Appendix B

Noise and Air Quality Technical Report

Draft

EA FOR THE EXTENSION OF RUNWAY 14-32 AND RELATED IMPROVEMENTS

Noise and Air Quality Technical Report

June 2023

Prepared for
Federal Aviation Administration
Orlando Airports District Office
8427 South Park Circle, Suite 524
Orlando, FL 32819

Prepared by
Palm Beach County Department of Airports
1000 Palm Beach International Airport
Suite 846
West Palm Beach, FL 33406-1412

Environmental Science Associates
5404 Cypress Center Drive, Suite 125
Tampa, FL 33609

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EA FOR THE EXTENSION OF RUNWAY 14-32 AND RELATED IMPROVEMENTS

Noise and Air Quality Modeling Technical Report

B.1 Introduction and Overview

This report describes the noise, air quality, and climate modeling analysis prepared in support of the Environmental Assessment (EA) for the Extension of Runway 14/32 (Proposed Project) at North Palm Beach County General Aviation Airport (F45 or Airport). As owner and operator of the Airport, Palm Beach County (County) proposes to allow users of the Airport to operate larger aircraft (including jets) with fewer operational restrictions than are currently imposed due to runway length by extending Runway 14-32 from 4,300 to 6,000 feet and implementing related airport improvements. In addition to extending the runway, Proposed Project improvements shifting the runway 60 feet to the southwest, extending parallel Taxiway F, relocating some aircraft parking, realigning the airport access road, realigning/relocating service roads, construction of a new airport traffic control tower (ATCT), and associated modifications to the storm water management system.

B.2 Methodology and Analysis Results

Noise and emissions modeling was performed for Existing Conditions (2021) and for the Proposed Project and No Action Alternative for the year of project opening (2025) and five years later (2030). The Aviation Environmental Design Tool (AEDT) version 3e, was used to perform aircraft noise modeling and to estimate emissions from aircraft operations. Construction emissions calculations were modeled using the Airport Construction Emissions Inventory Tool (ACEIT) for the Proposed Project. The input parameters and operational criteria for noise and emissions modeling are summarized in the following sections.

B.2.1 Noise Modeling Overview

The AEDT is the FAA's approved model for assessing noise and emissions at civilian airports. The methodology used in AEDT analysis follows established Federal Aviation Administration (FAA) guidelines for both the development of a representative data model and the evaluation of environmental impacts. AEDT has been used for environmental review of aviation noise and emissions impacts for airport projects since 2015 and is used for 14 Code of Federal Regulations (CFR) Part 150 studies and National Environmental Policy Act (NEPA) environmental documents, including EAs and Environmental Impact Statements (EISs).

Per FAA guidance, model input data are collected and aggregated to represent an Annual Average Day (AAD), including the expected mix of aircraft operations over the course of a representative "average" day. The model inputs, which consist of flight tracks and specific aircraft operations utilizing these tracks, are imported into the AEDT model and evaluated for noise exposure by using FAA-recommended AEDT settings. Key attributes of an aircraft operation relevant to noise modeling are the aircraft type, the operation type (arrival or departure), the runway, the ground track used, the time of day (day or night), and the stage length. From a grid of points, the AEDT draws contours of equal DNL that can be superimposed onto land use maps.

The FAA has determined that the cumulative noise energy exposure of individuals to noise resulting from aviation activities must be established in terms of yearly DNL. DNL is a 24-hour, time-weighted average noise metric, expressed in terms of a-weighted decibels (dBA), which accounts for the noise levels of individual aircraft events, the number of times those events occur, and the time of day they occur. The dB is a unit used to describe sound pressure level. When expressed as dBA, the sound has been filtered to reduce the effect of very low and very high frequency sounds, much as the human ear filters sound frequencies. Although referred to as dB in this document, the modeled noise levels are a-weighted to reflect how humans hear sound.

The DNL contours are a graphical representation of the distribution of noise over the surrounding area from an airport's average annual daily aircraft operations. The DNL is calculated based on noise levels and operational activity occurring during two time periods: daytime (7:00 a.m. to 9:59 p.m.) and nighttime (10:00 p.m. to 6:59 a.m.). To account for the added intrusiveness of noise during nighttime hours, DNL adds a weighting of 10 dB to noise events occurring during nighttime.

B.2.1.1 Aircraft Operations and Fleet Mix

Aircraft operations for the Existing Condition (2021) and for the Proposed Project and No Action Alternative for the year of project opening (2025) and five years later (2030) are detailed in **Table B-1**. Annual aircraft operations for the Existing Condition (2021) and No Action Alternative for 2025 and 2030 were obtained from the FAA's Terminal Are Forecast (TAF).[1] The year 2025 is anticipated to be the first full year that the Proposed Project will be in operation, and new operations are not expected to exceed 750 in 2025. This activity level reflects approximately two new aircraft operations per day, which is roughly equivalent to the number of aircraft already operating at F45 that would benefit from the Proposed Project. It is assumed that demand may grow to approximately 2,500 additional operations by 2030, representing an increase of 2.2 percent when compared to the No Action Alternative for the same timeframe.

TABLE B-1
AIRCRAFT OPERATIONS AND ESTIMATED INDUCED OPERATIONS

Study Year	Alternatives	Annual Aircraft Operations	Induced Aircraft Operations
2021	Existing Condition	97,400	--
2025	No Action Alternative	102,939	750

[1] FAA, 2022 *Terminal Area Forecast*, issued February 2023.

	Proposed Project	103,689	
2030	No Action Alternative	110,346	2,500
	Proposed Project	112,846	

NOTES:

An aircraft operation is equivalent to one arrival/landing or one departure/takeoff.

SOURCE: Environmental Science Associates, 2023.

Fleet information for the Proposed Project was obtained directly from the Palm Beach International Airport (PBI) Airport Noise and Operations Monitoring System (ANOMS). **Table B-2** shows the AEDT aircraft information for each aircraft in the fleet and the operations for an AAD of each aircraft for Existing Conditions (2021) and for the Proposed Project and No Action Alternative for 2025 and 2030. The fleet mix was derived from the aircraft types and aircraft tail numbers contained within the ANOMS data from PBI. The full list of aircraft types were then consolidated into a fleet and normalized using the expected annual aircraft operations for that specific year. The aircraft types that would be induced by the Proposed Project were identified and total induced operations were applied proportionally to these selected aircraft.

TABLE B-2
PROPOSED PROJECT AND NO ACTION AEDT ANNUAL OPERATIONS (BY AIRCRAFT TYPE)

Aircraft Type	AEDT Airframe Assignment	AEDT Engine	AEDT Engine Mod	2021 Existing Condition	2025 No Action Alternative	2025 Proposed Project	2030 No Action Alternative	2030 Proposed Project
Jet	Bombardier Challenger 300	6AL006	NONE	43	45	45	48	48
	Bombardier Challenger 600	01P05GE189	NONE	12	12	69	13	202
	Bombardier Learjet 35	1AS001	NONE	36	37	94	40	228
	Bombardier Learjet 55	1AS002	NONE	24	25	81	27	215
	Cessna 550 Citation II	1PW036	NONE	154	162	219	172	361
	Cessna 560 Citation Excel	PW530	NONE	650	683	739	726	914
	Cessna 560 Citation V	1PW037	NONE	175	184	240	195	384
	Cessna 650 Citation III	1AS002	NONE	11	11	68	12	200
	Cessna 680 Citation Sovereign	7PW078	NONE	225	236	236	251	251
	Cessna 680 Citation Sovereign	03P14PW194	NONE	86	90	147	96	284
	CESSNA CITATION 510	PW530	NONE	83	87	144	93	281
	Cessna CitationJet CJ/CJ1 (Cessna 525)	1PW035	NONE	225	236	293	251	440
	Cessna CitationJet CJ3 (Cessna 525B)	1PW038	NONE	65	69	69	73	73
	Cirrus Vision SF50 (FAS)	BIZVERYLIGHT JET_F	NONE	15	16	16	17	17
	Dassault Falcon 200	1AS002	NONE	3	3	60	3	192

TABLE B-2
PROPOSED PROJECT AND NO ACTION AEDT ANNUAL OPERATIONS (BY AIRCRAFT TYPE)

Aircraft Type	AEDT Airframe Assignment	AEDT Engine	AEDT Engine Mod	2021 Existing Condition	2025 No Action Alternative	2025 Proposed Project	2030 No Action Alternative	2030 Proposed Project
	Dassault Falcon 900	1AS002	NONE	9	9	66	10	198
	Eclipse 500 / PW610F	PW610F-A	NONE	338	355	355	378	378
	Embraer Legacy 450 (EMB-545)	01P14HN014	NONE	39	41	41	43	43
	Gulfstream G100	1AS002	NONE	6	6	63	7	195
	Gulfstream G400	1RR019	NONE	36	38	38	40	40
	Hawker HS-125 Series 700	TFE731	NONE	50	53	53	56	56
	Rockwell Sabreliner 65	1AS002	NONE	6	6	6	7	7
	T-38 Talon	J855HA	NONE	89	93	93	99	99
Piston	Cessna 150 Series	O200	NONE	594	623	623	663	663
	Cessna 172 Skyhawk	IO360	NONE	48,007	50,876	50,876	54,714	54,714
	Cessna 172 Skyhawk	IO320	NONE	505	530	530	563	563
	Cessna 172 Skyhawk	O320	NONE	4,297	4,512	4,512	4,799	4,799
	Cessna 182	IO360	NONE	1,674	1,758	1,758	1,869	1,869
	Cessna 206	TIO540	IO-540-AC	131	137	137	146	146
	Cessna 206	TIO540	TIO-540-AJ1A	12	12	12	13	13
	Cirrus SR20	IO360	NONE	1,801	1,892	1,892	2,012	2,012
	Cirrus SR22 Turbo (FAS)	TIO540	NONE	1,600	1,680	1,680	1,786	1,786
	Mooney M20-K	TSIO36	NONE	1,125	1,181	1,181	1,256	1,256
	Piper PA-18-150 (FAS)	O320	NONE	638	670	670	713	713
	Piper PA-28 Cherokee Series	O320	NONE	1,585	1,664	1,664	1,770	1,770
	Piper PA-28 Cherokee Series	IO360	NONE	1,285	1,349	1,349	1,435	1,435
	Piper PA-31 Navajo	TIO540	NONE	917	963	963	1,024	1,024
	Piper PA-32 Cherokee Six	TIO540	NONE	1,232	1,293	1,293	1,375	1,375
	Raytheon Beech Baron 58	TIO540	NONE	22,217	23,529	23,529	25,283	25,283
	Raytheon Beech Bonanza 36	TIO540	NONE	1,439	1,511	1,511	1,607	1,607
Turboprop	Cessna 208 Caravan	P6135A	NONE	75	79	86	84	109
	Cessna 208 Caravan	P6114A	NONE	57	60	60	64	64

