss of human life. Vultures and waterfowl cause the most losses to U.S. military aircraft.

Studies have shown that strike reporting has steadily increased over the past two decades; however, strike reporting is not consistent across all stakeholders (pilots, air carriers, airport operators, air traffic control personnel, etc.) in the National Airspace System. Although larger 14 CFR Part 139 airports and those with well-established wildlife programs have improved strike reporting, there is a wide disparity in overall reporting rates between Part 139 airports and general aviation (GA) airports in the National Plan of Integrated Airport Systems (NPIAS). Less than 6 percent of total strike reports come from NPIAS GA airports, whose reporting rates average less than 1/20th the rates at Part 139 airports. Most Part 139 airports (97 percent) have

reported at least one strike into the database through 2011, while only 43 percent of NPIAS GA airports have documented a strike into the database.

While overall reporting rates are much higher for strikes at Part 139 airports than at NPIAS GA airports, there is also a major disparity in reporting rates among Part 139 airports. Larger Part 139 airports, especially those with well-established wildlife hazard management programs, have reporting rates about four times higher on average compared to other Part 139 airports. The pattern of disparity in strike reporting among Part 139 airports is also found in reporting rates for commercial air carriers. However, the FAA believes the current voluntary reporting rate is adequate to track national trends in wildlife strikes, to determine the hazard level of wildlife species that are being struck, and to provide a scientific foundation for FAA policies and guidance about the mitigation of risk from wildlife strikes.

Ultimately, improvements can be made in the quantity and quality of strike reporting. In addition to the above-mentioned gaps in reporting to the NWSD, there is an overall bias toward the reporting of damaging strikes compared to non-damaging strikes, especially for NPIAS GA airports and certain Part 139 airports. The quality of data within a strike report can also be improved by providing as much information as possible, including species struck and cost of strike.

The FAA has initiated several programs to address this important safety issue, including the collection, analysis, and dissemination of wildlife strike data. The effectiveness of a Wildlife Hazard Management Plan (WHMP) to reduce wildlife hazards both on and near an airport and the reevaluation of all facets of damaging/non-damaging strikes from year to year requires accurate and consistent reporting. Therefore, every WHMP should include a commitment to document and report to the NWSD all wildlife strikes that occur within the separation distances described in sections 1-2 and 1-3 of Advisory Circular 150/5200-33, Hazardous Attractants On or Near Airports (current version), to better identify, understand, and reduce threats to safe aviation.

5. Types of Animals to Report if Involved in a Strike with Aircraft.

a. All birds.

b. All bats.

c. All terrestrial mammals larger than 1 kg (2.2 lbs) (e.g., report rabbits, muskrats, armadillos, foxes, coyotes, domestic dogs, deer, feral livestock, etc., but not rats, mice, voles, chipmunks, shrews, etc.). If in doubt, report the incident with a note in the comment section, and the Database Manager will determine whether to include the report into the NWSD based on body mass.

d. Reptiles larger than 1 kg (2.2 lbs).

6. When to Report a Wildlife Aircraft Strike.

A wildlife strike has occurred when:

a. A strike between wildlife and aircraft has been witnessed.

b. Evidence or damage from a strike has been identified on an aircraft.

c. Bird or other wildlife remains, whether in whole or in part, are found:

(1) Within 250 feet of a runway centerline or within 1,000 feet of a runway end unless another reason for the animal's death is identified or suspected.

(2) On a taxiway or anywhere else on or off the airport that you have reason to believe was the result of a strike with an aircraft. Examples might be:

(i) A bird found in pieces from a prop strike on a taxiway.

(ii) A carcass retrieved within 1 mile of an airport on the final approach or departure path after someone reported the bird falling out of the sky and a report of a probable wildlife strike.

d. The presence of birds or other wildlife on or off the airport had a significant negative effect on a flight (i.e., aborted takeoff, aborted landing, high-speed emergency stop, or the aircraft left pavement area to avoid collision with wildlife).

7. How to Report a Bird/Wildlife Strike.

The FAA strongly encourages pilots, airport operations, aircraft maintenance personnel, Air Traffic Control personnel, engine manufacturers, or anyone else who has knowledge of a strike to report it to the NWSD. The FAA makes available an online reporting system at the Airport Wildlife Hazard Mitigation web site (http://www.faa.gov/go/wildlife) or via mobile devices at http://www.faa.gov/mobile. Anyone reporting a strike can also print the FAA's Bird/Other Wildlife Strike Report Form (Form 5200-7) at the end of this AC or download it from the web site to report strikes. Paper copies of Form 5200-7 may also be obtained from the appropriate Airports District Offices (ADO), Flight Standards District Offices (FSDO), and Flight Service Stations (FSS) or from the Airman's Information Manual (AIM). Paper forms are pre-addressed to the FAA. No postage is needed if the form is mailed in the United States. It is important to include as much information as possible on the strike report.

Note: These forms are to be used to report strikes that do not have bird remains associated with them (instructions with addresses for sending remains to the Smithsonian Institute Feather Identification Lab are discussed in Paragraph 11, Instructions for Collecting and Submitting Bird/Wildlife Remains for Identification, of this AC). Please do not send bird remains to the FAA.

