

APPENDIX D

Noise Abatement Alternatives Supplemental Information

This Appendix includes supplemental information related to noise abatement measures that may reduce noncompatible land use in the vicinity of Fort Lauderdale-Hollywood International Airport (FLL). Information in this section is included in the following sub-appendix:

- Appendix D-1 Analysis of Suggested Noise Abatement Measures

Appendix D-1

Analysis of Suggested Noise Abatement Measures

In efforts to consider a full range of stakeholder concerns in the development of the NCP, the Part 150 Study Team solicited input from the TC, members of the public and various stakeholders regarding suggested noise abatement measures that may reduce noncompatible land uses within the Future Condition (Year 2023) DNL 65 contour. The Study Team received numerous suggestions, many of which were similar in nature. **Table D-1** contains a sample of noise abatement measures suggested by multiple stakeholders. Similar stakeholder suggestions were aggregated into six main noise abatement themes for initial review to help inform analysis of other measures.

TABLE D-1 SAMPLE OF NOISE ABATEMENT MEASURES SUGGESTED BY MULTIPLE STAKEHOLDERS	
Noise Abatement Measure Suggestion	Stakeholders Suggesting Measure
<u>Theme 1 - Close Runway 10R-28L during nighttime hours</u>	
Mandatory 10 p.m. to 7 a.m. South Runway curfew	ANAC
Close Runway 10R-28L from 9:00 p.m. to 9:00 a.m.	Public
<u>Theme 2 - Reduce or eliminate early northward turns of departing aircraft during west-flow conditions</u>	
Stagger flights from North and South runways to maintain use of heading 275° for departures - eliminate heading 290° completely, and maintain runway heading to 3 miles / 3,000 feet before turning	Public
Restructure arrival and departure routes for North Runway to replicate arrival and departure routes from pre-2014	ANAC
Establish and use a waypoint on runway heading west of the Turnpike for departures	ANAC
<u>Theme 3 - Maximize use of runway heading for all arrivals and departures</u>	
Departures should fly runway heading until 10,000 feet altitude before turning north	Public
Flights departing to the west should follow Interstate 595 until reaching the Everglades	Public
<u>Theme 4 - Implement aircraft departure procedures with steeper climb gradients</u>	
Use NADP1 for Runway 10L-28R and Runway 10R-28L departures	ANAC
Establish steep takeoff rules	Public
Implement NADP1	City of Dania Beach
<u>Theme 5 – Evaluate the 2013 Interlocal Agreement Voluntary Night Closure provision</u>	
Continue Interlocal Agreement Voluntary Night Closure provision	City of Dania Beach
<u>Theme 6 - Increase altitudes of aircraft arrivals to FLL during east-flow conditions.</u>	
Use Area Navigation- (RNAV-) controlled descent approaches	Public
Implement idle-power 3:1 ratio glide landings	Public
Minimize low approaches	Public
Use steeper descents close to the Airport	Public
Implement optimized profile descents (OPDs)	TC

SOURCE: BCAD and ESA, 2020.

The process of analyzing these themes served as a useful conceptual starting point to help the Study Team understand how different operational changes would affect the Airport noise environment. This information was then used to guide the evaluation of additional noise abatement measures that were either recommended or not recommended in this NCP. Importantly, the exercise of gathering stakeholder input not only brought the public into the decision-making process but also highlighted the aircraft noise-related issues of most concern to the surrounding communities. All stakeholder-suggested measures were ultimately considered for inclusion in the NCP and are discussed in greater detail in **Section 2.2** for NCP-recommended measures and **Section 2.3** for measures not recommended for the NCP. The following paragraphs describe how noise analysis was performed on the six stakeholder-suggested noise abatement themes listed above.

During the analysis process, the FAA-accepted Future Conditions (Year 2023) NEM was used as the baseline condition. This NEM includes the forecast changes in aircraft operations, aircraft fleet, and land uses; therefore, it represents the expected future noise exposure in the areas around FLL absent the implementation of the NCP. The Future Condition noise contours can be found in **Figure 1-7** of **Chapter 1**. The FLL NEM Report contains details of the Future Condition NEM development. To determine the potential changes in noise levels associated with the stakeholder-suggested noise abatement themes, the AEDT was used to model each theme. Modeled noise levels associated with each theme were then compared to the baseline Future Condition NEM noise levels.

D.1 Stakeholder-Suggested Noise Abatement Theme #1: Runway 10R-28L Nighttime Closure

A number of stakeholders suggested a noise abatement measure that would involve a mandatory closure of Runway 10R-28L during nighttime hours (possibly from either 10 p.m. to 7 a.m. or 9 p.m. to 9 a.m.); thus, requiring all arriving and departing aircraft to operate solely on Runway 10L-28R during these periods. The intended effect of this proposed measure would be to reduce noise levels in residential areas primarily located immediately west of Runway 10R-28L. This measure differs from the current voluntary nighttime closure in that it would be a mandatory closure; thus, preventing operational use during the closure period.

As described in **Section 1.8** of this NCP, the DNL metric assigns an additional weight of 10 dB to aircraft noise levels at night to represent the increased sensitivity of people to noise that occurs during the nighttime hours. This weighting makes an aircraft noise event occurring at night equivalent to 10 of the same aircraft noise events occurring during the day. Therefore, shifting an aircraft operation from Runway 10R to Runway 10L during the period from 10 p.m. to 7 a.m. is the weighted equivalent to shifting 10 daytime operations.

The implications of this stakeholder-suggested noise abatement theme were evaluated in order to determine the relationships between changes in Runway 10R-28L use and noise levels in the vicinity of FLL. The Future Condition (Year 2023) nighttime runway use for FLL was presented in Section 4.5 of the FLL NEM Report. Future fixed-wing aircraft arrival runway utilization for FLL is shown in **Table D-2** and fixed-wing aircraft departure runway use is shown in **Table D-3**.

TABLE D-2
2023 ARRIVAL RUNWAY USE (ALL FIXED-WING AIRCRAFT)

Arrivals (Time of Day)	Runway End Utilization			
	10L	28R	10R	28L
Daytime	51.8%	12.0%	28.9%	7.2%
Nighttime	73.5%	17.6%	7.6%	1.3%

NOTE: Does not include helicopter operations. Values may not add to 100% due to rounding.
SOURCE: Environmental Science Associates, 2018; Broward County Aviation Department, ANOMS data for calendar year 2016.

TABLE D-3
2023 DEPARTURE RUNWAY USE (ALL FIXED-WING AIRCRAFT)

Departures (Time of Day)	Runway End Utilization			
	10L	28R	10R	28L
Daytime	46.9%	11.8%	34.0%	7.2%
Nighttime	62.7%	16.0%	17.4%	3.8%

NOTE: Does not include helicopter operations. Values may not add to 100% due to rounding.
SOURCE: Environmental Science Associates, 2018; Broward County Aviation Department, ANOMS data for calendar year 2016.

A closure of Runway 10R-28L during nighttime hours would require all fixed-wing aircraft to operate from Runway 10L-28R at night. Using that information, noise contours were generated representing the changes in noise levels associated with reductions in Runway 10R-28L use at night (10 p.m. to 7 a.m.) with the understanding that an increase in the runway closure period would result in a greater magnitude of change. **Figure D-1** shows the DNL 65, 70, and 75 noise contours associated with the “Runway 10R-28L Nighttime Closure” stakeholder-suggested noise abatement theme, in comparison with the baseline Future Condition (Year 2023) noise contours. The figure also shows residential land uses, which are normally considered to be noncompatible with aircraft noise levels above DNL 65. Furthermore, the figure shows residential properties that were addressed during the 2008 EIS Sound Insulation and Mitigation Program. These residential properties are considered to be compatible with aircraft noise.

As illustrated in **Figure D-1**, elimination of Runway 10R-28L use at night could cause the following changes in the noise environment in the vicinity of FLL:

- To the west of the Runway 10L end, more residential land uses would be located within the DNL 65 contour. This is because closure of Runway 10R-28L would increase overflights of these land uses, which are noncompatible with aircraft noise levels of DNL 65 and higher. Therefore, implementation of the stakeholder-suggested noise abatement theme would cause noncompatible land uses to increase. The inset within **Figure D-1** shows the baseline and noise abatement theme contours in this vicinity; and

- To the west of the Runway 10R end, less residential land uses would be located within the DNL 65 contour due to the closure of Runway 10R-28L at night. However, these residential land uses have already been considered under the 2008 EIS Sound Insulation and Mitigation Program and were either sound-insulated or determined already compatible with aircraft noise.

