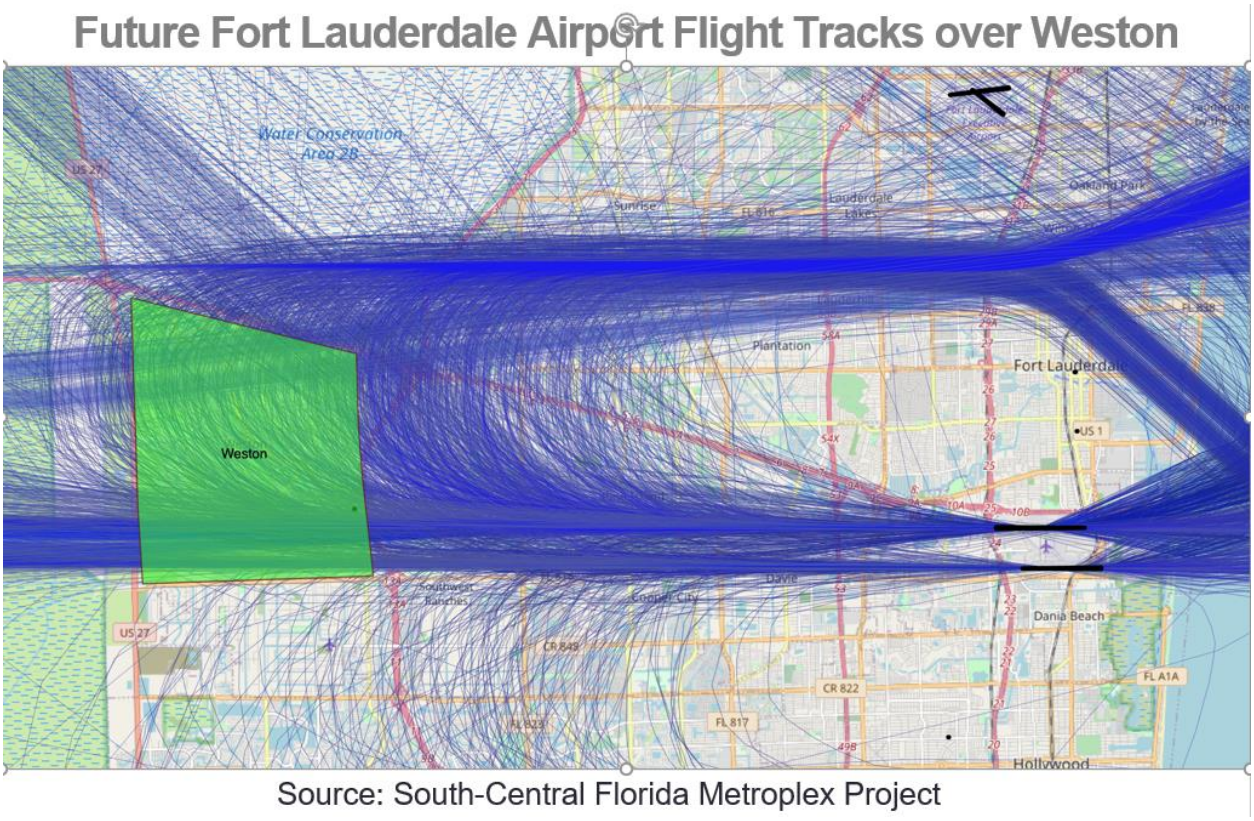
# City of Weston Comments
# Fort Lauderdale-Hollywood International Airport
# Noise Assessment and Recommendations



Source: South-Central Florida Metroplex Project

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## 1. Executive Summary

The purpose of this noise assessment is to conduct a simple noise analysis to quantify and verify noise impacts to the City of Weston and identify alternatives that may reduce aircraft noise impacts for residents of the City of Weston.

The City of Weston resides under the FLL airport approach paths to both runway 10L and 10R. By nature of location, Weston is being exposed to significant overflights of east flow approaches.

Additional factors contributing to Weston noise impact:

- 29.6% of FLL arrivals overfly Weston
- FLL operates in east flow 80% of the time and west flow 20% of the time
- 94.2% of FLL fleet mix are wake vortex class D & E which are quieter aircraft than classes A, B and C
- FLL Aircraft operations are forecast to grow by 48% by 2040
- 18% of FLL aircraft operations occur at night (very high as compared to other airports)
- 73.5% of nighttime arrivals use runway 10 L (lower altitude approach than 10R)
- Nighttime operations are penalized by 10 dB when modeling noise impacts to account for lower thresholds of annoyance at night
- 20% of FLL nighttime arrivals execute a trombone approach
- 80% of FLL nighttime arrivals fly straight in approaches from the west
- Most arrivals over Weston are flying below the altitude dictated by a normal 3 degree glideslope approach angle

8 potential noise mitigation options were identified to study noise relief potential for Weston.

1. Move flights to the west
2. Move all downwind flights 2nm west of the Weston boundary
3. Design an arrival procedure to follow the I-595 corridor
4. Prescribe steeper approaches to runways 10L and 10R to increase flyover altitude
5. Vector nighttime arrivals to the west
6. Mandate RNP RNAV 10L procedure for nighttime arrivals (short trombone)
7. Assign more straight in arrivals
8. Vector option and standard trombones

Option 4, 6 and 8 provide the most relief to all of Weston's residents. Option 1, 2 and 7 provide some relief to north Weston but increase impacts to south Weston. Option 3 is too far removed from conventional approach procedure design to be viable with the FAA. Option 5 will provide for dispersion but it is far less beneficial to Weston than option 6.



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During the study the FAA published new ILS approach procedures on 10L that raised the altitudes as recommended in Option 4.

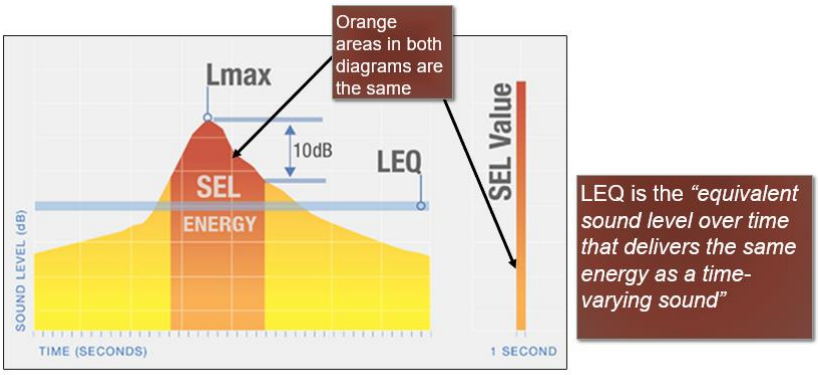
It is recommended that the City of Weston formally request FAA consideration of Options 4, 6 and 8.

## 2. Introduction

This report supplements the City of Weston Comments Fort Lauderdale-Hollywood International Airport 14 CFR Part 150 Draft Noise Compatibility Program Comments and recommendations dated May 14, 2021. The purpose of this noise assessment is to conduct a simple noise analysis to quantify and verify noise impacts to the City of Weston and identify alternatives that may reduce aircraft noise impacts for residents of the City of Weston.

## 3. Background of Noise Metrics Presented

Individual noise event impacts are represented by a Sound Exposure Level (SEL) metric for single flyover events. The FAA defines SEL as: ”a noise metric that represents all the acoustic energy (aka sound pressure) of an individual noise even as if it had occurred within a one second time period”.




Source: https://www.faa.gov/regulations_policies/policy_guidance/noise/basics/

*Figure 1 Sound Exposure Level (SEL)*

Equivalent sound level (LEQ) is the “equivalent sound level over time that delivers the same energy as a time varying sound.

Day Night Average Sound Level (DNL) represents a cumulative exposure to noise events over a 24 hour period. DNL is the integration of multiple SEL events. DNL adds logarithmically SEL events over a 24 hour period. Nighttime events are weighted 10



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dBA over their daytime SEL values (10 times the power of a single daytime event).

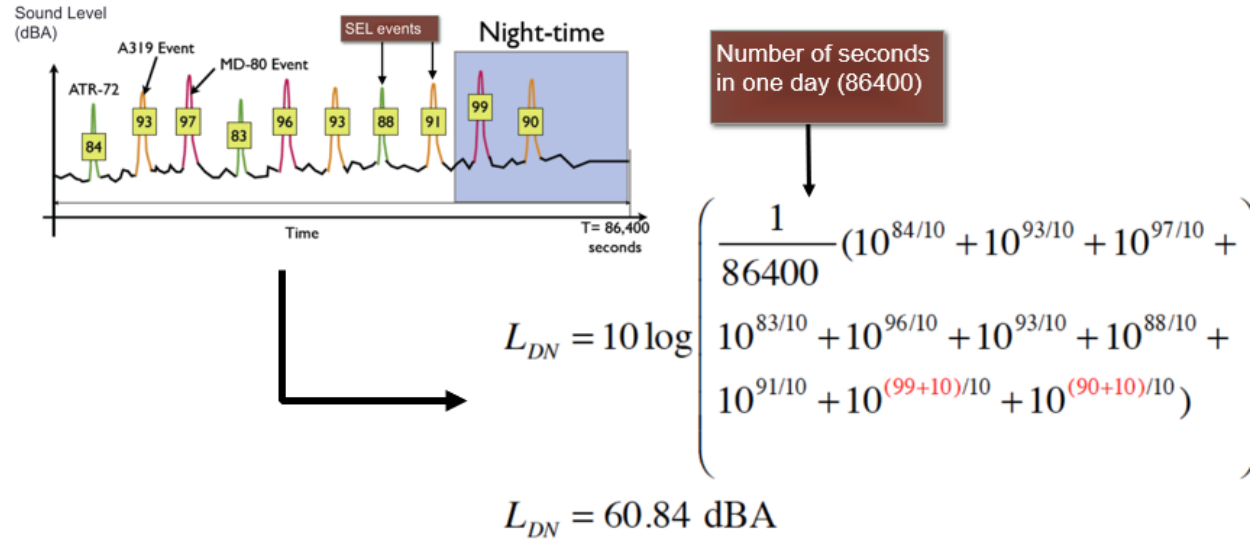


*Figure 2 Day Night Average Sound Level (DNL)*

Day-Night Average Sound Level (DNL) is the metric the FAA utilizes to measure noise impact and evaluate significance of impact.

The FAA utilizes the Airport Environmental Design Tool (AEDT) to model aircraft noise and evaluate impacts. Noise varies with distance to the source as demonstrated below based on AEDT modeling.

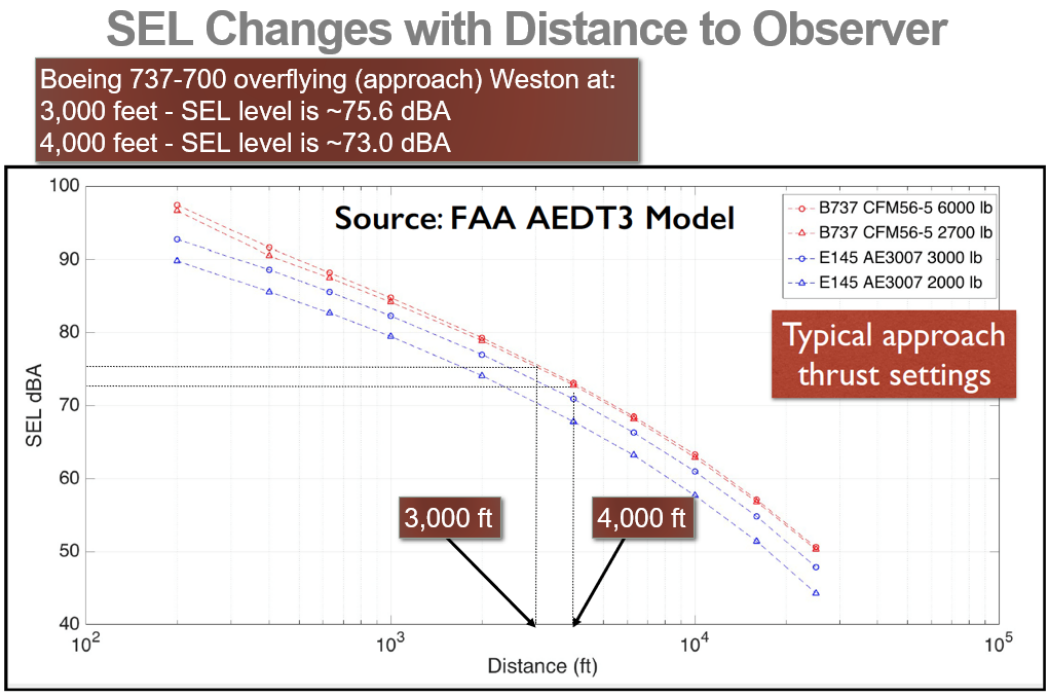


*Figure 3 Airport Environmental Design Tool (AEDT) Sound Exposure Level and Distance to the Observer*



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## 4. Review of Air Traffic Conditions Around the Area

FLL Airport operations rely on two parallel runways. Runway 10L/28R is 9,000' long and 150' wide and runway 10R/28L is 8,000' long and 150' wide. It is important to note that the runways are separated by 4,000', which is 300' short of 4,300' allowing independent simultaneous instrument operations in IFR.

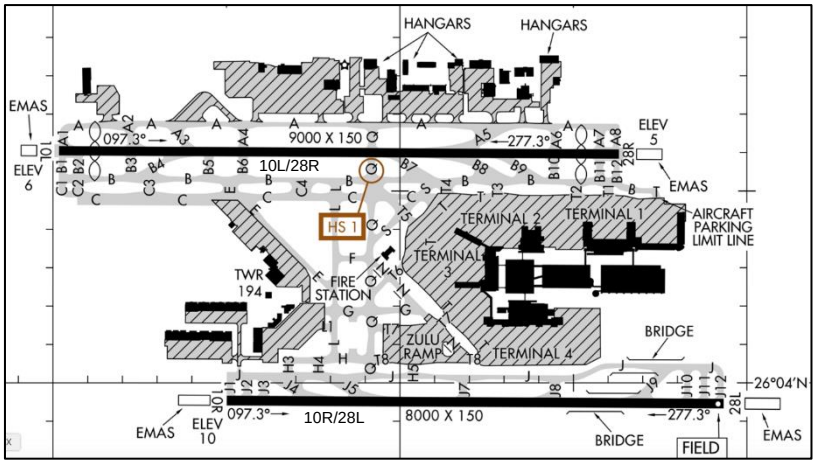
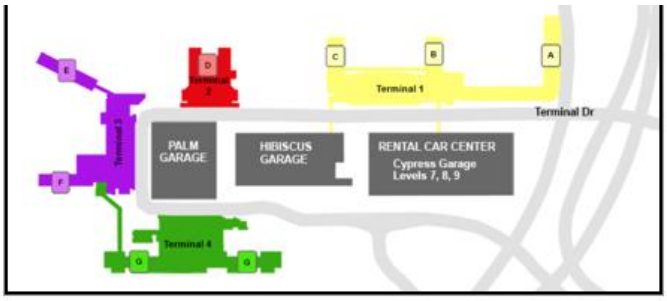



*Figure 4 Fort Lauderdale International Airport (FLL) Airport Diagram*

Current air traffic procedures are providing additional vertical separation between aircraft operating on these runways by assigning a lower elevation to the approaches to 10L. This is producing a higher noise level over the City of Weston.