8. FAA National Wildlife Strike Database Management and Data Analysis.

The FAA NWSD Manager edits all strike reports to ensure consistent, error-free data before entering a single, consolidated report into the database. This information is supplemented with non-duplicated strike reports from other sources. About every six weeks, the FAA posts an updated version of the database on the web site. Annually, the FAA sends a current version of the database to the International Civil Aviation Organization (ICAO) for incorporation into ICAO's Bird Strike Information System (IBIS) Database. Also, the FAA prepares and makes available a report summarizing wildlife strike results from 1990 through the most current year online at http://www.faa.gov/airports/airport_safety/wildlife/.

Analyses of data from the FAA NWSD have proved invaluable in determining the nature and severity of the aviation wildlife strike hazard. The database provides a scientific basis for identifying risk factors, justifying and implementing corrective actions at airports, and judging the effectiveness of those corrective actions. Table 1 below depicts the ranking of 50 bird and mammal species or groups by their relative hazard to aircraft in airport environments. The data for the analysis are from the NWSD. The database is invaluable to engine manufacturers, aeronautical engineers, and wildlife biologists as they develop new technologies for the aviation industry. Each wildlife strike report contributes to the accuracy and effectiveness of the database. Moreover, each report contributes to the common goal of increasing aviation safety and reducing the cost of wildlife strikes.

9. Access to the FAA National Wildlife Strike Database.

On April 24, 2009, the FAA made the NWSD available to the public. The FAA began systematically analyzing wildlife strike data in the 1990s for use by the FAA's Office of Airports, academia, and researchers as a means of improving airport safety and reducing wildlife hazards. The NWSD web site (http://www.faa.gov/go/wildlife) was retooled to make it more user-friendly and to allow more advanced data mining. The site has search fields that enable users to find data on specific airports, airlines, aircraft, and engine types, as well as damage incurred, date of strike, species struck, and state without having to download the entire database.

10. Bird/ Wildlife Identification.

Accurate species identification is critical for wildlife-aircraft strike reduction programs. The identification of the exact species of bird struck (e.g., ring-billed gull, Canada goose, mallard, mourning dove, or red-tailed hawk as opposed to gull, goose, duck, dove, or hawk) is particularly important. This species information is critical for airports and biologists developing and implementing wildlife hazard management programs at airports because a problem that cannot be measured or defined cannot be solved. Wildlife biologists must know what species of wildlife they are dealing with in order to identify local attractants and to make proper management decisions within the framework of the Migratory Bird Treaty Act and state and local regulations. The FAA, the U.S. Air Force, the U.S. Navy, and the U.S. Department of Agriculture – Wildlife Services work closely with the Feather Identification Lab at the Smithsonian Institution, Museum of Natural History, to improve the understanding and prevention of bird-aircraft strike hazards. Bird strike remains that cannot be identified by airport personnel or by a local biologist can be sent (with FAA Form 5200-7) to the Smithsonian Museum for identification. Remains may also be submitted to the Smithsonian for verification of the field identification and for long-term storage of the evidence.

Bird strike identification using feathers, DNA, or other body parts or materials from birds involved in bird-aircraft strikes will be provided free-of-charge to all U.S. airport operators, all U.S. aircraft owners/operators (regardless of where the strike happened), and to any foreign air carrier if the strike occurred at a U.S. airport.

11. Instructions for Collecting and Submitting Bird/Wildlife Remains for Identification.

Please observe the following guidelines for collecting and submitting feathers or other bird/wildlife remains for species identification. These guidelines help maintain species identification accuracy, reduce turn-around time, and ensure a comprehensive FAA National Wildlife Aircraft Strike Database. Many airports have found it beneficial to construct strike reporting kits for use by airport personnel and aircraft operators. Having pre-made kits available improves strike reporting and encourages the sampling of strike remains. A kit suitable for collecting remains from most strikes would include the following materials stored in a 1-quart, re-sealable plastic bag: (1) collection instructions, (2) a pre-packaged alcohol hand-wipe for softening/removing tissue/blood ("snarge"[1]) off of the aircraft, (3) a Whatman FTA® collection card for preserving blood/tissue for DNA identification, and (4) a pair of disposable gloves.

[1] Snarge is the term used for the residue and feathers left on an aircraft after an animal (typically a bird) collides with it.

a. Collect and submit remains from known/suspected bird strikes or strike remains that involved an unknown animal from each impact location as soon as possible and send to the Feather Lab (Smithsonian). If remains are known to be other than those of birds, please contact the Smithsonian before mailing them at (202) 633-0801. Collect remains using the criteria listed in item c below. If you cannot send the remains as soon as possible, refrigerate or freeze them in a sealed plastic bag until you can mail them.

b. Provide complete information about the incident.

(1) Fill out FAA Form 5200-7 – Bird/ Other Wildlife Strike Report.

(i) Print a copy of Form 5200-7 at the end of this AC or download a copy at http://www.faa.gov/go/wildlife.

(ii) File a report online and print a copy to send with the remains.