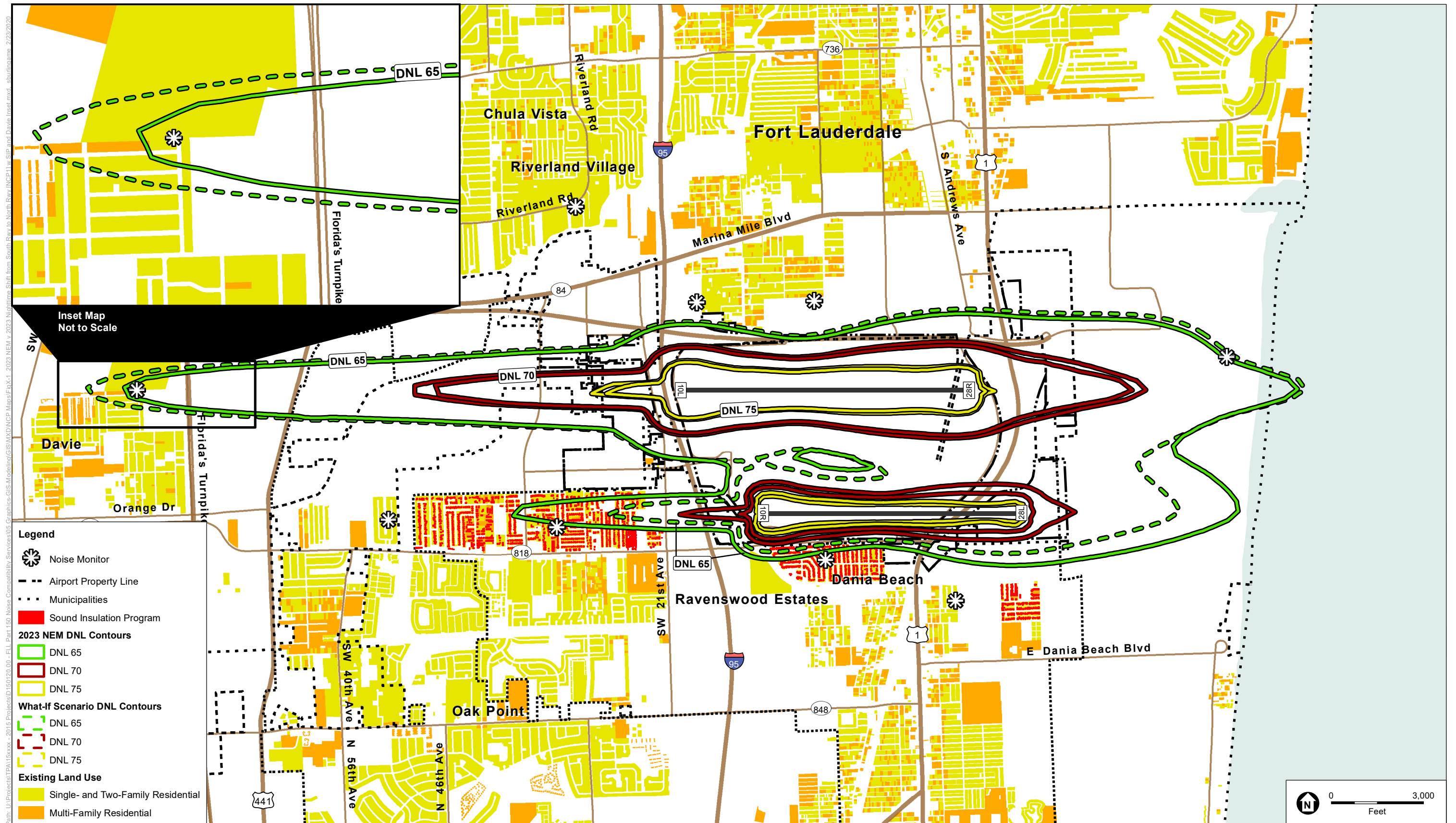
Implementation of the stakeholder-suggested “Runway 10R-28L Nighttime Closure” noise abatement theme could increase noncompatible land uses in the vicinity of FLL in comparison with baseline Future Condition (Year 2023) aircraft operations.

D.2 Stakeholder-Suggested Noise Abatement Theme #2: Reduce or Eliminate Early Northward Turns During West-Flow Conditions

A number of aircraft departures overfly residential areas located immediately northwest of FLL. FAA air traffic controllers instruct aircraft to execute early northward turns for a variety of reasons, including the maintenance of safe separation between aircraft, the efficient use of airspace, and the need to integrate FLL departures with aircraft departing from and arriving to other airports, such as MIA. Numerous stakeholders suggested reducing or eliminating northward turns in the immediate vicinity of FLL while operating in west-flow conditions, therefore requiring aircraft to turn farther out from the Airport and at a higher altitude. The intended effect of this proposed measure would be to reduce overflights of residential areas primarily located immediately northwest of the Airport and to keep aircraft in the compatible corridor (immediately south of I-595) longer during climb-out.

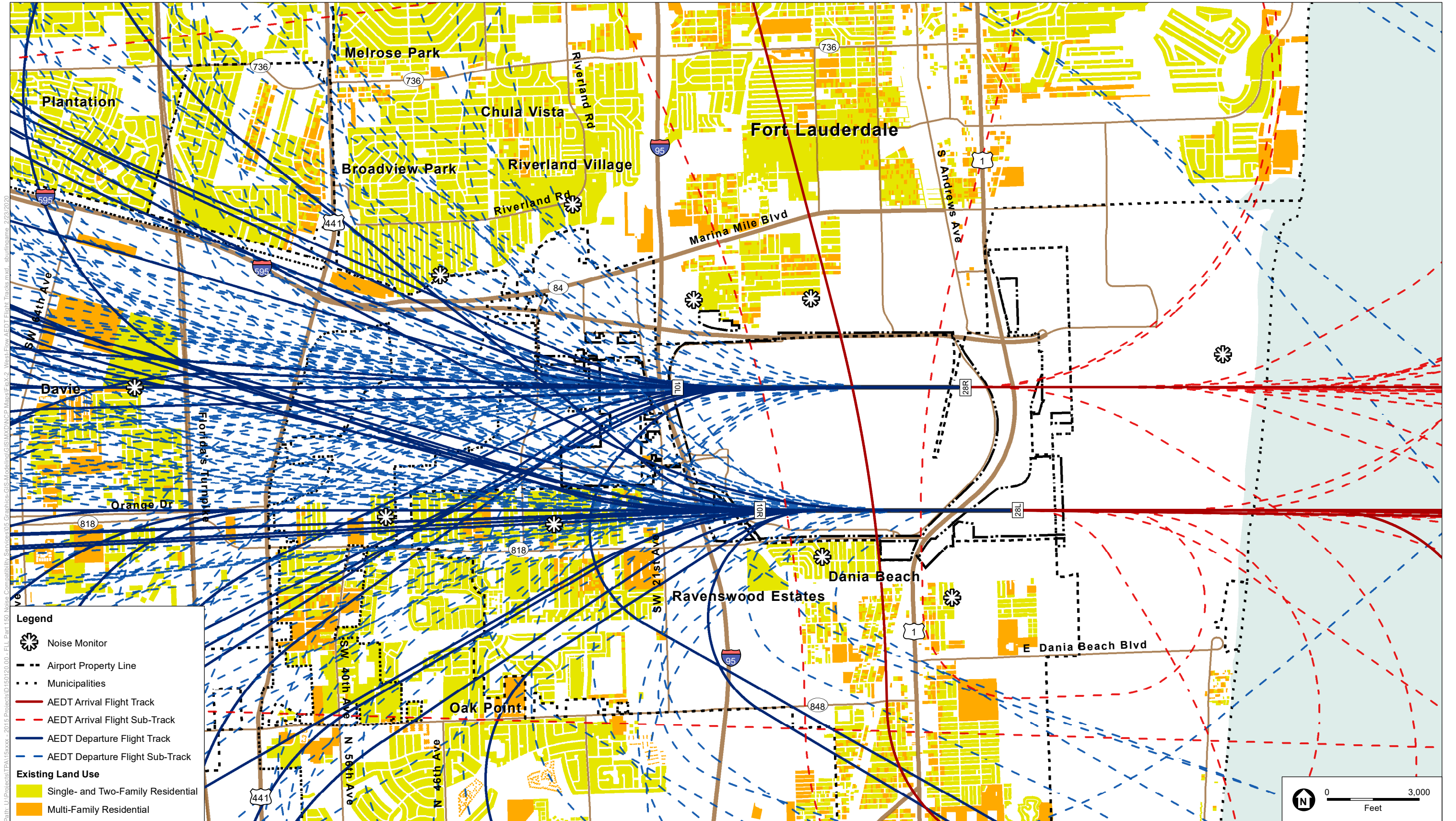
Flight tracks used in the AEDT to model the baseline Future Condition (Year 2023) NEM were developed based on recorded flight paths at FLL, as described in Section 4.5 of the FLL NEM Report. The AEDT flight tracks that represent west-flow departures and arrivals at FLL are shown in **Figure D-2**, and reflect tracks that overlay residential areas located immediately northwest of the Airport. Solid-line flight tracks represent overall aircraft flight path corridors, while dashed-line sub-tracks represent the variation of flight paths (also known as dispersion) within those overall corridors.