### FLL Airport Layout

FLL has four terminals, three of which are closer to runway 10L driving runway use patterns at FLL.




| Terminal 1 | Terminal 2 | Terminal 3 | Terminal 4 |
|---|---|---|---|
| Concourses A, B, and C | Concourse D | Concourses E and F | Concourses G |
| Alaska (Departs C) | Air Canada (Departs D) | American (Departs E) | Air Transat (Departs G) |
| Allegiant (Departs C) | Delta (Departs D) | Azul (Departs E and G) | Avianca (Departs G) |
| Bahamasair (Departs C) | | JetBlue (Departs E, F and G) | Caribbean (Departs G) |
| Silver (Departs C) | | Sun Country (Concourse E) | Copa (Departs G) |
| Southwest (Departs A and B) | | Sunwing (Departs E) | IBC (Departs G) |
| Swoop (Departs A) | | | Spirit (Departs E. F, and G) |
| United (Departs C) | | | |
| WestJet (Departs C) | | | |

*Figure 5 FLL Terminal Layout*

Wind conditions also drive runway use. Virgina Tech/FAA Landing Events Database demonstrate FLL operates in East flow 80% of the time and in West flow 20% of the time. Windrose analysis using 20 years of data (2000-2020) validates the runway use patterns.



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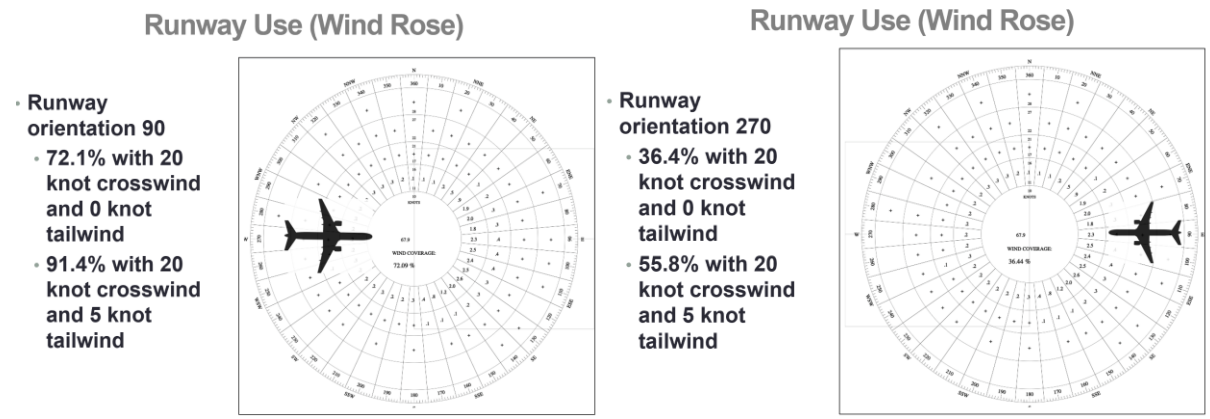


*Figure 6 FLL Wind Rose Analysis*

## FLL Fleet Mix

Noise is a function of aircraft operating at the airport. Larger aircraft create more noise. The FAA classifies aircraft by wake vortex (which contributes to the noise profile of the aircraft) as shown below. 94.2% of the operations at FLL are wake vortex classes D & E.

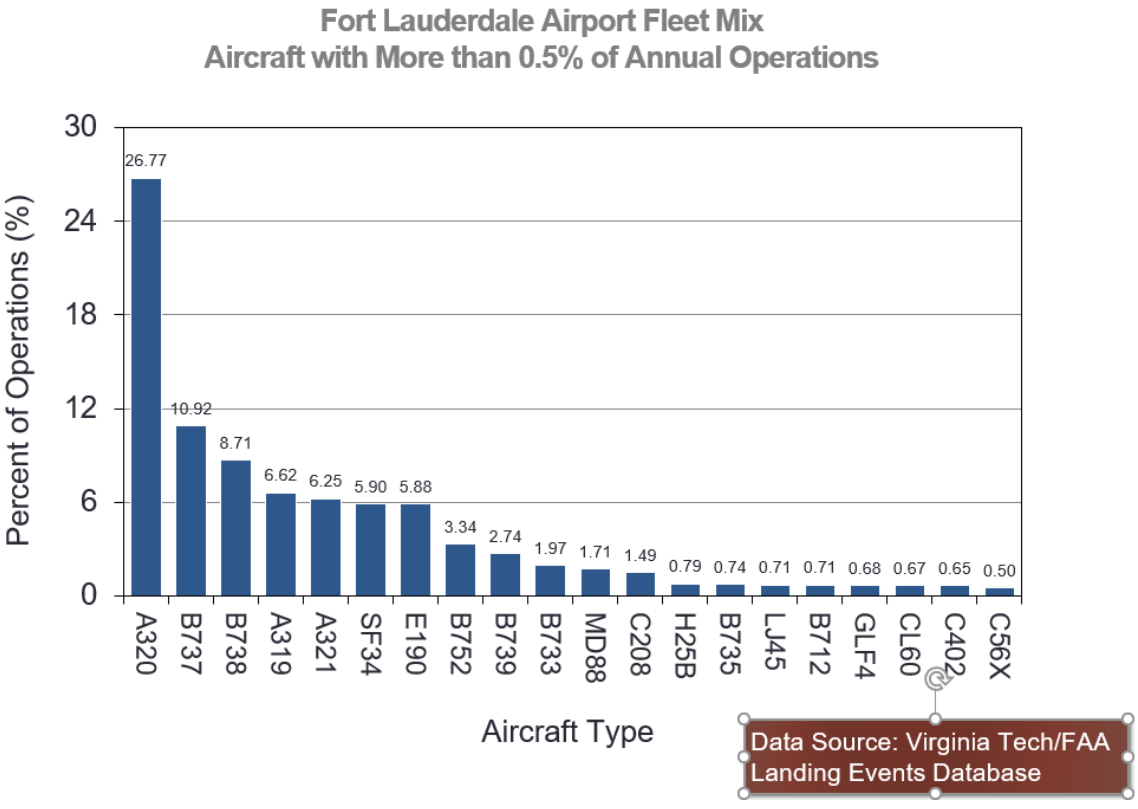


*Figure 7 FLL Fleet Mix*



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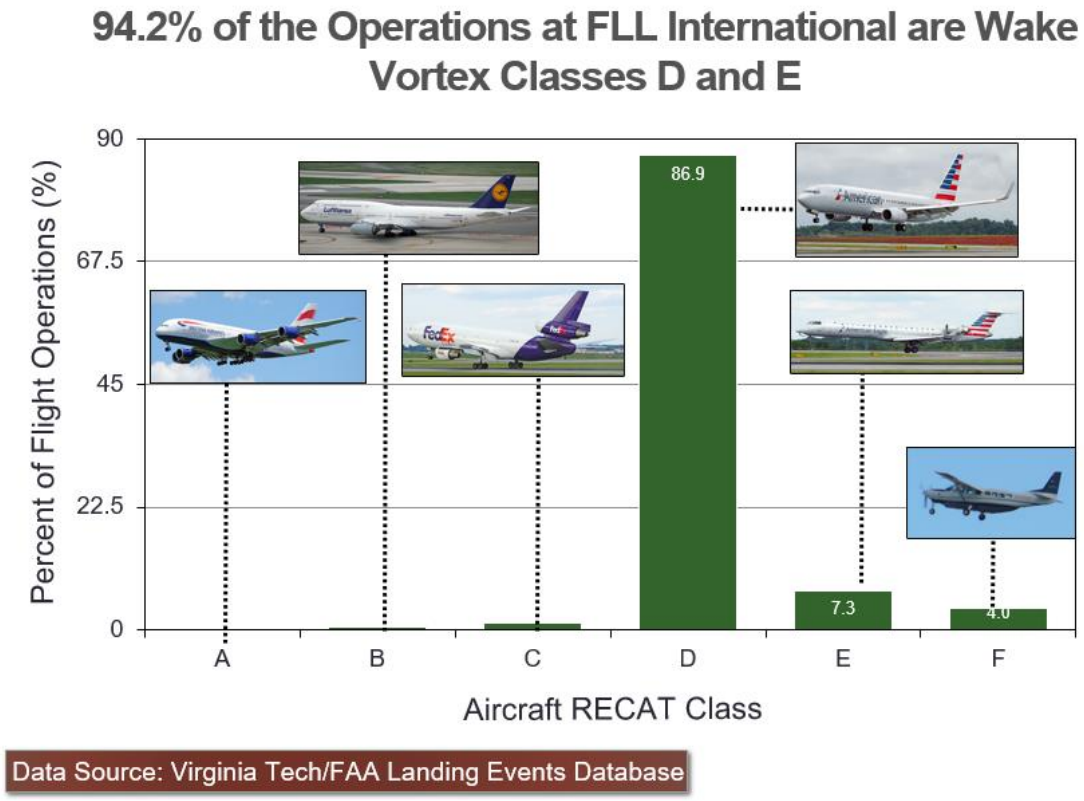


*Figure 8 FLL Percentage Aircraft by Wake Vortex*

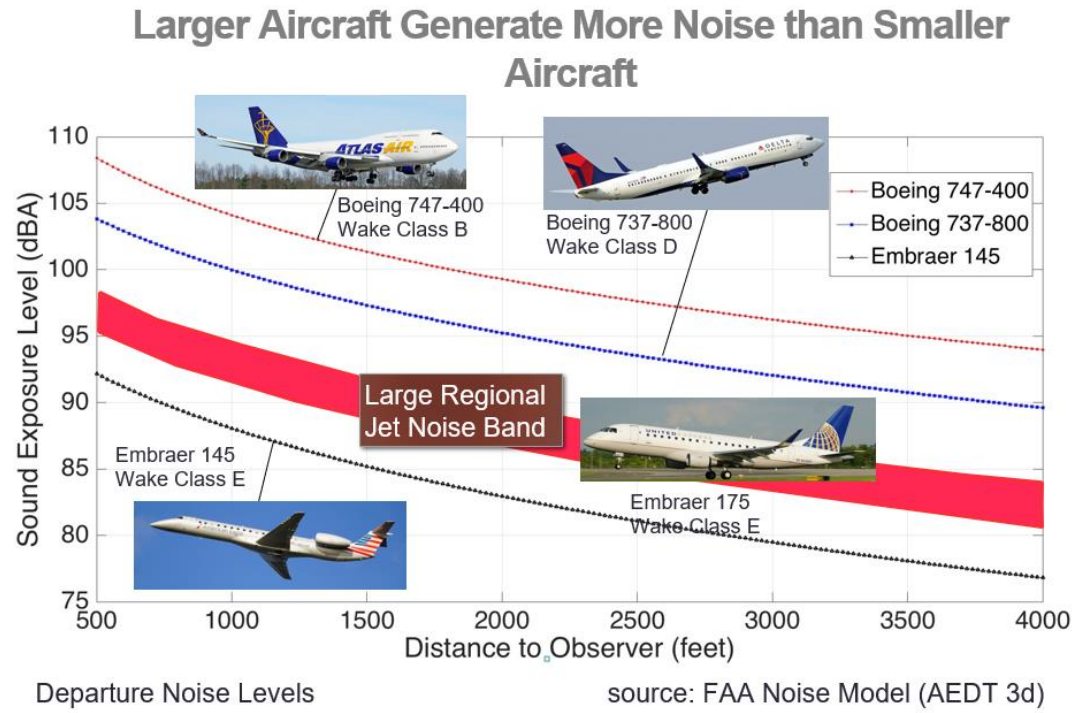


*Figure 9 Sound Exposure Level by Distance to Observer by Aircraft Type*



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## Airport Operations

FLL aircraft operations are forecast to grow 48.6 percent from 333,972 in 2019 to 496,231 by 2040.

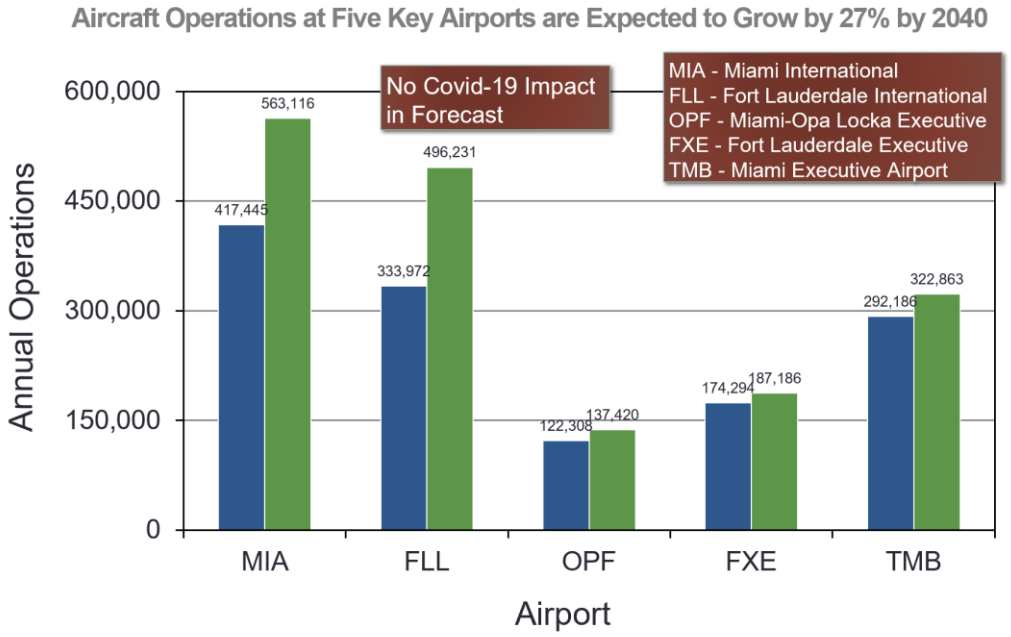


*Figure 10 Five Key Airports Annual Operation Forecast*

# Airport and Airline Operations at FLL

| Airline | Average Daily Arrivals in July 2019 | Terminal | Preferred Arrival Runway | Aircraft Used |
|---|---|---|---|---|
| Southwest | 136 | 1 | 10L | B738, B737 |
| JetBlue | 101 | 3 and 4 | 10L and 10R | E190, A320, A321 |
| Spirit | 86 | 3 and 4 | 10L and 10R | A319, A320, A321 |
| Delta | 32 | 2 | 10L | A319, B752, B738, A321 |
| Allegiant | 11 | 1 | 10L | A320, A319 |
| United | 18 | 1 | 10L | A319, B738, B739, B757 |
| Silver Airways | 38 | 1 | 10L | ATR 42 and Saab 340 |
| Bahamasair | 5 | 1 | 10L | ATR 42, B737 |
| Air Canada | 4 | 2 | 10L | A319, B763 |

*Figure 11 FLL Airport and Airline Operations*



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## Nighttime Operations

18% of FLL aircraft operations occur at night. This is a high number of nighttime operations. For example, Chicago O'Hare International Airport is one of the busiest airports in the nation with significant cargo operations. ORD averaged about 10.5% nighttime operations in 2019.