TABLE B-2
PROPOSED PROJECT AND NO ACTION AEDT ANNUAL OPERATIONS (BY AIRCRAFT TYPE)

Aircraft Type	AEDT Airframe Assignment	AEDT Engine	AEDT Engine Mod	2021 Existing Condition	2025 No Action Alternative	2025 Proposed Project	2030 No Action Alternative	2030 Proposed Project
	Cessna 425 Conquest I	PT6A60	NONE	154	162	162	172	172
	Cessna 441 Conquest II	TPE8	NONE	68	72	72	76	76
	Mitsubishi MU-2	TPE1	NONE	131	137	137	146	146
	Pilatus PC-12	PT6A67	NONE	614	645	645	686	686
	Piper PA-31T Cheyenne	PT6A11	NONE	33	34	34	36	36
	Quest Kodiak 100	PT6A34	NONE	125	131	131	139	139
	Raytheon King Air 100	PT6A28	NONE	125	131	131	139	139
	Raytheon King Air 100	TPE6	NONE	151	159	159	169	169
	Raytheon Super King Air 200	PT6A42	NONE	246	259	259	275	275
	Raytheon Super King Air 300	PT660A	NONE	175	184	184	196	196
	Reims-Cessna 406 Caravan II	PT6A14	NONE	18	19	19	20	20
	Rockwell OV-10 Bronco	T7612A	NONE	15	16	23	17	42
Helicopter	Bell 206 JetRanger	250B17	NONE	223	234	234	249	249
	Bell 427	TPE1	NONE	493	518	518	551	551
	Eurocopter EC 120	PT6A27	NONE	29	30	30	32	32
	Eurocopter EC-130	TPE3	NONE	234	246	246	262	262
	Robinson R22	O320	NONE	142	150	150	159	159
	Robinson R22	IO360	NONE	297	312	312	331	331
	Robinson R44 Raven / Lycoming O-540-F1B5	TIO540	NONE	2,395	2,515	2,515	2,675	2,675
	Sikorsky S-76 Spirit	T70070	NONE	56	59	59	63	63
	Sikorsky UH-60 Black Hawk	T70070	NONE	41	43	43	45	45
			Total	**97,400**	**102,939**	**103,689**	**110,346**	**112,846**

NOTES:

Due to rounding, the total number of operations reflected in the table above may vary slightly.

SOURCE: Environmental Science Associates, 2023; Palm Beach International Airport Noise and Operations Monitoring System, 2019.

B.2.1.2 Runway Usage and Airport Layout

Runway usage information for Existing Conditions (2021) and for the Proposed Project and No Action Alternative in 2025 and 2030 was derived from PBI ANOMS data. Helicopter operations were assumed to arrive and depart to and from each runway end. The runway usage by aircraft

type is expected to remain constant from Existing Conditions (2021) to the No Action Alternative in both 2025 and 2030. Runway use under the Proposed Project is anticipated to change as more aircraft use the extended runway. For example, jet aircraft activity from Runway 32 would increase under the 2025 and 2030 Proposed Project when compared to the Existing Conditions (2021) due to the runway modifications which allow for the runway to accommodate more fixed-wing aircraft. In contrast, helicopter runway use remains constant under the Proposed Project and the No Action Alternative for both study years. This is because the Proposed Project is not anticipated to impacted helicopter activity since runway length is not criteria for helicopter operations. The runway usage percentages by aircraft type for all scenarios are shown below in **Tables B-3** through **B-5**.

TABLE B-3
2021 BASELINE AND NO ACTION RUNWAY USAGE (2025 AND 2030)

Aircraft Type	Runway					
	14	32	27L	27R	9L	9R
Arrival						
Jet	50.5%	15.9%	29.4%	0.0%	0.0%	4.2%
Piston	38.7%	18.9%	33.2%	2.4%	0.5%	6.2%
Turboprop	37.5%	18.2%	34.5%	0.0%	0.0%	9.8%
Helicopter	39.6%	18.6%	33.0%	2.0%	0.5%	6.4%
Departure						
Jet	37.2%	31.4%	27.6%	0.0%	0.0%	3.7%
Piston	32.4%	23.6%	39.8%	2.0%	0.5%	1.6%
Turboprop	37.3%	24.5%	36.6%	0.0%	0.0%	1.6%
Helicopter	32.9%	24.1%	39.0%	1.8%	0.5%	1.7%

NOTES:

Values may not add to 100% due to rounding.

SOURCE: Environmental Science Associates, 2023; Palm Beach International Airport Noise and Operations Monitoring System, 2019.

TABLE B-4
2025 PROPOSED PROJECT RUNWAY USAGE

Aircraft Type	Runway					
	14	32	27L	27R	9L	9R
Arrival						
Jet	50.5%	19.5%	26.3%	0.0%	0.0%	3.7%
Piston	38.7%	18.9%	33.2%	2.4%	0.5%	6.2%
Turboprop	37.5%	18.4%	34.3%	0.0%	0.0%	9.8%
Helicopter	39.6%	18.6%	33.0%	2.0%	0.5%	6.4%
Departure						
Jet	38.6%	33.3%	24.7%	0.0%	0.0%	3.4%
Piston	32.4%	23.6%	39.8%	2.0%	0.5%	1.6%

Aircraft Type	Runway					
	14	32	27L	27R	9L	9R
Turboprop	37.4%	24.7%	36.4%	0.0%	0.0%	1.6%
Helicopter	32.9%	24.1%	39.0%	1.8%	0.5%	1.7%

NOTES:

Values may not add to 100% due to rounding.

SOURCE: Environmental Science Associates, 2023; Palm Beach International Airport Noise and Operations Monitoring System, 2019.

TABLE B-5
2030 PROPOSED PROJECT RUNWAY USAGE

Aircraft Type	Runway					
	14	32	27L	27R	9L	9R
Arrival						
Jet	50.4%	25.3%	21.3%	0.0%	0.0%	3.0%
Piston	38.7%	18.9%	33.2%	2.4%	0.5%	6.2%
Turboprop	37.7%	18.8%	33.8%	0.0%	0.0%	9.6%
Helicopter	39.6%	18.6%	33.0%	2.0%	0.5%	6.4%
Departure						
Jet	40.7%	36.5%	20.0%	0.0%	0.0%	2.7%
Piston	32.4%	23.6%	39.8%	2.0%	0.5%	1.6%
Turboprop	37.5%	25.1%	35.8%	0.0%	0.0%	1.6%
Helicopter	32.9%	24.1%	39.0%	1.8%	0.5%	1.7%

NOTES:

Values may not add to 100% due to rounding.

SOURCE: Environmental Science Associates, 2023; Palm Beach International Airport Noise and Operations Monitoring System, 2019.

B.2.1.3 Day/Night Modeling Splits

Another important component in developing the Day-Night Average Sound Level (DNL) contours is determining the day-night use percentages for each AEDT aircraft. This data is important because the DNL metric is a 24-hour, time-weighted energy average. The time-weighting refers to the fact that noise events occurring during certain noise-sensitive time periods receive an additional weighting. For the DNL metric, noise events occurring between the hours of 10:00:00 p.m. and 6:59:59 a.m. receive a 10-decibel (dB) weighting. These weightings attempt to account for the higher sensitivity to noise in the nighttime that would accompany the expected decrease in background noise levels compared to background noise levels during the day. Because noise is measured on a logarithmic scale, a 10-dB weighting means each nighttime noise event is weighted as equivalent to 10 daytime events. **Table B-6** shows the day/night splits across each year of AEDT modeling. For the purposes of modeling, the day/night splits were assumed to be constant for each year of the Proposed Project and No Action scenarios.

TABLE B-6
AEDT MODELING DAY/NIGHT SPLITS (BY AIRCRAFT TYPE)

Aircraft Type	Daytime	Nighttime
Jet	97.2%	2.8%
Piston	97.3%	2.7%
Turboprop	97.7%	2.3%
Helicopter	96.8%	3.2%

NOTES:

Values may not add to 100% due to rounding.

SOURCE: Environmental Science Associates, 2023; Palm Beach International Airport Noise and Operations Monitoring System, 2019.