(2) Mail the report with feather material (see address below).

(3) Provide your contact information if you wish to be informed of the species identification.

c. Collect as much material as possible in a clean plastic/ Ziplock® bag. (Please, do not send whole birds.)

(1) Pluck/pick a variety of many feathers representing color or patterns from the wings, tail, and body.

(2) **Do not** cut off feathers. This removes the downy region needed to aid in identification.

(3) Include any feathers with distinct colors or patterns.

(4) Include any downy “fluff”.

(5) Include beaks, feet, and talons if possible.

(6) Where only a small amount of snarge material is available, such as scrapings from an engine or smears on wings or windshields, send all of it.

(i) **Dry material** – Scrape or wipe off into a clean re-sealable bag **or** wipe the area with pre-packaged alcohol wipe **or** spray with alcohol to loosen material then wipe with clean cloth/gauze. Include the alcohol wipe or piece of cloth in the bag. (Do not use water, bleach, or other cleansers – they destroy or degrade DNA.)

(ii) **Fresh material** – Wipe the area with alcohol wipe and/or clean cloth/gauze **or** apply fresh tissue/blood to an optional Whatman FTA® DNA collecting card.

(1) **Do not** use any sticky substance such as tape or post-it notes to attach feathers.

(2) Collect remains from each impact location and place them in separate, labeled bags. Indicate the location on aircraft from which each sample came (i.e., windshield, radome, etc.) on the bag.

Please send whole feathers (tip and base) whenever possible as diagnostic characteristics are often found in the downy barbules at the feather base. Wings, as well as breast and tail feathers, should be sent whenever possible. Beaks, feet, bones, and talons are also useful diagnostic materials. Even blood smears can provide material for DNA analysis. Do not send entire bird carcasses through the mail. However, photographs of the carcasses can be very useful supplemental documentation.

If you send fresh blood/ tissue samples frequently for DNA identification, you may want to consider getting Whatman FTA® DNA cards. The material is sampled with a sterile applicator and placed onto the surface of the card that "fixes" the DNA in the sample. For more information about ordering these items, contact the Feather Lab. Otherwise, if you only occasionally send blood/ tissue samples, consider using a paper towel soaked with alcohol or an alcohol wipe to collect this type of material. Ethanol is the preferred type of alcohol.

Additional information on sending bird remains to the Smithsonian is available at http://www.faa.gov/go/wildlife.

d. Mail the Bird/Other Wildlife Strike Report and collected material to the Smithsonian's Feather Identification Lab. The lab will forward the report to the National Wildlife Strike Database Manager.

For Material Sent via Express Mail Service:	**For Material Sent via US Postal Service:**
Feather Identification Lab Smithsonian Institution NHB, E600, MRC 116 10th & Constitution Ave NW Washington DC 20560-0116 (This can be identified as "safety investigation material".)	Feather Identification Lab Smithsonian Institution PO Box 37012 NHB, E600, MRC 116 Washington DC 20013-7012 (Not recommended for priority cases.)

The species identification turn-around time is usually 24 hours from receipt if sufficient material is submitted and unless the sample is submitted for DNA analysis. DNA results usually take 6 to 10 days. Once processed, the lab sends the reports and species identification information to the Database Manager for entry into the FAA National Wildlife Strike Database. Persons wishing to be notified of the species identification must include contact information (e-mail, phone, etc.) on the report.

For more information contact the FAA National Wildlife Biologist at (202) 267-8731 or the Smithsonian's Feather Identification Lab at (202) 633-0801.

Michael J. O'Donnell
Director, Office of Airport Safety and Standard

FORM APPROVED OMB No. 2120-0045
Exp. 7/31/2013

BIRD / OTHER WILDLIFE STRIKE REPORT

U S. Department of Transportation
Federal Aviation Administration

Paperwork Reduction Act Statement: The information collected on this form is necessary to allow the Federal Aviation Administration to assess the magnitude and severity of the wildlife-aircraft strike problem in the U.S. The information is used in determining the best management practices for reducing the hazard to aviation safety caused by wildlife-aircraft strikes. A federal agency may not conduct or sponsor, and a person is not required to respond to, nor shall a person be subject to a penalty for failure to comply with a collection of information subject to the requirements of the Paperwork Reduction Act unless that collection of information displays a currently valid OMB Control Number. The OMB Control Number for this information collection is 2120-0045. Public reporting for this collection of information is estimated to be approximately 6 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, completing and reviewing the collection of information. The information collected is voluntary. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to the FAA at: 800 Independence Ave. SW, Washington, DC 20591, Attn: Information Collection Clearance Officer, AES-200.