The number of nighttime operations is important when evaluating noise impacts. Nighttime noise generates higher annoyance levels than daytime noise. In recognition of this higher capacity for annoyance, the FAA requires AEDT to assign a 10dB penalty to each nighttime aircraft operation. Noise is measured on a logarithmic scale. A change of 10dB is the equivalent of doubling the noise energy impact.

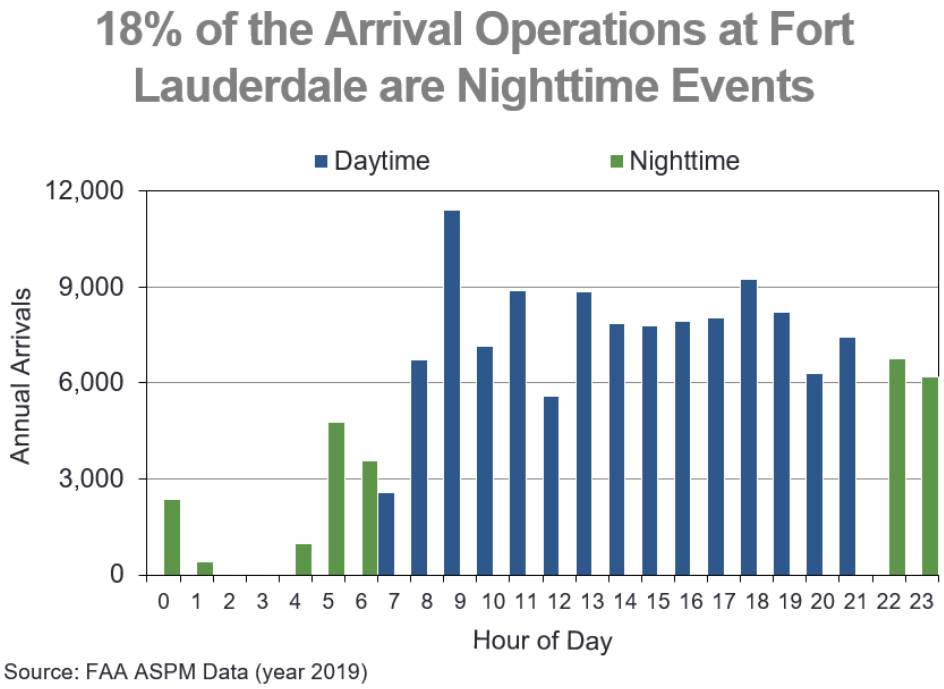


*Figure 12 FLL Annual Aircraft Operations*

20% of the nighttime arrivals are executing a trombone approach to FLL from the east and 80% of the nighttime operations fly straight in from the west.

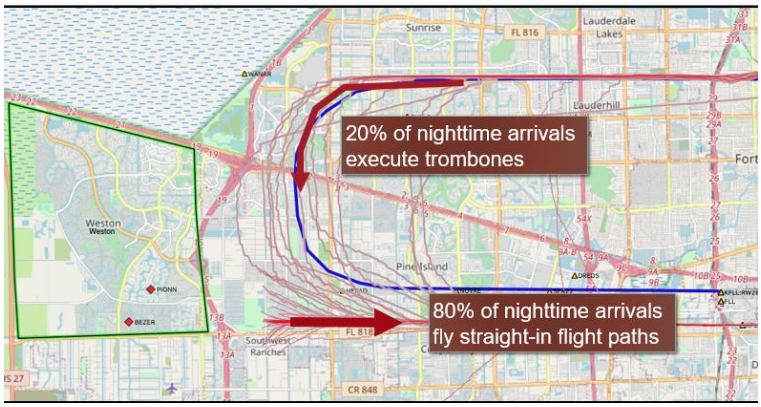


*Figure 13 Trombone Approach FLL*



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## 5. Flight Track Data

Flight track data was collected from Flightaware and the FAA. A sample of 5 days was collected (<5,000 flights). The data was used to validate the South Central Florida Metroplex proposed flight tracks. The month of July 2019 was selected (July 20-21, 2019) to observe lateral dispersion of flights subject to higher temperatures (i.e, reduced climb rates).

Flight track data shows large dispersion of flight tracks. Detailed flight tracks collected extend up to the I-75 corridor or the East boundary of the City of Weston. The flight tracks show detail of overflight altitudes up to the I-75 corridor and 2 miles to the East.

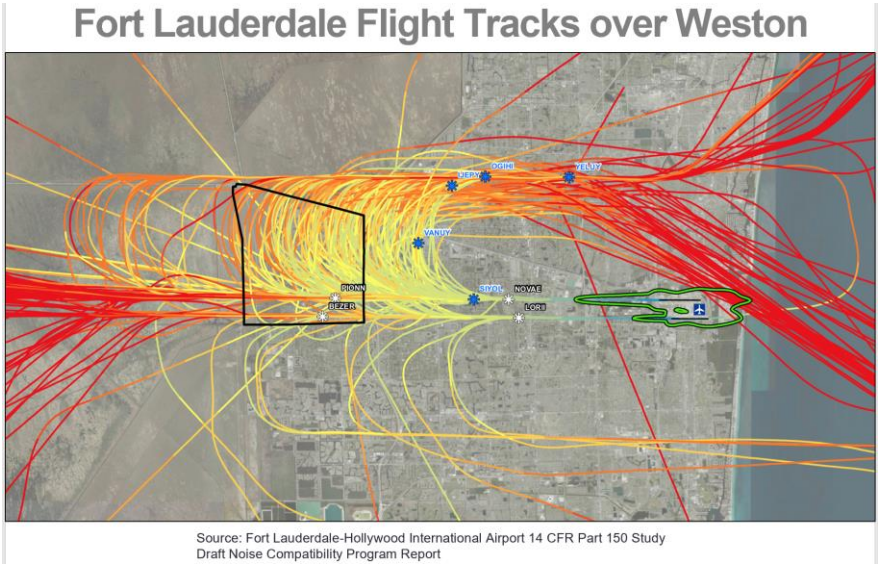


*Figure 14 July 2019 Flight Track Dispersion over Weston*

The profile view of flight track data demonstrates altitudes below what a normal 3 degree glideslope would predict at the east and west boundaries of Weston. These altitudes are consistent with the published approaches shown below.



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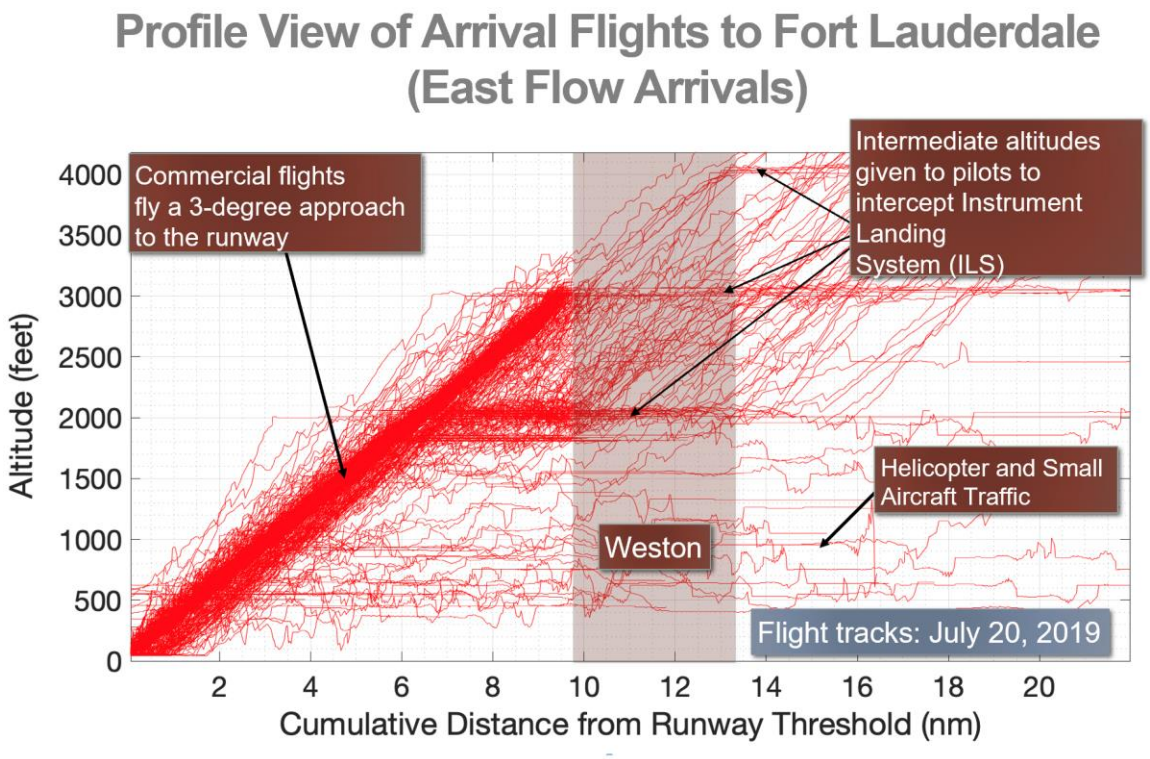


*Figure 15 Profile View of FLL East Flow Arrivals*

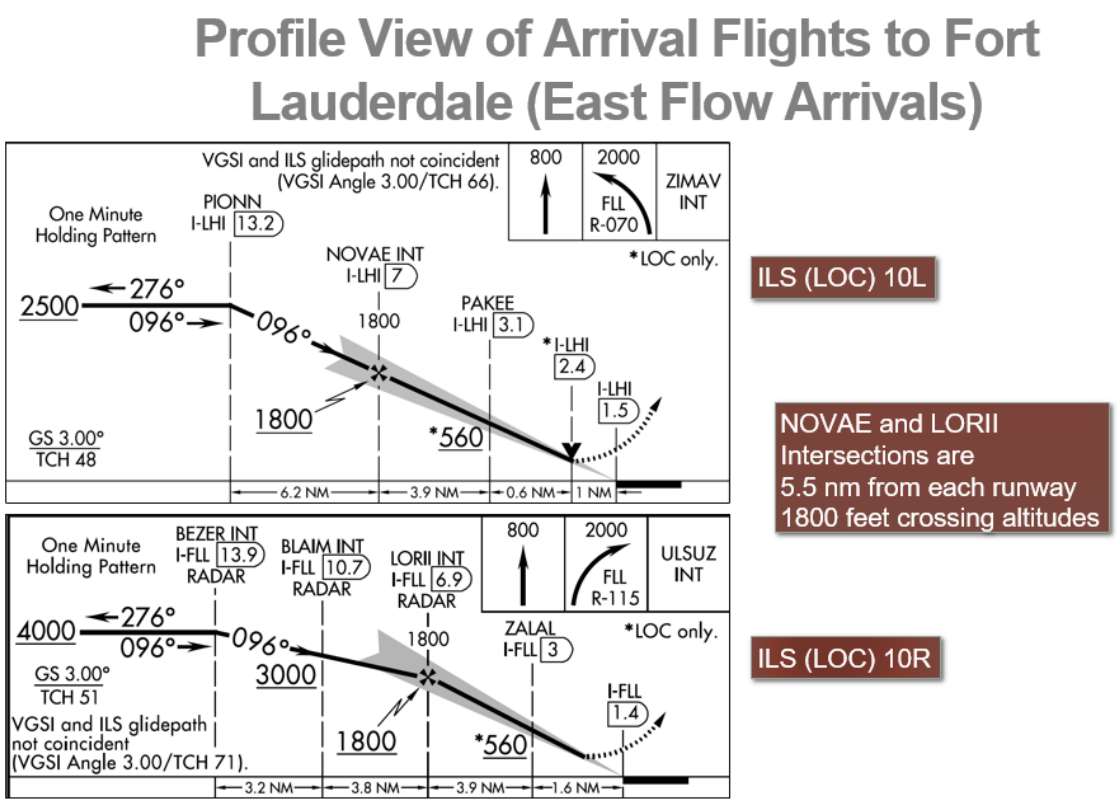


*Figure 16 ILS Procedures to 10L and 10R July of 2021*



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## Profile View of 10L Procedures

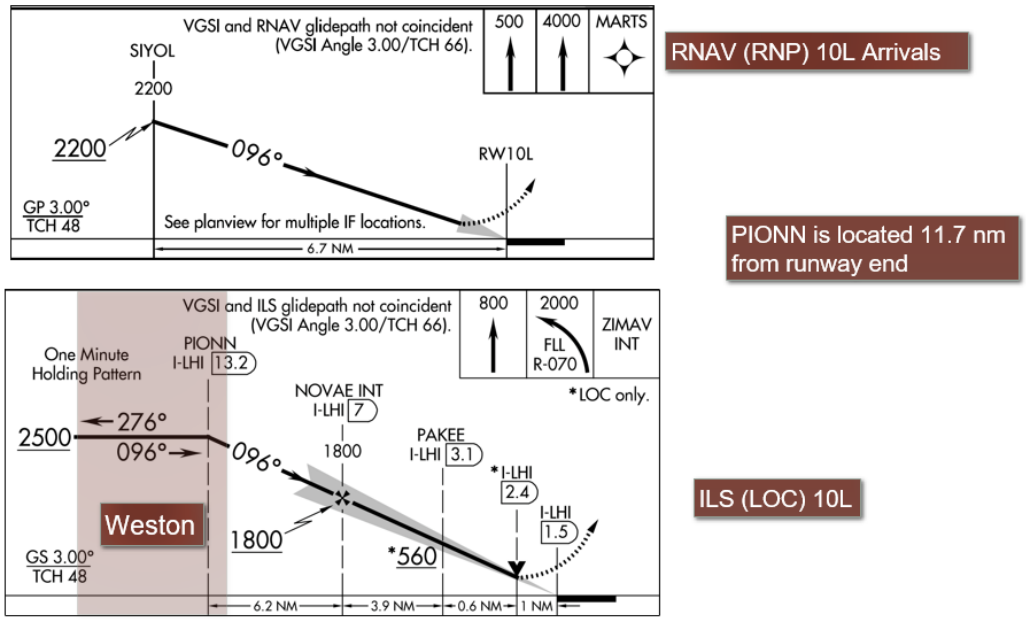


*Figure 17 Profile View of 10 L Procedures*

# Observations from Preliminary Analysis

- We recommend the adoption of recommendation NA-5 in the Fort Lauderdale-Hollywood International Airport 14 CFR Part 150 Study Draft Noise Compatibility Program Report (shown below)

**Conclusions:** *NA-5: Modify Aircraft Arrival Profiles to the West of FLL to Keep Aircraft Higher.* This measure could reduce noise levels outside the DNL 65 contour in residential areas west of FLL. The measure would involve modifying aircraft arrival profiles by raising the altitudes of aircraft transitioning from the downwind to the final legs in east-flow conditions. This measure would not reduce noncompatible land uses within the DNL 65 contour but could reduce annoyance caused by aircraft overflight in residential areas west of FLL.