BCAD does not have authority to control aircraft in flight. The pilot-in-command of an aircraft has sole responsibility for the safety of his or her aircraft operation. FAA air traffic controllers provide navigation instructions to pilots for a variety of reasons, including separation of aircraft, weather conditions, runway availability, efficiency and capacity needs, and air traffic impacts associated with nearby airports. Therefore, a draft conceptual departure flight procedure provided by the FAA was used to analyze the potential noise impacts of this stakeholder-suggested noise abatement theme by simulating conceptual departure paths for Runway 28L and Runway 28R departures. All west-flow aircraft departures in the baseline Future Condition (Year 2023) that turned northward after departure were assigned to the conceptual departure flight tracks for the purposes of noise modeling. These tracks are shown in **Figure D-3**, along with a comparison between the baseline DNL 65, 70, and 75 contours and the contours that may result if the stakeholder-suggested “Reduce or Eliminate Early Northward Turns During West-Flow Conditions” noise abatement theme were to be implemented.



SOURCE: Esri; Broward County GIS Parcel Data Set, October 2017; AEDT 2d; Adapted by Arora Engineers and ESA, 2020

2023 NEM versus 2023 Nighttime Operations Shift from South Runway to North Runway DNL Noise Contours
Fort Lauderdale-Hollywood International Airport



SOURCE: AEDT 2d; ESA, 2020
 NOTE: AEDT flight sub-tracks are used to replicate readar track dispersion.

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Figure D-2
 West-Flow AEDT Flight Tracks
 Fort Lauderdale-Hollywood International Airport

As depicted in **Figure D-3**, the neighborhoods to the immediate northwest of FLL are outside of the baseline DNL 65, 70, and 75 contours and are therefore considered by the FAA to be compatible with aircraft noise. There is a minimal difference in noise levels between the baseline Future Condition (Year 2023) DNL 65, 70, and 75 contours and the stakeholder-suggested “Reduce or Eliminate Early Northward Turns During West-Flow Conditions” theme noise contours. This is primarily because the majority of aircraft departures at FLL occur to the east, using Runways 10L and 10R, as shown in **Table D-2**.

Implementation of the stakeholder-suggested “Reduce or Eliminate Early Northward Turns During West-Flow Conditions” noise abatement theme could cause minimal changes in noise in comparison with baseline Future Condition (Year 2023) aircraft operations at FLL.

D.3 Stakeholder-Suggested Noise Abatement Theme #3: Maximize Use of Runway Heading for all Arrivals and Departures

Similar to Stakeholder-Suggested Noise Abatement Theme 2, some stakeholders suggested reducing or eliminating aircraft turns in the immediate vicinity of FLL. This measure would place aircraft on the extended runway centerline earlier and keep departures on the extended runway centerline longer during climb-out. The intended effect of this measure would be to reduce aircraft overflights of multiple residential areas in the immediate vicinity of FLL. In particular, aircraft noise concerns were expressed by numerous residents in cities and neighborhoods located immediately northwest of FLL, as well as neighborhoods located northeast of FLL.

Flight tracks used in the AEDT to model the baseline Future Condition (Year 2023) NEM were developed based on recorded flight paths at FLL, as described in Section 4.5 of the FLL NEM Report. The AEDT flight tracks that represent west-flow departures and arrivals at FLL are shown in **Figure D-2** and the flight tracks that represent east-flow departures and arrivals at FLL are shown in **Figure D-4**.

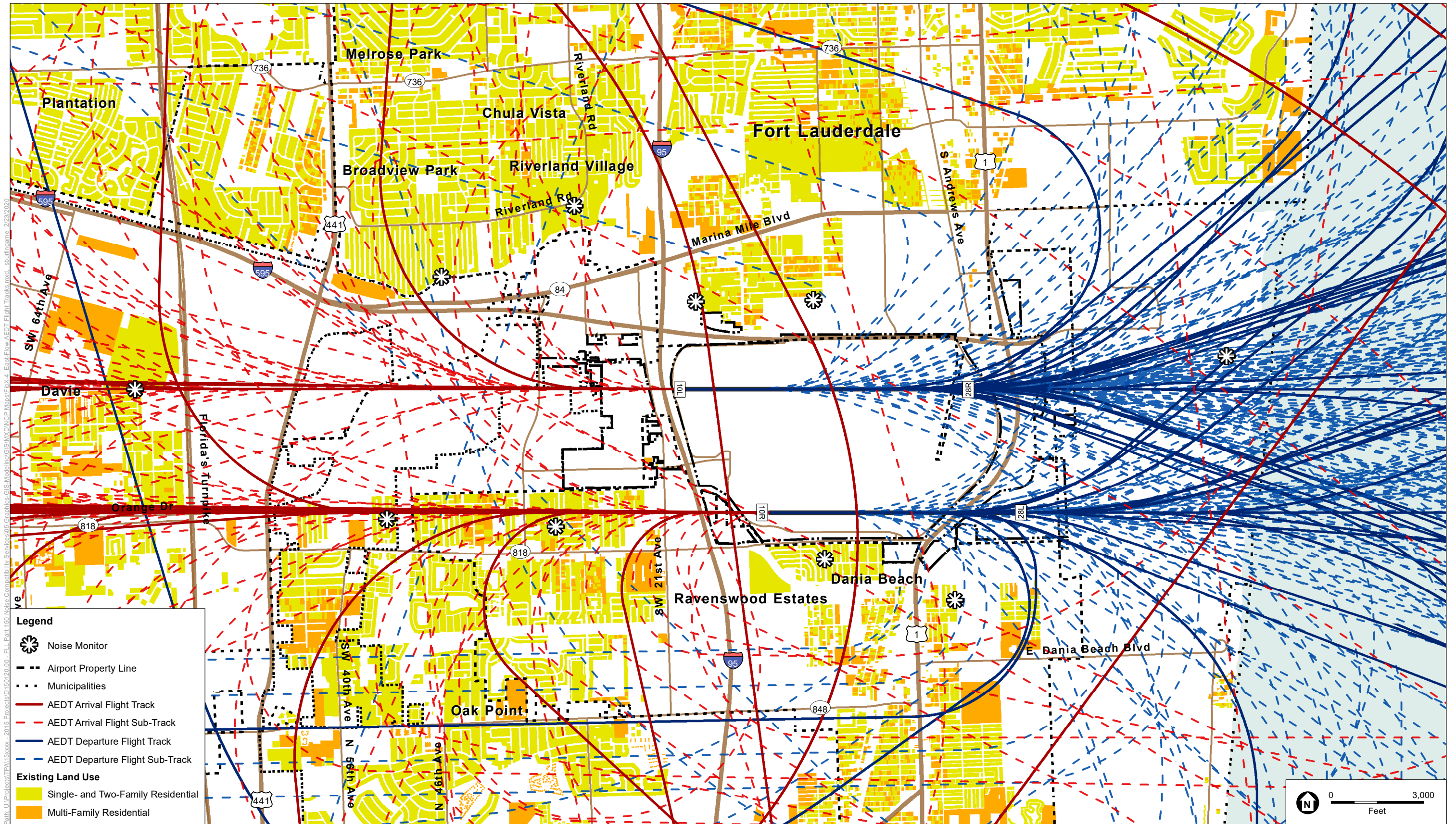
To analyze the potential noise impacts of this stakeholder-suggested noise abatement theme, a hypothetical modeling scenario was generated assuming that all aircraft departure and arrival operations in the immediate vicinity of FLL would be instructed to remain on the runway heading. Some dispersion was modeled for departures to represent the effects of crosswinds (which would cause aircraft to drift from the runway extended centerline even when maintaining a runway heading). Dispersion was also modeled for arrivals to represent positional corrections used by pilots to keep aircraft on the runway extended centerline. These hypothetical tracks are shown in **Figure D-5**. It is important to note that elimination of all aircraft turns in the immediate vicinity of FLL is unfeasible. BCAD does not have authority to control aircraft in flight. The pilot-in-command of an aircraft has sole responsibility for the safety of his or her aircraft operation. FAA air traffic controllers provide navigation instructions to pilots for a variety of reasons, including separation of aircraft, weather conditions, runway availability, efficiency and capacity needs, and air traffic impacts associated with nearby airports. Therefore, the purpose of analyzing this stakeholder-suggested “Maximize Use of Runway Heading for all Arrivals and Departures” noise abatement theme is to explore the maximum hypothetical change that could occur in the FLL noise environment if aircraft turns in the immediate vicinity of FLL were reduced.