B.2.1.4 Flight Tracks

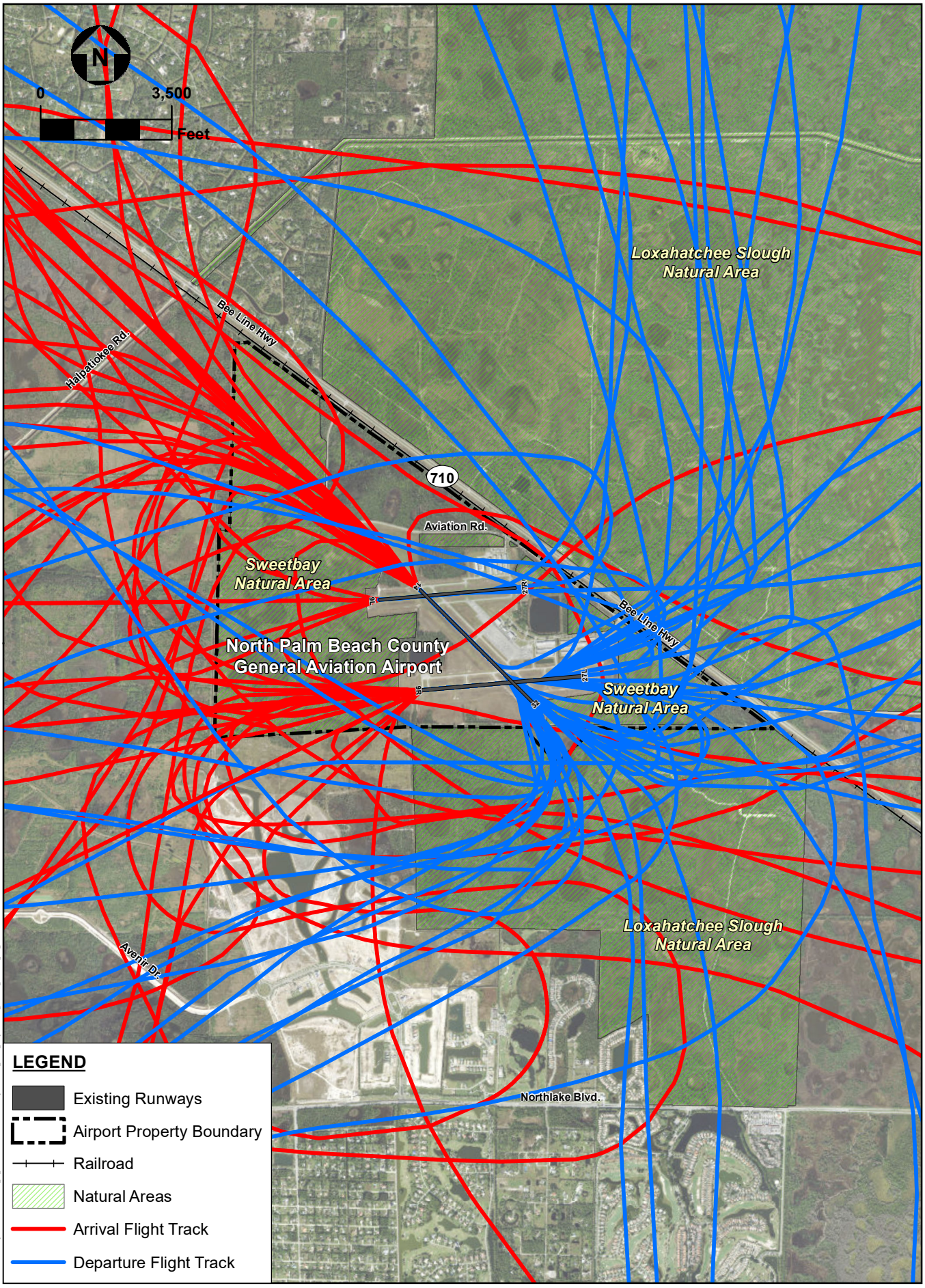
Flight tracks refer to the route an aircraft follows when arriving to or departing from a runway. Flight track locations and existing aircraft operational procedures (i.e., departure and arrival corridors) were developed using radar tracks from PBI ANOMS. The data was used to develop flight tracks for use in AEDT to represent a series of centerlines of the flight corridors (backbone tracks) utilized by aircraft arriving and departing to and from each runway. The flight tracks for the 2025 and 2030 No Action Alternative remain consistent with those used for Existing Conditions (2021). Under 2025 and 2030 Proposed Project conditions, arriving and departing aircraft were assumed to operate similarly to Existing Conditions (2021) because no major airspace changes are anticipated under the Proposed Project; if necessary, only minor procedural modifications would be required. However, arriving and departing flight tracks were shifted with respect to the extension and northwest shift of Runway 14-32 to account for differences in landing and take-off thresholds. East flow, west flow, and touch-and-go flight tracks used in the AEDT are depicted in **Figures B-1** through **B-6**.

B.2.1.5 Stage Length

An aircraft's stage length (or trip length) refers to the distance an aircraft flies from its origin airport to its intended destination. Stage length is important in noise modeling since the longer the distance an aircraft will fly to its destination, the greater the fuel load required and overall weight and, as a result, the lower its departure profile. Once the specific fleet mix was completed, departure destination information was analyzed to determine departure stage lengths. Stage lengths used in the AEDT include the following stages:

Stage Length 1:	0 to 500 miles	Stage Length 6:	3,501 to 4,500 miles
Stage Length 2:	500 to 1,000 miles	Stage Length 7:	4,501 to 5,500 miles
Stage Length 3:	1,001 to 1,500 miles	Stage Length 8:	5,501 to 6,500 miles
Stage Length 4:	1,501 to 2,500 miles	Stage Length 9:	6,500+ miles
Stage Length 5:	2,501 to 3,500 miles		

PBI ANOMS data were analyzed to determine existing departure stage lengths at the Airport by aircraft type. Due to the smaller size of aircraft operating at general aviation airports, the recorded stage lengths are generally smaller when compared to most commercial airports. This is because most general aviation (GA) aircraft default to stage length 1. Similarly, the majority of the GA aircraft in AEDT only have the option of stage length 1 regardless of distance flown. **Table B-7** summarizes both the modeled departure stage lengths for all aircraft for Existing Conditions (2021) and for the Proposed Project and No Action Alternative in 2025 and 2030. Since most general aviation aircraft default to stage length 1, the modeled stage length at F45 is highly concentrated around stage length 1.

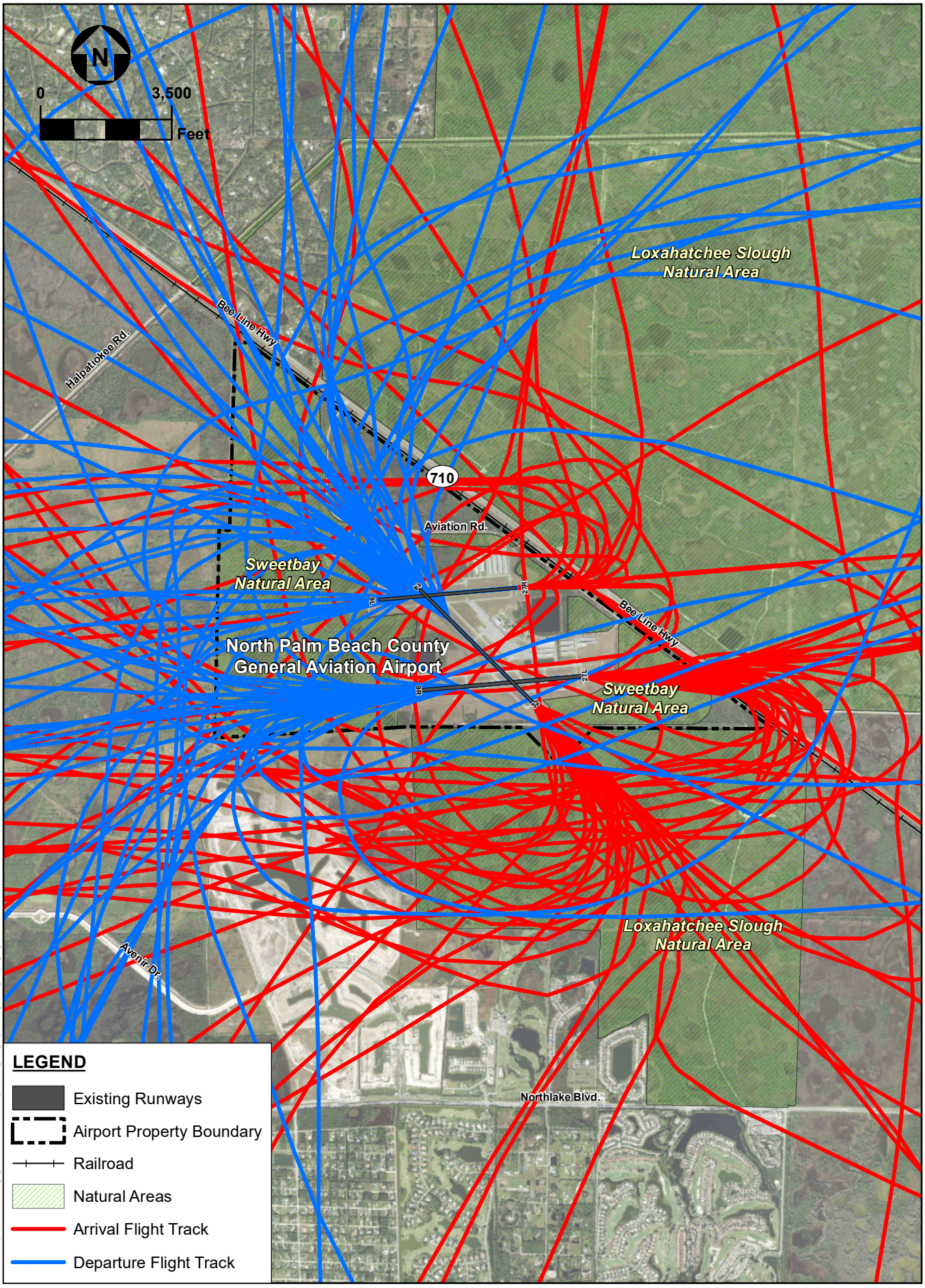


Source: AEDT 3e; ESA, 2023.