*Figure 18 Preliminary Analysis Recommendation NA-5 to Keep Aircraft Higher*



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## FLL Air Traffic Control Observations

Webtrak and ATC Live were monitored to better understand dynamics between published procedures and air traffic direction that results in flight path scenarios at FLL.

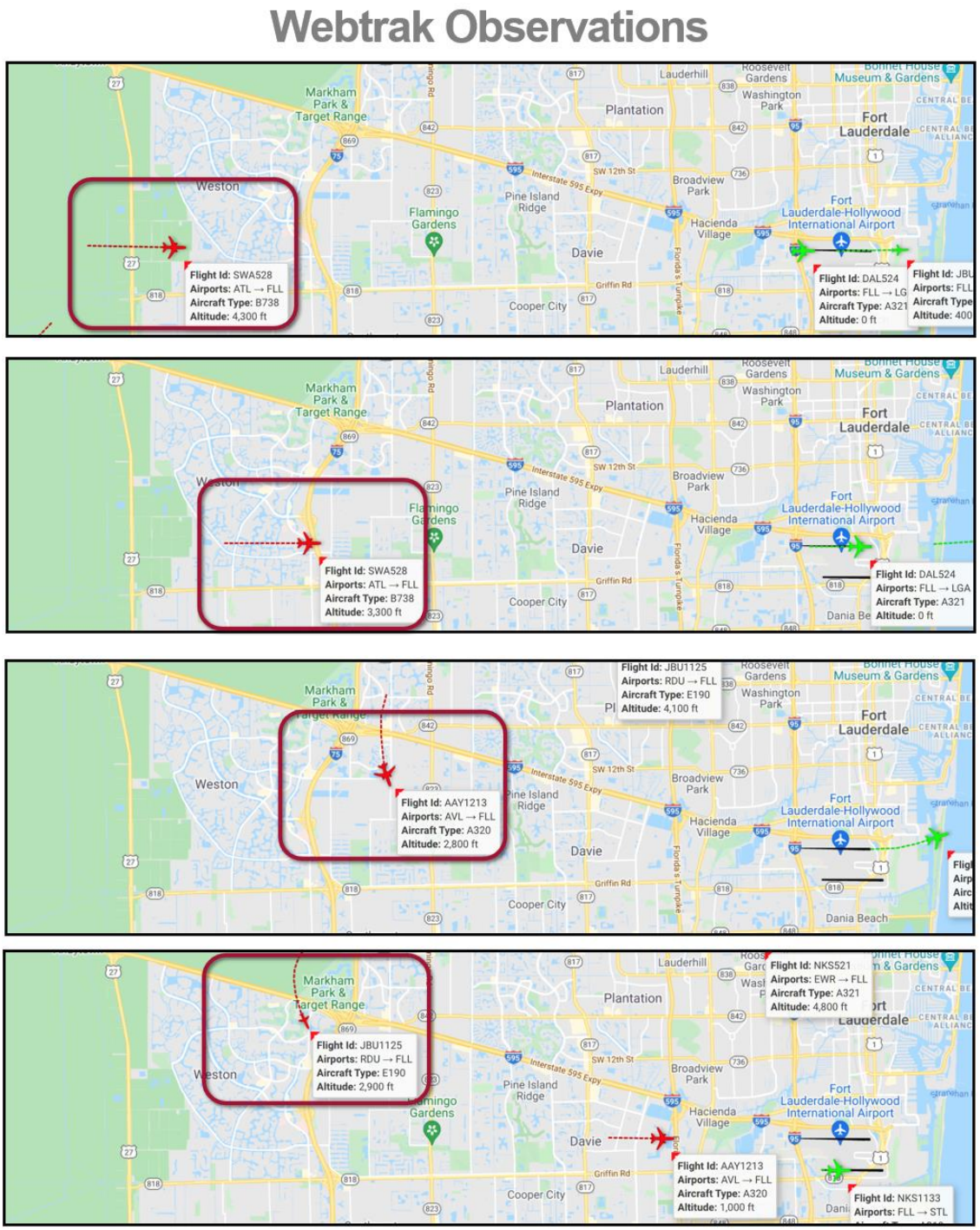


*Figure 19 Webtrak Observations of FLL Arrivals over Weston*

As traffic levels increase, the air traffic control tower must extend trombones over Weston to stage aircraft into the approach pattern to runways 10R and 10L.



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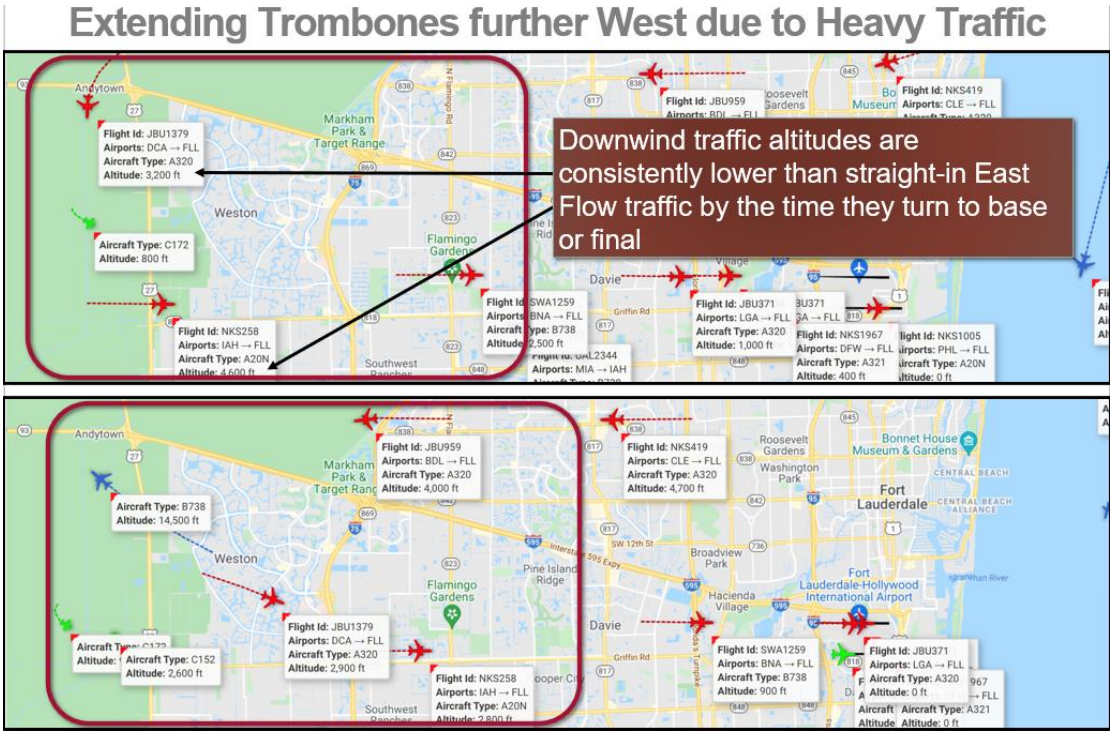


*Figure 20 Webtrak Observation Extending Trombones to Separate Traffic in Peak Periods*

MIA flights flying over the approach patterns into FLL must be separated vertically to maintain safe operations.

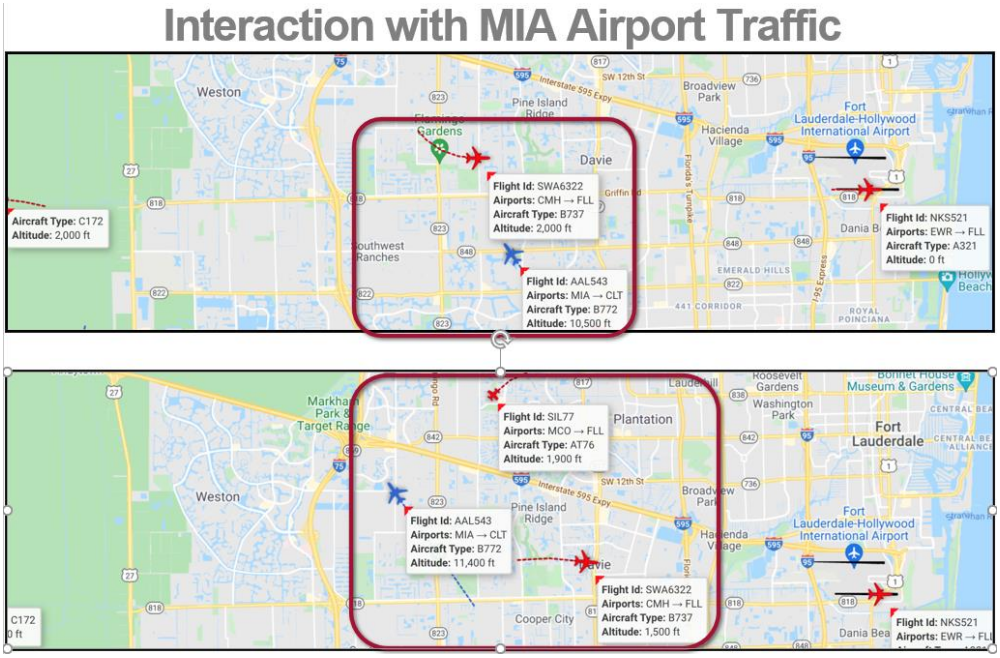


*Figure 21 Vertical Separation of MIA and FLL Traffic*



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## Current Arrival Procedures Affecting Weston

*Table 1 Current Arrival Procedures Affecting Weston*

| Procedure | Overflights | Track Dispersion over Weston | Estimated Overflight Altitude (feet) | Potential Noise Impact | Number of Tracks Modeled (East Flow) | Overflight Tracks over Weston (East Flow) |
|---|---|---|---|---|---|---|
| WAVUN RNAV | Yes | High | 2500-3800 | High | 446 | 228 |
| CURSO RNAV | Yes | Moderate | 3000-4000 | High | 145 | 110 |
| BLUFI Conventional STAR | Yes | High | 2500-3800 | Low (due to low use of this procedure) | 44 | 30 |
| JINGL RNAV | Yes | High | 3000-4000 | High | 579 | 439 |
| DVALL Conventional STAR | Yes | Low | 3000-4000 | Low (due to low use) | 79 | 52 |
| DEKAL Conventional STAR | Yes | High | 2500-3800 | Moderate | 229 | 22 |
| GISSH Conventional STAR | Yes | High | 2500-3800 | Low (due to low use) | 86 | 22 |
| FORTL Conventional STAR | Yes | Moderate | 3000-4000 | High | 370 | 307 |
| FISEL RNAV | Yes | High | 2500-3800 | Very High | 908 | 288 |
| Conventional Arrivals from the West | Yes | Moderate | 3000-4000 | Moderate (due to moderate use of procedure) | 65 | 50 |
| Conventional Arrivals from the North | Yes | High | 2500-3800 | Moderate (due to moderate use of procedure) | 113 | 26 |
| Conventional Arrivals from the East | Yes | High | 2500-3800 | Moderate (due to moderate use of procedure) | 56 | 16 |



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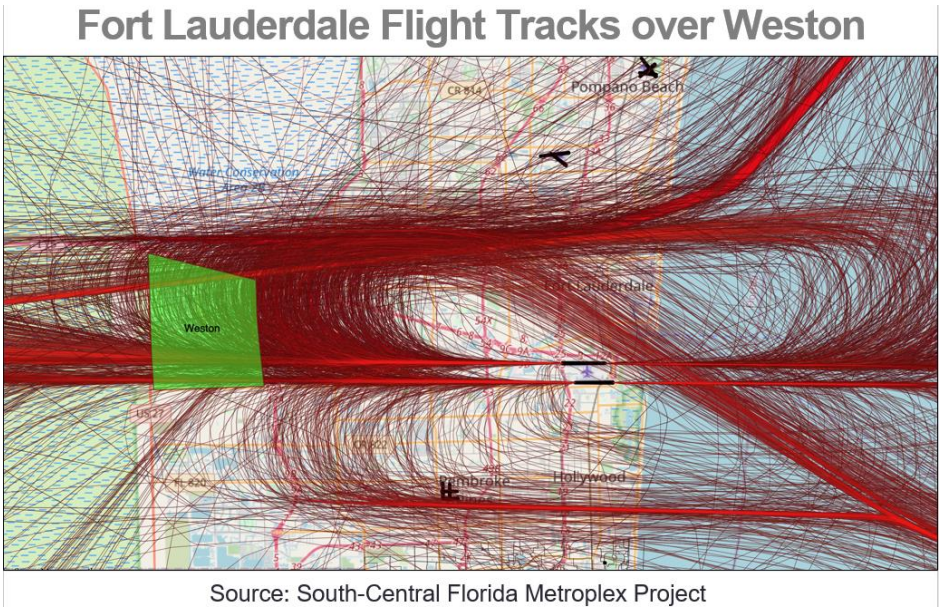


*Figure 22 South Central Florida No Action Flight Tracks Over Weston*

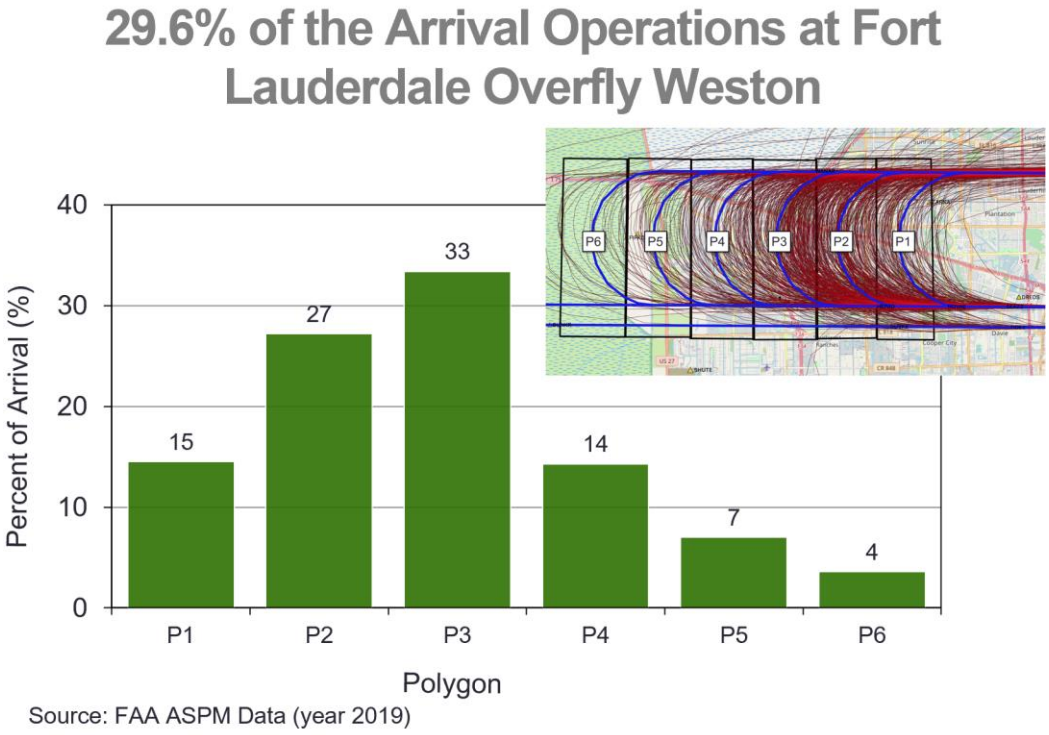


*Figure 23 FLL Arrival Overflights Weston (2019)*

The City of Weston is **heavily affected** by overflight arrivals because Fort Lauderdale International Airport is operated in East Flow operations

- 80.7% of the daytime arrivals occur in East Flow runways
- 81.1% of the nighttime arrivals occur in East Flow



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- 73.5% of the nighttime arrivals occur on runway 10L - the runway with higher impact on residents of the City of Weston

**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.

Nighttime traffic on runway 10L is higher

Driven by origin of aircraft

*Figure 24 Projected FLL Runway Use 2023*

Single Event Level Noise levels are in the range of 75 dBA over Weston while DNL levels range from 47-52 dBA.

