

Technical Analysis: Proposed BWI Marshall Flight Procedure Changes Developed by Roundtable Technical Committee

Presented by the DC Metroplex BWI Community Roundtable Technical Committee
with support from Roundtable technical advisors
the Maryland Department of Transportation Maryland Aviation Administration (MDOT MAA) and Industry

November 19, 2019

Agenda

- Purpose of tonight's meeting
- Review of October 15, 2019 Roundtable meeting and April 2018 FAA proposed procedure changes
- Flight track analysis of April 2018 FAA and Roundtable Technical Committee proposed procedure changes
- Noise analysis of April 2018 FAA and Roundtable Technical Committee proposed procedure changes
- Next steps
- Discussion



Purpose of Tonight's Meeting

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- Present technical analysis of the proposed procedure changes developed and supported by the Roundtable Technical Committee, MDOT MAA, and Industry
 - Review of proposed procedure changes as presented at the October 15, 2019 meeting
 - Review detailed noise and technical analysis results of proposed procedure changes
 - **Roundtable proposed procedure changes still require FAA consideration and approval for potential implementation**
 - **The FAA may choose NOT to implement these procedures or may make adjustments as necessary to meet safety, design, or other operational criteria**
 - **Any procedures that are implemented will be subjected to separate FAA environmental review as well as potential associated public outreach and final implementation will likely be a multi-year process**
- Goal at tonight's meeting is to come to agreement as a Roundtable to support proposed procedure changes developed by the Technical Committee and commence developing a submittal package for provision to FAA for consideration during the 2020 Performance Based Navigation (PBN) Working Group cycle
- **If necessary, additional changes to the proposed procedures may be considered following tonight's meeting based on Roundtable member feedback**



Review of October 15, 2019 Roundtable Meeting and April 2018 FAA Proposed Procedure Changes

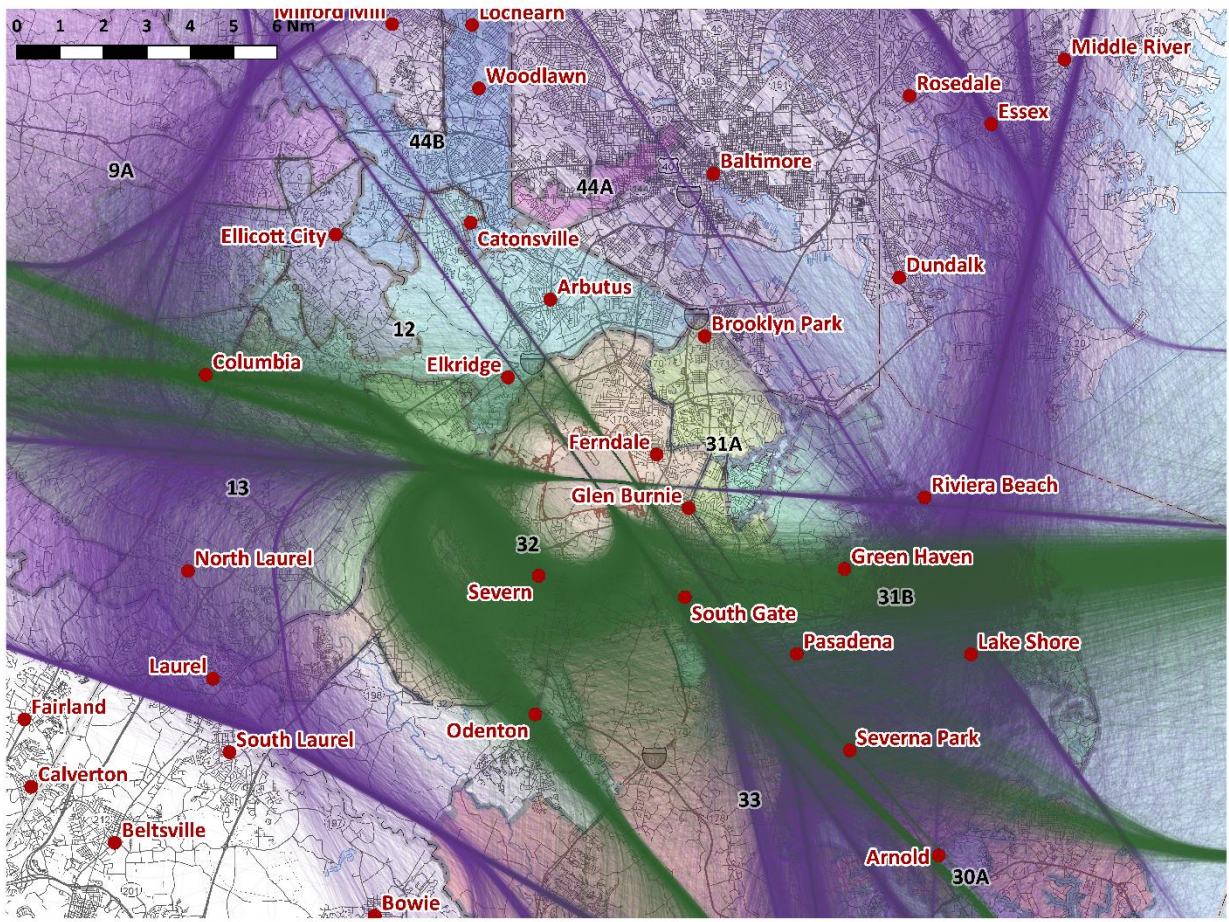
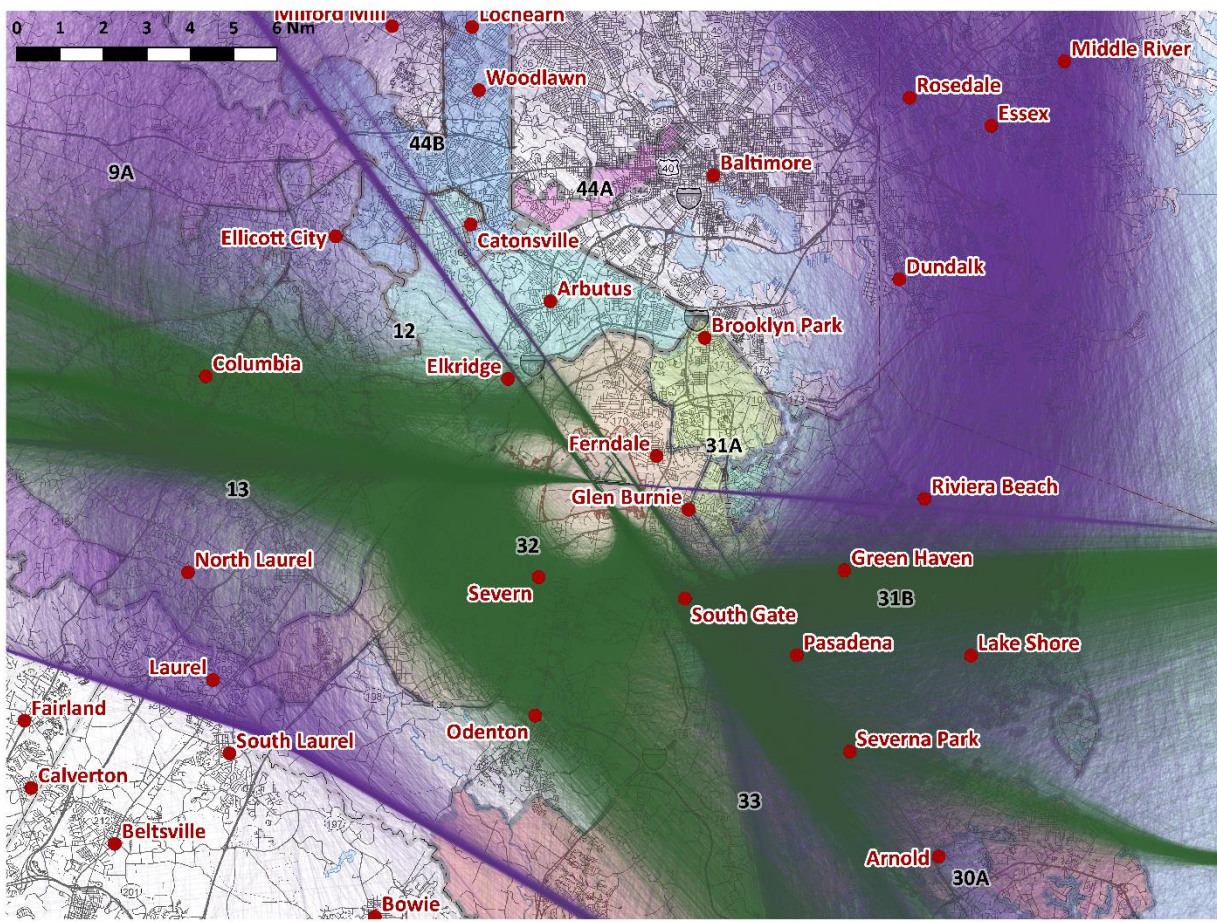
Abbreviated Timeline of Procedure Change/Roundtable Technical Committee Process

- **March 2015:** FAA completed implementation of DC Metroplex at BWI Marshall, communities voice concerns regarding flight path changes
- **February 2016:** FAA further modifies departure procedure (TERPZ) for Runways 28 and 15R
- **March 2017:** DC Metroplex BWI Community Roundtable formed to address community concerns regarding flight path changes
- **August 2017 – April 2018:** FAA convenes PBN Working Group to evaluate modifying BWI Marshall procedures. FAA presents proposed flight procedures (mainly departures) from PBN Working Group to Roundtable
- **December 2018 – January 2019:** MDOT MAA presents noise analysis of FAA proposed procedure changes from April 2018. Roundtable sends FAA letter assessing proposed procedure changes
- **February 2019 – September 2019:** Roundtable Technical Committee meets with MDOT MAA and industry to explore and finalize additional flight procedure changes (arrivals)
- **October 2019:** Roundtable Technical Committee presents “first look” at proposed flight procedure changes to full Roundtable

Historical/Existing BWI Marshall Flight Tracks

- The following slides present historical and existing Jet flight tracks from the MDOT MAA Airport Noise Monitoring and Management System (ANOMS) for context regarding the following time periods:
 - **Pre-Metroplex:** January, June, July, and December 2012 (123-days)
 - **Post-Metroplex/Existing:** November 2018, and February, May, and August 2019 (120-days)
 - The same flight tracks and aircraft operations were also used in the forthcoming technical analysis
 - Time periods selected to account for seasonal variability in aircraft operations, performance, and avoid runway closures
- Arrival flight tracks are depicted in Purple
- Departure flight tracks are depicted in Green
- Darker shades of color represent areas with greater concentrations of flight tracks, lighter shades represent areas of lesser concentrations

BWI Marshall Arrival and Departure Jet Flight Tracks – All Flows



2012 Pre-Metroplex arrival and departure flight tracks

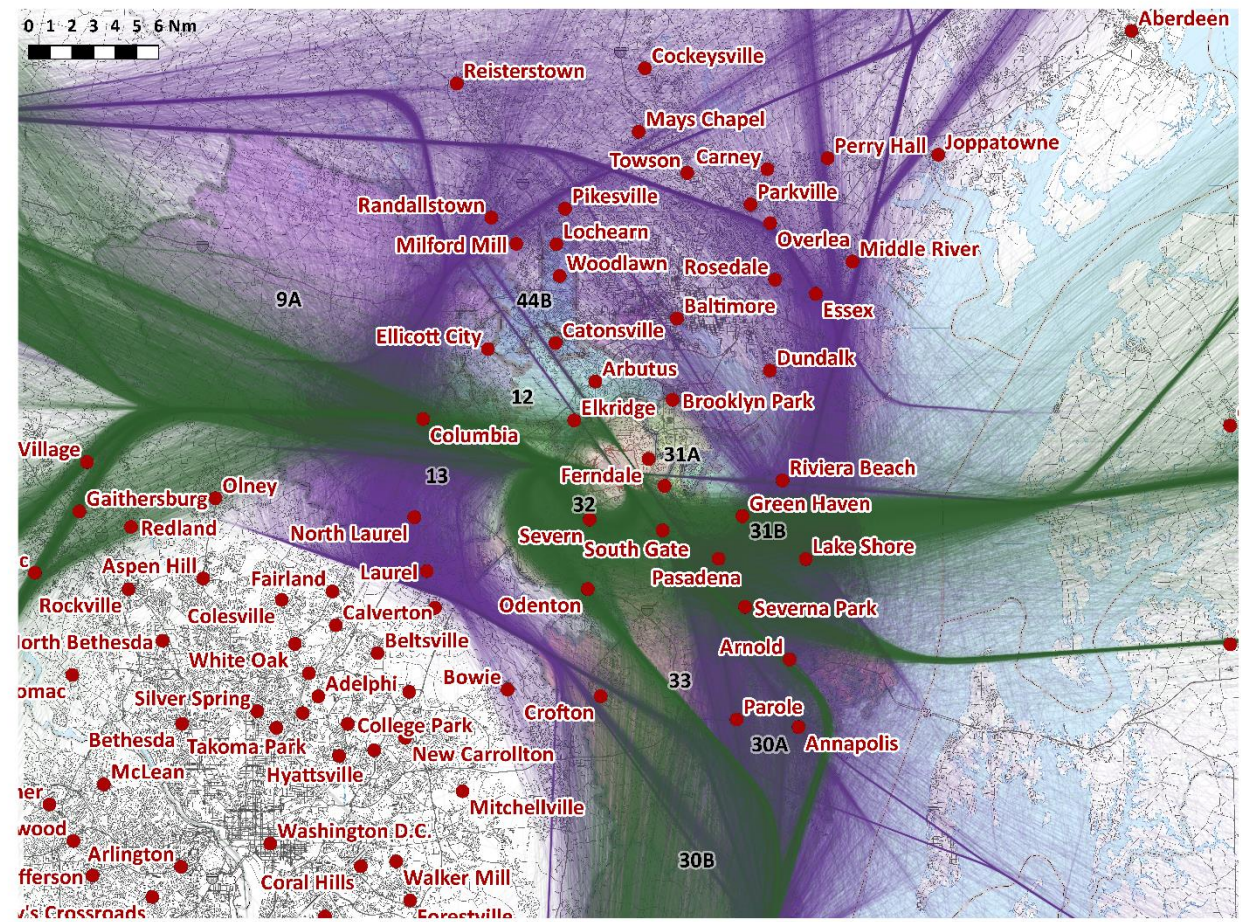
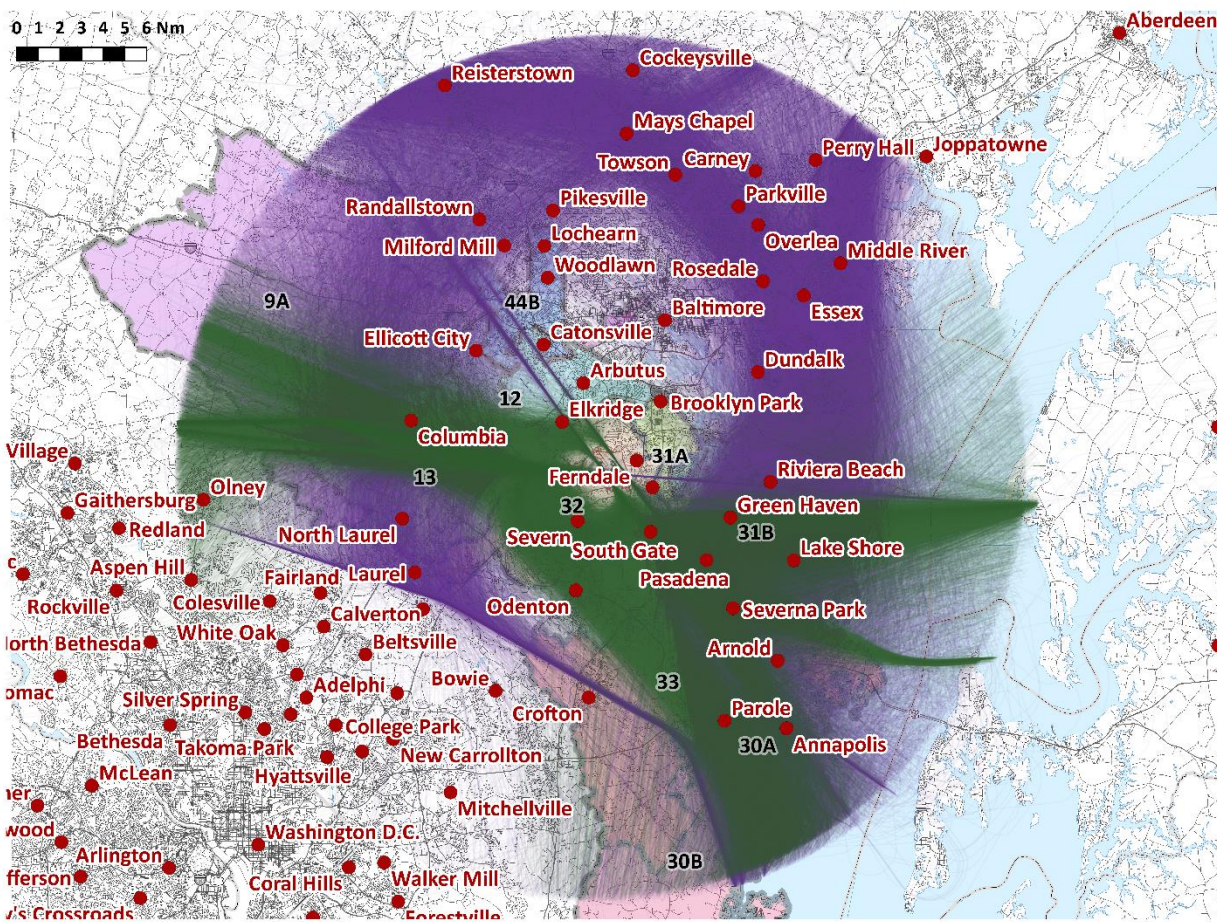
2018-2019 Existing arrival and departure flight tracks