Figure D-6 shows the DNL 65, 70, and 75 contours associated with implementation of the stakeholder-suggested “Maximize Use of Runway Heading for all Arrivals and Departures,” along with the baseline Future Condition (Year 2023) noise contours. The figure also shows residential land uses, which are normally considered to be noncompatible with aircraft noise levels above DNL 65. Furthermore, the figure shows residential properties that have been sound-insulated or otherwise addressed as a result of the 2008 EIS Sound Insulation Program. These residential properties are considered to be compatible with aircraft noise.

As illustrated in **Figure D-6**, the neighborhoods to the immediate northwest and northeast of FLL are outside of the baseline DNL 65, 70, and 75 contours and are therefore considered by the FAA to be compatible with aircraft noise. Implementation of the stakeholder-suggested “Maximize Use of Runway Heading for all Arrivals and Departures” could cause the following changes in the FLL noise environment:

- There is a visually-observed reduction in the DNL 65 contour immediately northeast of FLL, but this reduction occurs over compatible land uses;
- There is a minimal difference in noise levels between the baseline Future Condition (Year 2023) DNL 65, 70, and 75 contours and the stakeholder-suggested “Maximize Use of Runway Heading for all Arrivals and Departures” theme noise contours immediately northwest of FLL. This is primarily because the majority of aircraft departures at FLL occur to the east, using Runways 10L and 10R, as shown in **Table D-2**;
- To the west of the Runway 10L end, more residential land uses would be located within the DNL 65 contour, which are noncompatible with aircraft noise levels of DNL 65 and higher. Therefore, implementation of the stakeholder-suggested noise abatement theme would cause noncompatible land uses to increase. Addition of noncompatible land uses to the DNL 65 contour would occur because use of the hypothetical “runway heading” flight tracks would place more aircraft operations over these land uses; and
- To the west of the Runway 10R end, residential land uses would also increase within the DNL 65 contour. However, many of these residential land uses have already been sound-insulated and therefore are already considered compatible with aircraft noise.

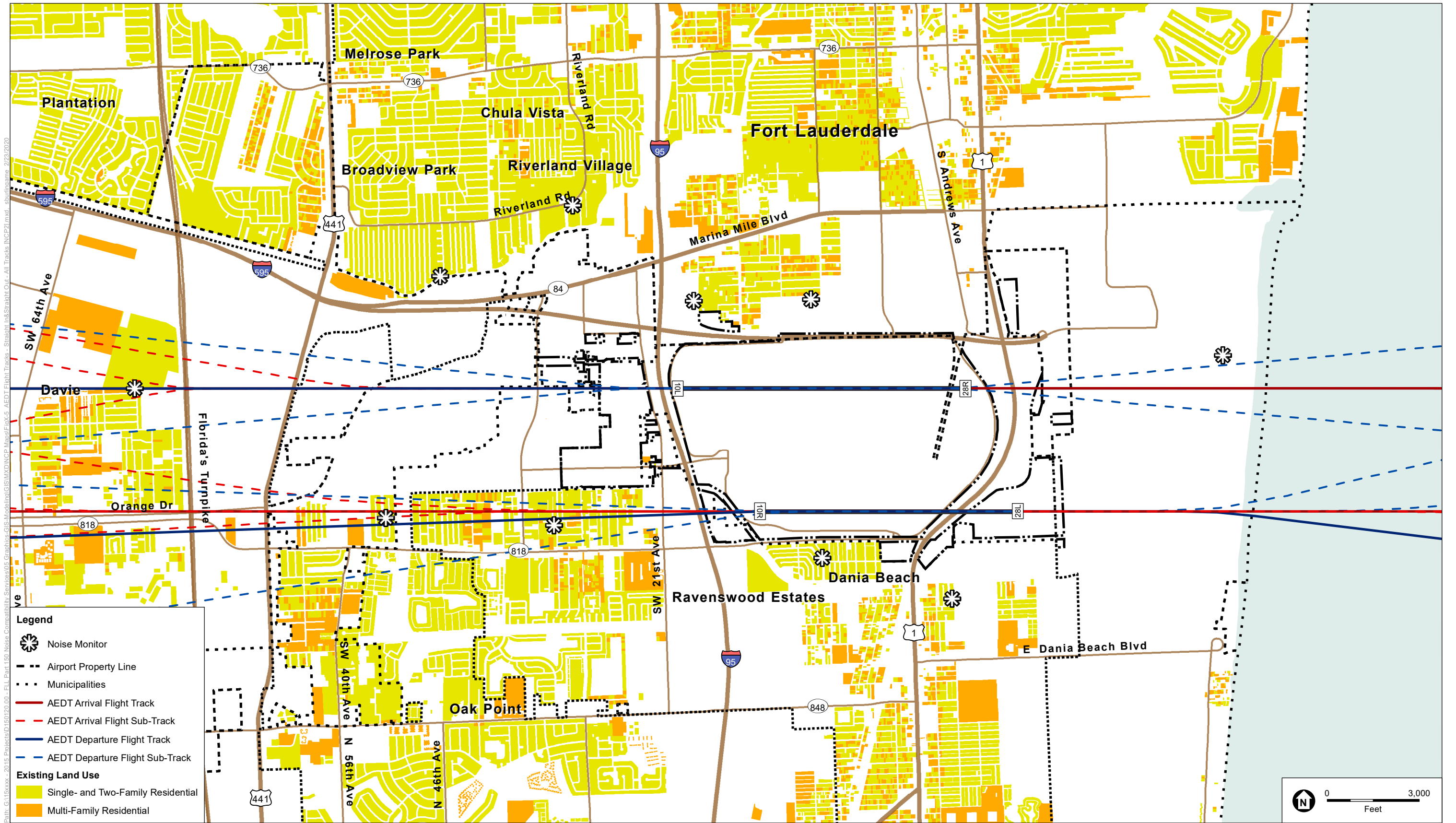
Implementation of the stakeholder-suggested “Maximize Use of Runway Heading for all Arrivals and Departures” noise abatement theme could increase noncompatible land uses in comparison with baseline Future Condition (Year 2023) aircraft operations at FLL.



SOURCE: AEDT 2d; ESA, 2020
 NOTE: AEDT flight sub-tracks are used to replicate readar track dispersion.