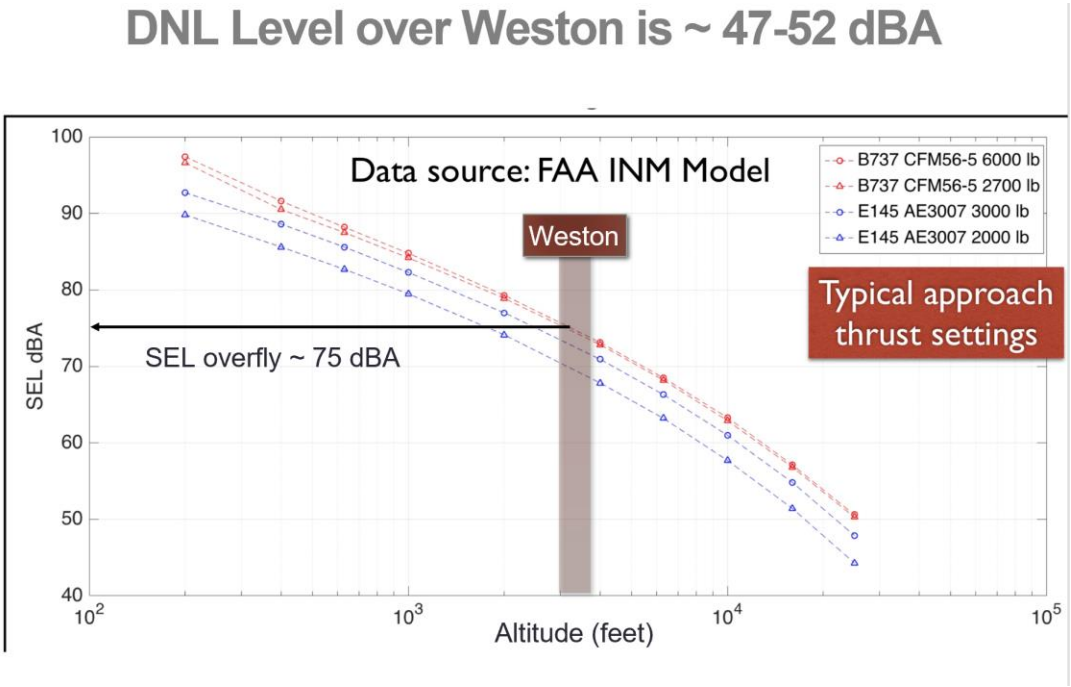


*Figure 25 Single Event Level (SEL) and Average Day and Night Level (DNL) over Weston*

## Future Arrival Procedure Affecting Weston



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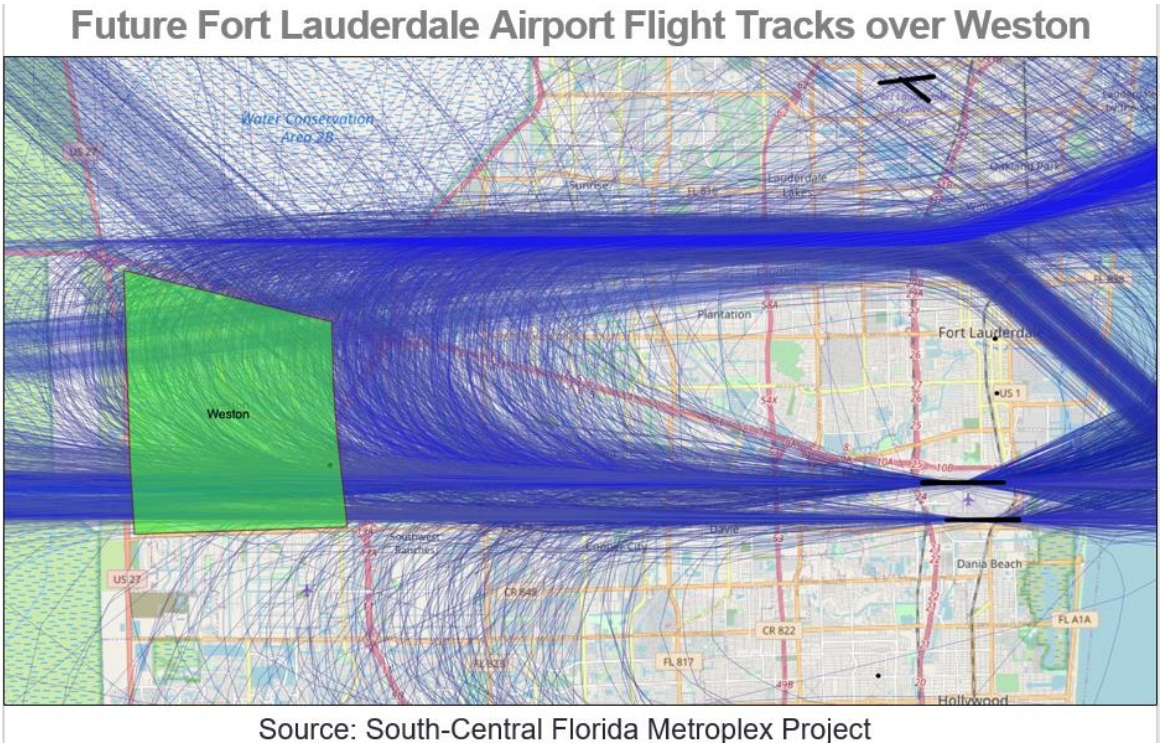


*Figure 26 South Central Floridat Metroplex Proposed Action Flight Tracks over Weston*

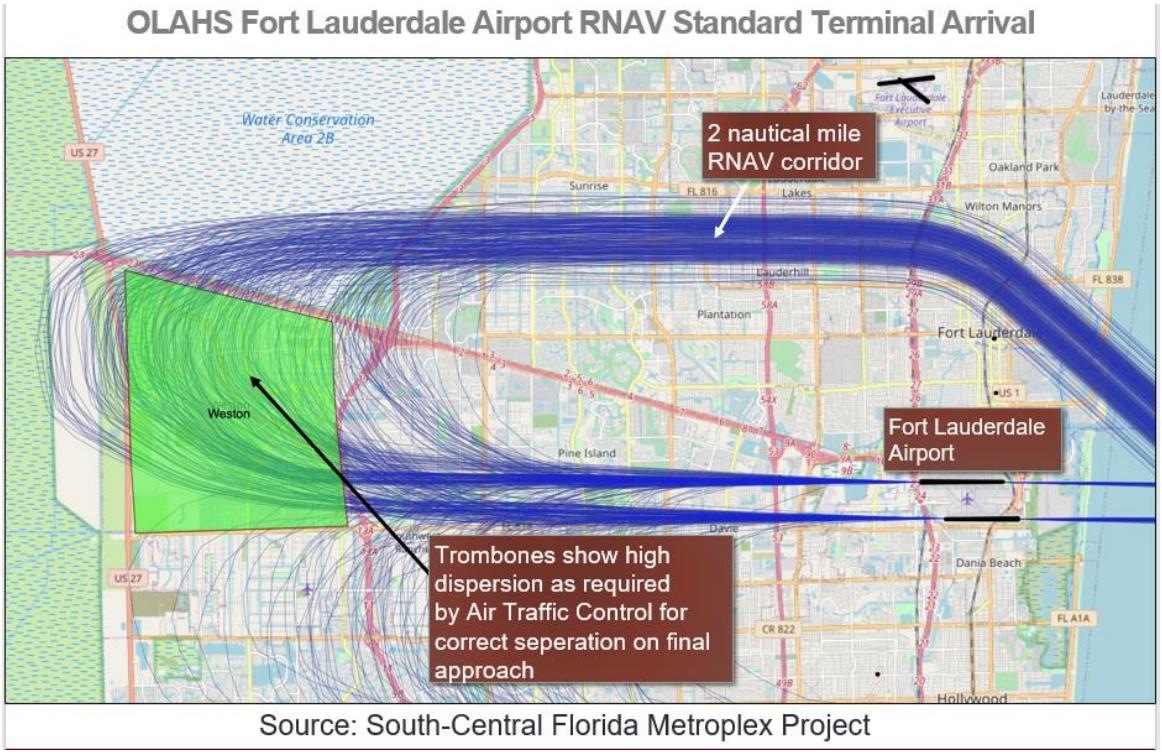


*Figure 27 OLAHS Standard Terminal Arrival RNAV Proposed Flight Tracks*



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*Table 2 South Central Florida Metroplex Proposed Flight Procedures*

| Procedure | Overflights | Track Dispersion over Weston | Estimated Overflight Altitude (feet) | Potential Noise Impact | Number of Tracks Modeled (East Flow) | Overflight Tracks over Weston (East Flow) |
|---|---|---|---|---|---|---|
| BAHIA RNAV | Yes | Low | 3000-4000 | Moderate | 208 | 176 |
| OLAHS RNAV | Yes | High | 2500-3800 | High | 406 | 204 |
| CUUDA RNAV | Yes | High | 2500-3800 | High | 897 | 299 |
| TEEKY RNAV | Yes | Low | 2500-3800 | High | 571 | 436 |
| TARPN RNAV | Yes | High | 2500-3800 | Low (due to low use) | 44 | 4 |
| Conventional Arrivals from the West | Yes | Moderate | 3000-4000 | Moderate (due to moderate use of procedure) | 65 | 50 |
| Conventional Arrivals from the North | Yes | High | 2500-3800 | Moderate (due to moderate use of procedure) | 200 | 49 |
| Conventional Arrivals from the East | Yes | High | 2500-3800 | Moderate (due to moderate use of procedure) | 56 | 15 |

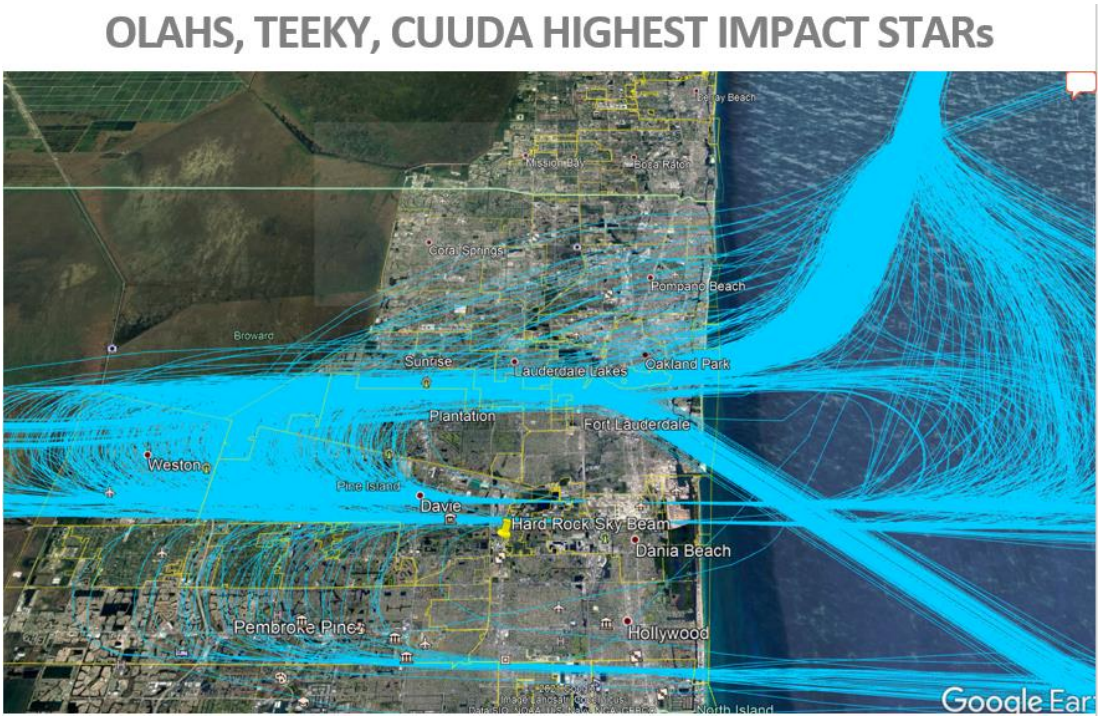


*Figure 28 Highest Impact to Weston Proposed Flight Procedures Flight Tracks without Vectors*