Legend

- Departure Flight Tracks
- Arrival Flight Tracks



BWI Marshall Arrival and Departure Jet Flight Tracks – All Flows



2012 Pre-Metroplex arrival and departure flight tracks

2018-2019 Existing arrival and departure flight tracks

Legend

- Departure Flight Tracks
- Arrival Flight Tracks



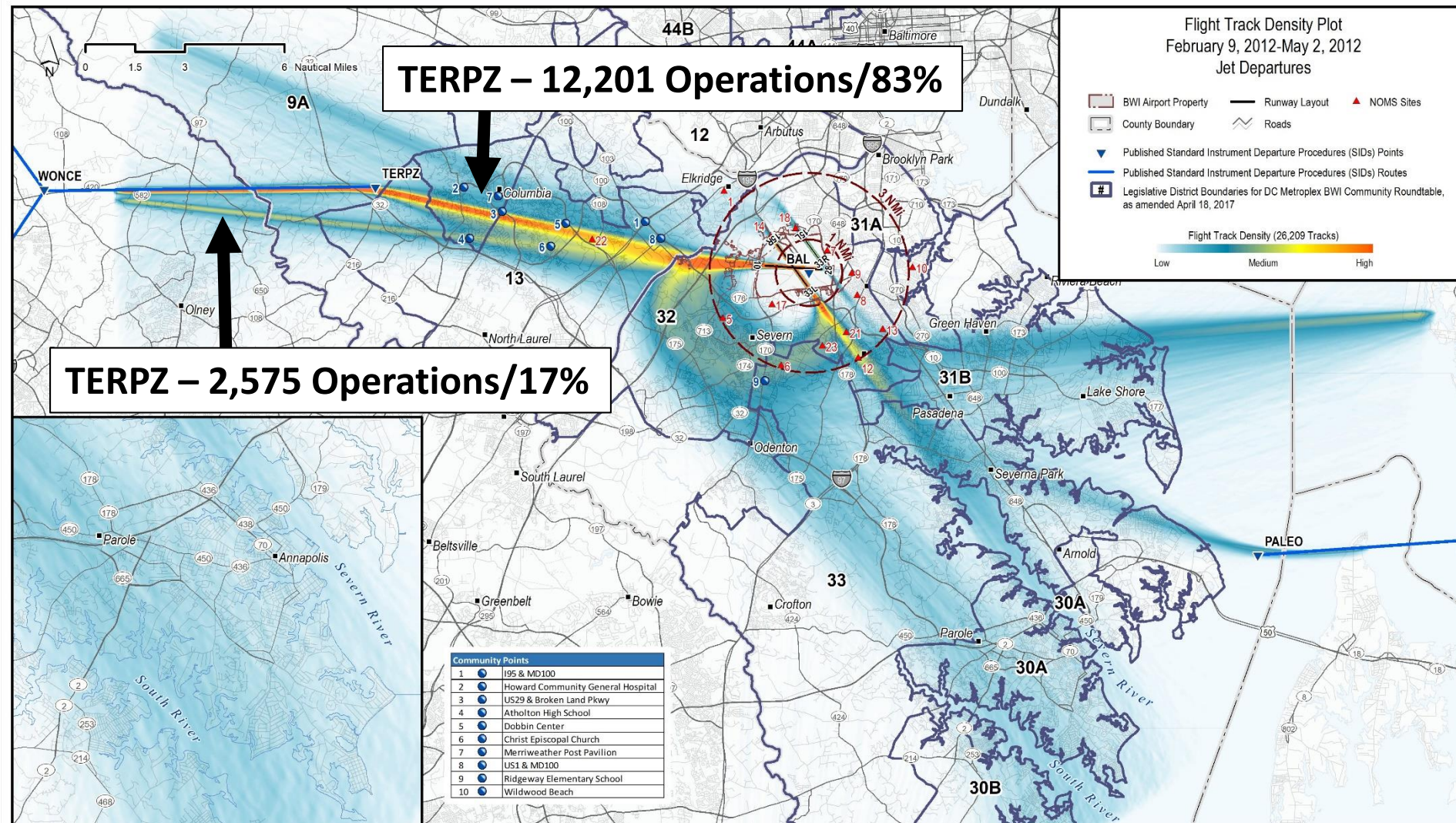
April 2018 FAA Proposed Procedure Summary

- FAA presented proposed changes to BWI Marshall arrival and departure procedures to the BWI Roundtable on April 24, 2018
 - Departure Changes:
 - Modification of Runway 15R and 28 westbound departures to return aircraft flight paths closer to pre-Metroplex historical locations and better distribute departures
 - Adjustments to Runway 28 southbound departures to meet FAA design criteria
 - “Climb Via” capability added to all procedures
 - Arrival changes:
 - Adjustment of downwind leg for Runway 28 for arrivals from the northeast and minor changes in high-altitude En-route airspace to address design criteria issues
 - Adjustment of the base leg for Runway 28 for arrivals from the southeast and minor changes in high-altitude En-route airspace to address design criteria issues
- Note: The full FAA presentation from April 24, 2018 can be found at:
https://maacommunityrelations.com/media/client/anznoiseupdate/2018/BWI_Overview_CapitalProject_FINAL_20180419.pdf

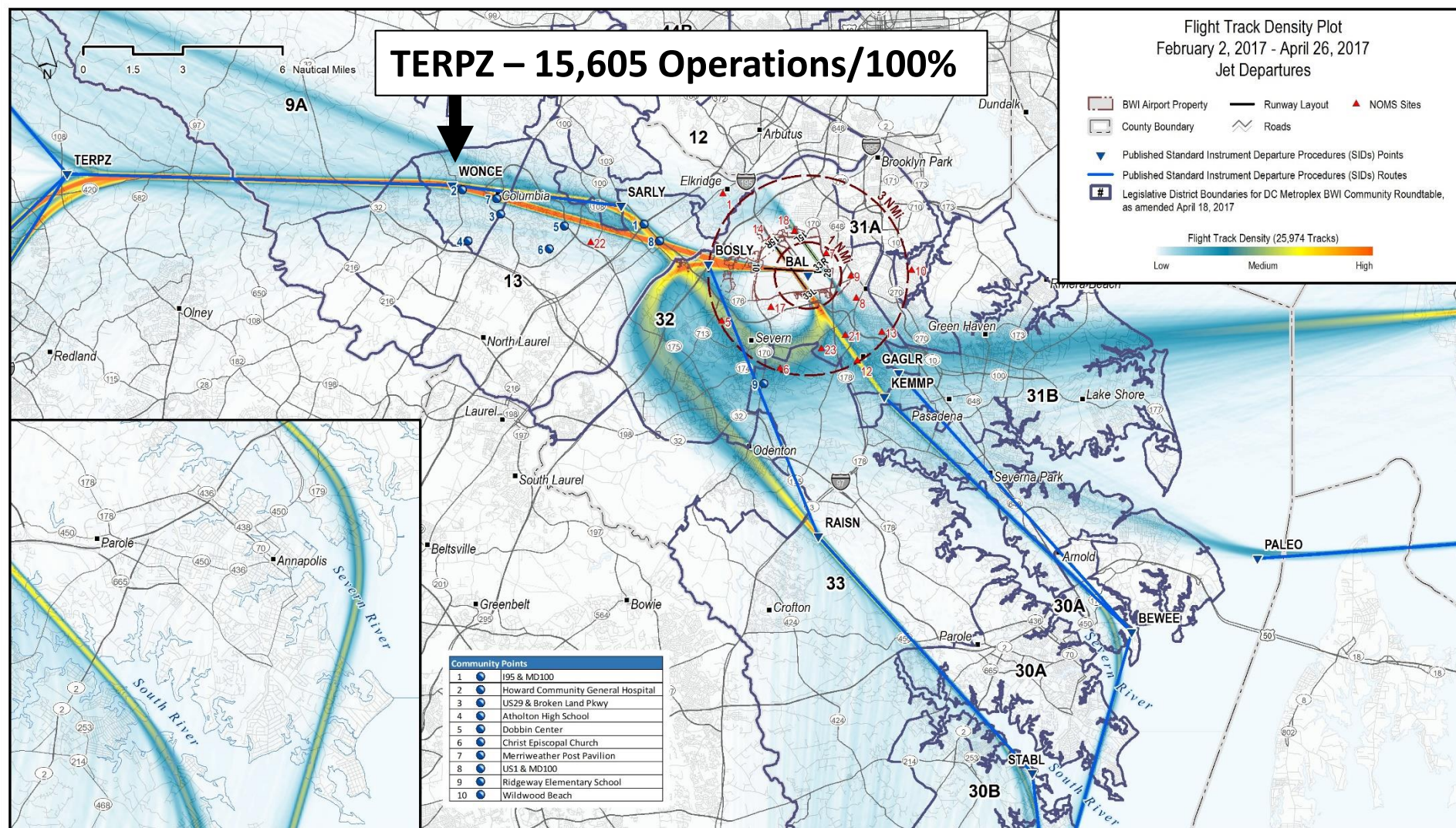
April 2018 FAA Proposed Procedure Summary

- The MDOT MAA prepared a noise and technical analysis of the FAA proposed changes at the request of the Roundtable and presented the results at the December 4, 2018 Roundtable meeting
 - Note: The full MDOT MAA presentation from December 4, 2018 can be found at:
https://maacommunityrelations.com/media/client/anznoiseupdate/2018/MDOT_MAA_BWI_Marshall_April_24_FAA_Proposed_Procedure_Analysis_20181204.pdf
- The following slides present graphics prepared and presented by MDOT MAA at the December 4, 2018 Roundtable meeting
 - Each graphic depicts flight track of Jet aircraft from three data samples: 2012, 2017, and 2017 proposed (simulated) to fly the FAA’s proposed procedures
 - Red (“warmer”) colors indicate areas of more tracks/concentration, Blue (“cooler”) colors indicate areas of less tracks/concentration
- The forthcoming technical analysis of the proposed procedure changes developed by the Roundtable Technical Committee **supplements and include** these FAA proposed departure and arrival changes

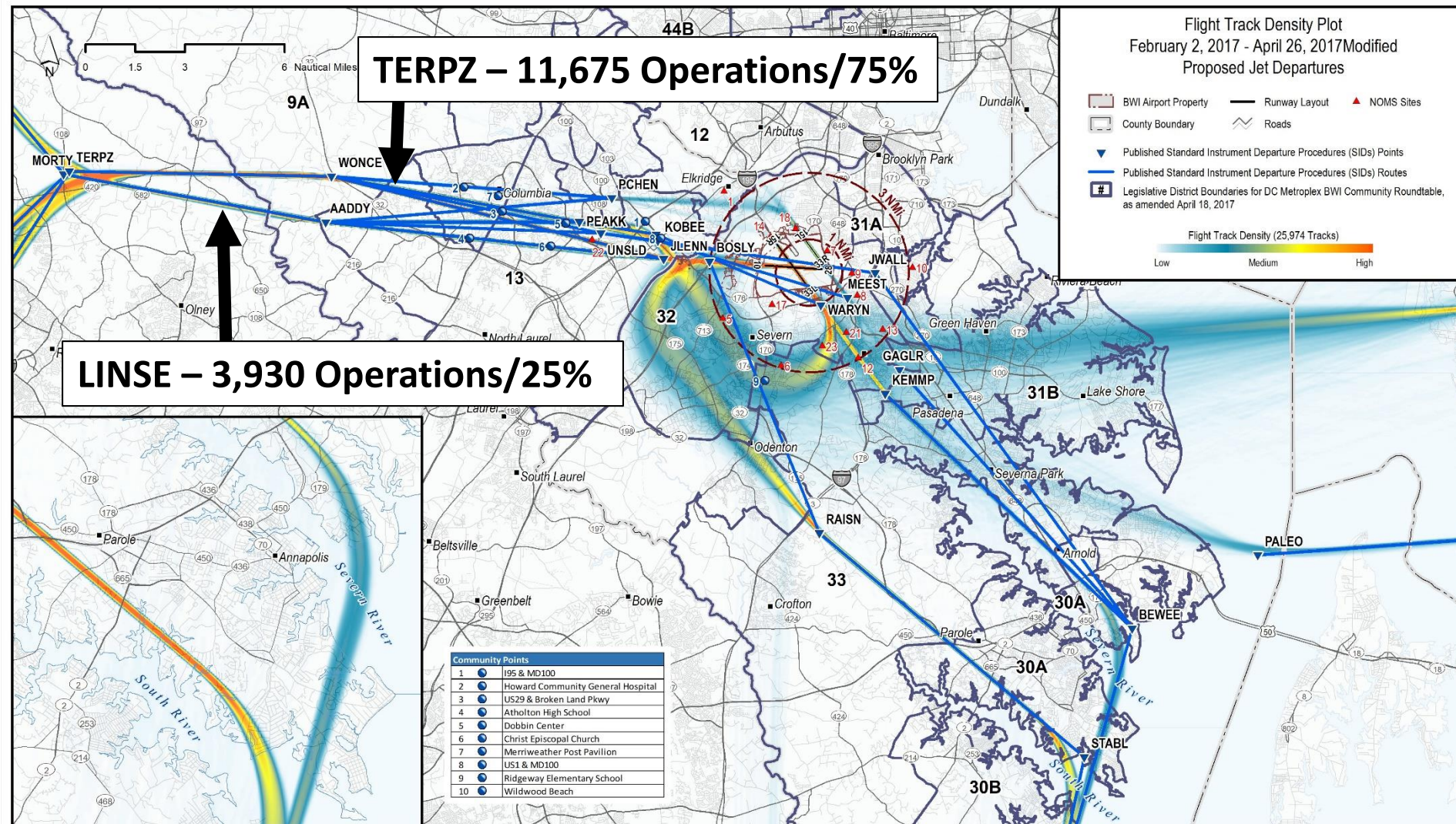
December 4, 2018 All Jet Departures – 2012



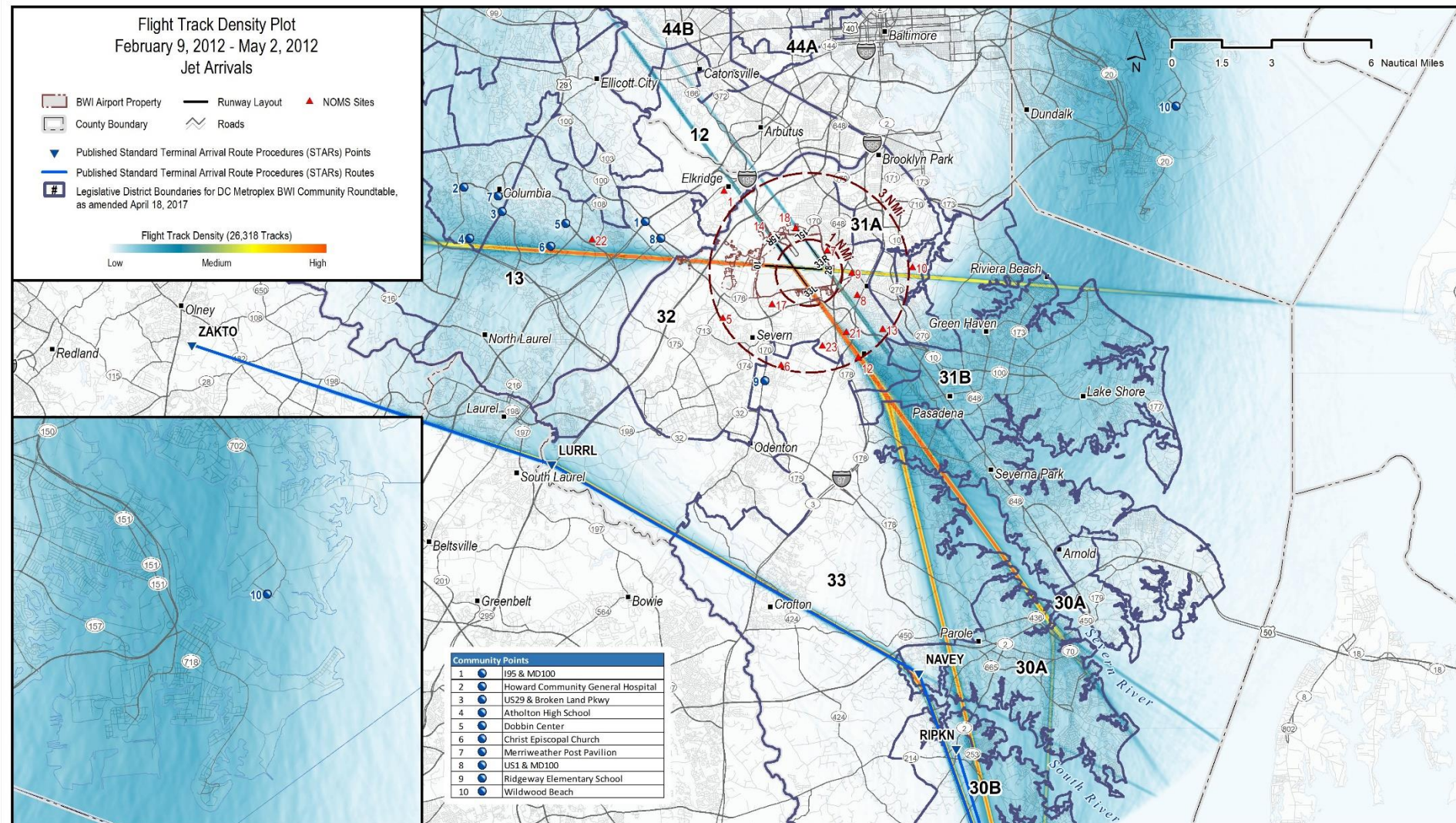
December 4, 2018 All Jet Departures – 2017