1. Name of Operator

2. Aircraft Make/Model

3. Engine Make/Model

4. Aircraft Registration

5. Date of Incident
/ /
Month Day Year

6. Local Time of Incident
☐ Dawn ☐ Dusk __HR __MIN
☐ Day ☐ Night ☐ AM ☐ PM

6A. Flight Number

6B. Wildlife/Bird Remains:
☐ Collected ☐ Sent to Smithsonian

7. Airport Name/ID

8. Runway Used

9. Location if En Route (Nearest Town/Reference & State/Airport)

10. Height (AGL)

11. Speed (IAS)

12. Phase of Flight
- ☐ A. Parked
- ☐ B. Taxi
- ☐ C. Take-off Run
- ☐ D. Climb
- ☐ E. En Route
- ☐ F. Descent
- ☐ G. Approach
- ☐ H. Landing Roll

13. Part(s) of Aircraft Struck or Damaged

	Struck	Damaged		Struck	Damaged
A. Radome	☐	☐	H. Propeller	☐	☐
B. Windshield	☐	☐	I. Wing/Rotor	☐	☐
C. Nose	☐	☐	J. Fuselage	☐	☐
D. Engine No. 1	☐	☐	K. Landing Gear	☐	☐
E. Engine No. 2	☐	☐	L. Tail	☐	☐
F. Engine No. 3	☐	☐	M. Lights	☐	☐
G. Engine No. 4	☐	☐	N. Other: (Specify)	☐	☐

Bird(s) Ingested? ☐ Yes

Specify if "N. Other" is checked:

14. Effect on Flight
- ☐ None
- ☐ Aborted Take-Off
- ☐ Precautionary Landing
- ☐ Engines Shut Down
- ☐ Other: (Specify)

15. Sky Condition
- ☐ No Cloud
- ☐ Some Cloud
- ☐ Overcast

16. Precipitation
- ☐ Fog
- ☐ Rain
- ☐ Snow
- ☐ None

17. Bird/Other Wildlife Species

18. Number of birds seen and/or struck

Number of Birds	Seen	Struck
1	☐	☐
2-10	☐	☐
11-100	☐	☐
more than 100	☐	☐

19. Size of Bird(s)
- ☐ Small
- ☐ Medium
- ☐ Large

20. Pilot Warned of Birds ☐ Yes ☐ No

21. Remarks *(Describe damage, injuries and other pertinent information)*

DAMAGE / COST INFORMATION

22. Aircraft time out of service
_____ hours

23. Estimated cost of repairs or replacement (US $)
$

24. Estimated other Cost *(U.S. $) (e.g. loss of revenue, fuel, hotels)*
$

Reported by *(Optional)*

Title

Date

Email

Phone

FAA Form 5200-7 (5/13) SUPERSEDES PREVIOUS EDITION

U.S. Department of Transportation

Federal Aviation Administration

800 Independence Ave SW
Washington DC 20591

Official Business
Penalty for Private Use, $300

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 12438 WASHINGTON D.C.

POSTAGE WILL BE PAID BY FEDERAL AVIATION ADMINISTRATION

Federal Aviation Administration
Office of Airport Safety and Standards, AAS-300
Attn: Wildlife Strike Report
800 Independence Avenue SW
WASHINGTON DC 20591

FOLD AND TAPE HERE

Directions for FAA Form 5200-7
Bird/Other Wildlife Strike Report

1. Name of Operator - This can be an airline (abbreviations okay - UAL, AAL, etc.), business (Coca Cola), government agency (Police Dept., FAA), or if a private pilot, his/her name.
2. Aircraft Make/Model - Abbreviations are okay, but include the model (e.g., B737-200).
3. Engine Make/Model - Abbreviations are allowed (e.g., PW 4060, GECT7, LYC 580).
4. Aircraft Registration - This means the N# (for USA registered aircraft).
5. Date of Incident - Give the local date, not the ZULU or GMT date.
6. Local Time of Incident - Check the appropriate light conditions and fill in the hour and minute local time and check AM or PM or use the 24-hour clock and skip AM/PM.

6A. Flight Number - Self-explanatory.

6B. Wildlife/Bird Remains - If remains were found at the airport or on the aircraft, check “Collected”. If the remains were also sent to the Smithsonian for identification, also check “Sent to Smithsonian”.

7. Airport Name - Use the airport name or 3 letter code if a US airport. If a foreign airport, use the full name or 3 letter code and location (city/country).
8. Runway used - Self-explanatory.
9. Location if En Route - Put the name of the nearest city and state.
10. Height AGL - Put the feet above ground level at the time of the strike (if you don't know, use MSL and indicate this). For take-off run and landing roll, it must be 0.
11. Speed (IAS) - Speed at which the aircraft was traveling when the strike occurred.
12. Phase of Flight - Phase of flight during which the strike occurred. Take-off run and landing roll should both be 0 AGL.
13. Part(s) of Aircraft Struck or Damaged - Check which parts were struck and damaged. If a part was damaged but not struck, indicate this with a check on the damaged column only and indicate in comments (#21) why this happened (e.g., the landing gear might be damaged by deer strike, causing the aircraft to flip over and damage parts not struck by deer).
14. Effect on Flight - You can check more than one. If you check “Other”, please explain in Comments (#21).
15. Sky condition - Check the one that applies.
16. Precipitation - You may check more than one.
17. Bird/Other Wildlife Species - Try to be accurate. If you don't know, put unknown and some description. Collect feathers or remains for identification for damaging strikes.
18. Number of birds seen and/or struck - check the box in the Seen column with the correct number if you saw the birds/other wildlife before the strike and check the box in the Struck column to show how many were hit. The exact number can be written next to the box.
19. Size of Bird(s) - Check what you think is the correct size (e.g. sparrow = small, gull = medium, and geese = large).
20. Pilot Warned of Birds - Check the correct box (even if it was an ATIS warning or NOTAM).
21. Remarks - Be as specific as you can. Include information about the extent of the damage, injuries, anything you think would be helpful to know (e.g., number of birds ingested).
22. Aircraft time out of service - Record how many hours the aircraft was out of service.
23. Estimated cost of repairs or replacement - This may not be known immediately, but the data can be sent at a later date or put down a contact name and number for this data.
24. Estimated other cost - Include loss of revenue, fuel, hotels, etc. (see directions for #23).
25. Reported by - Although this is optional, it is helpful if questions arise about the information on the form (a phone number could also be included).
26. Title - This can be Pilot, Tower, Airport Operations, Airline Operations, Flight Safety, etc.
27. Date - Date the form was filled out.