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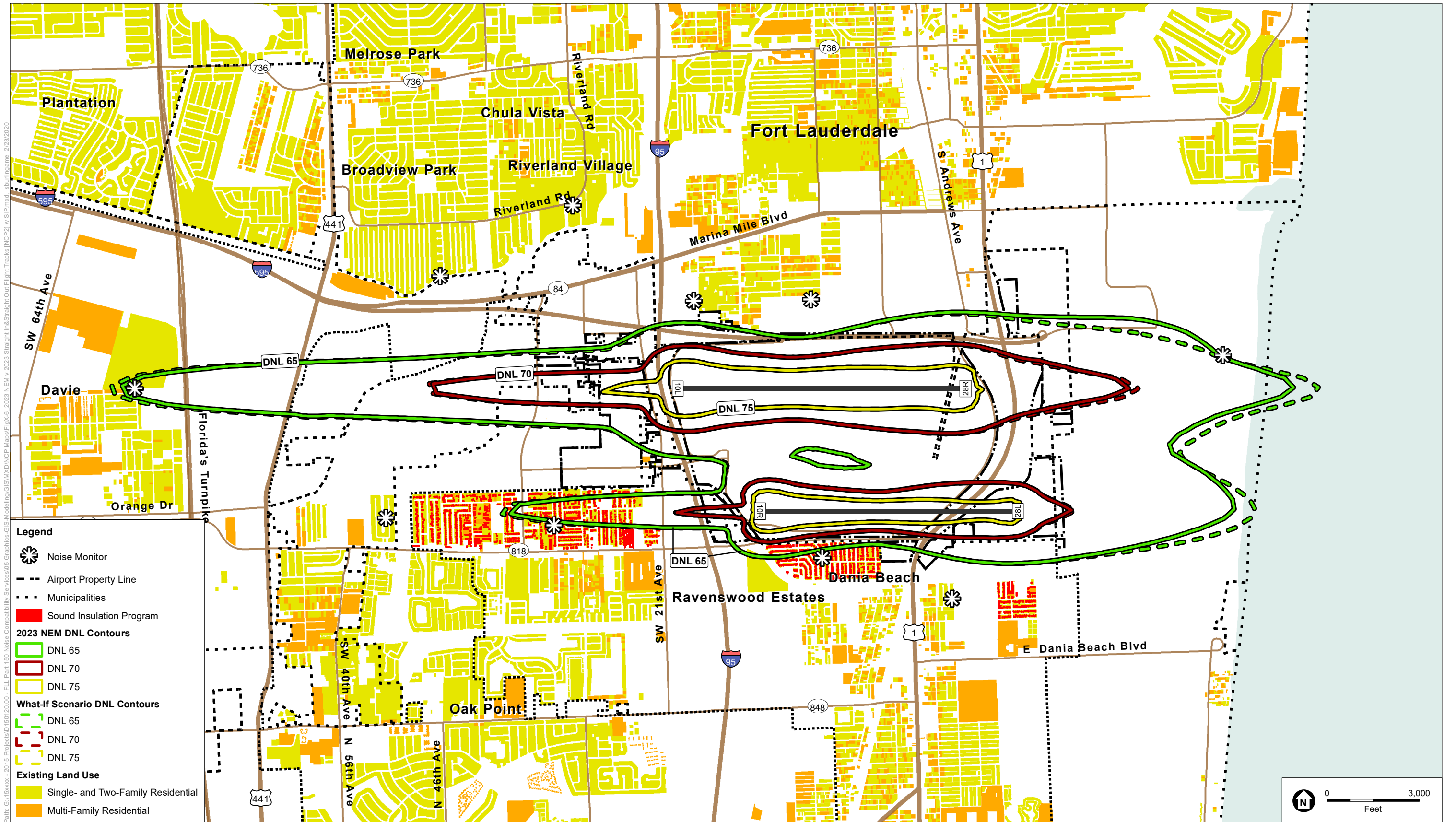
Figure D-4
 East-Flow AEDT Flight Tracks
 Fort Lauderdale-Hollywood International Airport



SOURCE: AEDT 2d; ESA, 2020
 NOTE: AEDT flight sub-tracks are used to replicate radar track dispersion.

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Figure D-5
 AEDT Flight Tracks - Maximize Use of Runway
 Heading For All Arrivals And Departures
 Fort Lauderdale-Hollywood International Airport



SOURCE: Esri; Broward County GIS Parcel Data Set, October 2017; AEDT 2d; Adapted by Arora Engineers and ESA, 2020

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Figure D-6

2023 NEM versus 2023 Maximize Use of Runway Heading
For All Arrivals And Departures DNL Noise Contours
Fort Lauderdale-Hollywood International Airport

D.4 Stakeholder-Suggested Noise Abatement Theme #4: Implement Steeper Departure Climb Gradients

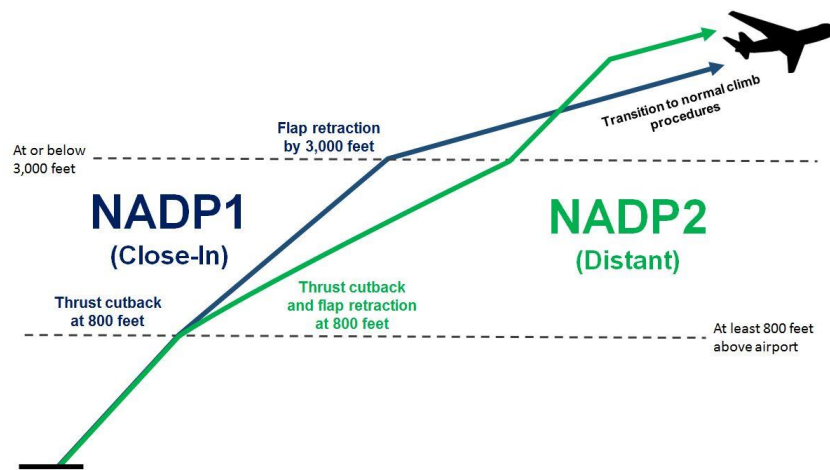
Several stakeholders suggested increasing the climb gradient for all departures. The intended effect of this proposed measure would be to place departing aircraft at higher altitudes in close proximity to FLL, thereby reducing the intensity and duration of noise events in noise-sensitive areas in the immediate vicinity of the Airport. For analysis, the Study Team assumed that such a measure would be implemented through the use of the close-in noise abatement departure procedure (frequently referred to as “NADP1”) described in FAA Advisory Circular (AC) 91-53A. The close-in noise abatement departure procedure contrasts with the distant noise abatement departure procedure (frequently referred to as “NADP2”) described in the same AC; NADP1 is intended to reduce aircraft noise levels over communities closer to an airport while NADP2 is intended to reduce aircraft noise levels over communities farther from an airport. Conceptual illustrations of NADP1 and NADP2 are shown in **Figure D-7**.

BCAD does not have authority to mandate the use of specific noise abatement departure procedures. It’s also important to note that airlines often request that only one NADP be designated for an airport to reduce pilot confusion. To analyze how aircraft noise impacts in the vicinity of FLL might change if NADP1 were implemented for aircraft departures, a hypothetical noise model was developed where a generic NADP1 procedure, as described in FAA AC 91-53A, was assigned to the top five most frequently-occurring aircraft types forecasted to use FLL in 2023. These aircraft types represent 73% of aircraft operations forecasted to occur in 2023 and include:

- Airbus A320-200 Series;
- Boeing 737-800 Series;
- Airbus A321-200 Series;
- Boeing 737-700 Series; and
- Embraer ERJ190.

Actual NADP procedures are specific to aircraft and operator. For the purposes of noise modeling, the baseline departure procedures were retained for the remaining aircraft types.

Figure D-7
General Overview of NADP1 (Close-In) and NADP2 (Distant)



SOURCE: FAA AC 91-53A; ESA, 2019.
 NOTE: Graphic not to scale.

Figure D-8 shows the DNL 65, 70, and 75 contours associated with implementation of the stakeholder-suggested “Implement Steeper Departure Climb Gradients” noise abatement theme, along with the baseline Future Condition (Year 2023) noise contours. The figure also shows residential land uses, which are normally considered to be noncompatible with aircraft noise levels above DNL 65. Furthermore, **Figure D-8** shows residential properties included in the 2008 EIS Sound Insulation Program. These residential properties are considered to be compatible with aircraft noise.

As illustrated in **Figure D-8**, implementation of the stakeholder-suggested “Implement Steeper Departure Climb Gradients” noise abatement theme could cause the following changes in the FLL noise environment:

- To the west of the Runway 10L end, more residential land uses would be located within the DNL 65 contour. These residential land uses are noncompatible with aircraft noise levels of DNL 65 and higher. Therefore, implementation of the stakeholder-suggested noise abatement theme would cause noncompatible land uses to increase. **Figure D-8** contains an upper inset box, which depicts this change in noise exposure. The addition of noncompatible land uses to the DNL 65 contour would occur because aircraft flying an NADP1 procedure reduce their climb rates in order to accelerate to cruising speed while overflying these areas. This aspect of aircraft operation increases noise levels; and
- To the west of the Runway 10R end, more residential land uses would also be located within the DNL 65 contour, which is depicted in the lower inset box in **Figure D-8**. However, many of these residential land uses have already been sound-insulated and therefore are already considered compatible with aircraft noise.