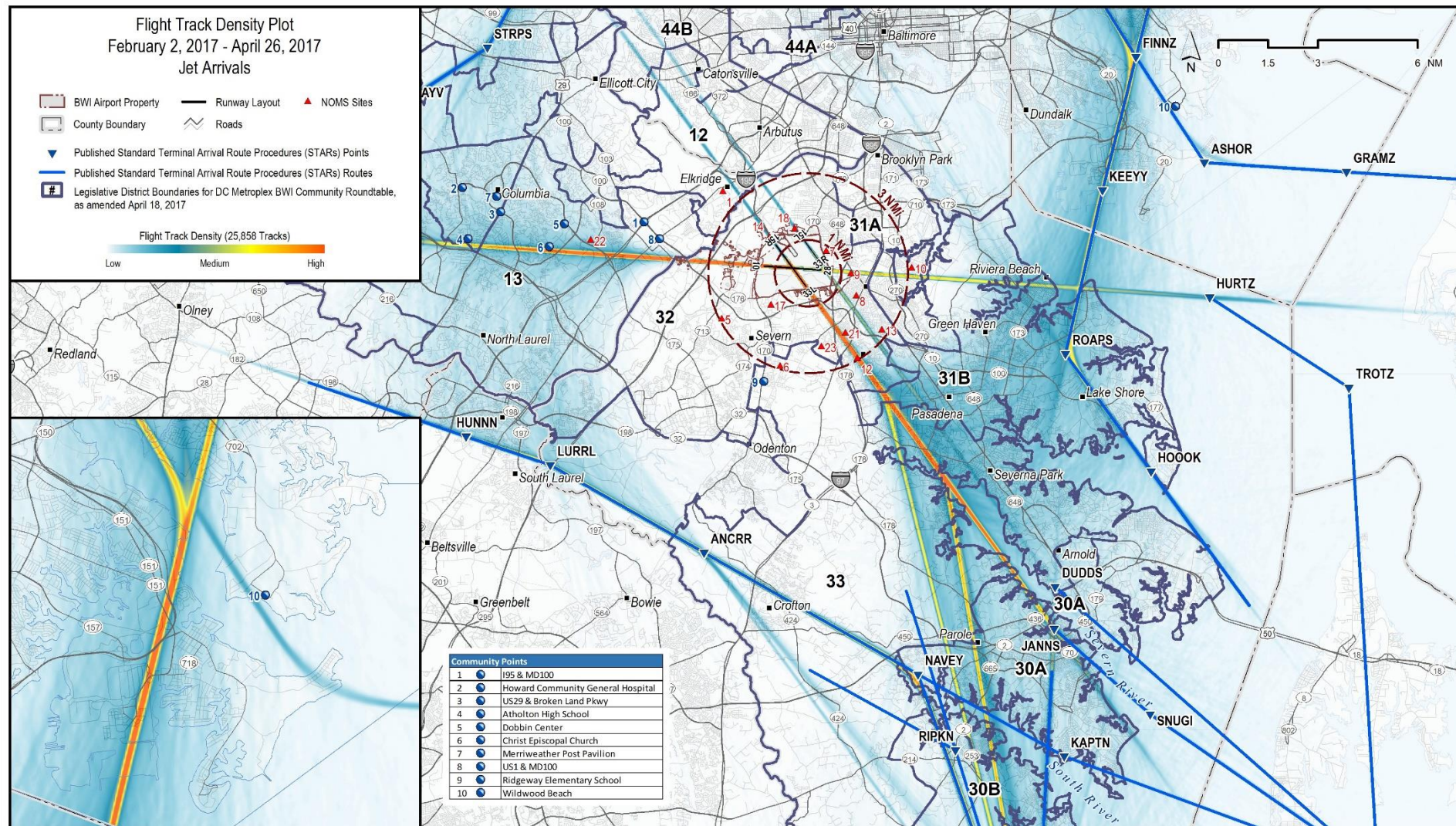
December 4, 2018 All Jet Departures – 2017 Proposed (Simulated)



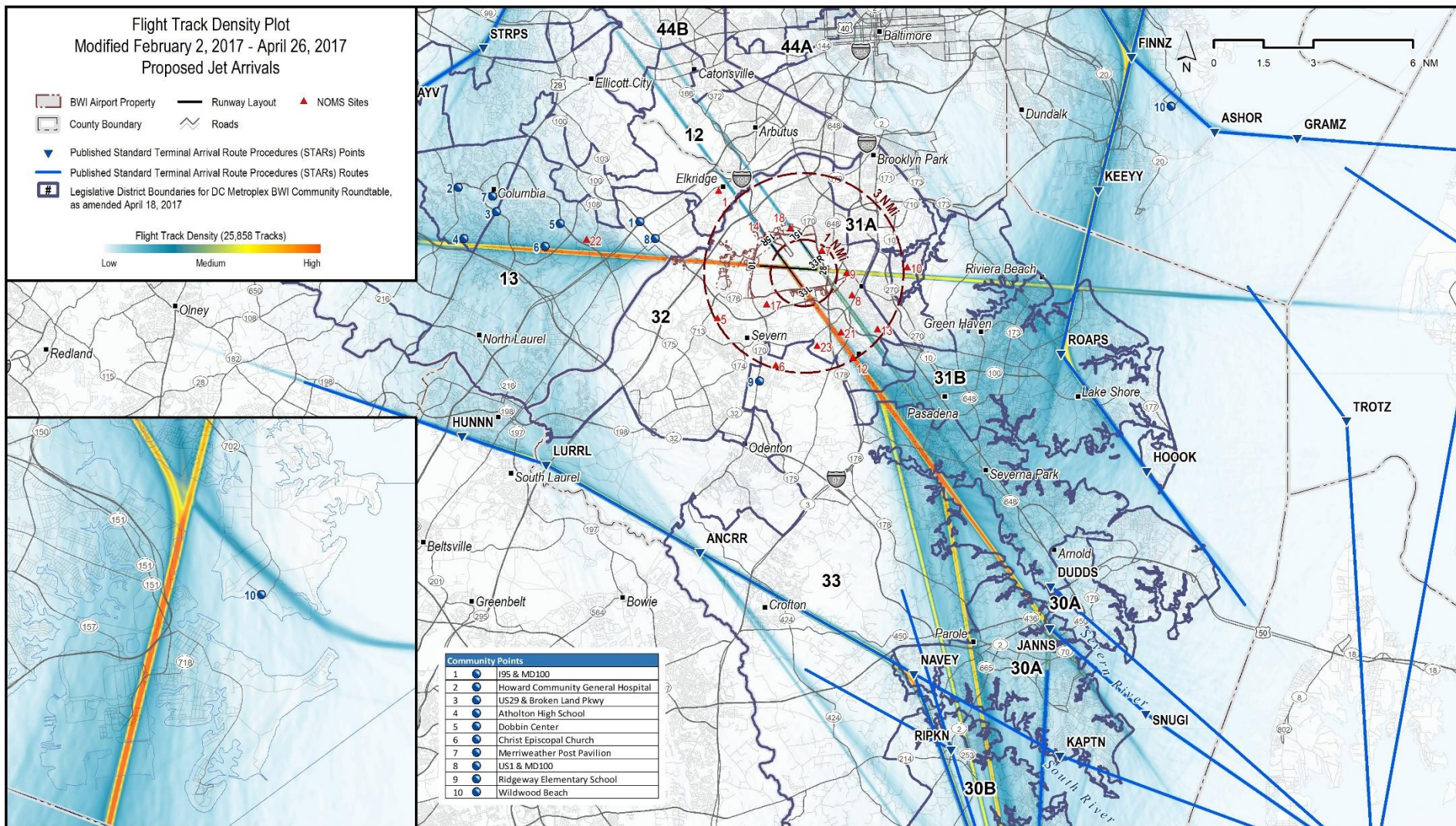
December 4, 2018 All Jet Arrivals – 2012



December 4, 2018 All Jet Arrivals – 2017



December 4, 2018 All Jet Arrivals – 2017 Proposed (Simulated)



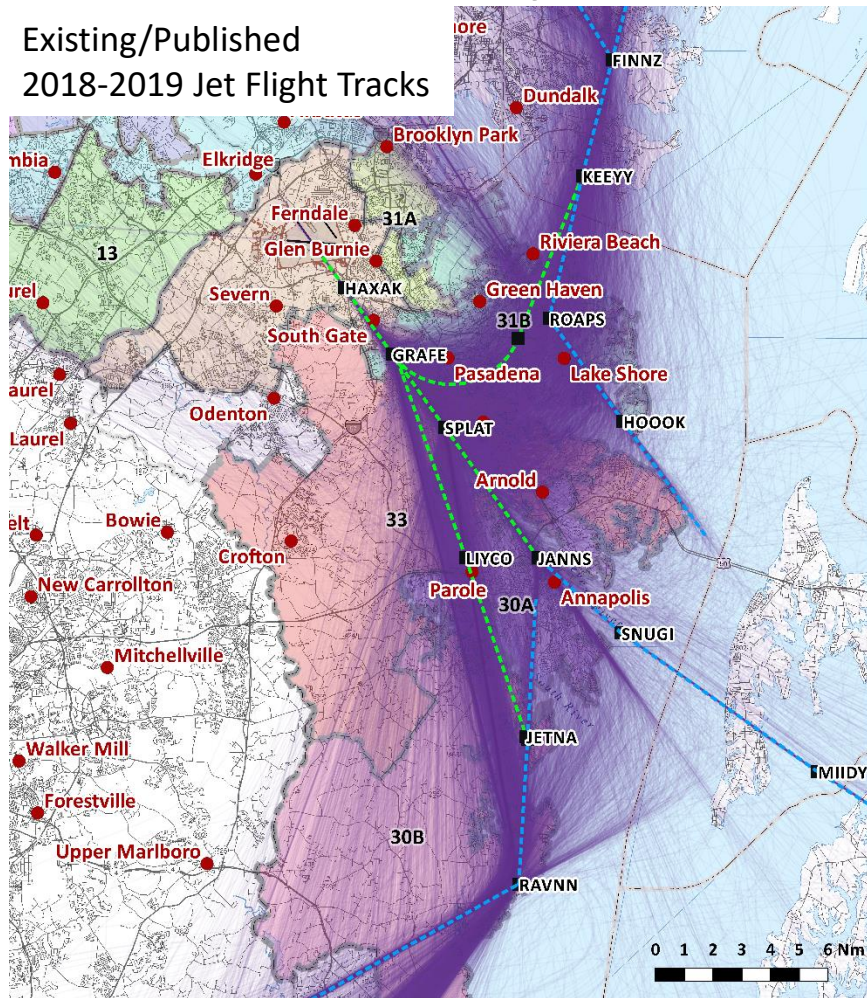
Note: Previously presented by MDOT MAA on December 4, 2018

Goals of the Technical Committee in Developing Procedure Changes

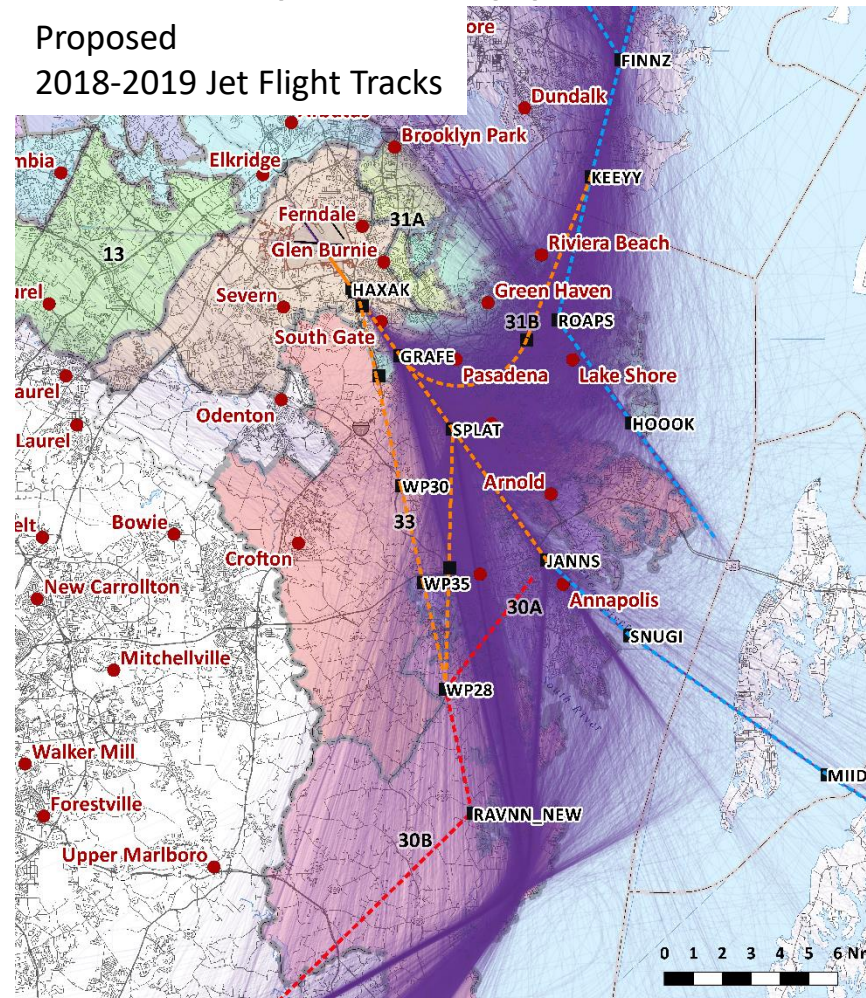
- The goal of the Roundtable Technical Committee was to develop solutions that address the following issues that have resulted from the implementation of NextGen at BWI Marshall, and related Performance Based Navigation (PBN) procedures:
 - Concentrated flight paths associated with existing FAA published and proposed NEXTGEN arrival and departure procedures
 - Extended periods of level flight by arrival aircraft at low altitudes and low altitude approaches
 - Changes to lateral flight paths of arrival and departures to relocate flight parts to historical locations or locations with the potential to reduce community noise exposure
- Roundtable developed proposed procedure changes with the goal of developing procedures that can be supported by the Roundtable, MDOT MAA, and Industry
- MDOT MAA and Industry support proposed changes, now seek support of the full Roundtable to move proposals forward to FAA
- The following slides briefly review the proposed approach and arrival procedure changes developed by the Roundtable Technical Committee as presented at the October 15, 2019 Roundtable meeting

RAVNN Runway 33L Arrivals and Runway 33L Approaches

Existing/Published
2018-2019 Jet Flight Tracks



Proposed
2018-2019 Jet Flight Tracks



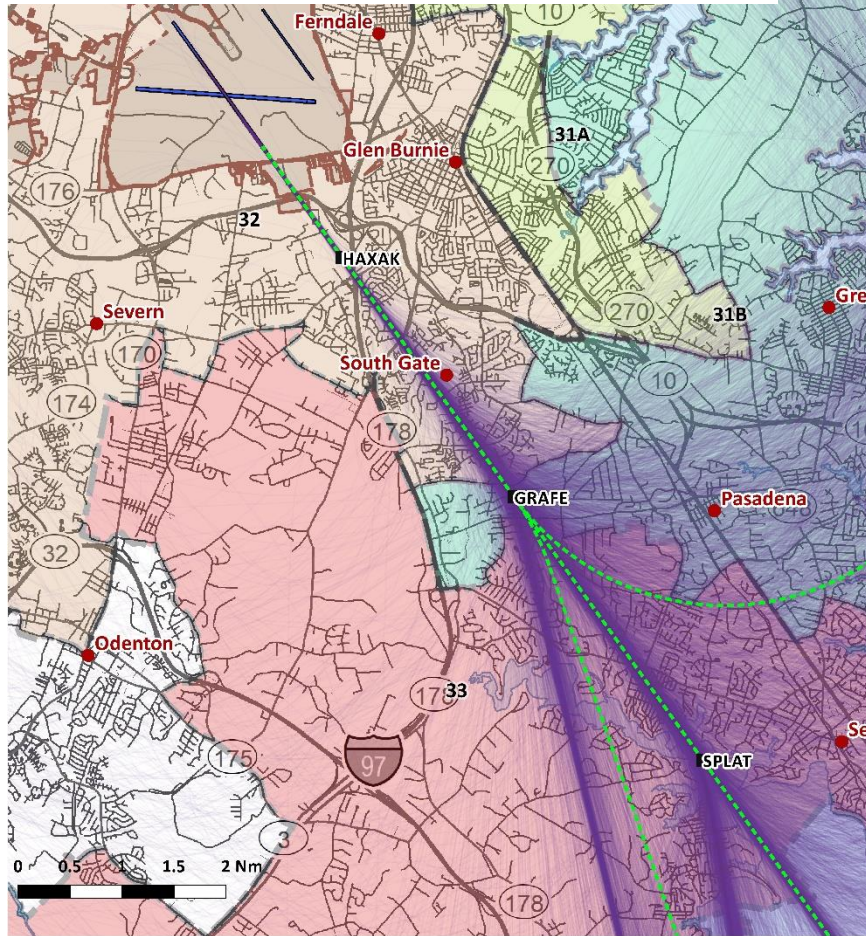
Legend

- Navigational Points
- Proposed Arrival Procedure Changes
- Existing Published Arrival Procedures
- Proposed Approach Procedure Changes
- Existing Published Approach Procedures
- Arrival Flight Tracks