Table 1. Composite ranking (1 = most hazardous, 50 = least hazardous) and relative hazard score of 50 wildlife species with at least 100 reported strikes with civil aircraft based on three criteria (damage, major damage, and effect-on-flight). Data were derived from the FAA National Wildlife Strike Database.

Wildlife species	% of strikes with:			Mean hazard level[4]	Composite ranking	Relative hazard score[5]
	Damage[1]	Major damage[2]	Effect on flight[3]			
White-tailed deer	84	36	46	55	1	100
Snow goose	77	41	39	53	2	95
Turkey vulture	51	19	35	35	3	63
Canada goose	50	17	28	31	4	57
Sandhill crane	41	13	27	27	5	48
Bald eagle	41	12	28	27	6	48
D.-crested cormorant	34	15	24	24	7	44
Mallard	23	9	13	15	8	27
Osprey	22	7	15	15	9	26
Great blue heron	21	6	16	15	10	26
American coot	24	7	11	14	11	25
Coyote	9	2	21	11	12	19
Red-tailed hawk	15	5	11	10	13	19
Cattle egret	10	3	15	9	14	17
Great horned owl	15	3	6	8	15	14
Herring gull	10	5	9	8	16	14
Rock pigeon	10	4	10	8	17	14
Ring-billed gull	8	3	8	6	18	11
American crow	8	3	8	6	18	11
Peregrine falcon	8	2	5	5	20	9
Laughing gull	5	2	7	5	21	8
American robin	7	1	4	4	22	7
Snow bunting	1	1	9	4	23	7
Red fox	3	0	8	4	23	7
European starling	4	1	5	3	25	6
Amer. golden-plover	4	2	4	3	26	6
Barn owl	4	2	3	3	27	5
Upland sandpiper	4	1	4	3	27	5
Purple martin	5	1	2	3	29	5

Wildlife species	% of strikes with:			Mean hazard level[4]	Composite ranking	Relative hazard score[5]
	Damage[1]	Major damage[2]	Effect on flight[3]			
Mourning dove	3	1	4	3	30	5
Red-winged blackbird	3	0	5	3	31	5
Woodchuck	2	0	4	2	32	4
Northern harrier	2	1	2	2	33	3
Chimney swift	2	0	2	1	34	2
Killdeer	1	0	2	1	35	2
House sparrow	2	0	1	1	35	2
Blk-tailed jackrabbit	1	1	1	1	37	2
American kestrel	1	<1	2	1	38	2
Eastern meadowlark	1	<1	2	1	38	2
S.-tailed flycatcher	0	0	2	1	40	1
Horned lark	1	<1	1	1	41	1
Pacific golden-plover	1	0	1	1	41	1
Barn swallow	1	0	1	1	43	1
Savannah sparrow	1	0	<1	1	43	1
Common nighthawk	1	0	1	1	45	1
Tree swallow	0	0	1	<1	46	1
Burrowing owl	1	0	0	<1	46	1
Western kingbird	0	0	1	<1	48	0
Virginia opossum	1	0	0	<1	48	0
Striped skunk	0	0	0	0	50	0

[1] Aircraft incurred at least some damage (destroyed, substantial, minor, or unknown) from strike.

[2] Aircraft incurred damage or structural failure, which adversely affected the structure strength, performance, or flight characteristics, and which would normally require major repair or replacement of the affected component, or the damage sustained made it inadvisable to restore aircraft to airworthy condition.

[3] Aborted takeoff, engine shutdown, precautionary landing, or other negative effect on flight.

[4] Based on the mean value for percent of strikes with damage, major damage (substantial damage or destroyed), and negative effect-on-flight.

[5] Mean hazard level (see footnote 4) was scaled down from 100, with 100 as the score for the species with the maximum mean hazard level and thus the greatest potential hazard to aircraft.