Implementation of the stakeholder-suggested “Implement Steeper Departure Climb Gradients” noise abatement theme could increase noncompatible land uses in comparison with baseline Future Condition (Year 2023) aircraft operations at FLL.

D.5 Stakeholder-Suggested Noise Abatement Theme #5: Evaluate the 2013 Interlocal Agreement Voluntary Night Closure Provision

As described in **Section 2.1** of this NCP, the 2013 Interlocal Agreement between the City of Dania Beach and Broward County contains a “Voluntary Night Closure” of Runway 10R-28L, which is in effect between the hours of 10:30 p.m. and 6:00 a.m. Because the program has been in effect for several years, the Existing Condition (Year 2018) and baseline Future Condition (Year 2023) NEMs depict the effects of the program on runway use at FLL. Fixed-wing aircraft arrival runway utilization for FLL is shown in **Table D-1** and fixed-wing aircraft departure runway utilization is shown in **Table D-2**.

The 2013 Interlocal Agreement stipulates, in part, the following:

“b. The Voluntary Night Closure shall remain in effect until a new Part 150 noise study ("New Part 150 Study") for the Airport is completed by the County and the FAA has made a determination based on the New Part 150 Study. The FAA's determination as a result of the New Part 150 Study shall establish whether or not the Voluntary Night Closure of the Expanded South Runway will remain in effect and, if so, for what periods of time and under what conditions. In order to ensure that the New Part 150 Study sufficiently considers the impact of the Voluntary Night Closure, the County shall not commence the New Part 150 Study before eighteen (18) months following the Runway Opening Date, unless the County determines it is required to do so pursuant to other legal obligations.”

c. The County agrees that in the development of the New Part 150 Study, as described in subparagraph 2(a)(iii)(b), above, the County will include the Voluntary Night Closure as an abatement measure to be analyzed as part of such New Part 150 Study. The County further agrees that it will include continuation of the Voluntary Night Closure in its recommendations to the FAA in connection with such New Part 150 Study unless the City agrees in writing to the contrary.”

To analyze how the FLL noise environment may change if the Interlocal Agreement nighttime runway use program were not in place, a hypothetical noise modeling scenario was produced by assuming that nighttime (10:00 p.m. to 7:00 a.m.) runway use would be the same as daytime runway use if the Interlocal Agreement nighttime runway use program were removed. Using that scenario, noise contours were generated representing the potential changes in the noise environment associated with the stakeholder-suggested noise abatement theme.

Figure D-9 shows the DNL 65, 70, and 75 noise contours associated with the “Evaluate the 2013 Interlocal Agreement Voluntary Night Closure Provision” stakeholder-suggested noise abatement theme, in comparison with the baseline Future Condition (Year 2023) noise contours. **Figure D-9** also shows residential land uses, which are normally considered to be noncompatible with aircraft noise levels above DNL 65. **Figure D-9** also shows residential properties included within the 2008 EIS Sound Insulation/Mitigation Program footprint. These residential properties are considered to be compatible with aircraft noise.

As illustrated in **Figure D-9**, removal of the 2013 Interlocal Agreement nighttime runway use program could cause the following changes in the noise environment in the vicinity of FLL:

- To the west of the Runway 10L end, residential land uses would no longer be located within the DNL 65 contour, which is shown in the upper inset box of **Figure D-9**. These residential land uses are noncompatible with aircraft noise levels of DNL 65 and higher. Removal of the residential land uses from the DNL 65 contour could occur because removal of the 2013 Interlocal Agreement nighttime runway use program may increase use of Runway 10R-28L at night and reduce use of 10L-28R; and
- To the west of the Runway 10R end, residential land uses would increase within the DNL 65 contour. However, many of these residential land uses have already been addressed as part of the 2008 EIS Sound Insulation/Mitigation Program and therefore are already considered compatible with aircraft noise, which is shown in the lower inset box of **Figure D-9**.

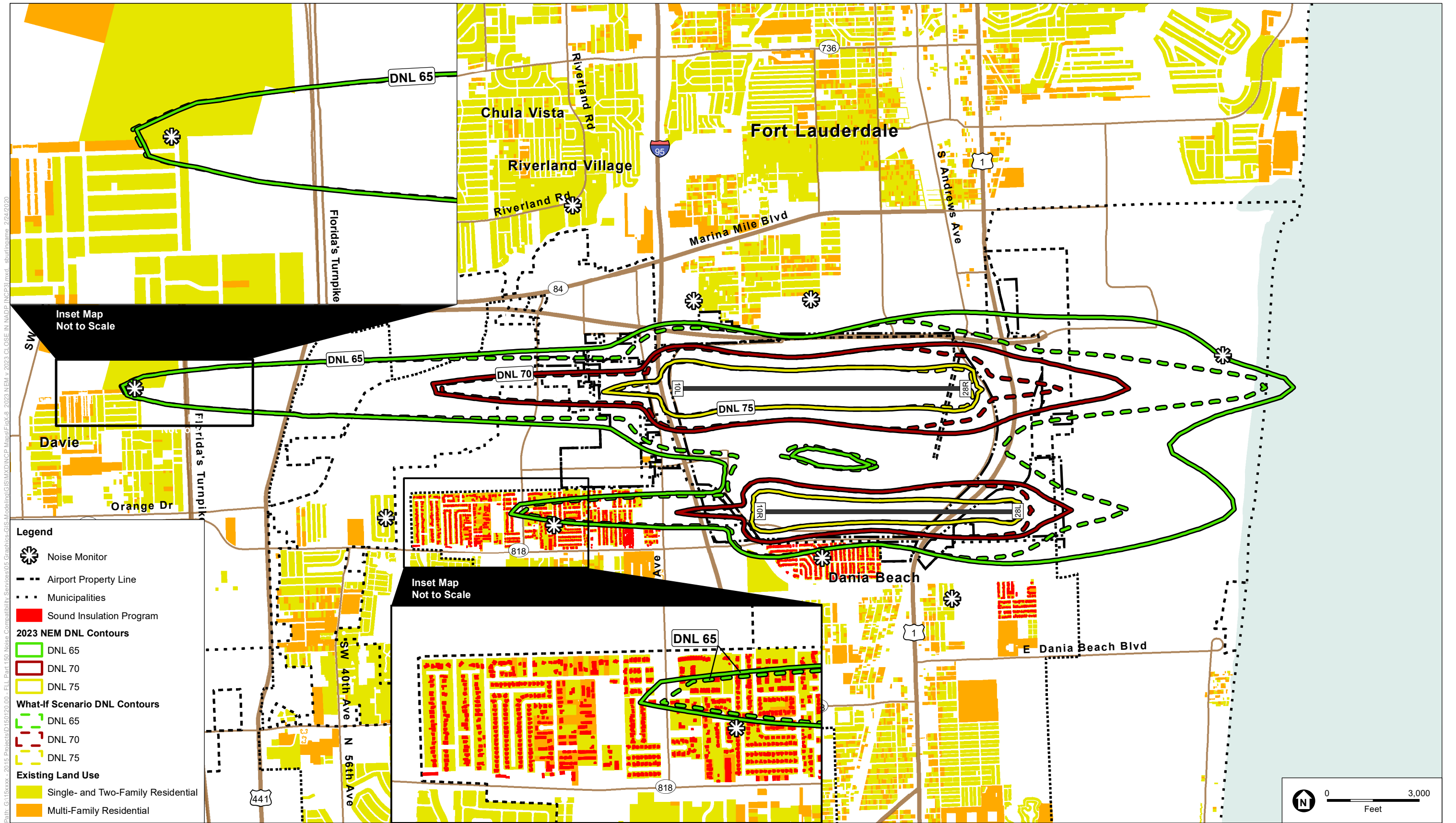
Analysis of the stakeholder-suggested “Evaluate the 2013 Interlocal Agreement Voluntary Night Closure Provision” noise abatement theme shows that noncompatible land uses could be reduced if the 2013 Interlocal Agreement Voluntary Night Closure were not in place.