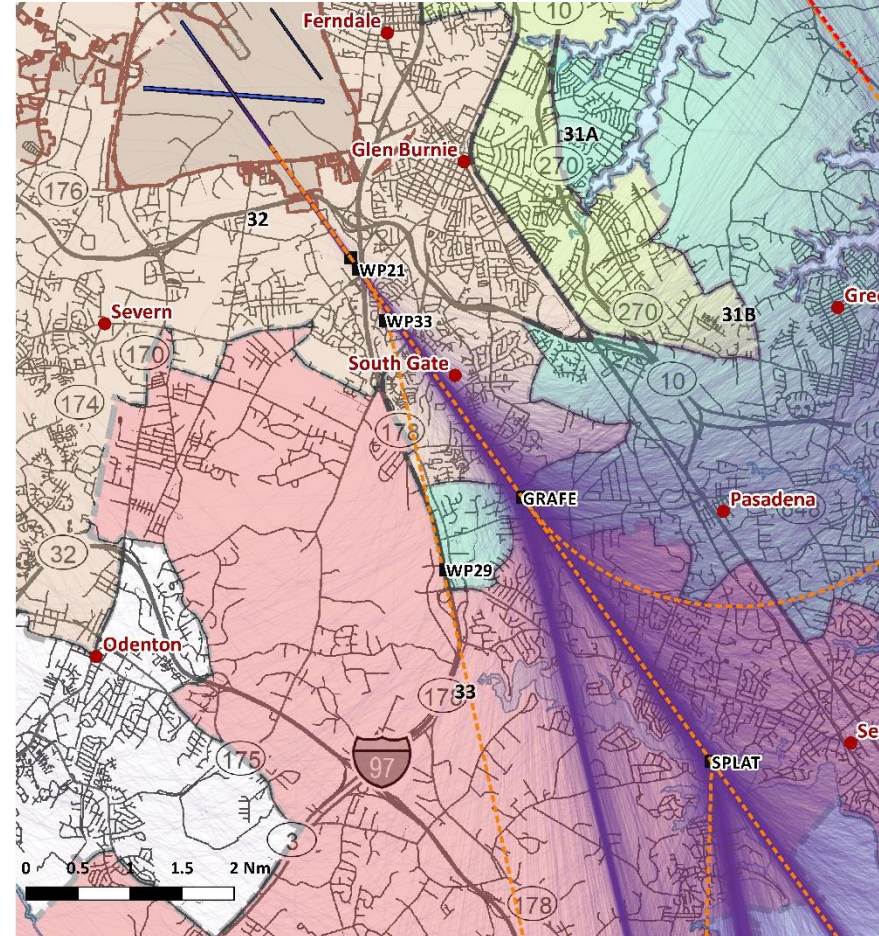
Pre-Decisional: For informational purposes only

RAVNN Runway 33L Arrivals and Runway 33L Approaches

Existing/Published – 2018-2019 Jet Flight Tracks



Proposed – 2018-2019 Jet Flight Tracks

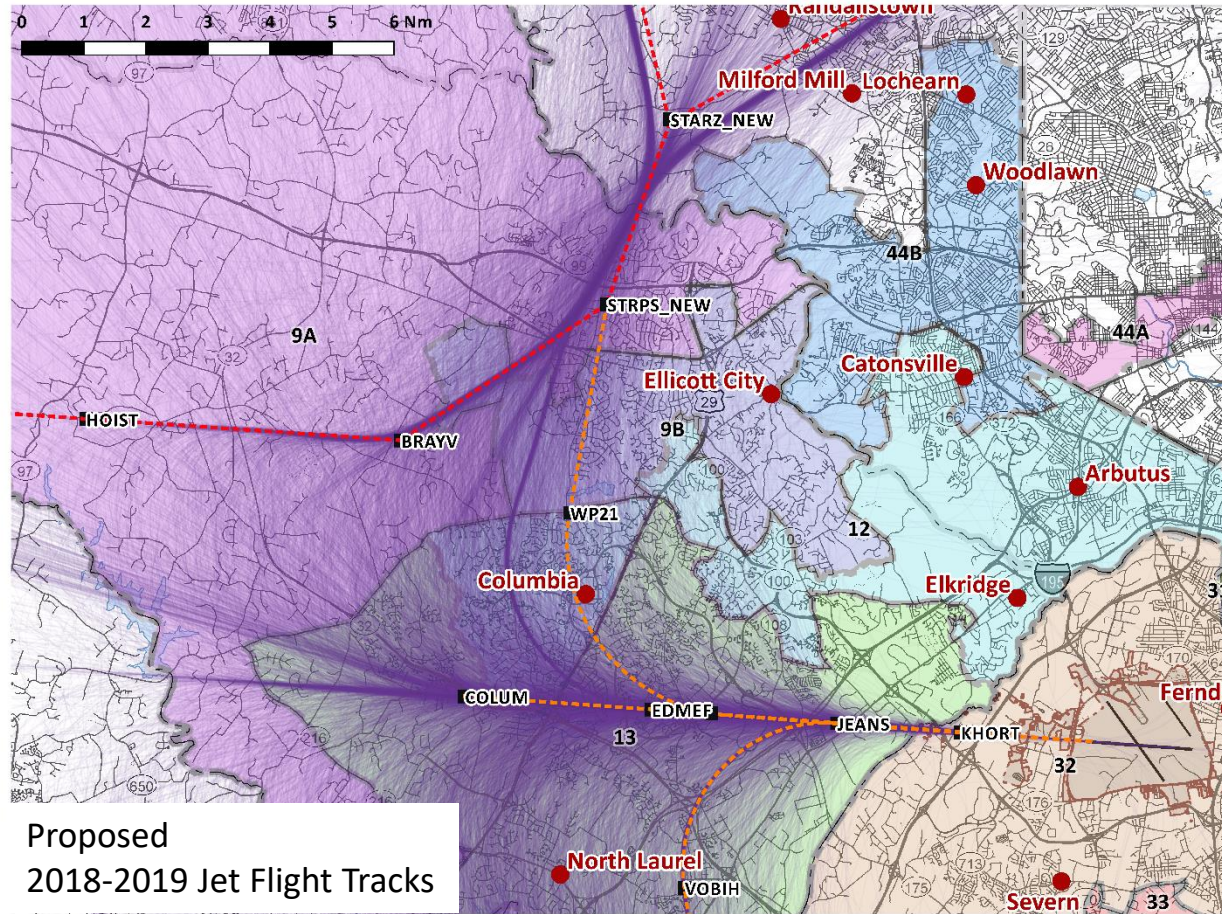
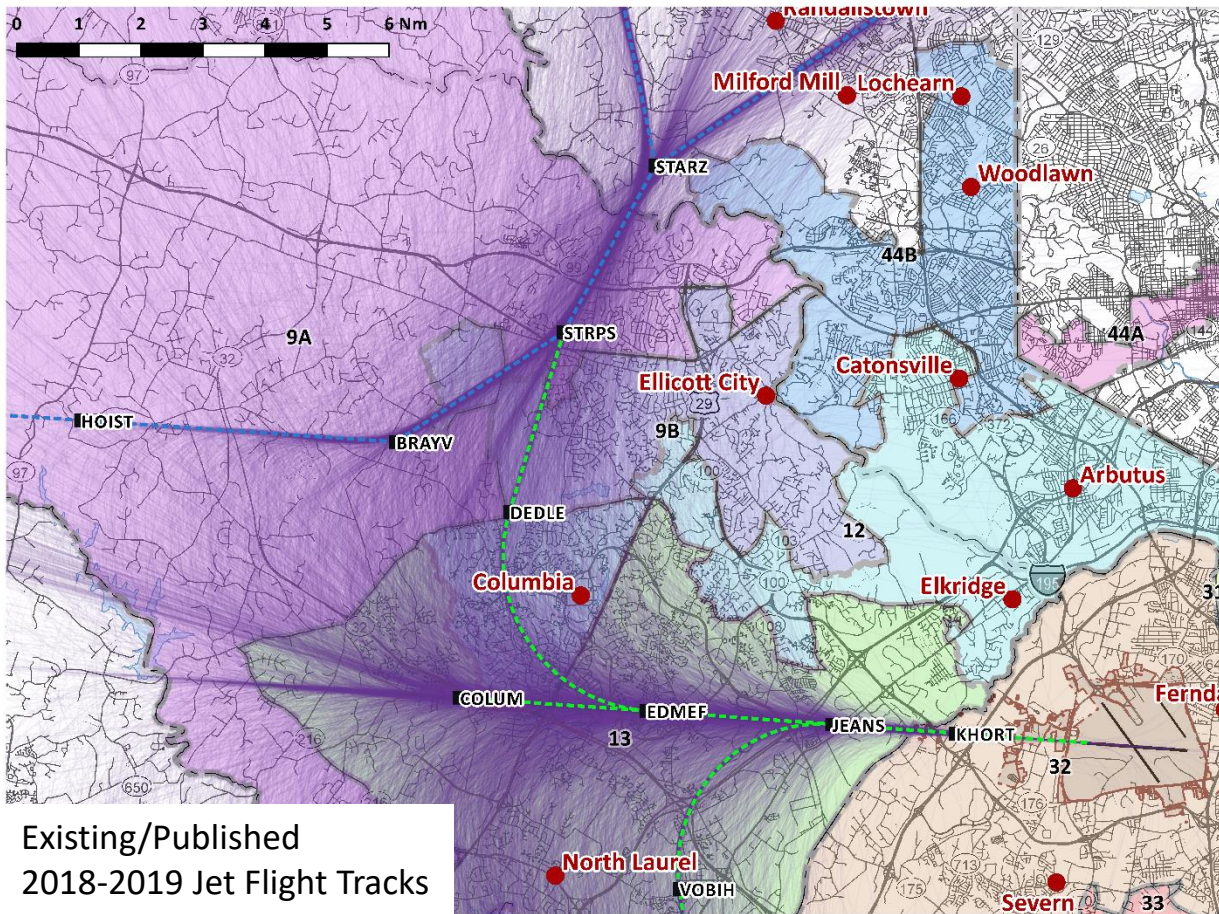


Legend

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Pre-Decisional: For informational purposes only

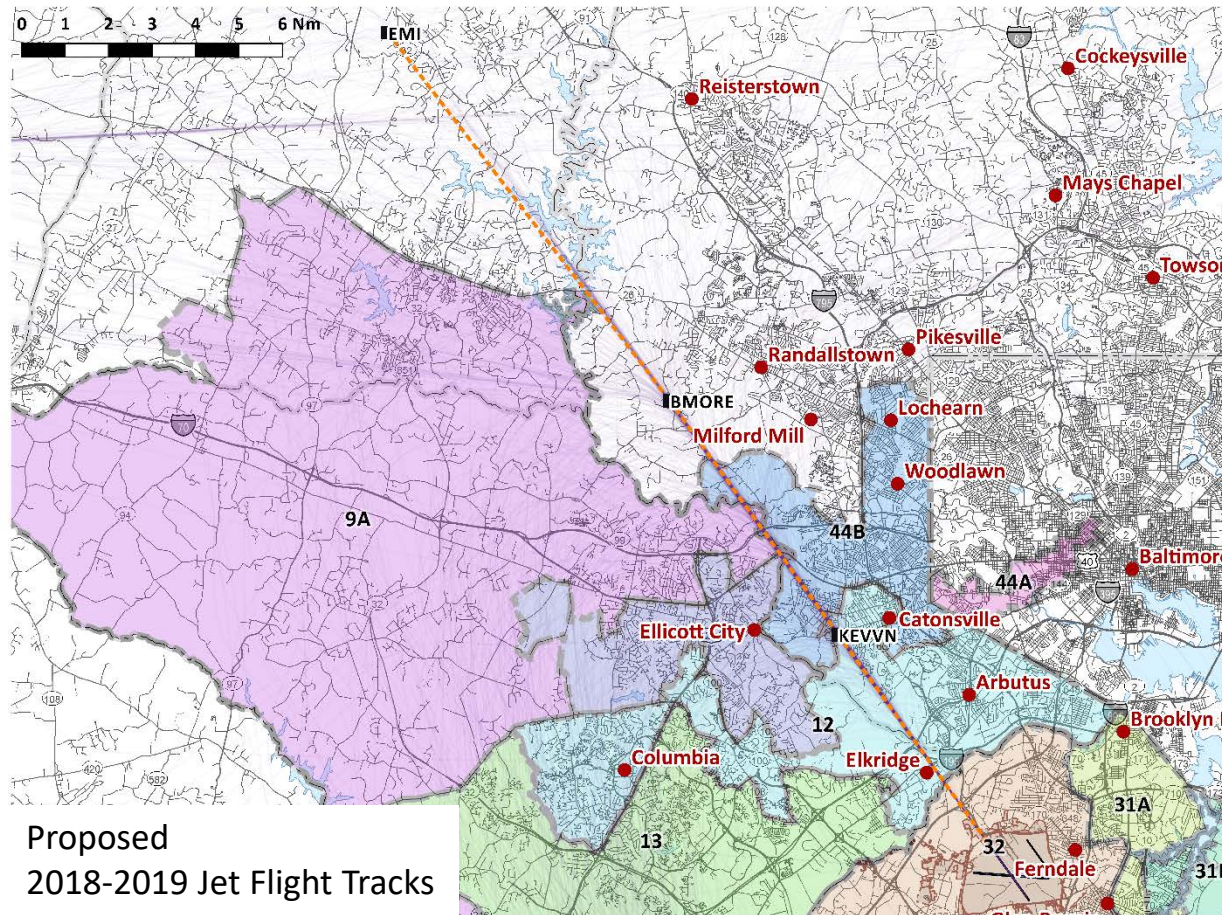
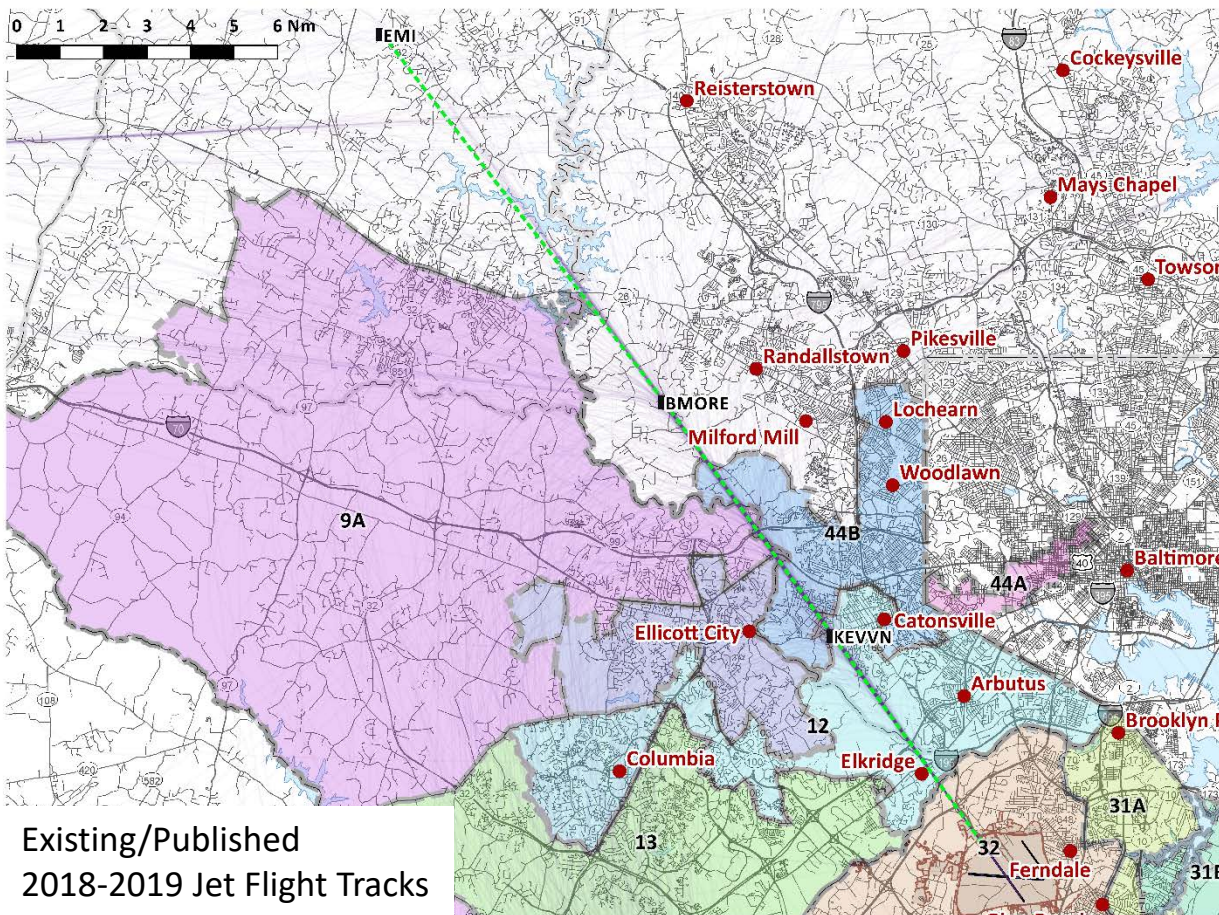
ANTHM and TRISH Runway 10 Arrivals and Runway 10 Approaches