North Palm Beach County General Aviation Airport Runway Extension EA

FIGURE B-1

2021 BASELINE, 2025 NO ACTION, AND 2030 NO ACTION ITINERANT EAST FLOW AEDT FLIGHT TRACKS

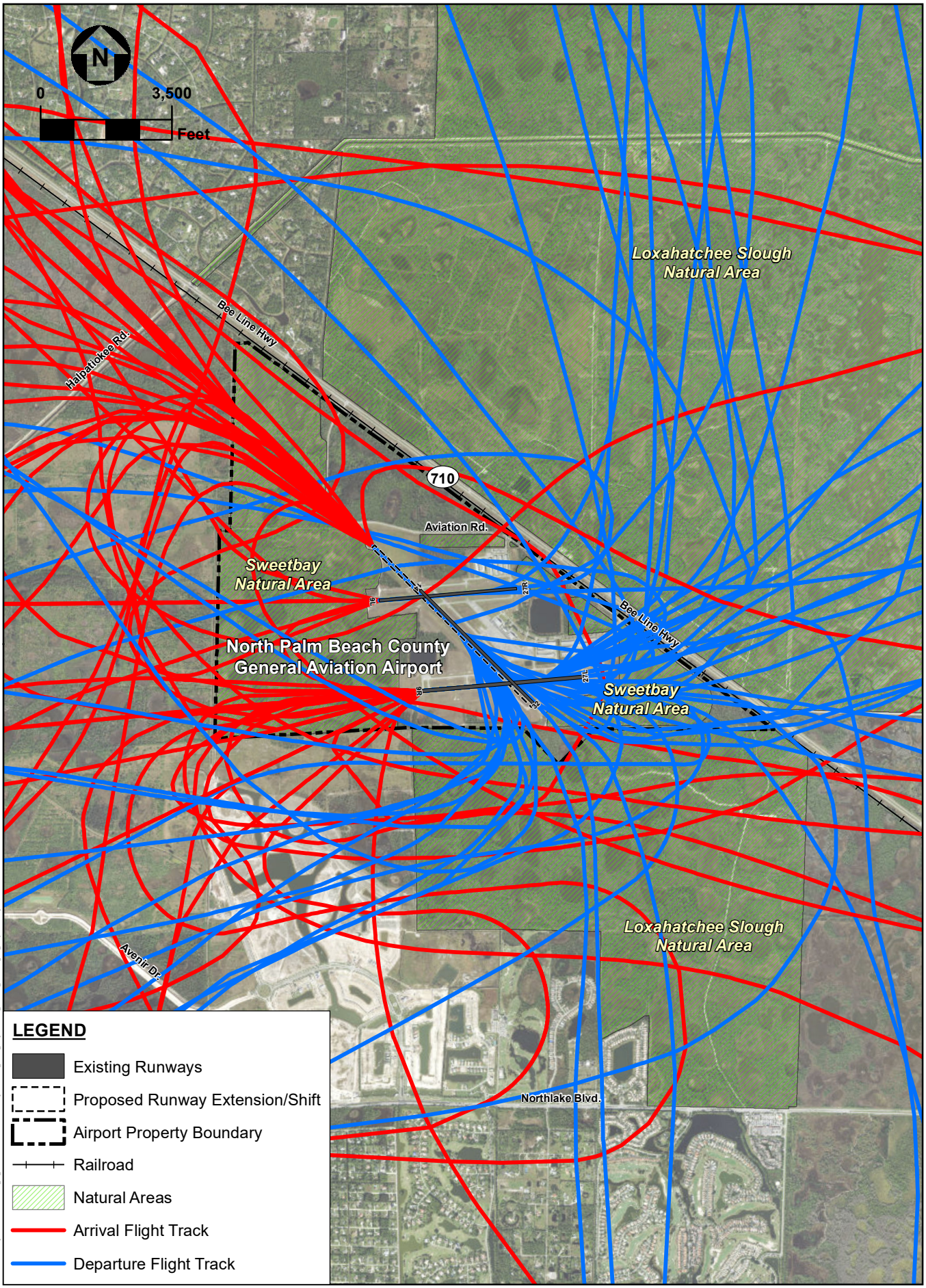


Source: AEDT 3e; ESA, 2023.

North Palm Beach County General Aviation Airport Runway Extension EA

FIGURE B-2

2021 BASELINE, 2025 NO ACTION, AND 2030 NO ACTION ITINERANT WEST FLOW AEDT FLIGHT TRACKS

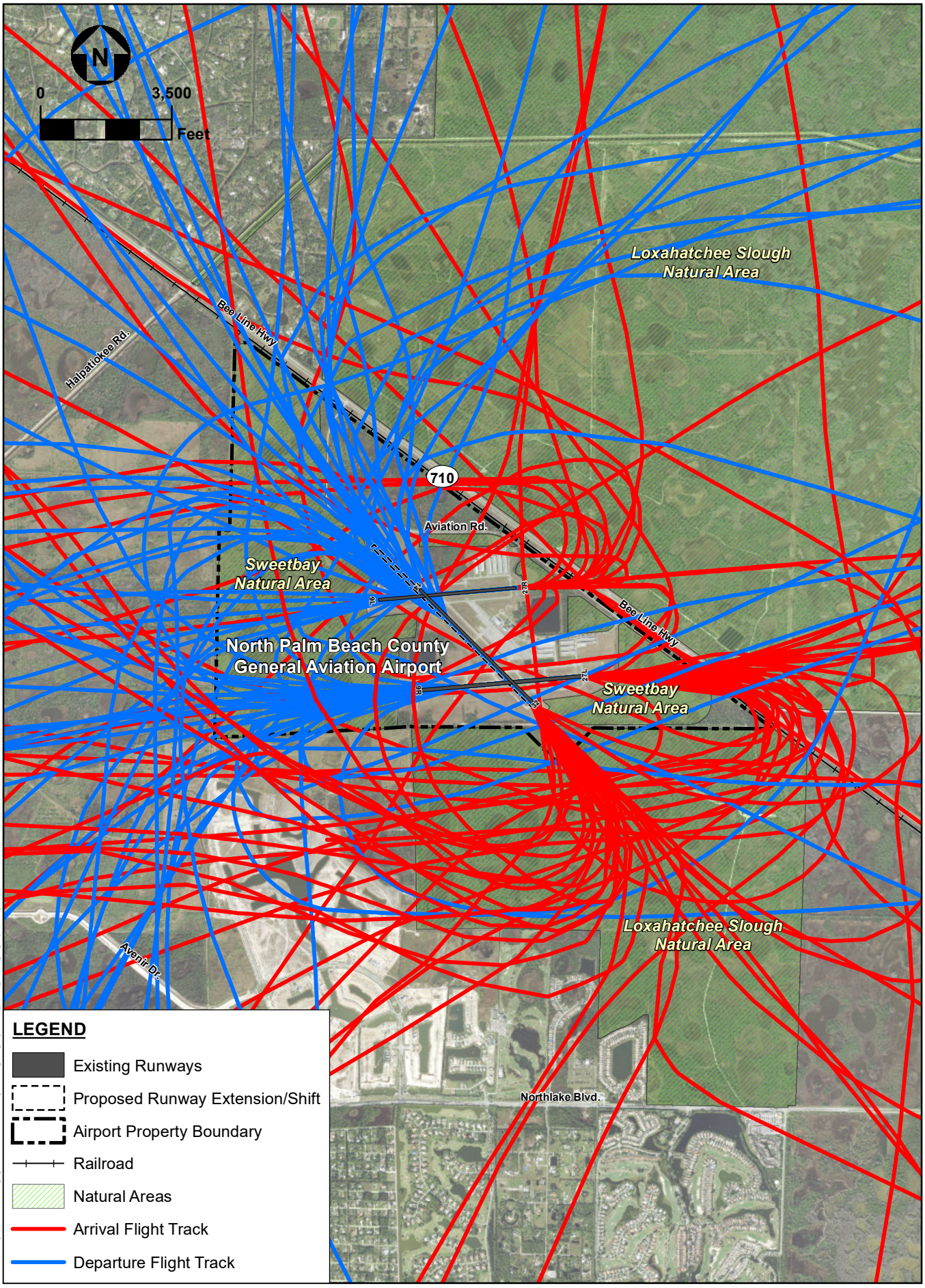


North Palm Beach County General Aviation Airport Runway Extension EA

Source: AEDT 3e; ESA, 2023.