D.6 Increase Altitudes of Aircraft Arrivals to FLL in East-Flow Conditions

A number of stakeholders expressed concerns about aircraft altitudes and noise levels farther to the west of FLL. These residential areas are located far outside the DNL 65 contour associated with FLL aircraft operations, as shown in **Figure D-10**. However, the Study Team recognizes the annoyance caused by aircraft overflights at altitudes lower than expected. Increasing aircraft altitudes has the potential to reduce annoyance of overflow communities.

To analyze the altitudes of aircraft, east-flow commercial aircraft arrival flight track data was reviewed. Those flight tracks are shown in **Figure D-11** for the peak day in March 2020, with a color legend to indicate altitudes. It was previously noted that aircraft are well established on a standard 3-degree approach path by the time they reach the final approach fixes (FAF) 5.5 miles from the 10L and 10R runway ends. This is well beyond the limits of the DNL 65 contour. Additionally, there is an RNP approach to Runway 10L--RNAV (RNP) Y Rwy 10L--which provides an OPD to Runway 10L. This OPD procedure, shown in **Figure D-12**, transitions aircraft from the north downwind arrival path and merges with the final approach just west of the FAF. Based on discussions with FAA air traffic control tower staff, this procedure does not appear to be in use due to sequencing challenges. Use of the OPD could reduce community annoyance by keeping aircraft higher and reducing engine thrust, but would have no impact on the DNL 65 contour.

Altitudes as aircraft transition over the western portions of Broward County were reviewed for several time periods, as shown in **Table D-4**. Increasing aircraft altitudes has the potential to benefit all communities in western Broward County, prior to reaching the FAF. The review indicated that, overall, altitudes over communities in western Broward County have actually increased. However, the average minimum altitude for aircraft transitioning from the downwind to the final approach leg decreased between 2016 and 2019. It was also found that aircraft using the north downwind transition to the final approach path at a lower altitude the aircraft already established on the final approach (straight in). The aircraft transitioning from the north downwind are often brought to an altitude at least 1,000 feet lower to provide the required vertical



SOURCE: Esri; Broward County GIS Parcel Data Set, October 2017; AEDT 2d; Adapted by Arora Engineers and ESA, 2020

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Figure D-8

2023 NEM versus 2023 CLOE IN Noise Abatement
Departure Procedure DNL Noise Contours
Fort Lauderdale-Hollywood International Airport

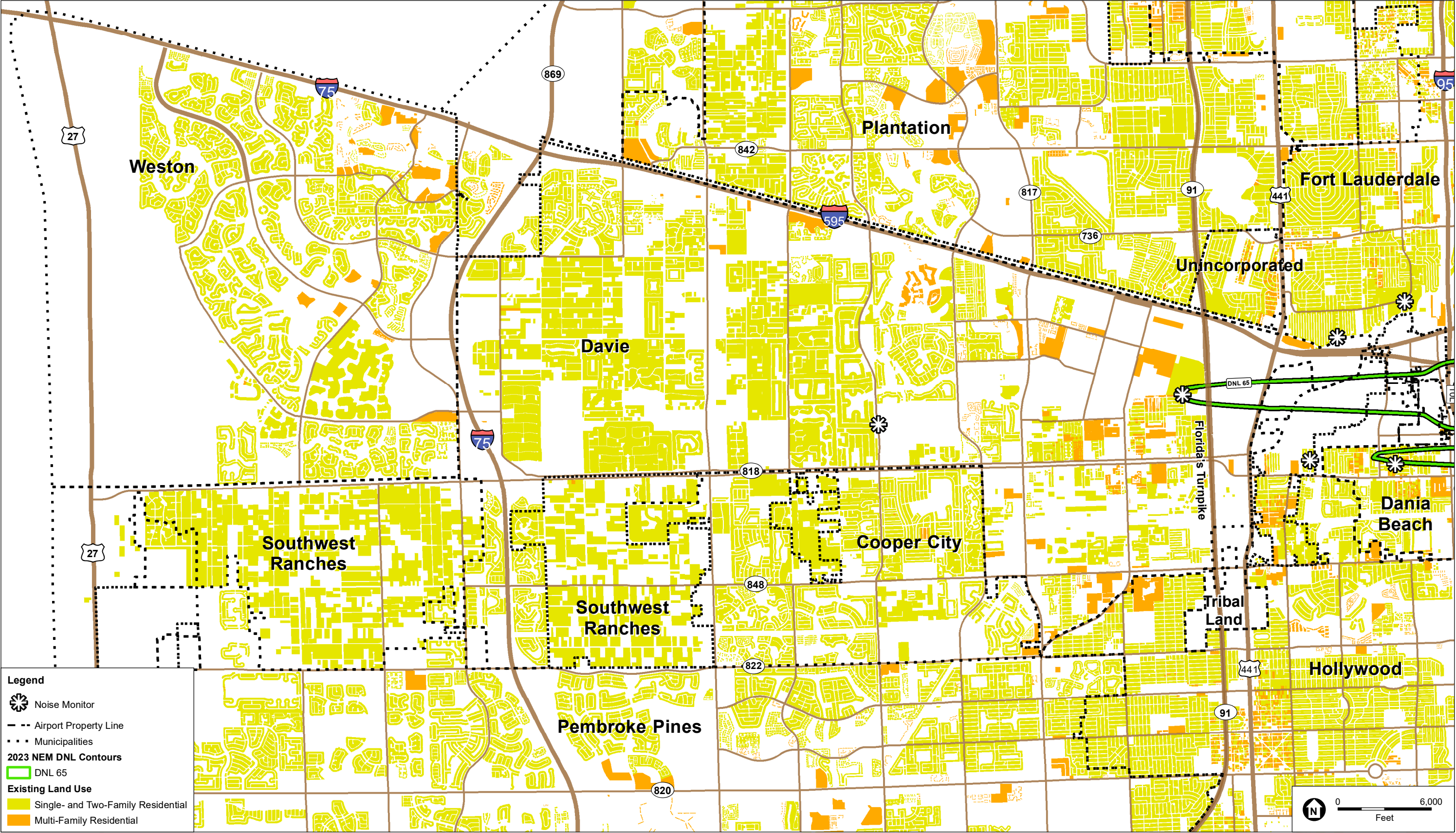


SOURCE: Esri; Broward County GIS Parcel Data Set, October 2017; AEDT 2d; Adapted by Arora Engineers and ESA, 2020

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Figure D-9

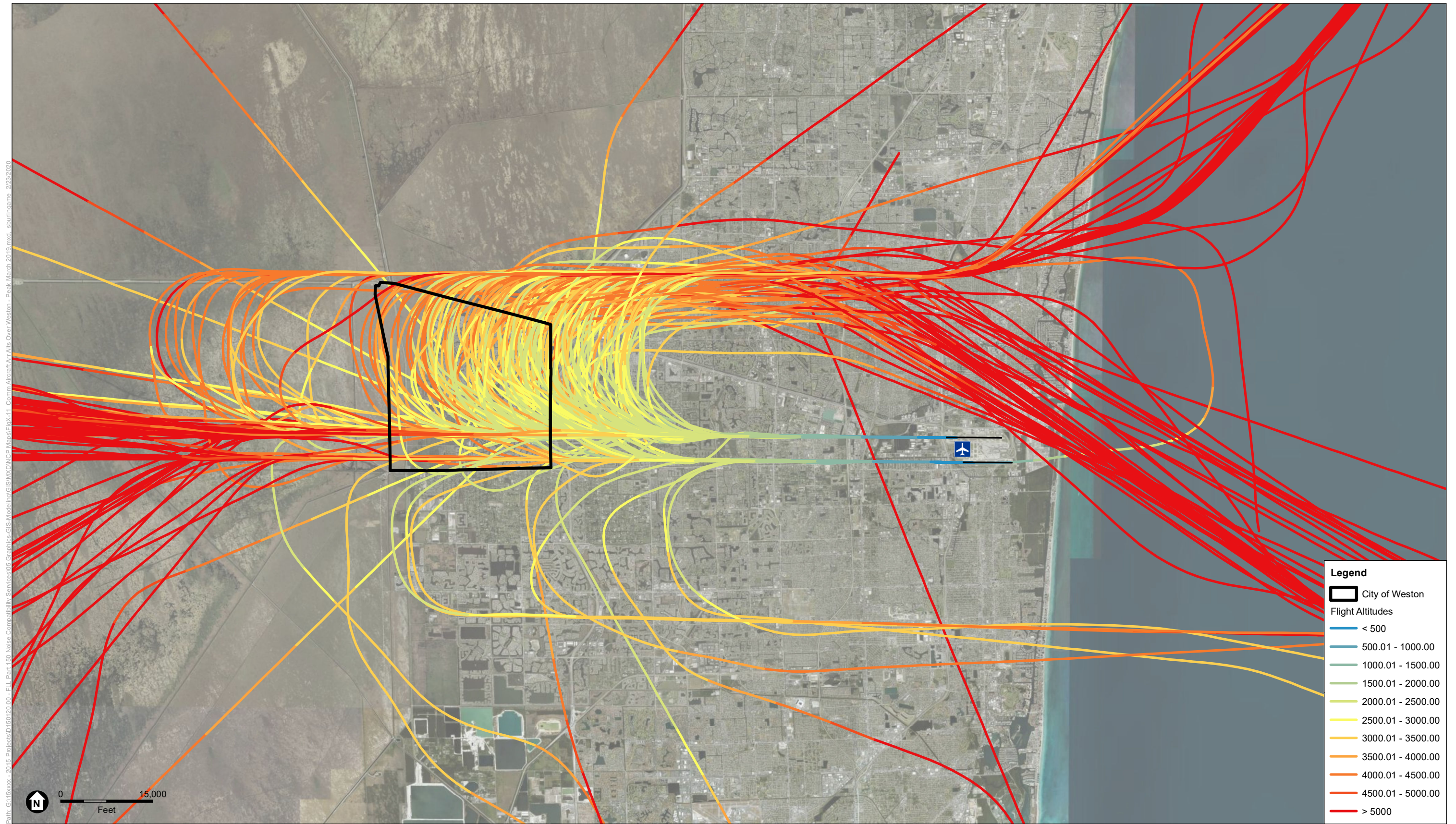
2023 NEM versus 2023 Removal of Interlocal Agreement
Voluntary Nighttime Closure DNL Noise Contours
Fort Lauderdale-Hollywood International Airport