ATTACHMENT G

U.S. Department
of Transportation
Federal Aviation Administration

Advisory Circular

Subject: Qualifications for Wildlife Biologist Conducting Wildlife Hazard Assessments and Training Curriculums for Airport Personnel Involved in Controlling Wildlife Hazards on Airports

Date: 01/31/2012 **AC No:** 150/5200-36A
Initiated by: AAS-300 **Change:** 1

1. Purpose.

This Advisory Circular (AC) has two purposes. First, this AC describes the qualifications for wildlife biologists who conduct Wildlife Hazard Assessments (WHA) for airports certificated under Title 14, Code of Federal Regulations, Part 139 (14 CFR Part 139), and at non-certificated airports funded by a Federal Aviation Administration (FAA) Airport Improvement Program (AIP) or Passenger Facility Charge (PFC) Program. We recommend that airports, at a minimum, consult with a qualified airport wildlife biologist when developing a Wildlife Hazard Management Plan (WHMP).

Second, this AC addresses the minimum wildlife hazard management curriculum for the initial and recurrent training of airport personnel who implement an FAA-approved WHMP.

2. Applicability.

The standards and practices in this AC for public-use airports and for those who conduct Wildlife Hazard Assessments and conduct required training are:

a. Mandatory for airports certificated under Title 14, Code of Federal Regulations, Part 139 (14 CFR Part 139).

b. Highly recommended for airports that have accepted AIP or the Passenger Facility Charge (PFC) Program funds.

c. Highly recommended for all other airports that independently fund Wildlife Hazard Assessments.

3. Cancellation.

This AC cancels AC 150/5200-36, Qualifications for Wildlife Biologist Conducting Wildlife Hazard Assessments and Training Curriculums for Airport Personnel Involved in Controlling Wildlife Hazards on Airports, dated June 28, 2006.

(4) Have successfully completed at least one of the following within five years of their initial FAA approved airport wildlife hazard management training course, and every five years thereafter:

(i) An airport wildlife hazard management training course that is acceptable to the FAA Administrator (Appendix C) **or**,

(ii) Attendance, as a registered participant, at a joint Bird Strike Committee–USA/Bird Strike Committee–Canada annual meeting **or**,

(iii) Other training acceptable to the FAA Administrator.

d. Individuals who work under the direct supervision of a qualified airport wildlife biologist are allowed to conduct Wildlife Hazard Assessments if the airport sponsor and the qualified airport wildlife biologist agree in writing to determine how the qualified airport wildlife biologist will:

(1) Supervise how the individual(s) will conduct the Wildlife Hazard Assessment; and

(2) Report progress of the Wildlife Hazard Assessment; and

(3) Supervise the Wildlife Hazard Assessment report production.

e. Certificate Holders or Airport Sponsors must obtain documentation verifying the qualifications outlined in c (1) – (3) above of any person(s) conducting wildlife hazard assessments or providing requisite training.

f. Holders of Airport Operating Certificates issued under Part 139 must retain records documenting the airport wildlife biologist(s) qualifications to conduct Wildlife Hazard Assessments and Wildlife Hazard Management Plans. These records must be retained for 10 years. If an airport conducts another WHA before the ten year expiration, the airport must maintain the qualification records for the previous WHA one year after the new WHA is completed.

7. Initial and Recurrent Training for Airport Personnel Actively Involved in Managing Hazardous Wildlife On or Near Airports.

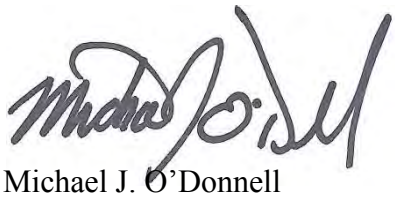
a. Personnel actively involved in implementing FAA-approved Wildlife Hazard Management Plans are subject to the requirements of 14 CFR Part 139.303. Section 139.303 requires a specific training regimen for all airport personnel. Section 139.303(c) and (e) require the holder of an Airport Operating Certificate issued under Part 139 to provide initial training and, every 12 months thereafter, recurrent training in wildlife hazard management to airport personnel actively involved in implementing FAA-approved Wildlife Hazard Management Plans. The required training must include "Any additional subject areas required under … §139.337" [§139.303(c)(5)] and, "As appropriate, comply with the following training requirements of this part … §139.337, Wildlife Hazard Management" [§139.303(e)(5)].

b. Appendix D outlines the minimum training requirements for airport personnel who carry out an airport's Wildlife Hazard Management Plan. Depending on local wildlife and environmental issues, additional topics or more in-depth coverage of listed topics might be needed.