FIGURE B-3

2025 AND 2030 PROPOSED PROJECT ITINERANT EAST FLOW AEDT FLIGHT TRACKS

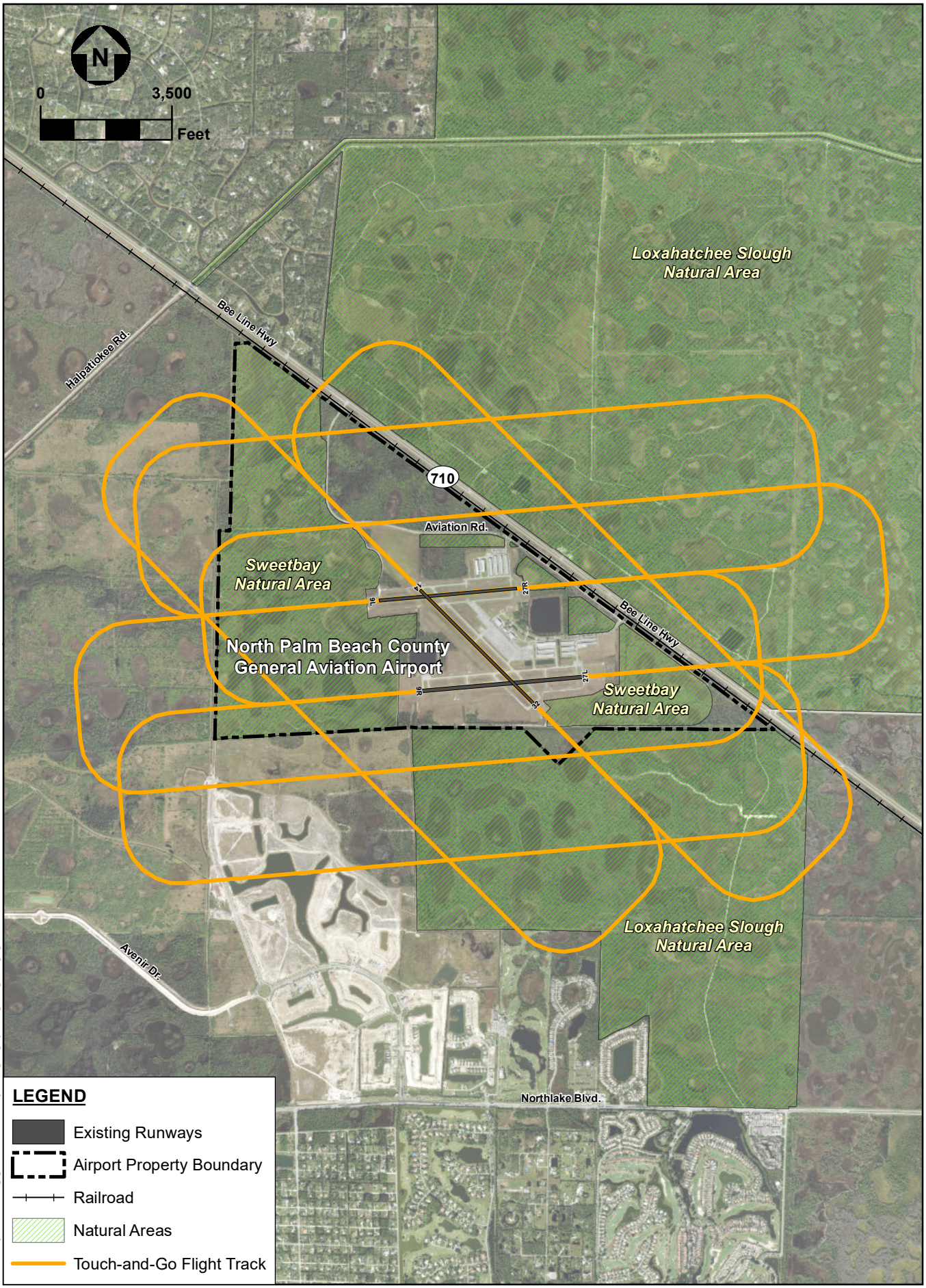


Source: AEDT 3e; ESA, 2023.

North Palm Beach County General Aviation Airport Runway Extension EA

FIGURE B-4

2025 AND 2030 PROPOSED PROJECT ITINERANT WEST FLOW AEDT FLIGHT TRACKS

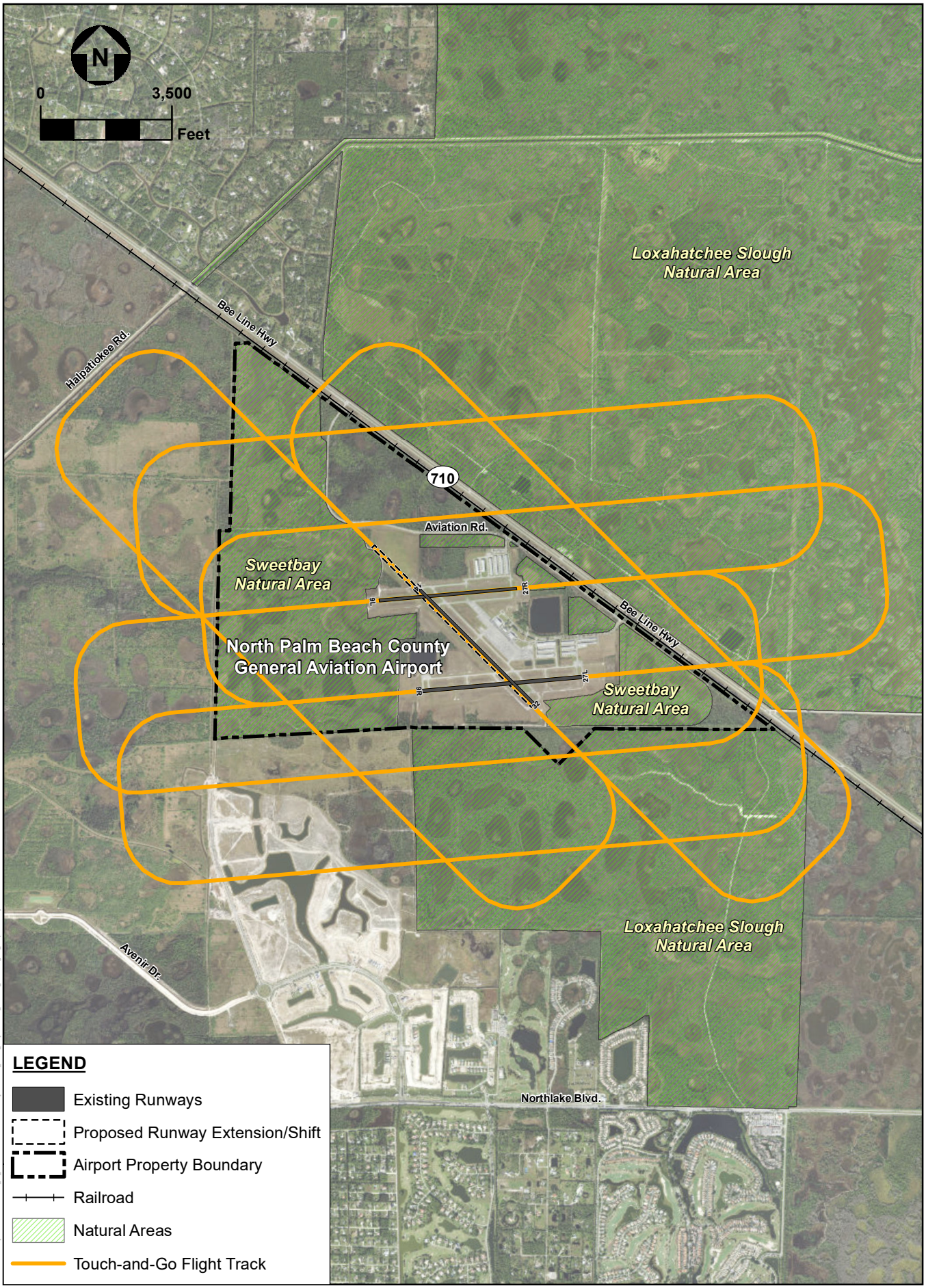


Source: AEDT 3e; ESA, 2023.

North Palm Beach County General Aviation Airport Runway Extension EA

FIGURE B-5

2021 BASELINE, 2025 NO ACTION, AND 2030 NO ACTION TOUCH-AND-GO AEDT FLIGHT TRACKS



Source: AEDT 3e; ESA, 2023.

North Palm Beach County General Aviation Airport Runway Extension EA

FIGURE B-6

2025 AND 2030 PROPOSED PROJECT TOUCH-AND-GO AEDT FLIGHT TRACKS

TABLE B-7
MODELED AEDT STAGE LENGTH (BY AIRCRAFT TYPE)

Aircraft Type	1	2	3
2021 Existing Conditions			
Jet	85.5%	13.6%	1.0%
Piston	100.0%	0.0%	0.0%
Turboprop	100.0%	0.0%	0.0%
Helicopter	100.0%	0.0%	0.0%
2025 No Action Alternative			
Jet	84.7%	14.3%	1.0%
Piston	100.0%	0.0%	0.0%
Turboprop	100.0%	0.0%	0.0%
Helicopter	100.0%	0.0%	0.0%
2025 Proposed Project			
Jet	86.2%	12.9%	0.9%
Piston	100.0%	0.0%	0.0%
Turboprop	100.0%	0.0%	0.0%
Helicopter	100.0%	0.0%	0.0%
2030 No Action			
Jet	84.0%	14.9%	1.1%
Piston	100.0%	0.0%	0.0%
Turboprop	100.0%	0.0%	0.0%
Helicopter	100.0%	0.0%	0.0%
2030 Proposed Project			
Jet	88.2%	11.0%	0.8%
Piston	100.0%	0.0%	0.0%
Turboprop	100.0%	0.0%	0.0%
Helicopter	100.0%	0.0%	0.0%