SOURCE: Esri; Broward County GIS Parcel Data Set, October 2017; AEDT 2d; Adapted by Arora Engineers and ESA, 2020

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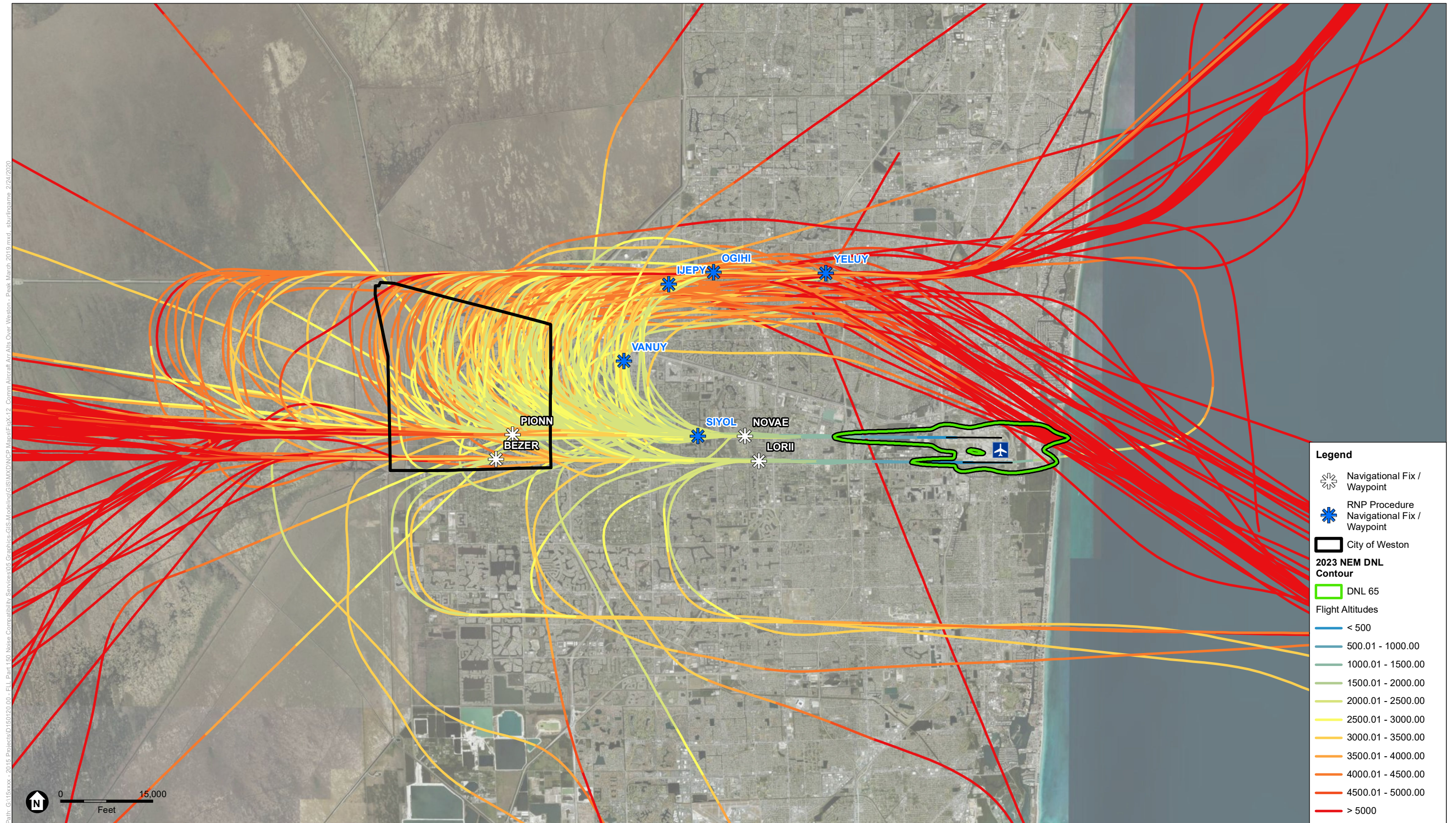
Figure D-10
2023 NEM DNL 65 Noise Contour
Fort Lauderdale-Hollywood International Airport



SOURCE: ESA, 2020

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Figure D-11
 Commercial Aircraft Arrival Altitudes Over Weston
 Peak Day - March 2019
 Fort Lauderdale-Hollywood International Airport



SOURCE: ESA, 2020

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Figure D-12
Commercial Aircraft Arrival Altitudes Over Weston
Peak Day - March 2019
Fort Lauderdale-Hollywood International Airport

separation between the two arrival streams. In November 2019, the FAA implemented a series of operational management techniques to address community concerns regarding noise and aircraft altitudes. The associated analysis showed that altitudes were generally higher in November 2019 than in earlier time periods.

TABLE D-4 COMMERCIAL AIRCRAFT ARRIVAL ALTITUDES OVER WESTERN BROWARD COUNTY				
Type of Arrival	Time Period (Month/Year)	Average Maximum Altitude (ft)	Average Altitude (ft)	Average Minimum Altitude (ft)
All East-Flow Commercial Arrivals over Western Broward County	March/April 2012	3,562	3,301	3,039
	March/April 2016	4,004	3,561	3,119
	March/April 2019	4,082	3,609	3,136
	July 2019	4,234	3,771	3,308
	November 2019	4,384	3,871	3,359
Subset - North Downwind Arrivals over Western Broward County	March/April 2016	3,541	3,145	2,748
	March/April 2019	3,606	3,168	2,730
	July 2019	3,706	3,294	2,882
	November 2019	3,790	3,357	2,923
Subset - Straight-In Arrivals Over Western Broward County	March/April 2016	4,283	3,768	3,253
	March/April 2019	4,412	3,905	3,399
	July 2019	4,608	4,097	3,585
	November 2019	4,704	4,149	3,594
SOURCE: Environmental Science Associates, 2018; Broward County Aviation Department, ANOMS data for 2012, 2016, 2019. Altitudes depicted reflect altitudes of aircraft as they transition the airspace above the City of Weston, the westernmost community in Broward County.				

Analysis of the stakeholder-suggested “Increase Altitudes of Aircraft Arrivals to FLL in East-Flow Conditions” noise abatement theme suggests that aircraft arrival altitudes may be able to be increased, thereby reducing annoyance in communities to the west of FLL. However, these changes would be in areas well outside the DNL 65 contour and have no effect on future noncompatible land uses.