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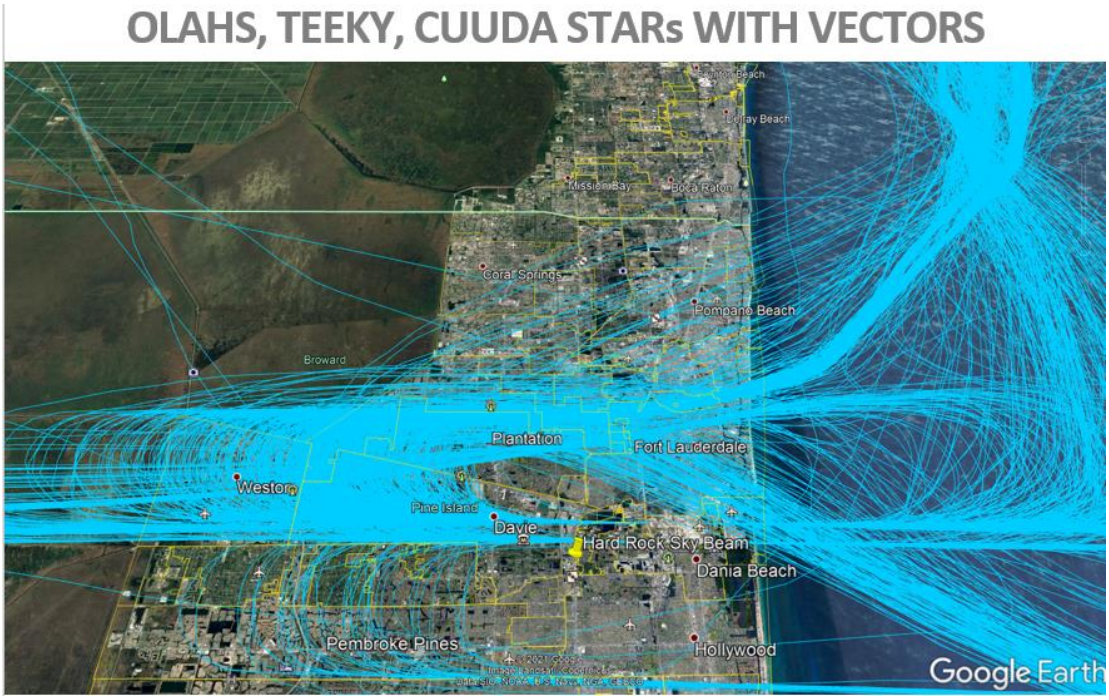
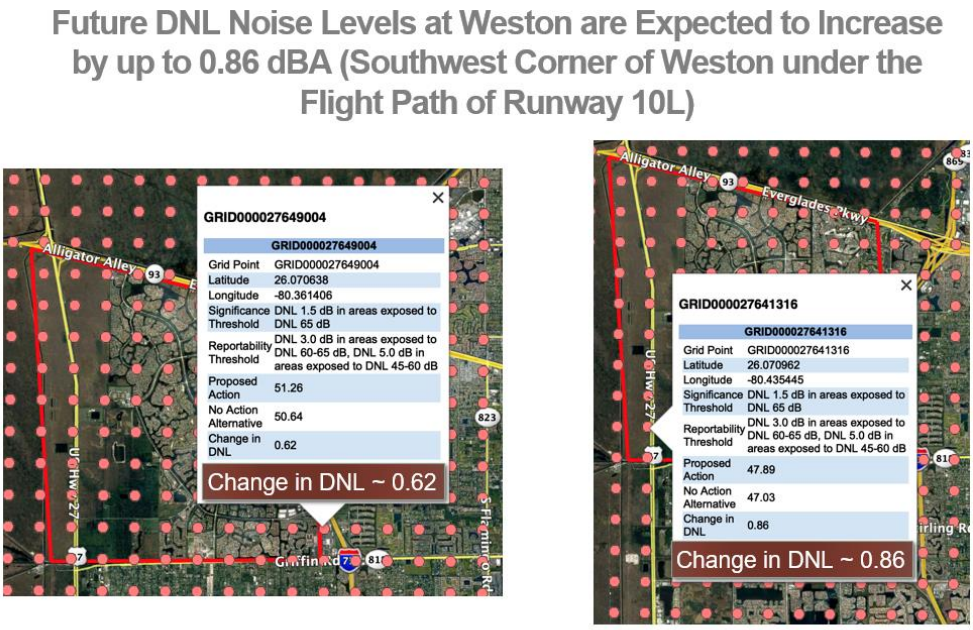



*Figure 29 Highest Impact to Weston Proposed Flight Procedures Flight Tracks with Vectors*

## Metroplex Study Reported Weston DNL Levels

According to the South Central Metroplex Study the new departure and arrival procedures are expected to increase DNL noise levels at Weston by up to 0.86 dBA. DNL levels at the City of Weston are expected to be as high as 52.2 dBA.




Source: South-Central Florida Metroplex Project

*Figure 30 South Central Florida Metroplex DNL Levels Weston*



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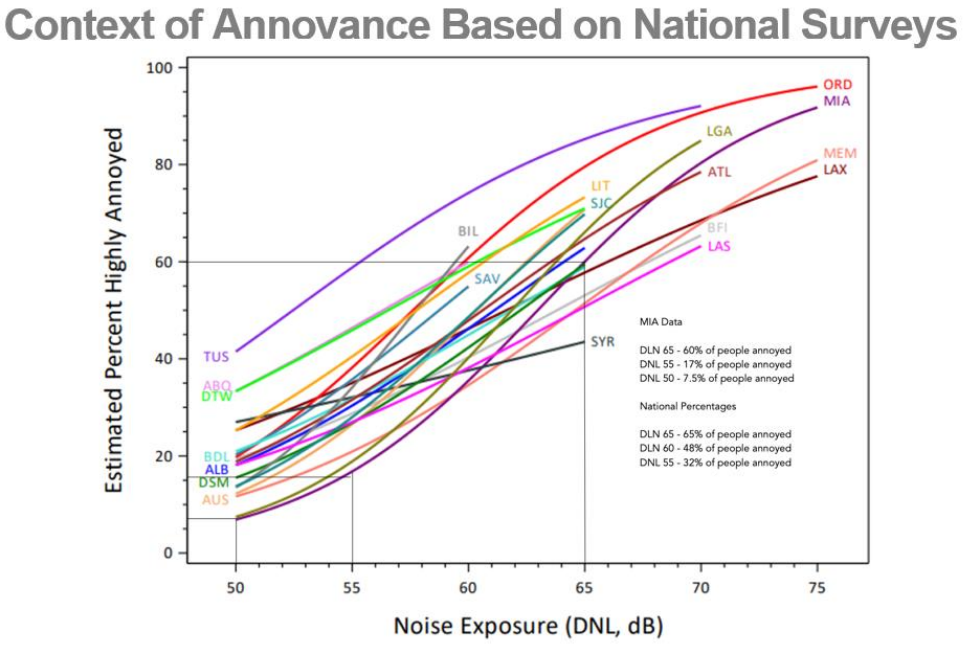
According to a recent FAA commissioned survey, 7.5% of Miami area residents are highly annoyed at a 50 DNL level.




Source: https://www.faa.gov/regulations_policies/policy_guidance/noise/survey/

*Figure 31 FAA Environmental Noise Survey Annoyance Curve*

According to the South-Central Florida Metroplex Project:

1. Future arrival flight tracks over the City of Weston will include many RNAV routes
2. RNAV arrival routes concentrate the flight tracks over a smaller land area
3. Benefit: affect fewer population block groups on the ground
4. Dis-benefit: increase the noise levels for fewer people on the ground. This may cause more complaints among the groups affected.
5. 51% of baseline modeled flight tracks overfly Weston
6. 50.5% of future metroplex modeled flight tracks overfly Weston
7. In the future, the population in the City of Weston that lies in the straight-in arrival to runway 10L is likely to perceive higher noise levels compared to today.



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## 6. Options Reviewed for Potential Mitigation Alternatives

8 potential noise mitigation options were identified to study noise relief potential for Weston.

*Table 3 Mitigation Alternatives*

| Option | Remarks | Effect on Overflights | Potential Noise Impact | Other Impacts |
|---|---|---|---|---|
| Baseline | Do Nothing | None | High | None |
| Option 1 | Move a high percentage of the flight tracks to the West (over the Everglades) | Reduces overflights for the Northern part of Weston<br><br>Increases number of overflights for the Southern section of Weston | Reduction in noise levels on the Northeast side of Weston<br><br>Increased noise levels on the South side of Weston | Increased fuel consumption (135 kilograms per flight typical for narrow-body aircraft)<br><br>Increased travel time for flights affected (7.5 minutes typical) |
| Option 2 | Move all downwind flight tracks 2 nm West of the boundary of Weston | Reduces base leg crossover flight tracks over Weston<br><br>Increases the number of overflights over the South side of Weston | Substantial reduction in noise levels on the North and Middle of Weston<br><br>Increased noise levels on the South side of Weston | Increased fuel consumption (135 kilograms per flight typical for narrow-body aircraft)<br><br>Increased travel time for flights affected (7.5 minutes typical) |
| Option 3 | Design arrival procedure to use the I-595 Corridor | Reduces overflights over Weston (some flights still have to transition to 10R) | Reduction in noise levels for Weston<br><br>Moves noise impact to communities to the North of Weston | Visual or Instrument procedure with very high visibility minima (converging approaches)<br><br>Requires extensive safety analysis with man-in-the-loop simulations<br><br>Reduced runway capacity |



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*Table 4 Mitigation Alternatives Continued*

| Option | Remarks | Effect on Overflights | Potential Noise Impact | Other Impacts |
|---|---|---|---|---|
| Option 4 | Prescribe steeper approaches to runways 10L and 10R | Same number of overflights as baseline case<br><br>Overflight altitudes increase slightly | Potential Sound Exposure Noise Level (SEL) reduction of 1.5 dBA due to higher flight altitudes over Weston (see graphic on next page) | Increases flyover altitude by 450-550 feet over Weston<br><br>Requires longer downwind segments to allow pilots to intercept the glideslope and have a stabilized approach (adds fuel consumption) |
| Option 5 | Vector nighttime arrivals to the West | Provides relief to communities to the West of the airport at night | Overflies over South section of Weston would be impacted with higher DNL noise levels<br><br>A single nighttime operation is equivalent to 10 daytime operations | Increased fuel consumption (135 kilograms per flight typical for narrow-body aircraft)<br><br>Increased travel time for flights affected (7.5 minutes typical) |
| Option 6 | Mandate RNP RNAV 10L Procedure for nighttime arrivals (short trombone)<br><br>See graphic provided of the RNP/RNAV procedure | Reduces overflights over Weston<br><br>A small number of non-equipped aircraft may not be able to execute the procedure | Reduction in noise levels to all Weston residents because aircraft do not overfly Weston | RNP/RNAV procedure has a higher ceiling minima compared to the ILS 10L procedure<br><br>ILS minima is 200 feet and 3/4 of a mile<br><br>RNP/RNAV is 400 feet and 1 nm visibility |



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*Table 5 Mitigation Alternatives Continued*

| Option | Remarks | Effect on Overflights | Potential Noise Impact | Other Impacts |
|---|---|---|---|---|
| Option 7 | Assign more straight-in arrivals to runway 10R | Overflights landing on runway 10R generate slightly less noise for some areas of Weston (middle and northern section of town) | Small reduction of noise levels for middle and northern sections of Weston | Arrivals to 10R still overfly the southern communities of Weston |
| Option 8 | Vector Option and standard trombones | Introduces more randomness to arrivals | Spreads the noise around multiple communities | This alternative attempts to spread noise over larger number of communities |

Option 4, 6 and 8 provide the most relief to all of Weston residents. Option 1, 2 and 7 provide some relief to north Weston but increase impacts to south Weston. Option 3 is too far removed from conventional approach procedure design to be viable with the FAA. Option 5 will provide for dispersion but it is far less beneficial to Weston than option 6.



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# 7. Noise Modeling to Quantify Potential Noise Impact of Mitigation Options