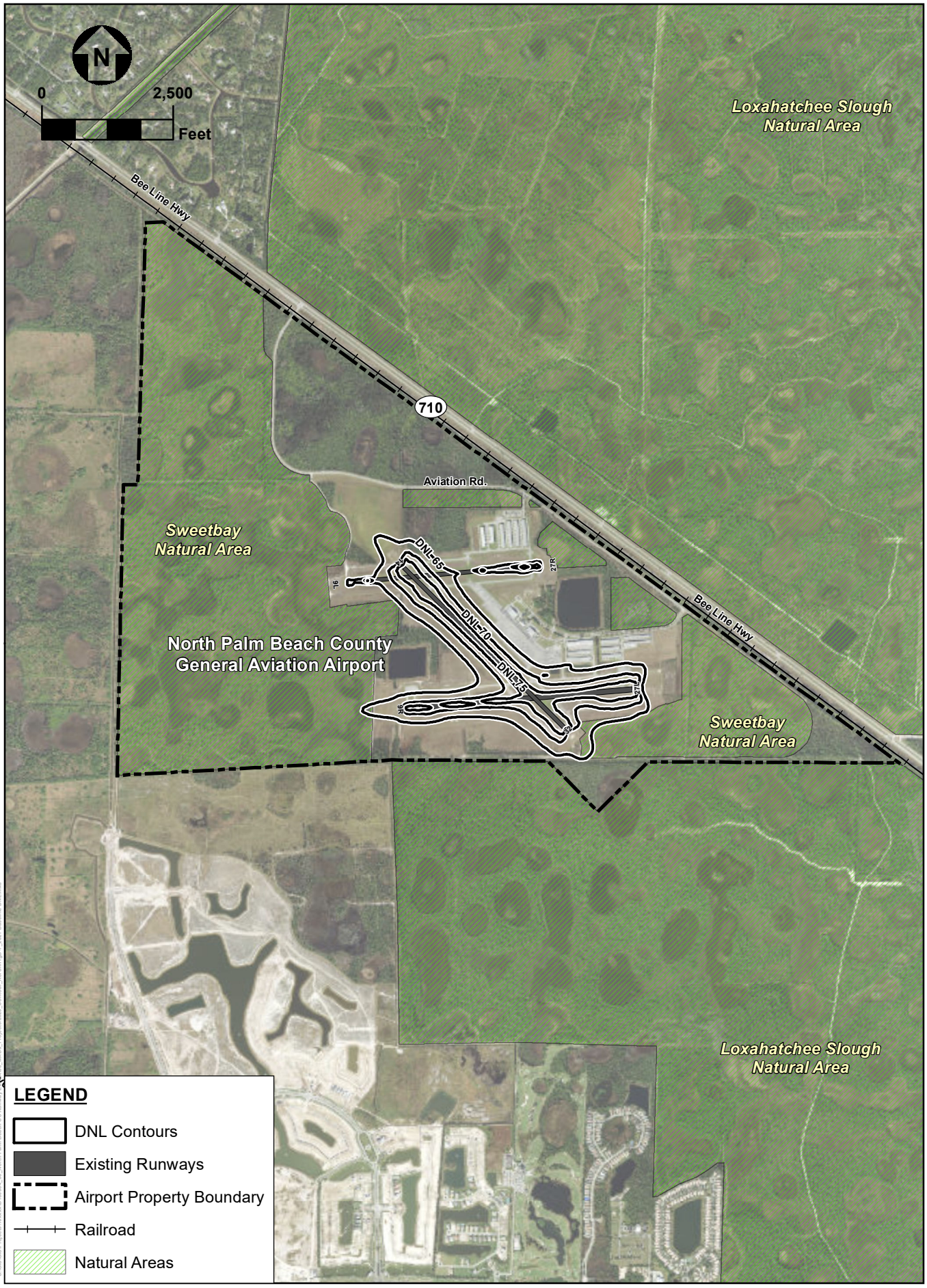
NOTES:

Most general aviation aircraft default to stage length 1 which is the maximum takeoff weight in AEDT regardless of distance flown. Values may not add to 100% due to rounding. No aircraft were modeled for a stage length greater than 3.

SOURCE: Environmental Science Associates, 2023; Palm Beach International Airport Noise and Operations Monitoring System, 2019.

B.2.1.6 Noise Modeling Results

Using the inputs described in previous sections, DNL noise contours for the No Action Alternative and Proposed Project for 2025 and 2030 were generated using AEDT Version 3d. Under the Proposed Project there would be a minor increase in aircraft noise exposure at F45 in both 2025 and 2030 when compared to the No Action Alternative. FAA Order 1050.1F states that a significant noise impact would occur if analysis shows that the Proposed Project when compared to the No Action Alternative for the same timeframe would increase noise by DNL 1.5 dB or more for a noise sensitive area that is exposed to noise at or above DNL 65, or that would be exposed at or above DNL 65 dB due to a DNL 1.5 dB or greater increase. There are no noise-sensitive sites or land uses within the DNL 65+ contours under either alternative. Accordingly, when compared to the No Action Alternative, the Proposed Project would not result in any noise impacts in either 2025 or 2030. The noise contours for the 2025 and 2030 No Action Alternative and Proposed Project are depicted in **Figures B-7** through **B-10**.

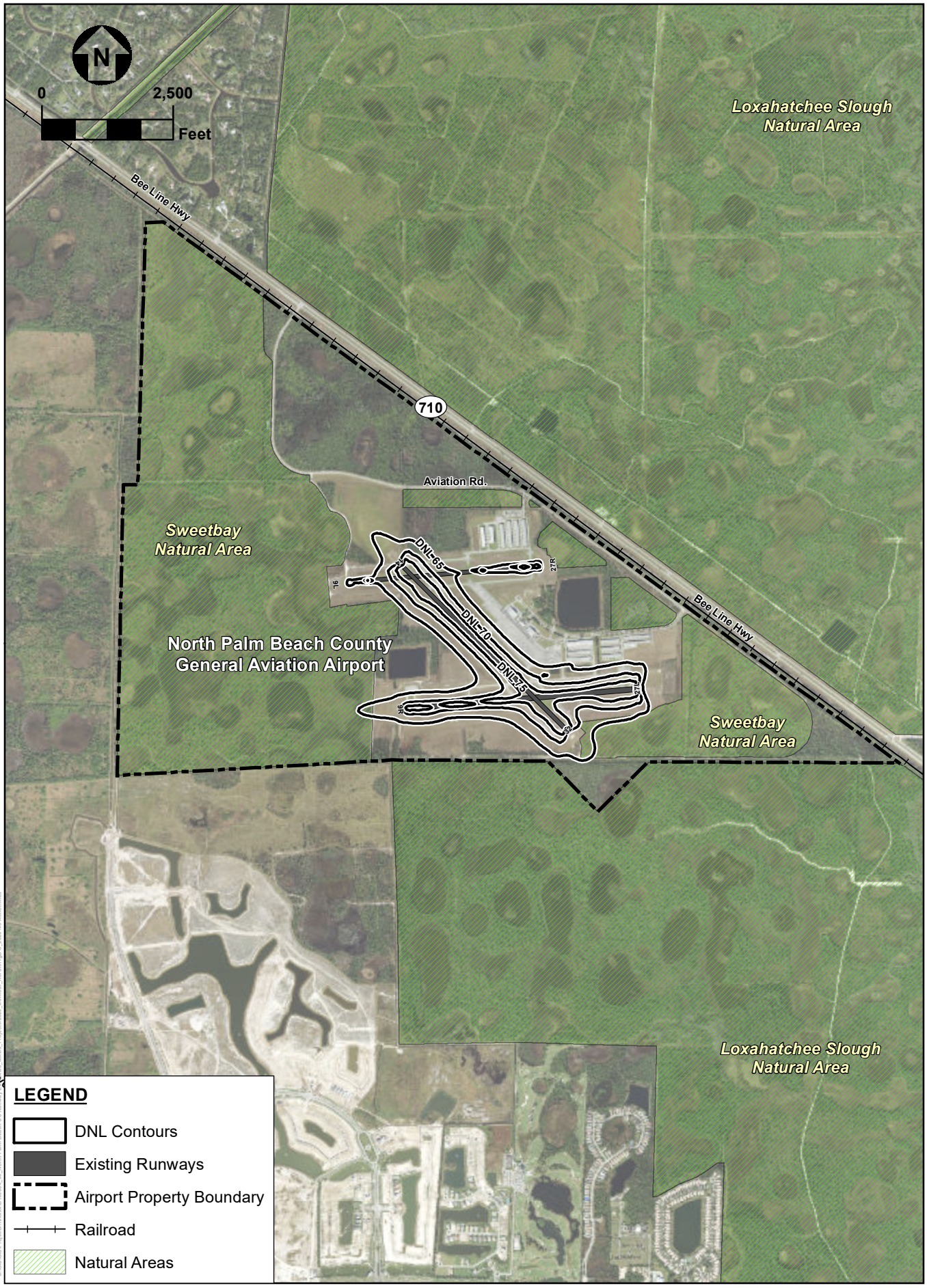


Source: AEDT 3e; ESA, 2023.