Legend

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 - Proposed Approach Procedure Changes
 - Existing Published Approach Procedures
 - Arrival Flight Tracks
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Proposed Runway 15R RNP Approach



Legend

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 - Existing Published Approach Procedures
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Anticipated Benefits of Proposed Procedure Changes

- Increased/higher aircraft altitudes on arrival where possible
- Increased/higher aircraft altitudes on approach during good and bad weather conditions leveraging Continuous Descent Approaches (CDAs)
 - Fewer instances of aircraft flying large distances from the airport at lower altitudes in level flight
 - Reduced/near-idle engine power settings due to continuous descent
 - Published procedures along existing approach corridors used during good weather (visual approaches) that allow for vertical guidance
- Better distribution of approach operations
- Relocation of flight paths to locations with the potential to reduce cumulative community noise exposure



Flight Track Analysis of April 2018 FAA and Roundtable Technical Committee Proposed Procedure Changes

Flight Track Analysis – Overview

- Obtained flight track data from MDOT MAA Airport Noise Monitoring and Management System (ANOMS) for the following selected sample periods:
 - **Pre-Metroplex:** January, June, July, and December 2012 (123-days)
 - **Post-Metroplex:** November 2018, and February, May, and August 2019 (120-days)
 - Time periods selected to account for seasonal variability in aircraft operations and avoid runway closures

Year(s)	Months	Duration	Arrival Flight Tracks	Departure Flight Tracks	Total Flight Tracks	Notes
2012	January, June, July, and December	123 days	44,384	42,167	86,551	Pre-Metroplex
2018-2019	November 2018 and February, May and August 2019	120 days	41,912	42,234	84,146	Post-Metroplex

- Modified the 2018-2019 data sample to simulate aircraft usage of April 24, 2018 FAA departure and arrival procedure changes as well as Roundtable Technical Committee proposed arrival and approach procedure changes

Flight Track Analysis – Overview

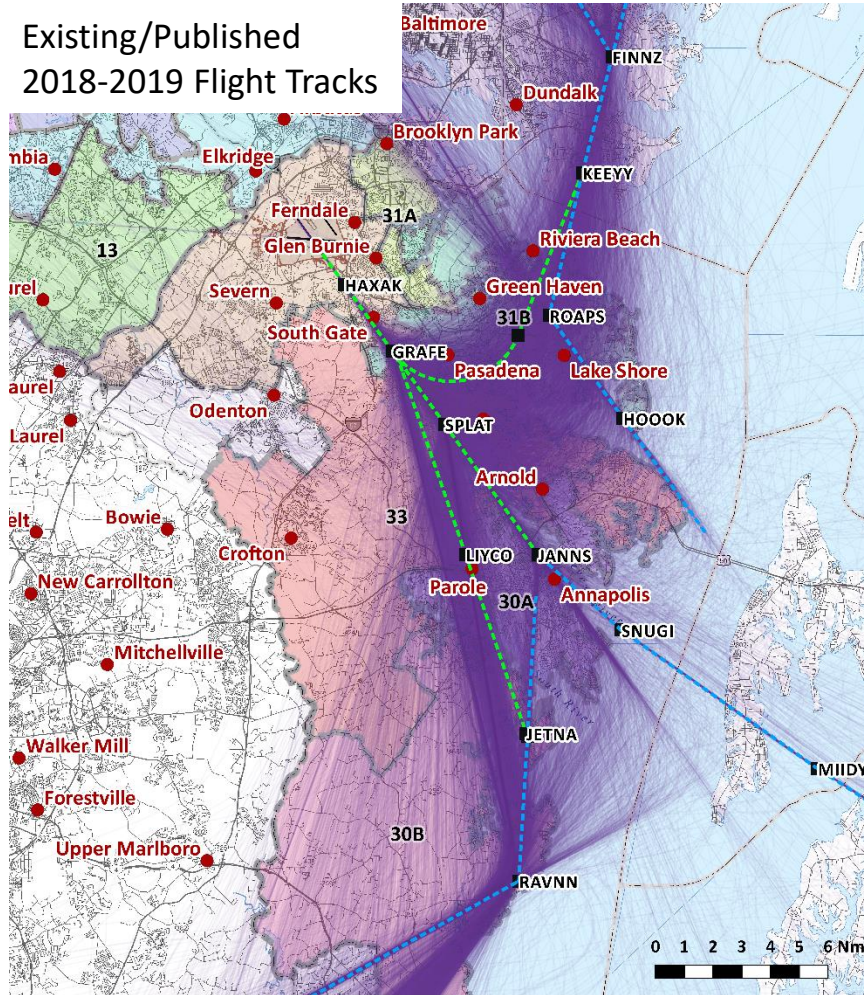
- 2018-2019 proposed departure and arrival procedure data sample simulation assumptions:
 - Only Jet aircraft would utilize the proposed procedures
 - Turbine and Piston Propeller aircraft would fly procedures as published today
 - A majority of Jet aircraft would fly the arrival procedures as published and would not be “short cut” by air traffic controllers. **However, some Jet aircraft that today are not flying on a published arrival procedure are assumed not to change**
 - Proposed Required Navigation Performance (RNP) and Area Navigation (RNAV) approach procedures would be limited to only those aircraft found in the 2018-2019 data sample to be capable of flying RNP or RNAV approach procedures
 - Some approach aircraft will continue to intercept each Runway’s final approach course in the same locations as they do today based on the need for sequencing/vectoring from air traffic controllers. **Not all aircraft will fly the new proposed RNP or RNAV approach procedures**
 - Runway 15R and 28 approach aircraft fly a concentrated path to each runway when arriving from the southwest (RAVNN arrival procedure). However, these aircraft may be sequenced/vectored by air traffic control which may better disperse these operations
- **Simulated flight tracks represent our interpretation of how aircraft may fly the FAA’s proposed procedures and aircraft may fly the procedures differently once implemented**

Flight Track Analysis – Overview

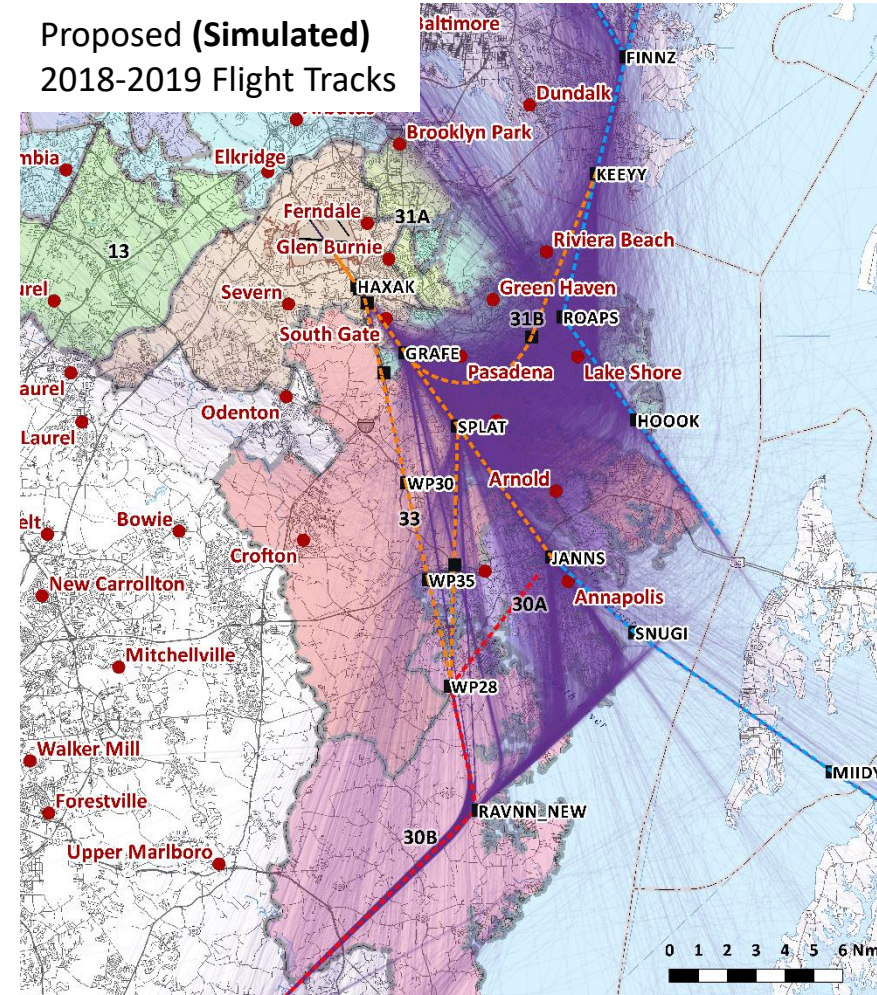
- The following slides present Jet flight tracks from the 2012, 2018-2019, and 2018-2019 proposed (simulated) data samples
 - Arrival flight tracks are depicted in Purple
 - Departure flight tracks are depicted in Green
 - Darker shades of color represent areas with greater concentrations of flight tracks, lighter shades represent areas of lesser concentrations
 - Turbine and Piston Propeller aircraft are not shown as it is assumed they will continue to fly as they do today (remain unchanged)
- Focus on Runway 33L, 15R, and 10 arrival and approach procedure changes developed by the Roundtable Technical Committee. However, all Jet arrivals and departures including the April 2018 FAA proposed approach and departure procedure changes were evaluated in the flight track analysis

Runway 33L Jet Arrivals – 2018-2019 compared to 2018-2019 Proposed (Simulated)

Existing/Published
2018-2019 Flight Tracks



Proposed (Simulated)
2018-2019 Flight Tracks

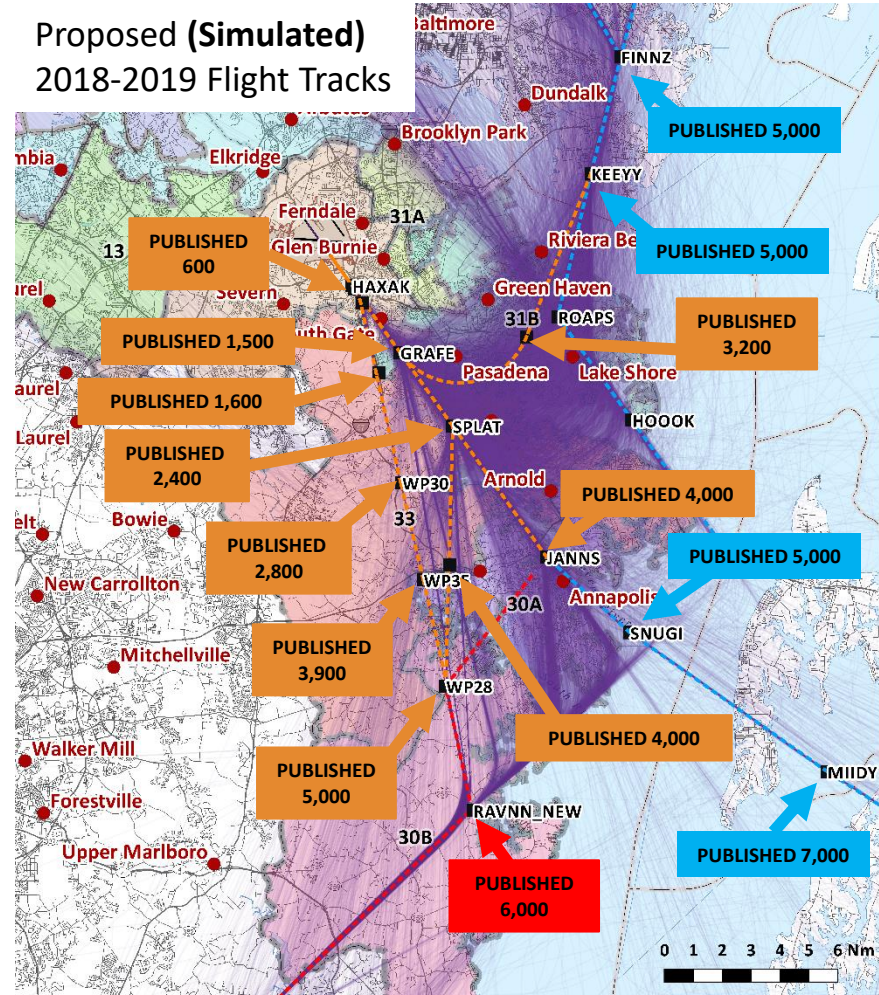
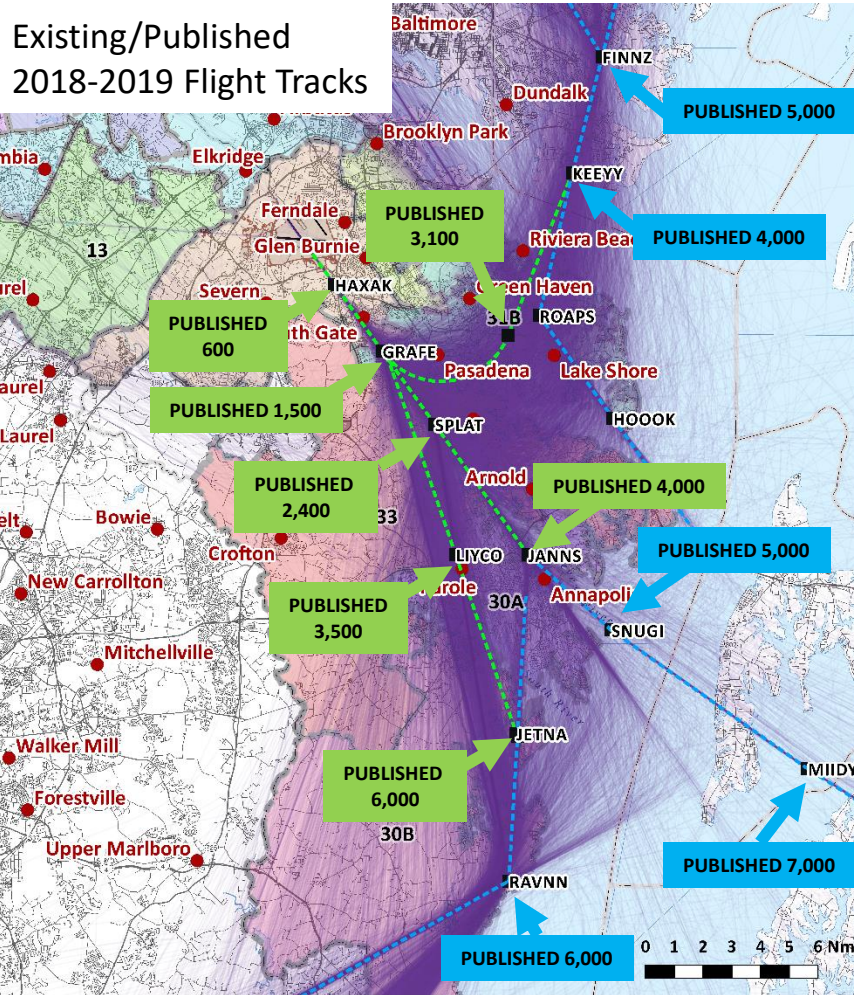