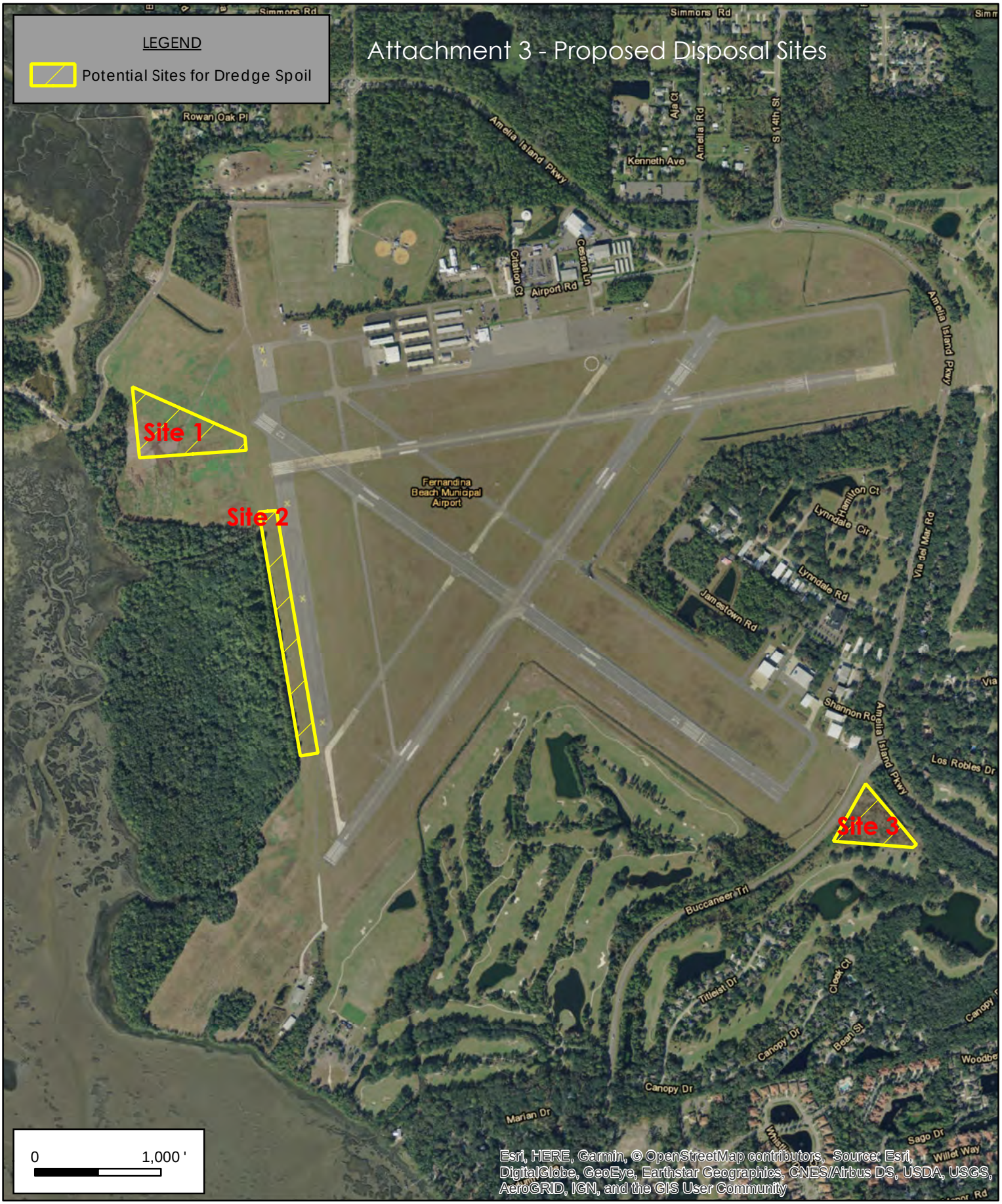
c. §139.337(f)(1) requires the Wildlife Hazard Management Plan to include a list of the individuals having authority and responsibility for implementing each aspect of the plan. This list identifies the individuals who must complete the required training.

d. §139.337(f) does not prohibit holders of Airport Operating Certificates from using a "train-the-trainer" approach when providing the requisite training, provided the trainers receive and successfully complete their initial and recurrent training from a qualified airport wildlife biologist. Trainers who are not qualified airport wildlife biologists are limited to providing training to their airport employees.

e. Holders of Airport Operating Certificates issued under Part 139 are required to make and keep records of all training for airport personnel involved in controlling wildlife hazards for at least 24 consecutive calendar months.[§139.301(b)(1) and §139.303(d)].



Michael J. O'Donnell
Director of Airport Safety and Standards



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Fernandina Beach
Municipal Airport (FHB)
Proposed Dredge Spoil Sites

Project No.:	18151
Exhibit No.:	7
Date:	10-26-18
By: MEF	Rev. Date:

N W E S

Source: ArcGIS Online Imagery

X:\GIS Projects\2018\18151\mxd\18151_spoil_sites_10-3-18.mxd

Attachment 3 - FHB ALP

Building ID	Description	AMSL Elevation
1	Airport Administration	26.38'
2	FBO Terminal & Hangar	31.44'
3	Civil Air Patrol	23.85'
4	Bulk Hangar	31.34'
5	6-Unit T-Hangar	24.50'
5a	Office	24.87'
6	6-Unit T-Hangar	27.39'
7	6-Unit T-Hangar	27.49'
8	6-Unit T-Hangar	27.65'
8a	Lean-to	24.15'
9	6-Unit T-Hangar	27.58'
9a	Lean-to	25.26'
10	6-Unit T-Hangar	27.58'
11	6-Unit T-Hangar	30.03'
12	Bulk Hangar w/Offices	41.53'
13	Row Hangars (4 Units)	32.60'
14	6-Unit T-Hangar	30.97'
15	Skydive Amelia	22.13'
16	Bulk Hangar w/Offices	39.32'
17	Bulk Hangar w/Offices	48.08'
18	Bulk Hangar	29.12'
19	Electrical Vault	23.29'