North Palm Beach County General Aviation Airport Runway Extension

FIGURE B-7

EXISTING CONDITIONS (2021) DNL CONTOURS

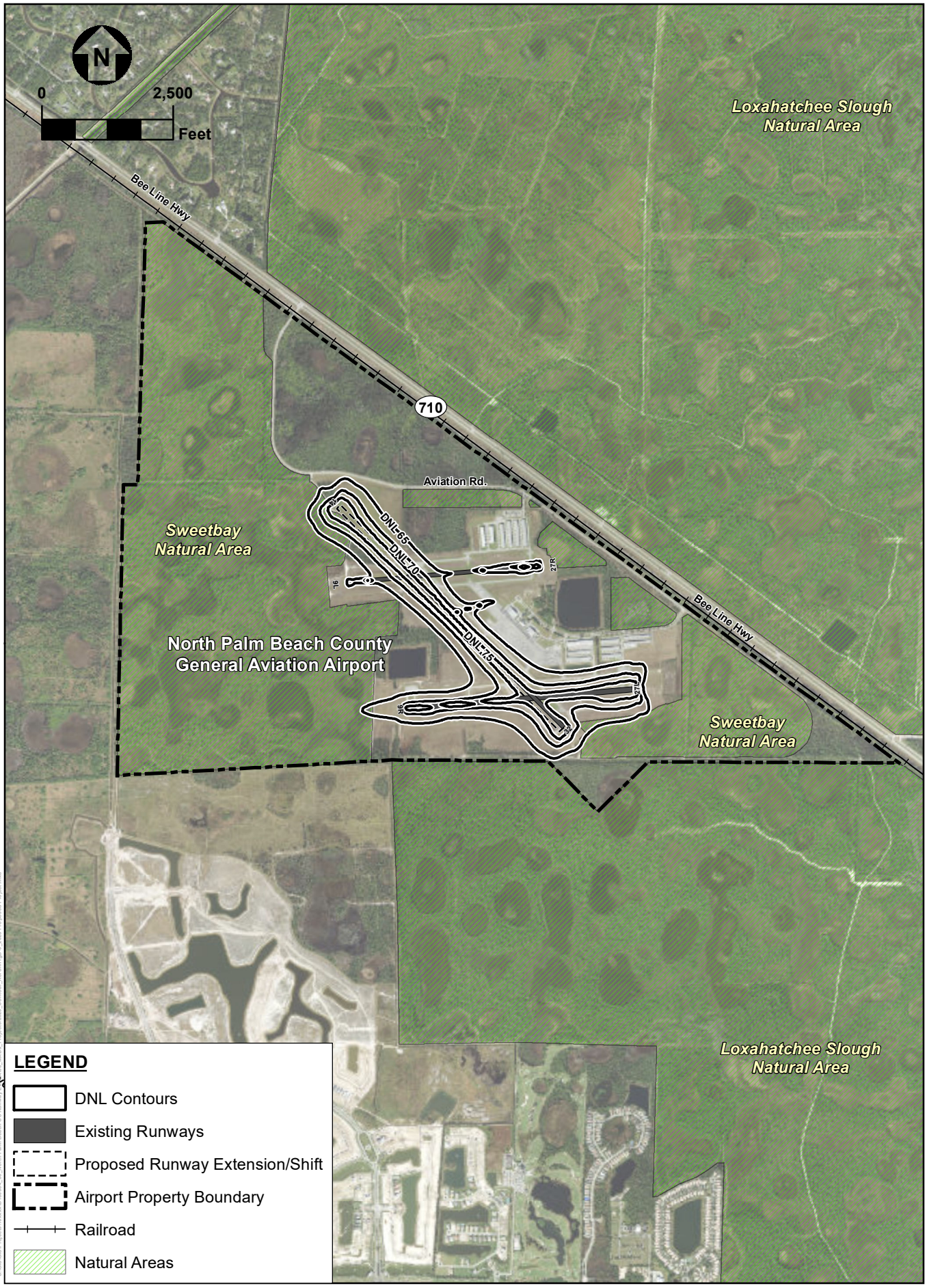


Source: AEDT 3e; ESA, 2023.

North Palm Beach County General Aviation Airport Runway Extension

FIGURE B-8

NO ACTION ALTERNATIVE: 2025 DNL CONTOURS AT F45

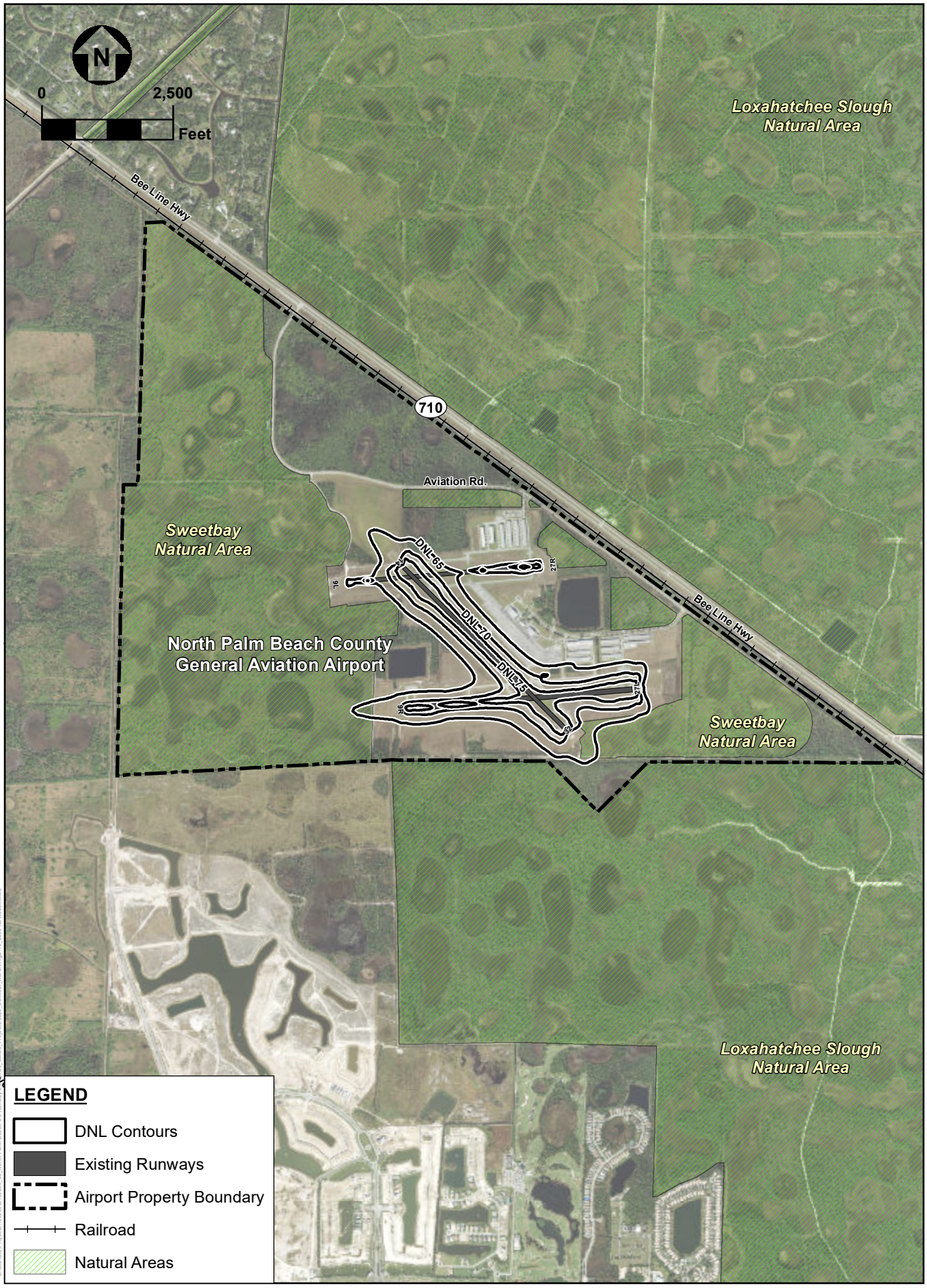


Source: AEDT 3e; ESA, 2023.

North Palm Beach County General Aviation Airport Runway Extension

FIGURE B-9

PROPOSED PROJECT: 2025 DNL CONTOURS AT F45

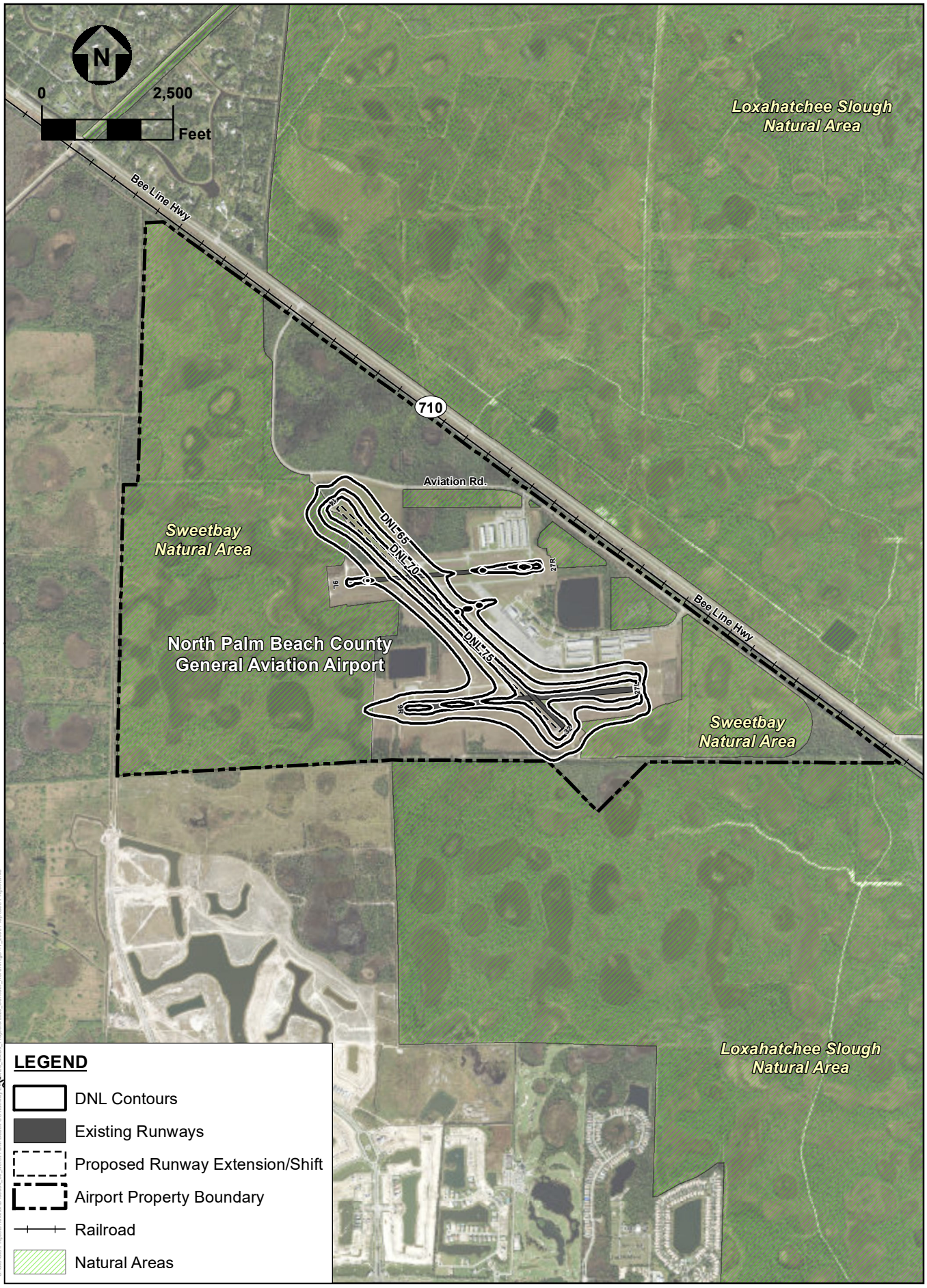


Source: AEDT 3e; ESA, 2023.

North Palm Beach County General Aviation Airport Runway Extension

FIGURE B-10

NO ACTION ALTERNATIVE: 2030 DNL CONTOURS AT F45



Source: AEDT 3e; ESA, 2023.