## Baseline Noise Exposure

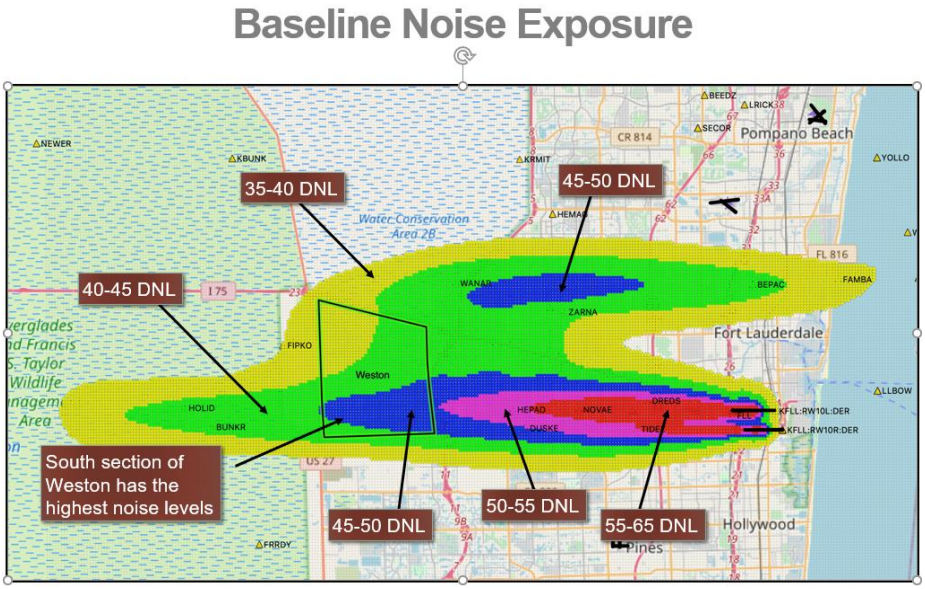


*Figure 32 Baseline Noise Exposure*

## Option 1 Move Flights to the West

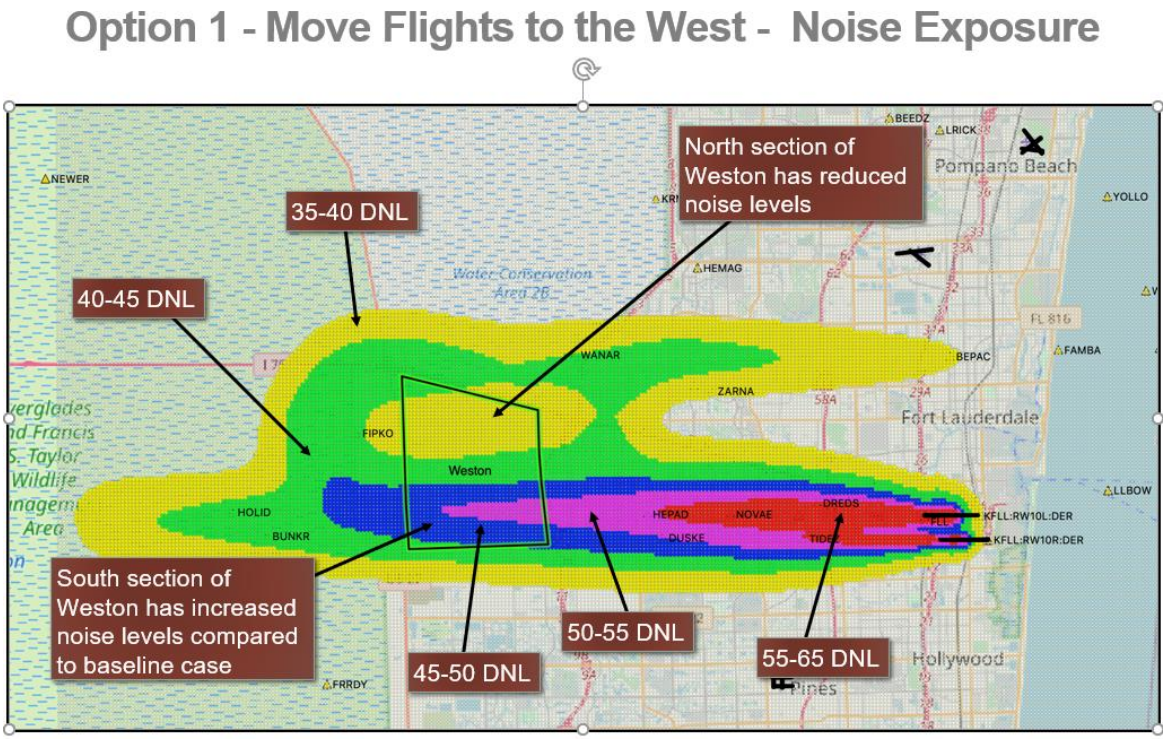


*Figure 33 Option 1 Noise Exposure*



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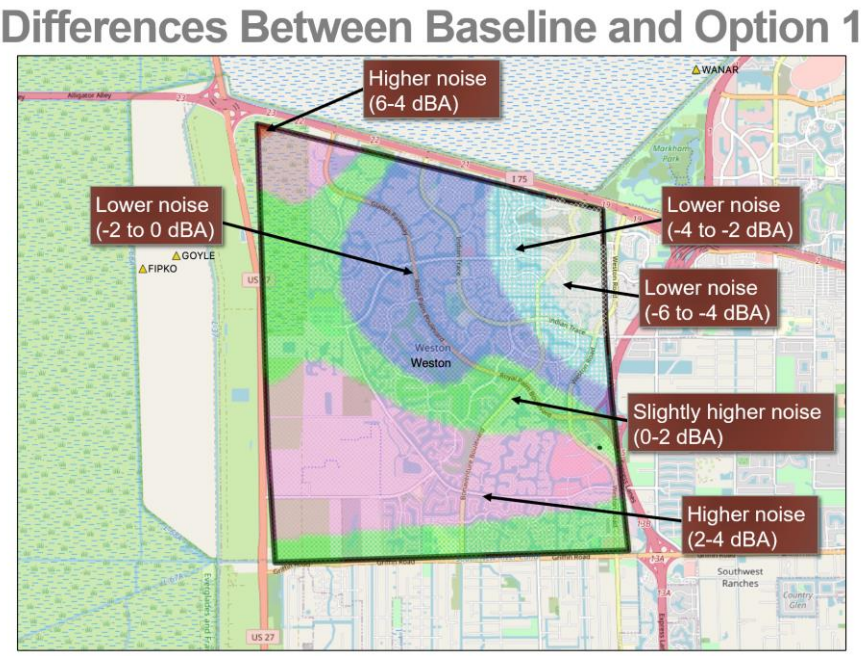


*Figure 34 Difference Between Baseline and Option 1*

### Option 2 Move all Downwind Flight Tracks 2 nm West of the Boundary of Weston

Option 2 results in similar increases to south Weston as option 1. Because south Weston is one of the higher overflight areas of Weston Options 1 and 2 are not recommended.

### Option 3 Design Arrival Procedure to Use the I-595 Corridor

Interstate corridors are often good locations to concentrate overflights because of the high ambient noise level. The I-595 corridor was reviewed for potential flight procedure compatibility. The orientation of the corridor is not conducive to meeting a standard flight approach procedure design and is not recommended as it would not be considered viable by the FAA.

### Option 4 Prescribe Steeper Approaches to Runways 10L and 10R

Current FLL approach altitudes in east flow are below the altitudes derived from a 3-degree approach (normal procedure) at the east and west boundaries of Weston.



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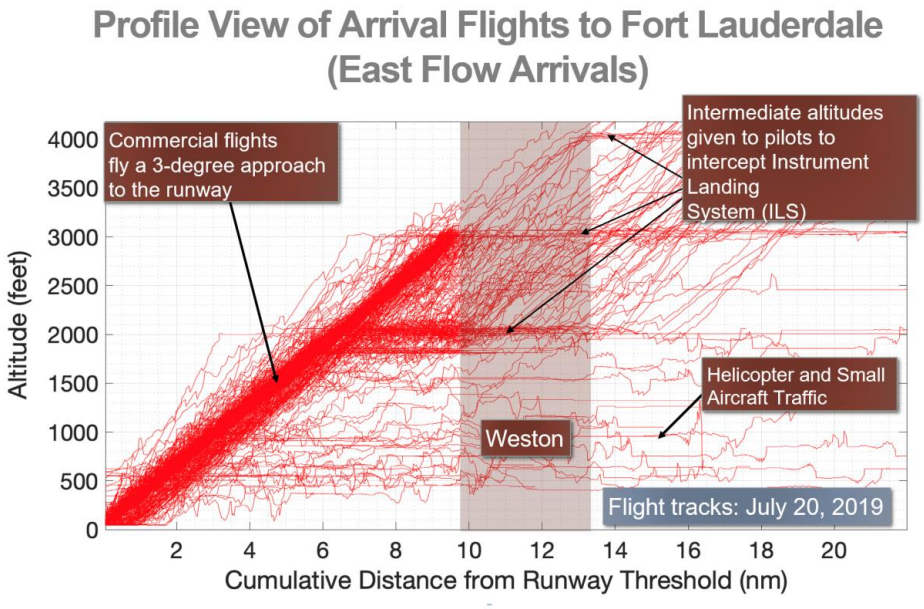


*Figure 35 Profile View of East Flow Arrivals to FLL Over Weston*

This recommendation is to at minimum adjust waypoints to fly continuous descent on approaches to both runways 10L and 10R keeping aircraft on the 3 degree glideslope and raise PION to 3,300'. At a maximum, raise the necessary approach waypoints to fly continuous descent on approaches to a 3.5 degree glide slope to runways 10L and 10R.

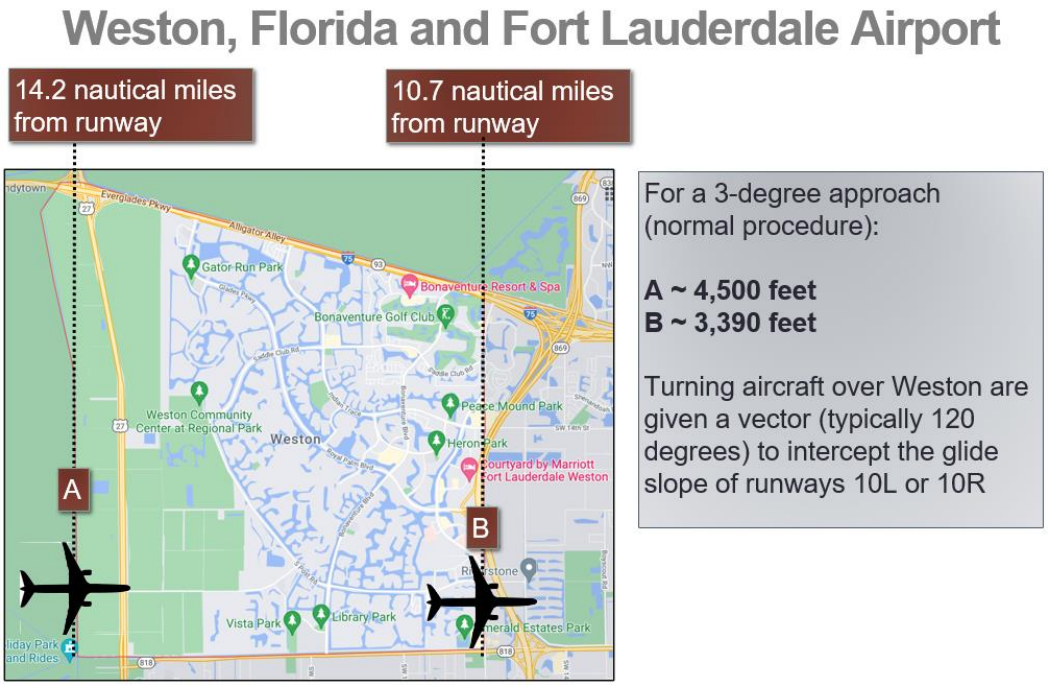


*Figure 36 Typical Standard Altitudes for 3 Degree Normal Approach Procedure at Weston Boundaries*



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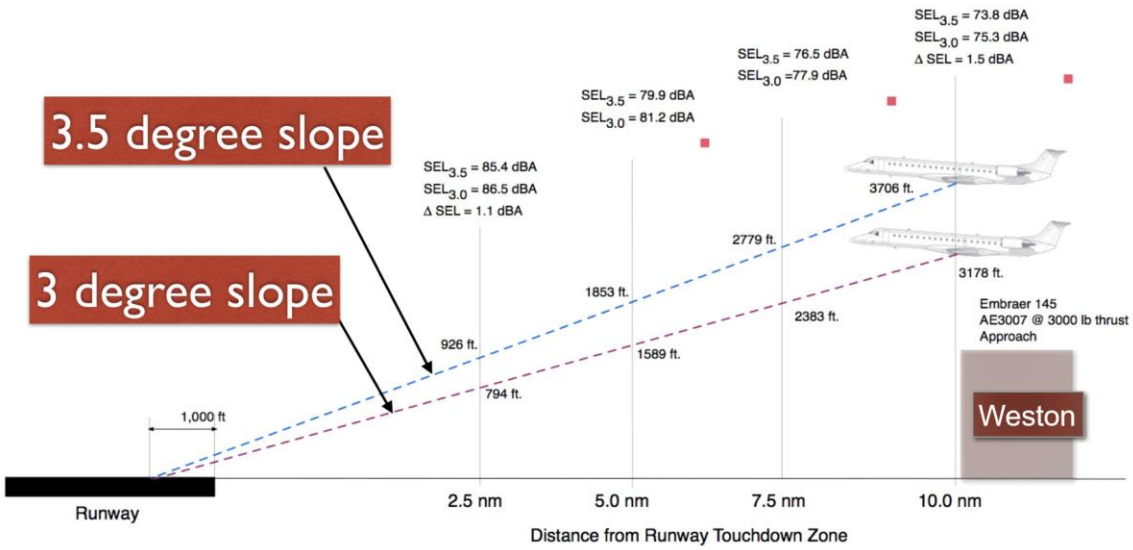


*Figure 37 Noise Reduction with Steeper Approach Angles*

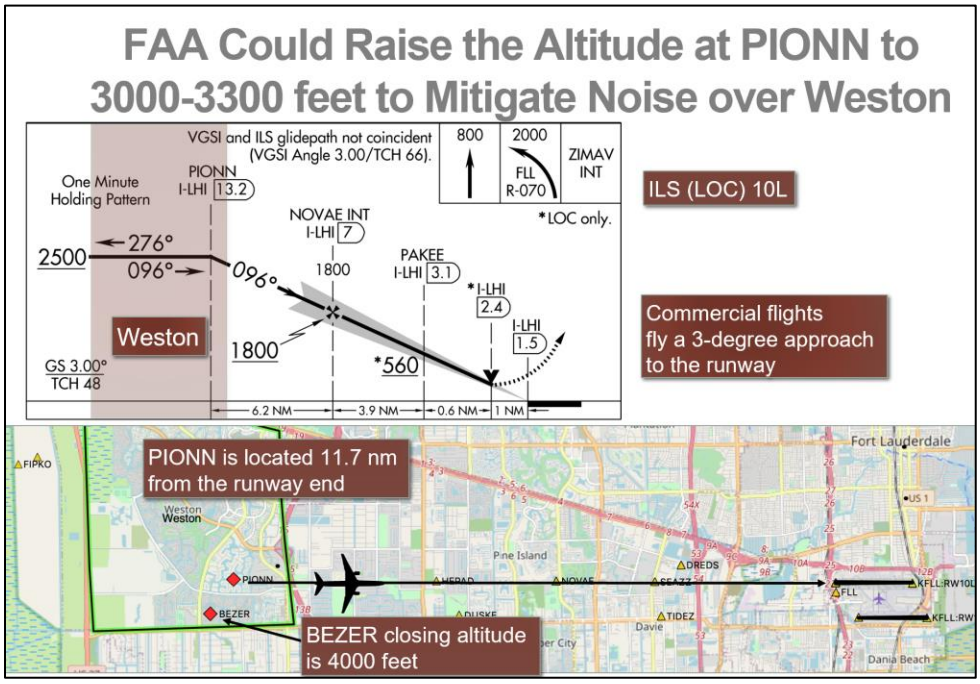


*Figure 38 Raise PIONN Waypoint to 3,000-3,300 feet*

The simulated effect of imposing higher altitudes for straight in flights over Weston results in 500 feet higher altitudes on average compared to observed flight tracks. This



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resulted in a 2-3 dBA maximum SEL reduction (or approximately 1.5-2 dBA DNL reduction).

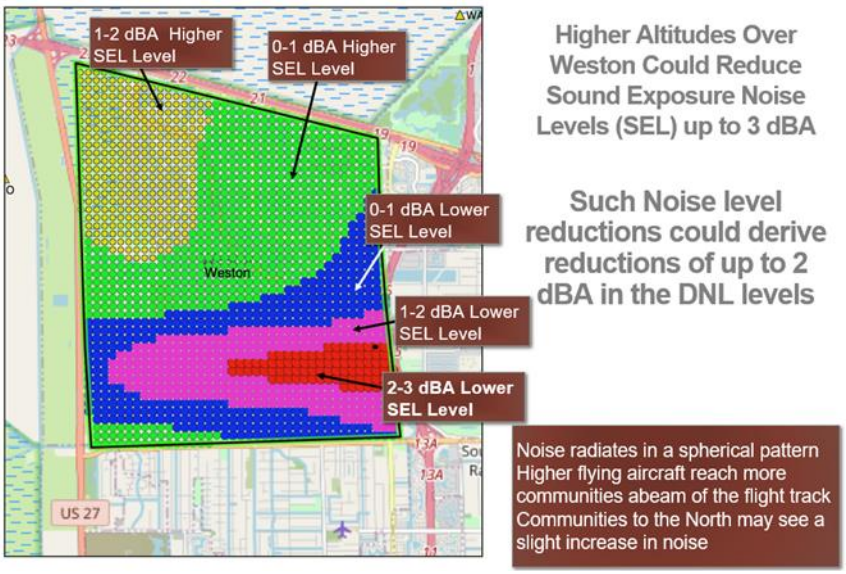


*Figure 39 Option 4 Noise Reduction with Higher Altitudes over Weston*

Option 4 is recommended as an alternative to propose to the FAA with additional analysis to understand future vertical flight profiles of future metroplex flight tracks and revise accordingly.