Legend

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- Arrival Flight Tracks

Pre-Decisional: For informational purposes only

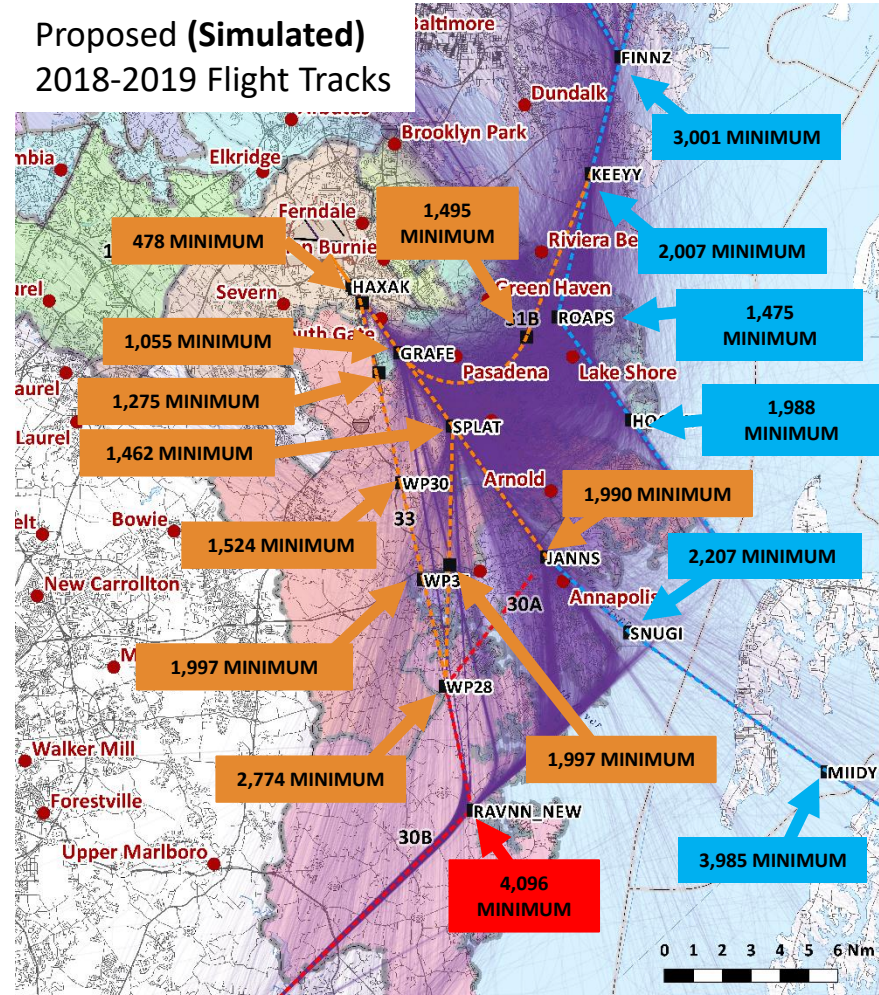
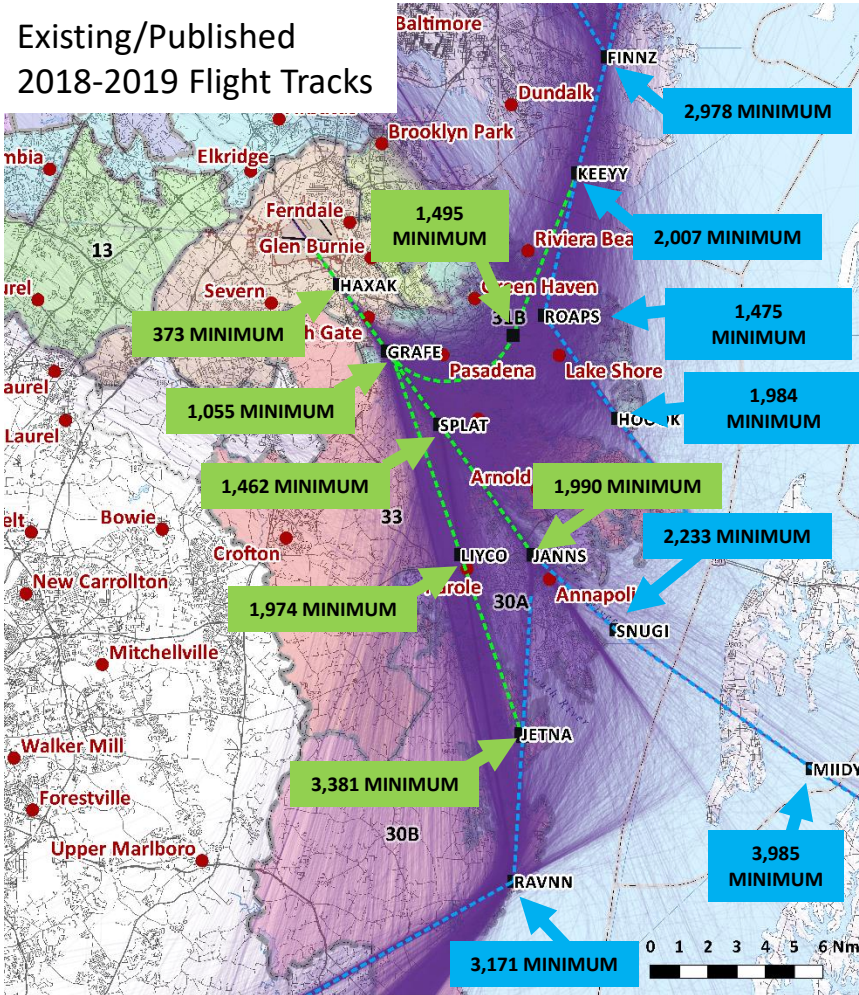
Runway 33L Jet Arrivals – 2018-2019 compared to 2018-2019 Proposed (Simulated)



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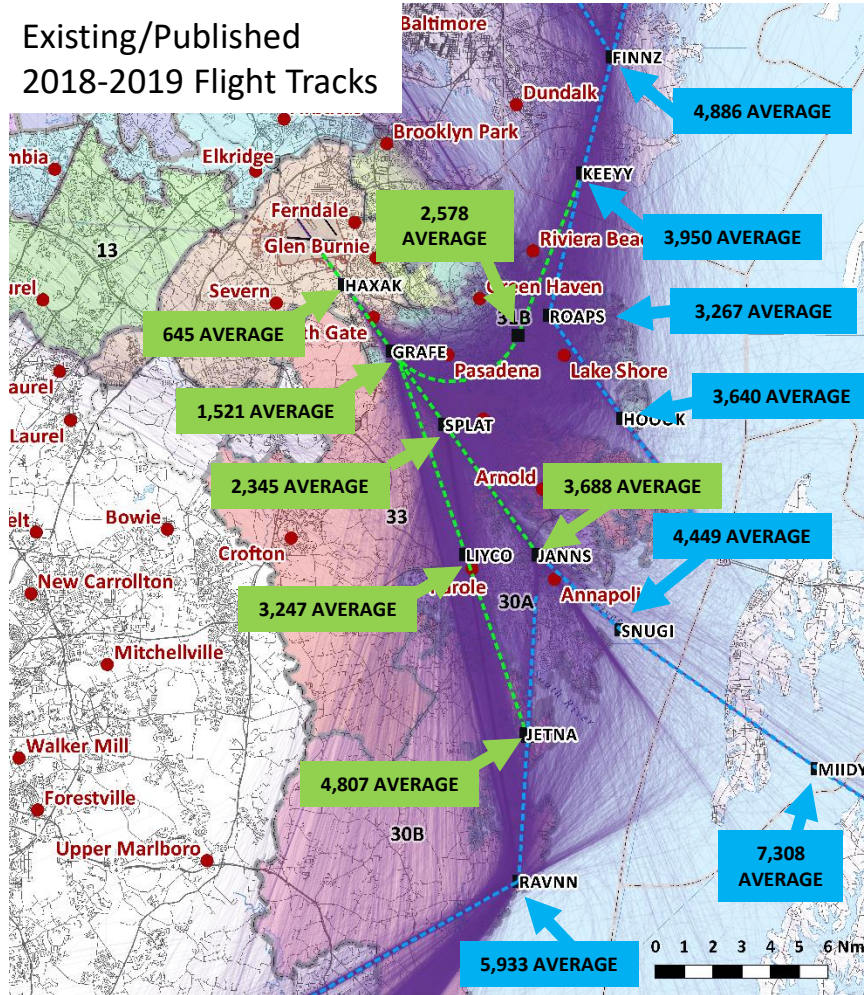


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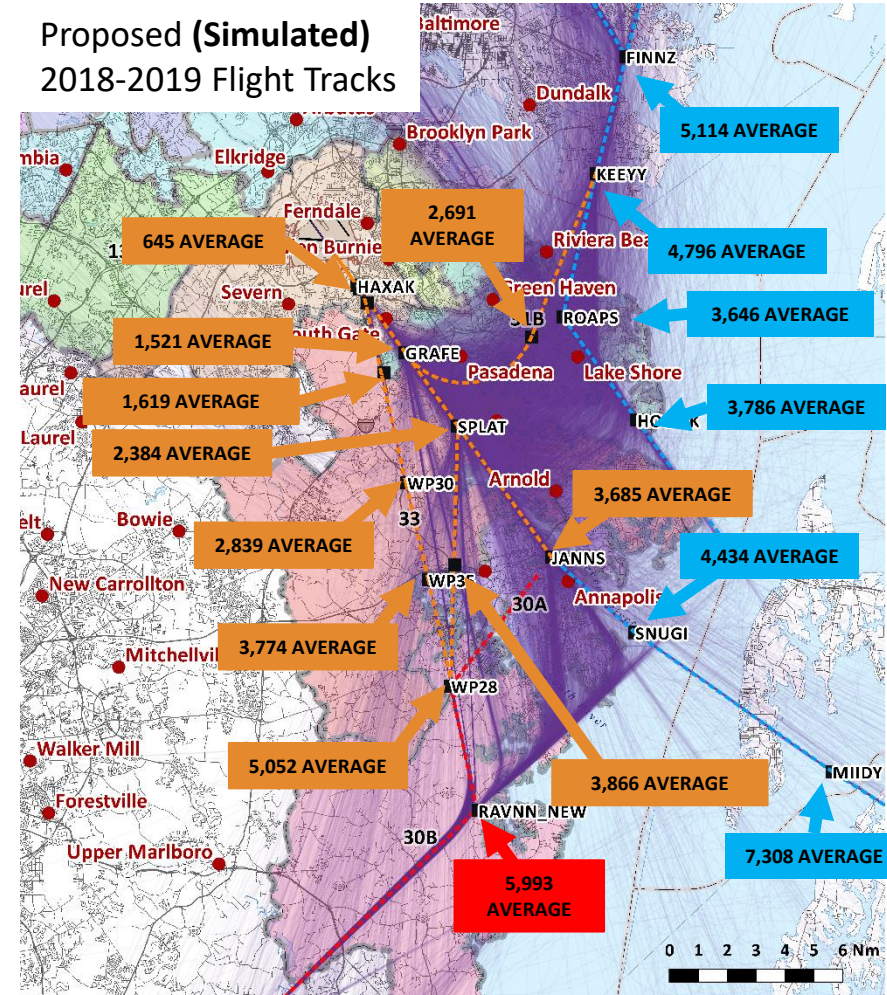
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Existing/Published
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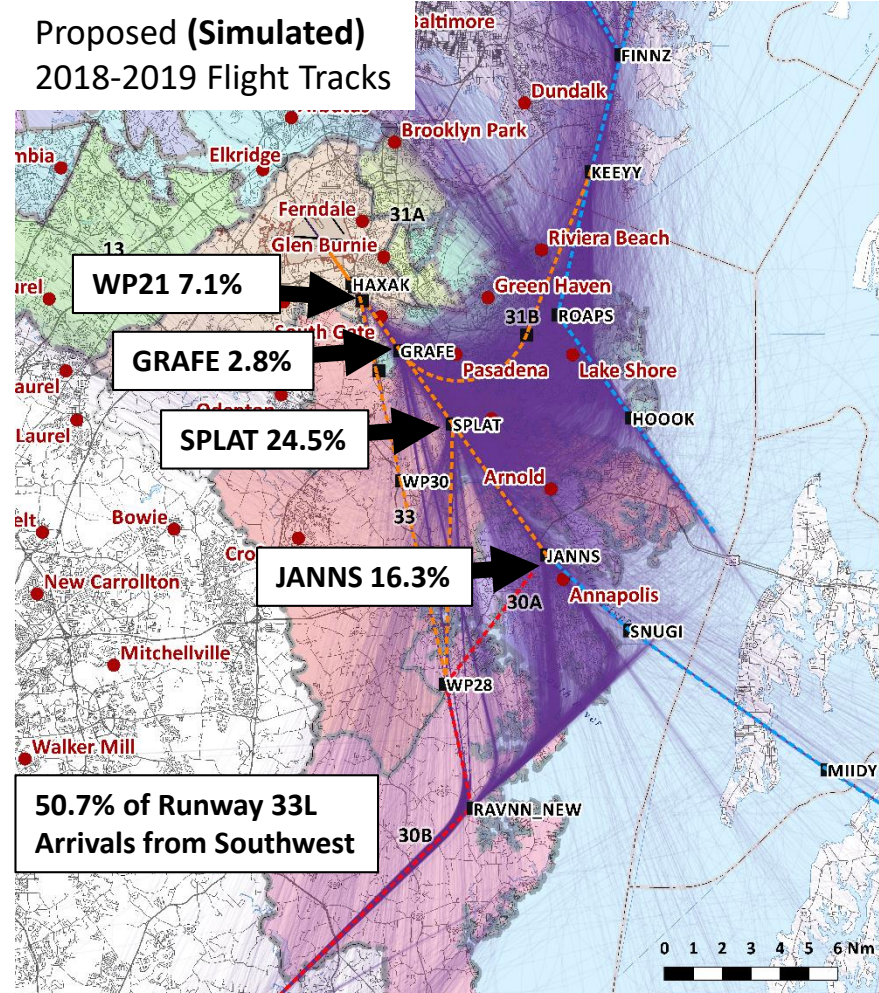
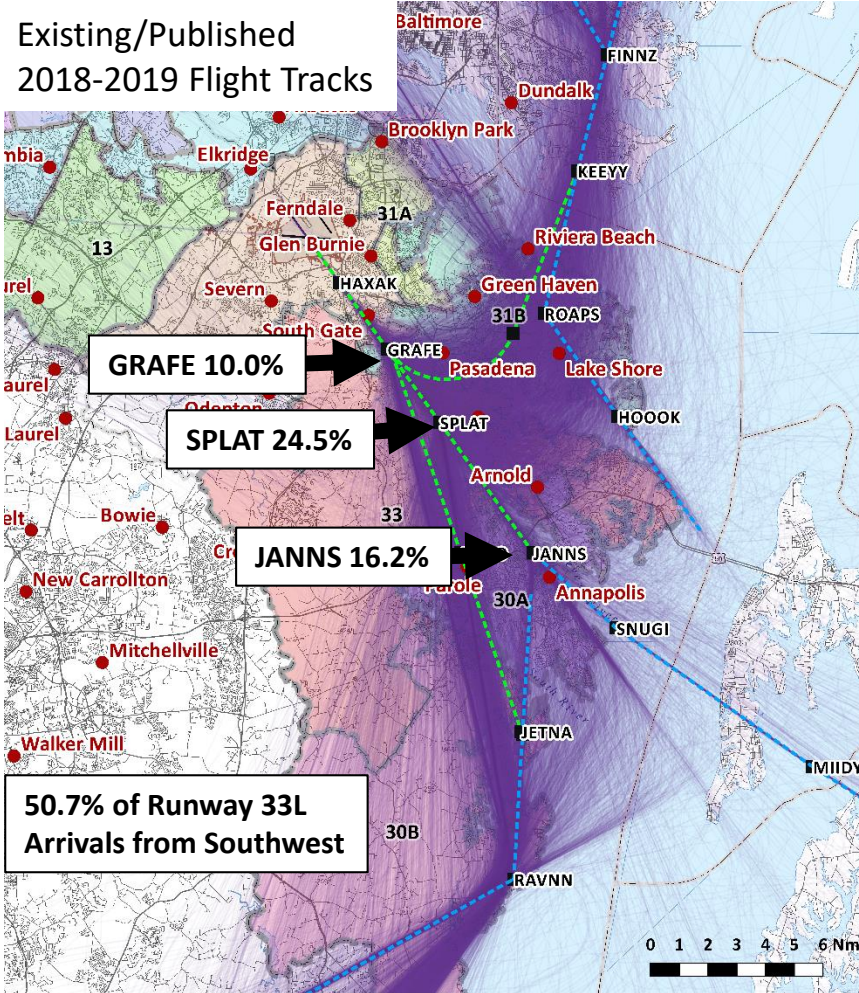
Proposed (Simulated)
2018-2019 Flight Tracks



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Runway 33L Jet Arrivals – 2018-2019 compared to 2018-2019 Proposed (Simulated)