North Palm Beach County General Aviation Airport Runway Extension

FIGURE B-11

PROPOSED PROJECT: 2030 DNL CONTOURS AT F45

B.2.2 Emissions Modeling Overview

Emissions modeling was performed for carbon dioxide (CO_2) and the six criteria air pollutants for Existing Conditions (2021) and for the No Action Alternative and Proposed Project for the year of project opening (2025) and five years later (2030). The AEDT was used to calculate emissions from aircraft main engines while the ACEIT model was used to calculate construction emissions. Since ground service equipment (GSE) and auxiliary power units (APU) are primarily associated with commercial aircraft activity, they were not expected to be used to support aircraft identified under the Proposed Project and No Action Alternative. Therefore, GSE and aircraft APU usage was not included in emissions modeling.

B.2.2.1 Aircraft Main Engines

Emissions modeling was performed to estimate criteria air pollutant and carbon dioxide emissions associated with the operation of aircraft main engines during aircraft operation (e.g., take-off, landing, and departure) and aircraft taxiing. The following criteria air pollutants were evaluated to produce emissions estimates: carbon monoxide (CO), ozone (O_3) and its precursors such as oxides of nitrogen (NO_X) and volatile organic compounds (VOCs), particulate matter (PM_{10} and $PM_{2.5}$), and oxides of sulfur (SO_X).

Emissions from aircraft main engines are computed by factoring aircraft operational activity against a database of aircraft and engine-specific emission factors based on engine manufacturer, model, and aircraft operational mode within the landing-takeoff (LTO) cycle. An LTO cycle typically includes the approach/landing, taxi-in, start-up, taxi-out, takeoff, and departure. For aircraft AEDT inputs, the emissions modeling used the same airframe types, engine types, operational counts, flight tracks, and vertical profiles used for noise modeling (see Table B-2). For purposes of modeling emissions, the AEDT uses the default national average mixing height of 3,000 feet above field elevation (AFE) as a vertical limit.

Taxi emissions can also be a significant portion of the overall aircraft operational emissions. For the 2025 and 2030 No Action Alternative, a taxi-out time of 13 minutes, 35 seconds was used and a taxi-in time of 4 minutes, 58 seconds was used. For the 2025 and 2030 Proposed Project, a taxi-out time of 15 minutes, 16 seconds was used and a taxi-in time of 6 minutes, 15 seconds was used. The No Action Alternative taxi time values came from the FAA's Aviation System Performance Metrics report for F45 and the Proposed Project Alternative values were adjusted for the extended runway using average taxi time and runway extension length. **Table B-8** provides the operational criteria pollutant emissions estimates for Existing Conditions (2021) as well as for the Proposed Project and the No Action Alternative in 2025 and 2030.

TABLE B-8
OPERATIONAL CRITERIA AIR POLLUTANT EMISSIONS INVENTORY (SHORT TONS PER YEAR)

Source	CO	VOC	NO_X	SO_X	PM_{10}	$PM_{2.5}$
2021 Existing Conditions						
Aircraft	571.0	12.38	2.14	0.83	0.40	0.40
Total	571.0	12.38	2.14	0.83	0.40	0.40

TABLE B-8
OPERATIONAL CRITERIA AIR POLLUTANT EMISSIONS INVENTORY (SHORT TONS PER YEAR)

Source	CO	VOC	NO_X	SO_X	PM_{10}	$PM_{2.5}$
2025 No Action						
Aircraft	602.0	12.99	2.26	0.87	0.42	0.42
Total	602.0	12.99	2.26	0.87	0.42	0.42
2025 Proposed Project						
Aircraft	607.0	14.46	2.82	0.96	0.44	0.44
Total	607.0	14.46	2.82	0.96	0.44	0.44
Difference from No Action (+/-)	**5.0**	**1.47**	**0.56**	**0.09**	**0.02**	**0.02**
2030 No Action						
Aircraft	643.0	13.85	2.42	0.93	0.45	0.45
Total	643.0	13.85	2.42	0.93	0.45	0.45
2030 Proposed Project						
Aircraft	655.0	18.12	4.21	1.22	0.51	0.51
Total	655.0	18.12	4.21	1.22	0.51	0.51
Difference from No Action (+/-)	**12.0**	**4.27**	**1.79**	**0.29**	**0.06**	**0.06**

NOTES:

Due to rounding, the difference between the No Action and Proposed Project may vary slightly.

SOURCE: AEDT 3e, 2023; Environmental Science Associates, 2023.

Table B-9 provides the operational greenhouse gas emissions estimates for Existing Conditions (2021) as well as for the Proposed Project and the No Action Alternative in 2025 and 2030.

TABLE B-9
OPERATIONAL GREENHOUSE GAS EMISSIONS INVENTORY (METRIC TONS PER YEAR)

Study Year	Alternatives	Carbon Dioxide-Equivalent (CO_2e) Emissions	Difference from No Action (+/-)
2021	Existing Condition	2,073	--
2025	No Action Alternative	2,194	+229
	Proposed Project	2,423	
2030	No Action Alternative	2,311	+730
	Proposed Project	3,041	

SOURCE: AEDT 3e, 2023; Environmental Science Associates, 2023.

B.2.2.2 Construction Emissions

The Proposed Project includes extensive construction activity. The ACEIT model was used for calculating emissions associated with construction activity. This model was released with the Transportation Research Board's (TRB) Airport Cooperative Research Program (ACRP) Report 102, *Guidance for Estimating Airport Construction Emissions*. ACEIT contains construction emission factors from existing U.S. Environmental Protection Agency (EPA) regulatory models, such as the Motor Vehicle Emissions Simulator (MOVES) and

NONROAD, as well as emission factors for fugitive emissions from EPA's Compilation of Air Pollution Emission Factors (AP-42). Through the user specification of high-level inputs such as project cost and project site weather, the ACEIT uses a series of assumptions to generate lists of emissions sources (such as construction equipment and employee on-road automobiles) and associated usage factors in order to calculate a construction emissions inventory.

The construction projects (project costs) captured in this air emissions analysis using ACEIT are as follows:

- Runway 14 extension to the southwest 1,700 feet to a total length of 6,000 feet. Widen entire length of runway an additional 25 feet to a total width of 100 feet. Mill and overlay existing Runway 14-32 pavement, as necessary. Extend Taxiway F to the northwest 1,700 feet to a total length of 6,000 feet, to include connector taxiways to the new Runway 14 threshold. Mill and overlay existing Taxiway F pavement (6,000 feet long and 35 feet wide). Provide a runway-to-taxiway centerline separation of 300 feet by shifting runway or taxiway centerline 60 feet.

- Service Road Construction. In order to continue to facilitate airport and Sweetbay Natural Area maintenance access requirements, two single-lane, gravel service roads would be constructed to replace for loss of service roads.

- Airport Traffic Control Tower. Construct a new ATCT at the southeast corner of the aircraft parking apron off Aviation Road (Site 1) location as designated in the F45 Tower Siting Study.

Project weather information loaded into ACEIT used the 2010 NCDC weather station normals from the National Climate Data Center weather station for Palm Gardens, Florida. The average annual temperature at F45 was 73.53 degrees Fahrenheit (°F). The monthly variation between low and high temperatures ranged from 14.2° F to 19.7°F.

For the purposes of emissions modeling, all construction was assumed to occur in the year 2024 to ensure a conservative analysis. ACEIT automatically reduces construction vehicle emission factors over time, under the assumption that construction equipment emissions control technology will continue to advance; however, to reduce the likelihood of underestimating construction emissions levels, all construction activity was modeled using 2024 emission factors. This provides a more conservative emissions estimate.

ACEIT uses a small number of inputs to estimate emissions for construction projects, and the number of required inputs varies by project type. The construction projects in the F45 emissions inventory required up to three inputs each including the estimated cost of the Proposed Project. These inputs were developed based on information provided by the Airport about the Proposed Project and are summarized in **Table B-10**.

TABLE B-10
LIST OF F45 PROPOSED PROJECT CONSTRUCTION PROJECTS AND ACEIT MODELING PARAMETERS

Project Name	Type of ACEIT Project	Estimated Cost (Millions of $)	Maximum Length	Maximum Width
Service Road Construction	Service Road	2.34	10,900	10
Runway 14 Extension	New Runway	17.04	7,100	100
Air Traffic Control Tower	10,000 sq. ft.- 1 story	5.76	NA	NA

NOTES:

Totals may vary due to rounding.

SOURCE: Environmental Science Associates, 2023.

Table B-11 provides the estimates for criteria pollutant emissions and CO_2 estimates for construction of the Proposed Project.

TABLE B-11
SUMMARY OF EMISSIONS ESTIMATES FOR CONSTRUCTION ACTIVITY (METRIC TONS PER YEAR)

Project	CO	VOC	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2
Non-Road	2.61	1.55	3.86	0.03	0.21	0.19	4708.87
On-Road	8.51	0.54	0.53	0.02	0.02	0.02	1106.56
Fugitive	1.98	30.44	0.12	0.02	0.71	--	--
Total	**13.10**	**32.54**	**4.51**	**0.06**	**0.94**	**0.21**	**5,815.43**

NOTES:

Totals may vary due to rounding.

SOURCE: Environmental Science Associates, 2023.

B.2.2.3 Emissions Summary

The differences in emissions between the Proposed Project and No Action Alternative represent "project-related" emissions. The construction and operations emissions associated with the Proposed Project when compared to the No Action Alternative for the same timeframe, would not cause or contribute to violations of the NAAQS for criteria air pollutants in either 2025 or 2030. Therefore, the Proposed Project would not cause significant impacts to air quality. Furthermore, it is not anticipated that GHG emissions associated with the Proposed Project would be significant. GHG emissions are expected to increase temporarily in relation to construction activities and incrementally as related to increased operations.

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