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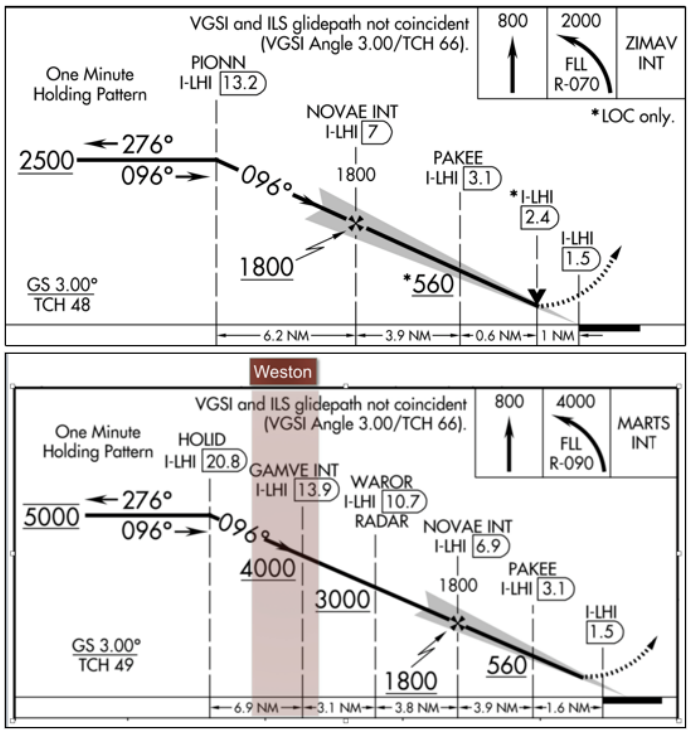
Note: The FAA implemented Option 4 during the study raising the ILS arrivals on 10L and 10R by 1,200-1,800 feet.

**New ILS Arrival Procedure to Runway 10L Reduces Noise Over Weston by Increasing Crossing Altitudes by 1,200 to 1,800 feet**




ILS (LOC) 10L June 2021

ILS (LOC) 10L November 2021

*Figure 40 New ILS Arrival Procedures for 10L November 2021 Raise Altitudes over Weston*

The new descent profile stated in the ILS forces aircraft to cross the City of Weston between 4,400 and 3,300 feet based on a descent gradient of 325ft/nm. The new altitudes over the City of Weston will help mitigate noise by 1-1.5 dBA

### Option 5 Vector Nighttime Arrivals to the West

Option 5 increases noise impacts to south Weston. Because nighttime operations are more annoying and 18% of FLL operations are at night, option 5 is not recommended.

### Option 6 Mandate RNP RNAV 10L Procedure for nighttime arrivals (short trombone)

Option 6 recomends utilizing the existing RNP RNAV 10L procedure for nighttime arrivals. It provides for complete relief to all of Weston for 10L operations at night. Option 6 is recommended to move forward as an alternative to propose to the FAA.



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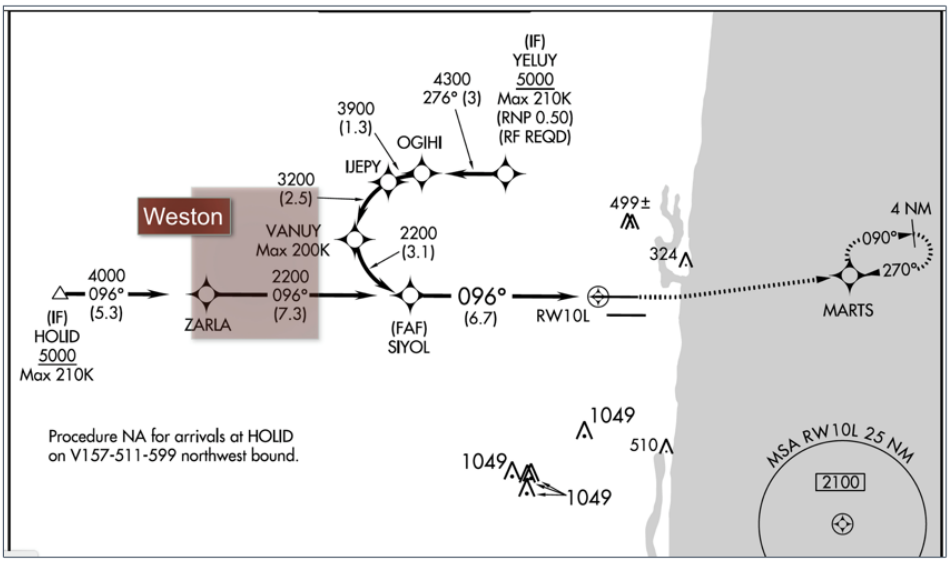
# Option 6 - Nighttime and Low Traffic Conditions use of Short 10L/RNAV Arrival Procedure




## Fort Lauderdale Runway 10L RNP/ RNAV

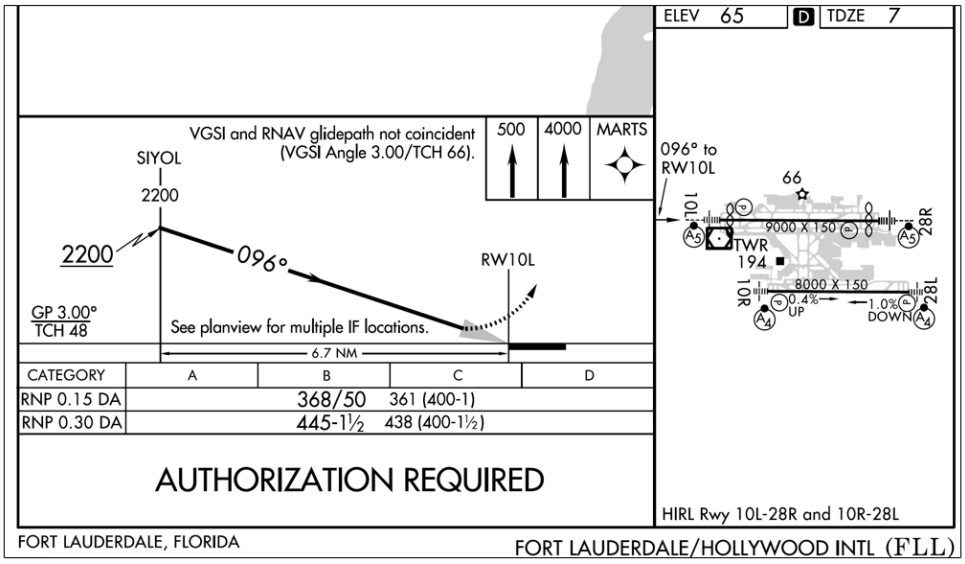



*Figure 41 FLL 10L RNP/RNAV Procedure*



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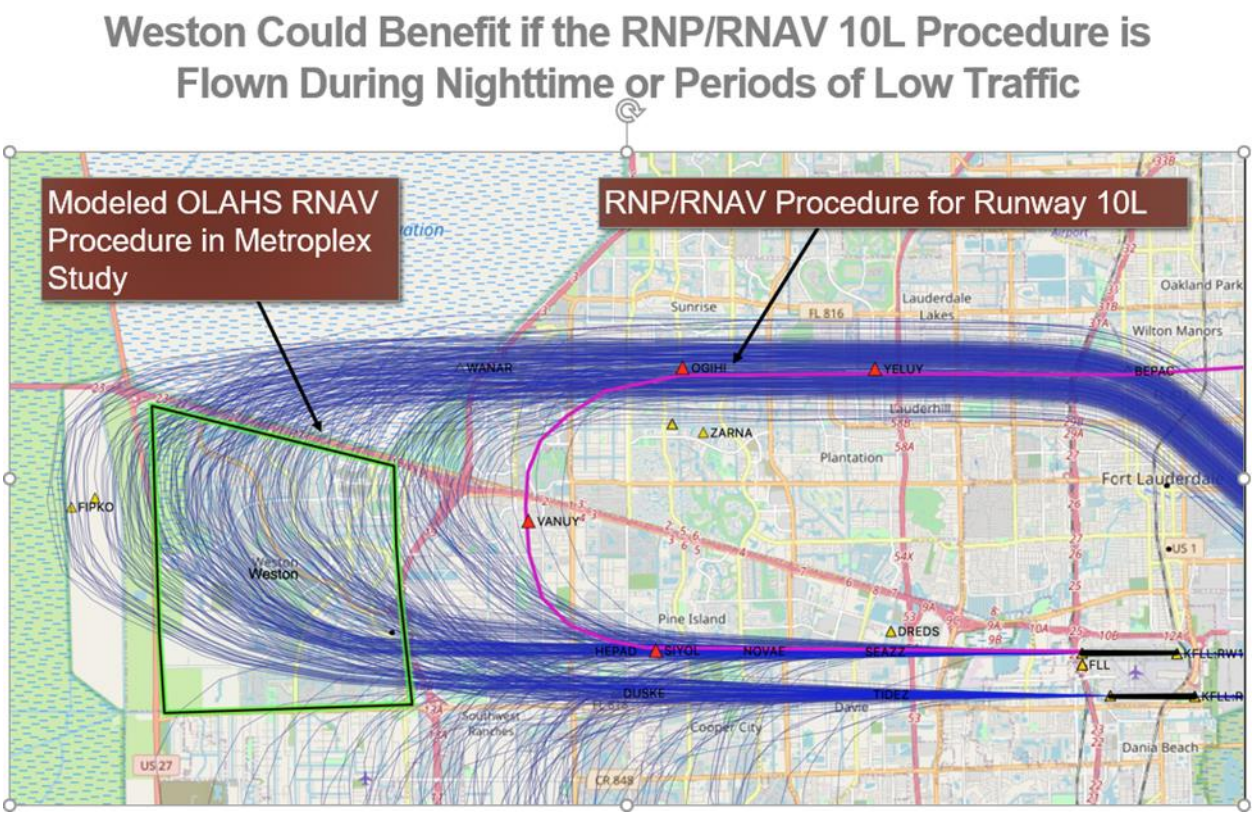


*Figure 42 10L RNP/RNAV Procedure Relative to OLAHS RNAV STAR*



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## Option 7 Assign more Straight-in Arrivals

Option 7 produces small reduction of noise impacts for north and middle Weston but arrivals to 10R still overfly south Weston. Option 7 is not recommended.

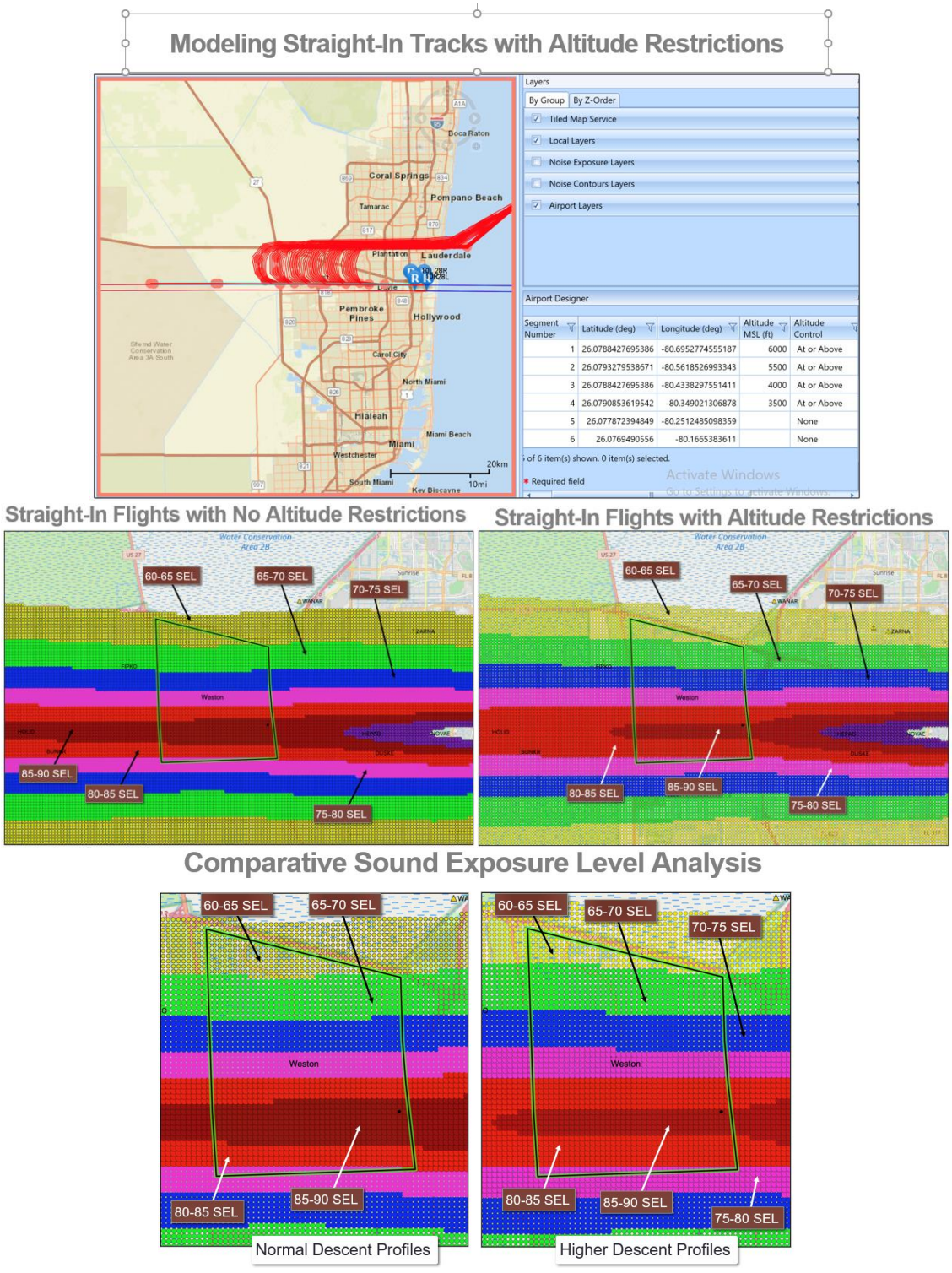


*Figure 43 Option 7 Noise Analysis*



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## Option 8 Vector Option and Standard Trombones

Option 8 is to increase vectored approaches utilizing standard trombones. Vectoring produces more randomness to arrivals (increases dispersion of aircraft) spreading noise around more communities. The goal of the metroplex flight procedures is 95% utilization of RNAV flight procedures. Vectoring will still be utilized to manage flow of traffic into FLL. Due to the dispersion of impact resulting from vectoring, Option 8 is recommended as an alternative to recommend to the FAA and request locally of the Air Traffic Control tower.



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