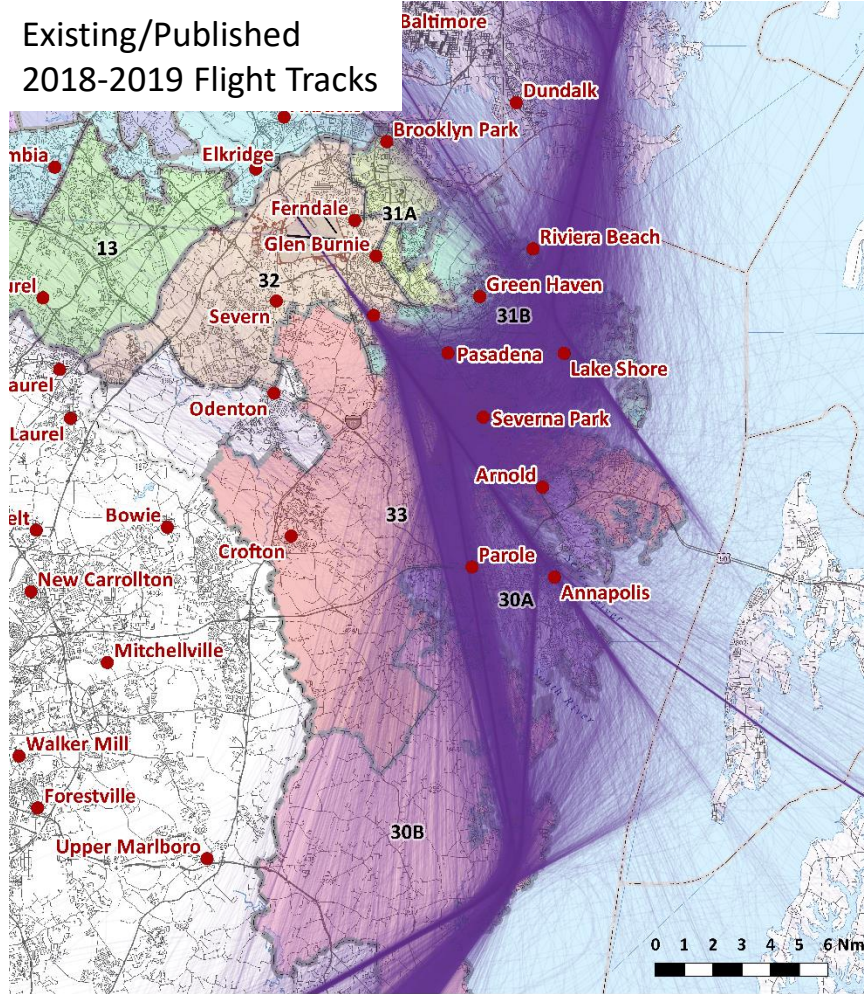


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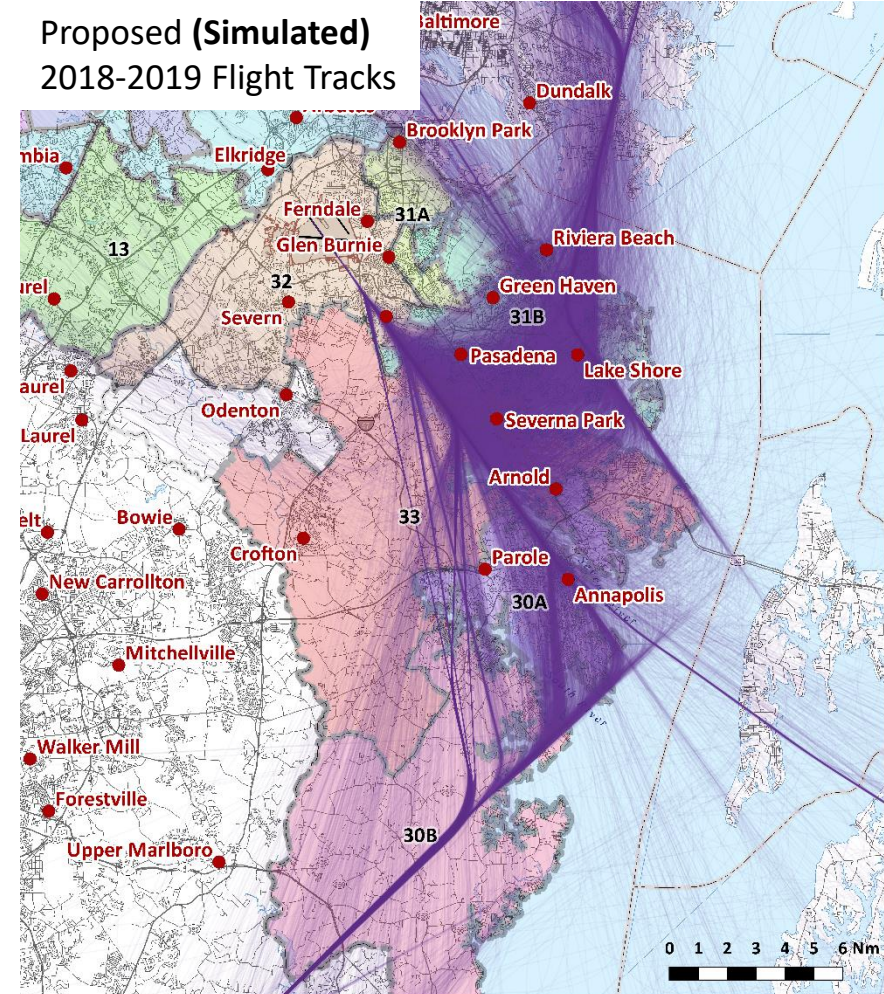
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Runway 33L Jet Arrivals – 2018-2019 compared to 2018-2019 Proposed (Simulated)

Existing/Published
2018-2019 Flight Tracks



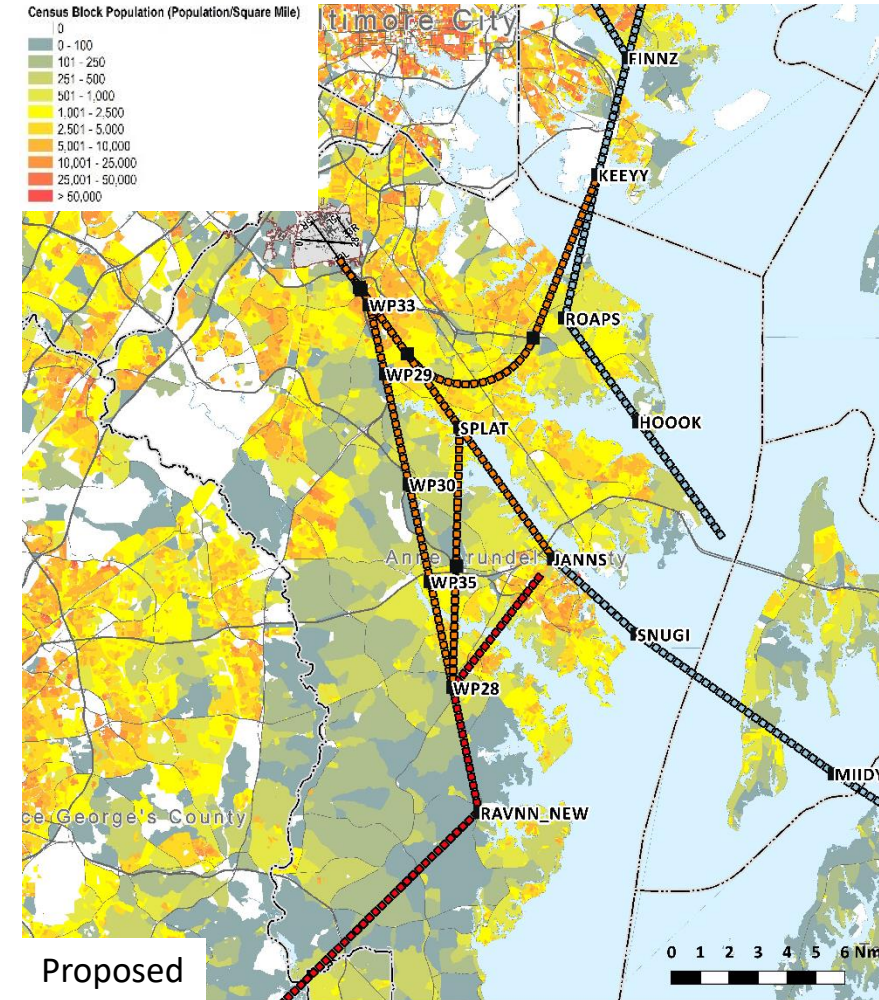
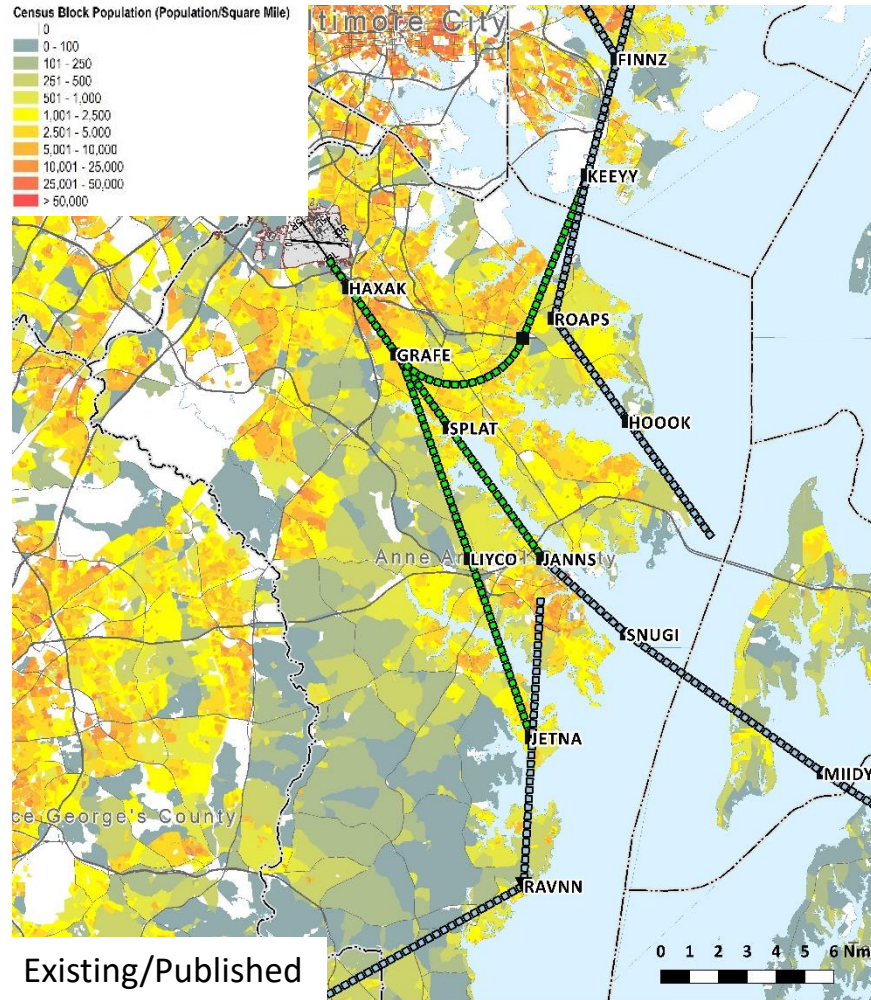
Proposed (Simulated)
2018-2019 Flight Tracks



Legend

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Runway 33L Arrivals/Approaches – Population 2019 Published compared to Proposed

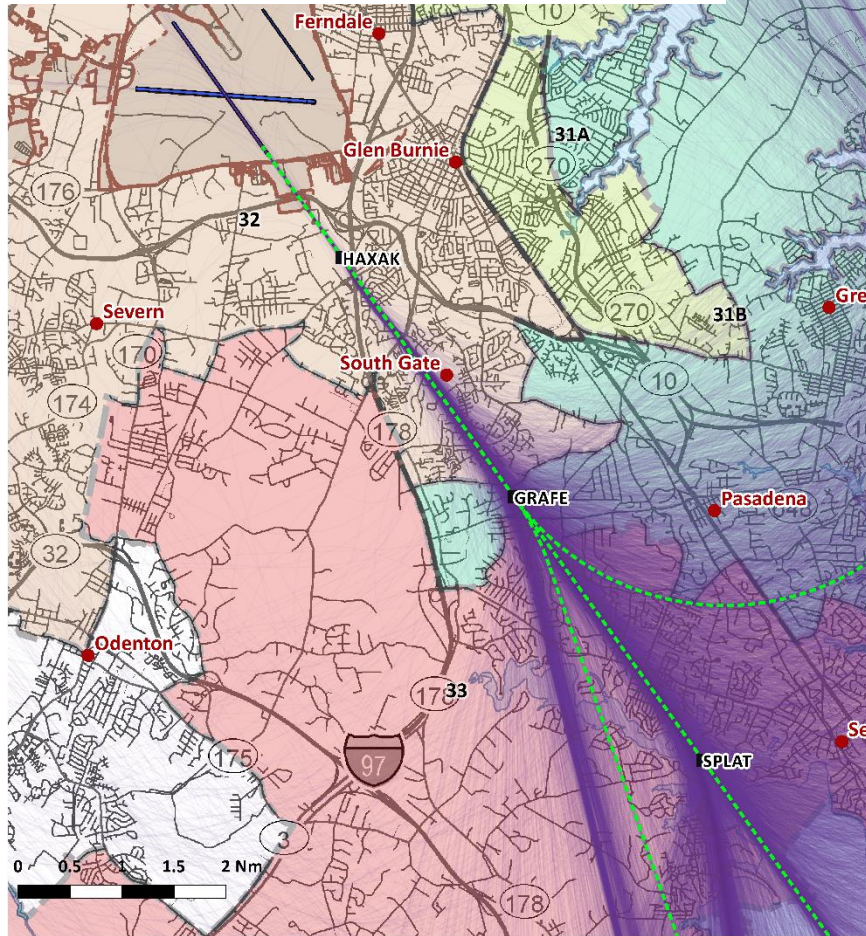


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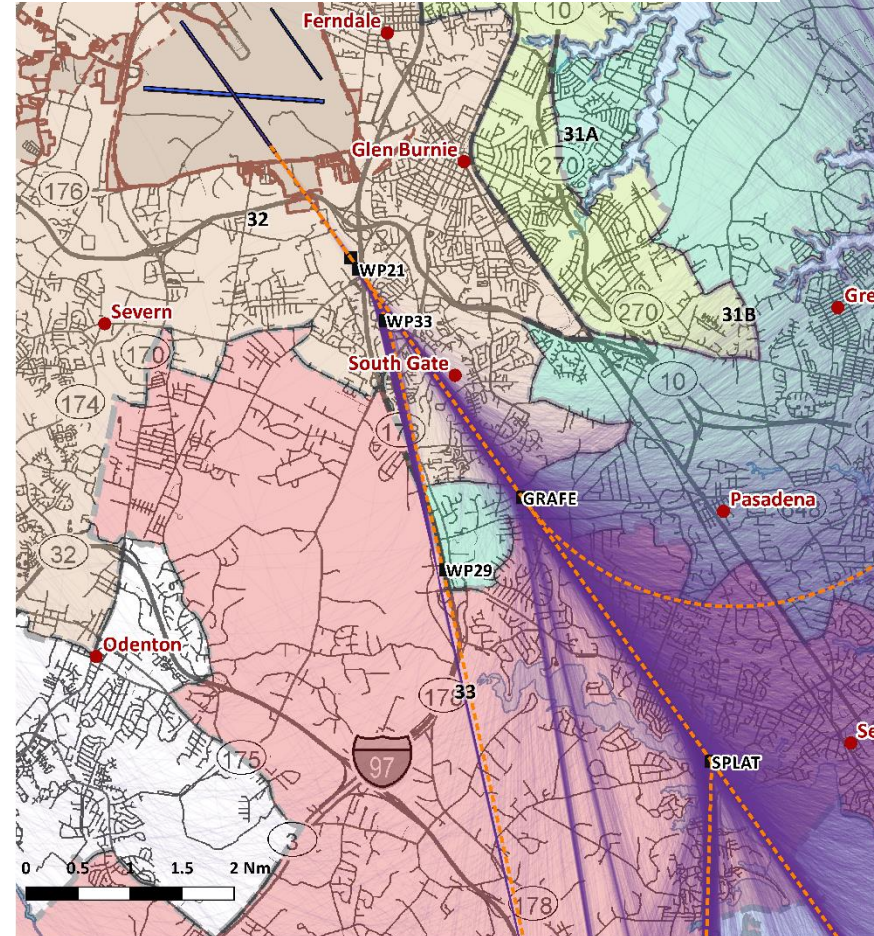
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Runway 33L Jet Arrivals – 2018-2019 compared to 2018-2019 Proposed (Simulated)