LEGEND

DESCRIPTION	EXISTING	ULTIMATE
AIRPORT PROPERTY LINE	PL	PL
RUNWAY SAFETY AREA (RSA)	RSA	(RSA)
RUNWAY OBJECT FREE AREA (ROFA)	ROFA	(ROFA)
RUNWAY OBJECT FREE ZONE (ROFZ)	ROFZ	(ROFZ)
RUNWAY PROTECTION ZONE (RPZ)	RPZ	(RPZ)
TAXIWAY OBJECT FREE AREA (TOFA)	TOFA	(TOFA)
RUNWAY VISIBILITY ZONES (RVZ)	RVZ	(RVZ)
AIRPORT PAVEMENT		
AIRPORT REFERENCE POINT		
AIRPORT BUILDINGS		
FENCE	-X-X-	-XX-XX-
ROAD		
WETLANDS		N/A
GROUND ELEVATION CONTOURS	10'	N/A
PAVEMENTS TO BE REMOVED	N/A	
GENERIC VISUAL GLIDE SLOPE INDICATOR		
THRESHOLD LIGHTING		
AIRPORT BEACON		N/A
AUTOMATED SURFACE OBSERVING SYSTEM		N/A
WINDSOCK		

PASSERO ASSOCIATES
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06° 23' 24"
West Declination

TRUE
MAGNETIC

0 400 800
Feet

Client:

City of Fernandina Beach
204 Ash Street
Fernandina Beach, FL 32034

Passero Associates
13453 N Main St. #106, Jacksonville, FL 32218 (904) 757-6106 www.passero.com
Principal-in-Charge Andrew M. Holesko
Project Manager Zach E. Nelson
Designed by Zach E. Nelson

Revisions

No.	Date	By	Description
1			

Airport Layout Plan

A L P

Fernandina Beach Municipal Airport

Town/City: Fernandina Beach
County: Nassau State: Florida

Project No.
99047.59

Drawing No.
4A OF 18

Date
September 2015

City of Fernandina Beach **Nathan Coyle**

Office of the Airport Manager ncoyle@fbfl.org

Attachment 4

Value and Benefit to the Fernandina Beach Municipal Airport

1. Through placement of material at the airport, the community will receive significant benefit through cost savings achieved by not hauling and disposing of dredge spoils off of Amelia Island. Furthermore, use of airport property would prevent hauling of material on primary roadways which serve traffic entering and departing the island. Under this proposal, the airport would continue its strong partnership of good will with its surrounding community.

2. In addition to a significant benefit to community, the following two methodologies were utilized in establishing a recommended value for placement of material on the airport:

    a. Research of existing fee schedules for placement of dredge material at spoil sites was conducted. This research indicated that disposal fees/costs could range from $0.10 per cubic yard to $0.75 per cubic yard based on a number of factors. Based on this comparison of fees utilized for storage of dredge spoils in other locations, $0.55 per cubic yard of material would be reasonable and consistent with other rates observed. City officials currently estimate a quantity of 30,000 cubic yards of material to be placed on airport property. Under this proposal, this would yield $16,500 in payment to the airport enterprise for placement of this material.

    b. An alternative method considered is through use of a discounted lease rate. The Fernandina Beach Municipal Airport currently has a non-aeronautical lease rate for development of non-aeronautical property. This lease rate is $0.35 per square foot. The property proposed for placement of dredge spoil is not suitable for development and we have therefore applied a 50% reduction in the proposed lease rate and assumed a one-time payment of this rate. Based on the anticipated 30,000 cubic yards of material, we estimate potential property usage of 120,000 square feet of airport property. This would yield $21,000 in payment to the airport enterprise for placement of this material.

3. Both of the methodologies above provide a proposed rate which seems consistent, and the airport proposes use of the rate structure outlined under item 2 (a) as it would be administratively efficient to track yardage of material delivered to the airport through a process where dump-truck delivery tickets can be obtained and tracked/calculated to provide a total quantity of material delivered to the airport.

City of Fernandina Beach **Nathan Coyle**

Office of the Airport Manager ncoyle@fbfl.org

Attachment 5

Process for Placement of Material and Expected Outcome

1. Under this proposal, dredge spoil material would be excavated from the marina and conveyed to a nearby drying site where the material will be dewatered, dried, and consolidated. Once dried, the material would then be transported to airport property where it would be placed and graded appropriately. The enclosed wildlife assessment expressed concern for the potential to attract wildlife if standing water were associated with the placement of this material, however the process of pre-drying the material should eliminate this potential issue.

2. In 2012, dredge spoils from the same location, and of similar composition, were placed on the airport. As demonstrated in the photos below, turf and vegetation has regrown in this area over the past few years. The material placed in 2012 is similar in composition to the material proposed for placement now, and the same outcome is expected. In review of the placement process in 2012, sand was not mixed with the dredge material prior to placement.

2012 Dredge Spoil Placement Site (Airport Property)