Existing/Published – 2018-2019 Flight Tracks



Proposed (Simulated) – 2018-2019 Flight Tracks



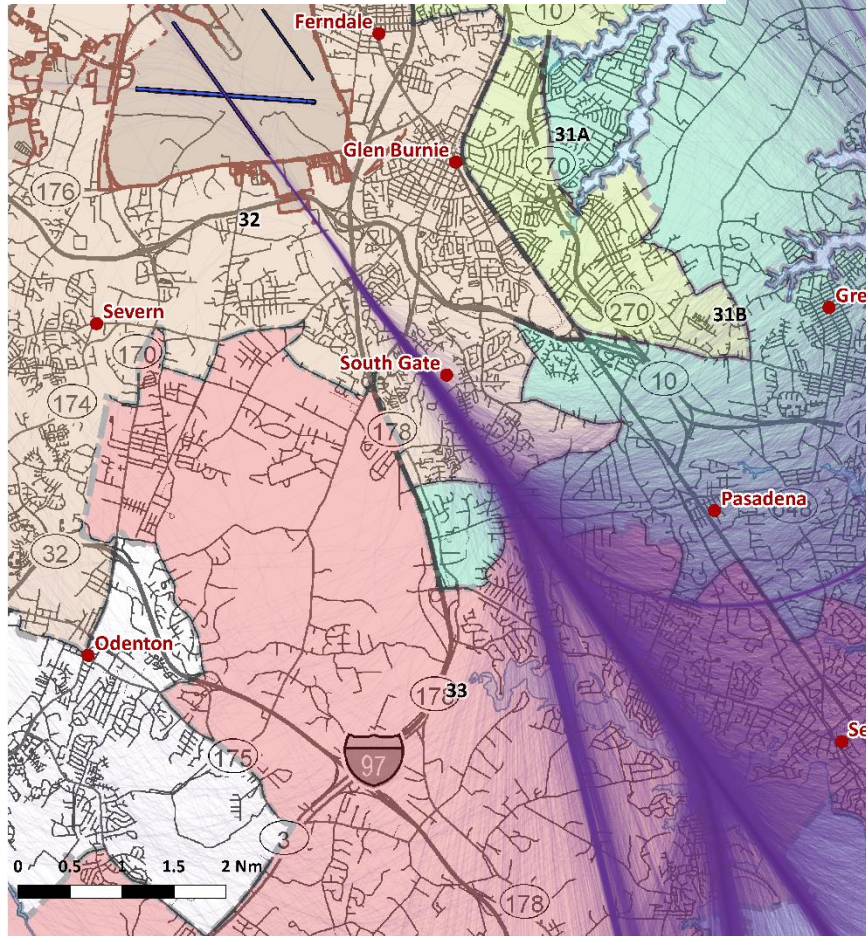
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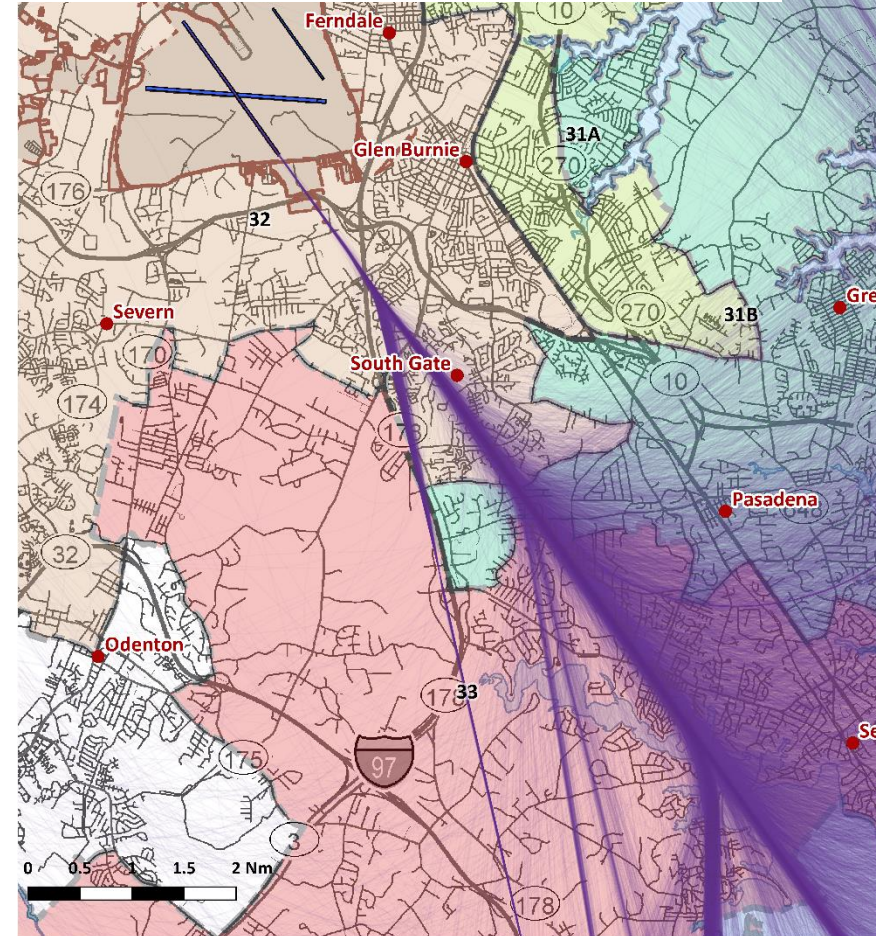
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Runway 33L Jet Arrivals – 2018-2019 compared to 2018-2019 Proposed (Simulated)

Existing/Published – 2018-2019 Flight Tracks



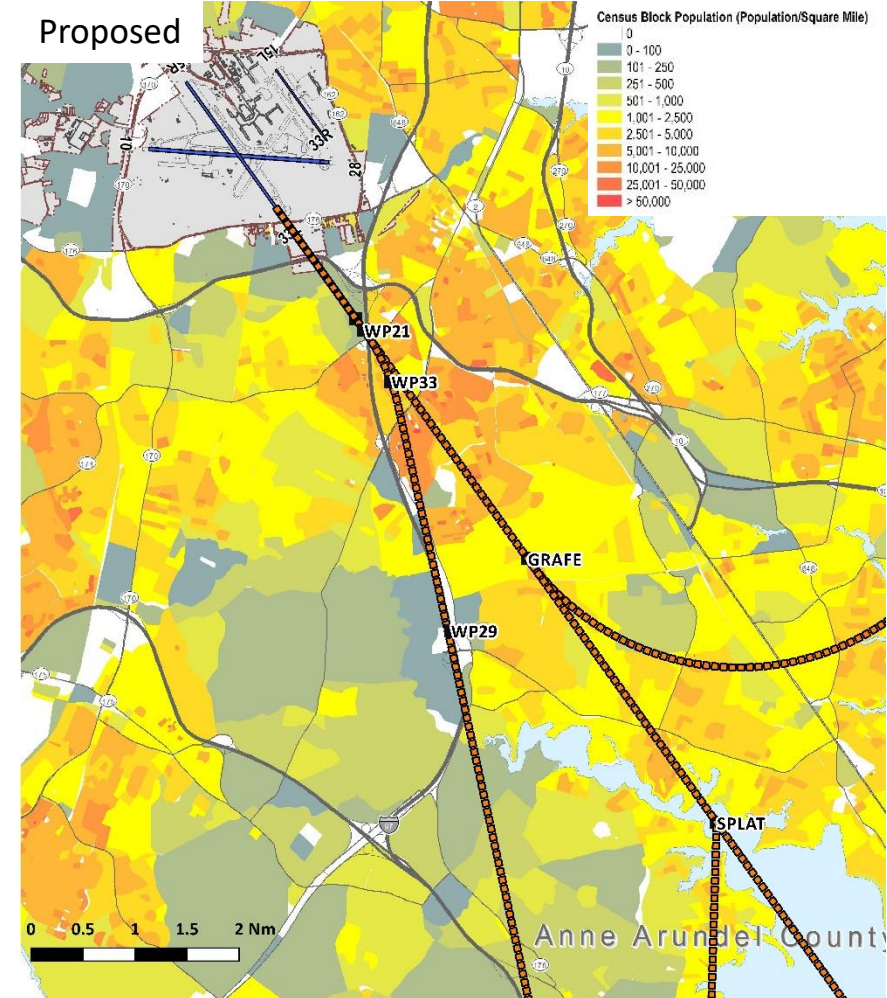
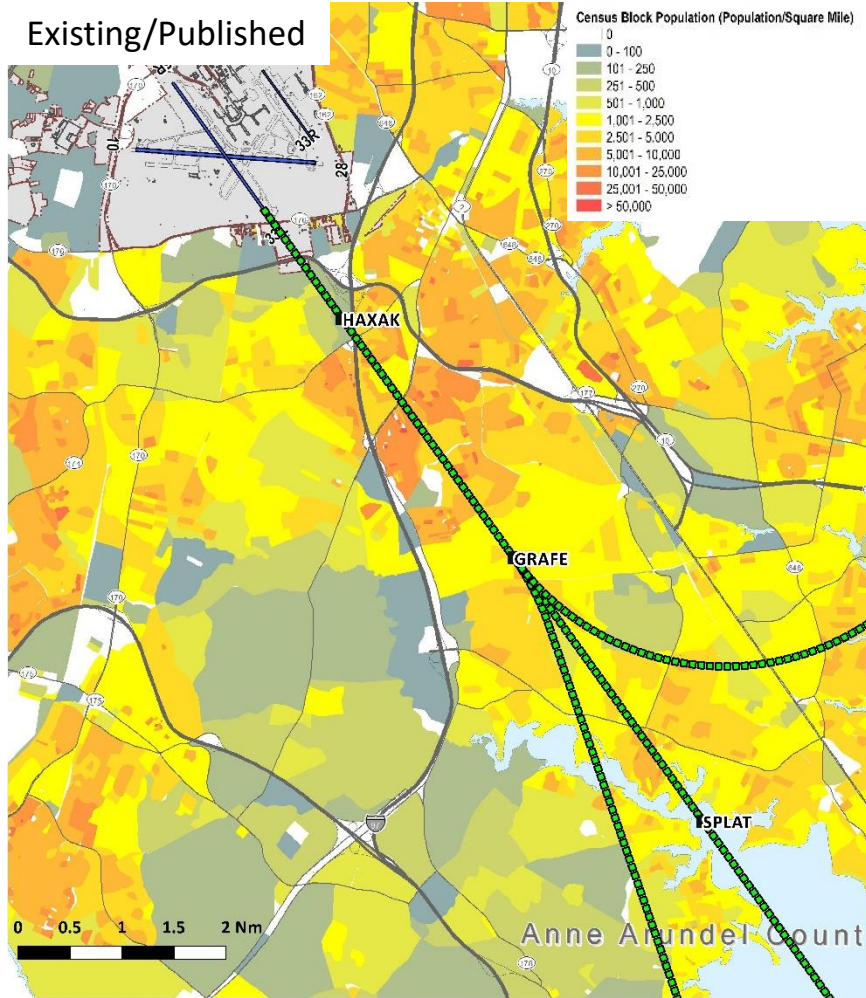
Proposed (Simulated) – 2018-2019 Flight Tracks



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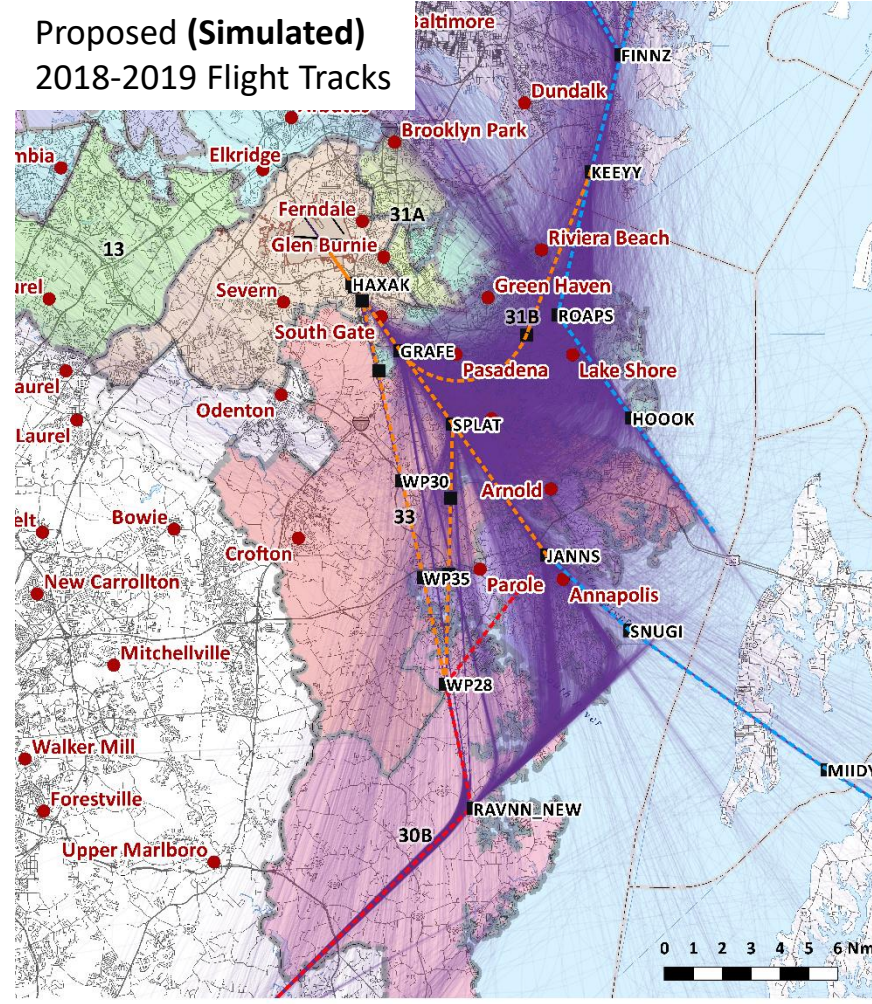
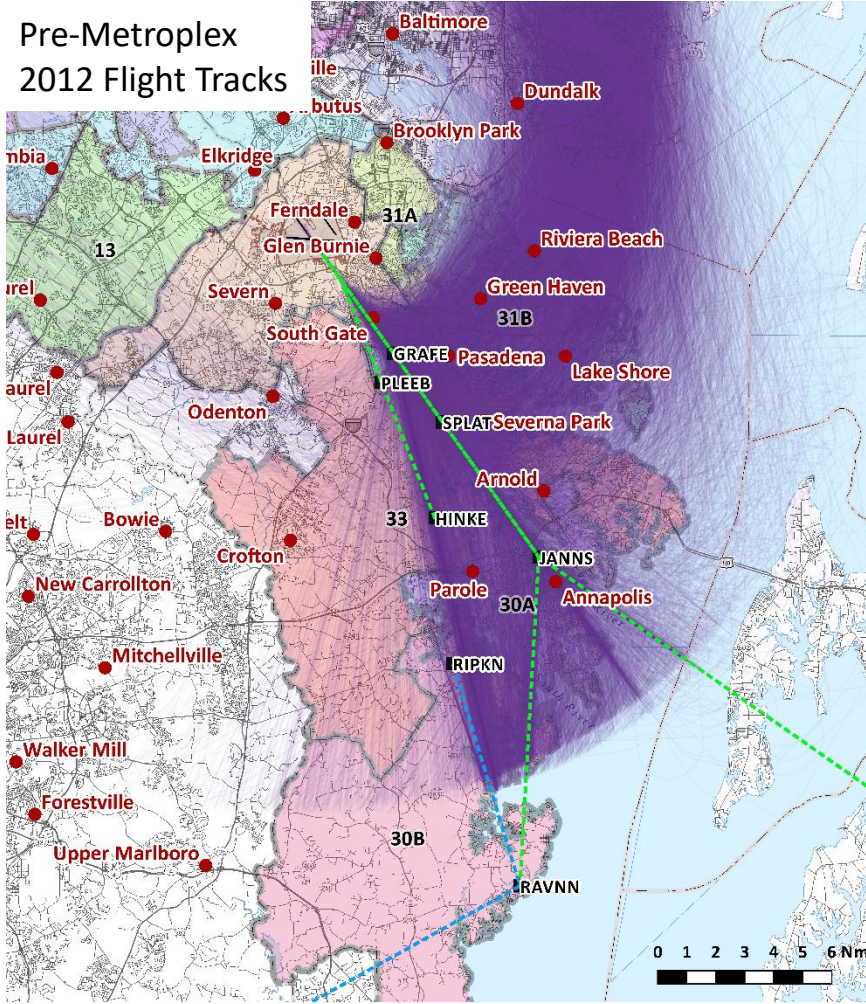
Runway 33L Arrivals/Approaches – Population 2019 compared to Proposed



Legend

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Runway 33L Jet Arrivals – 2012 compared to 2018-2019 Proposed (Simulated)

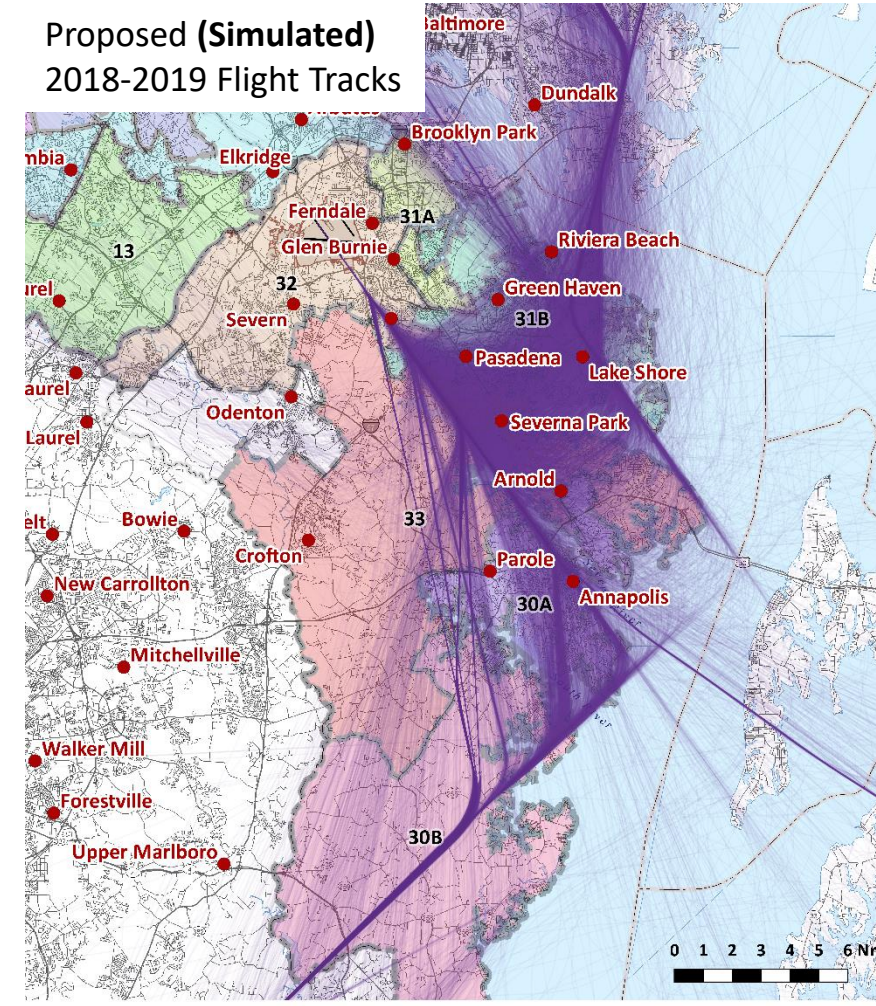
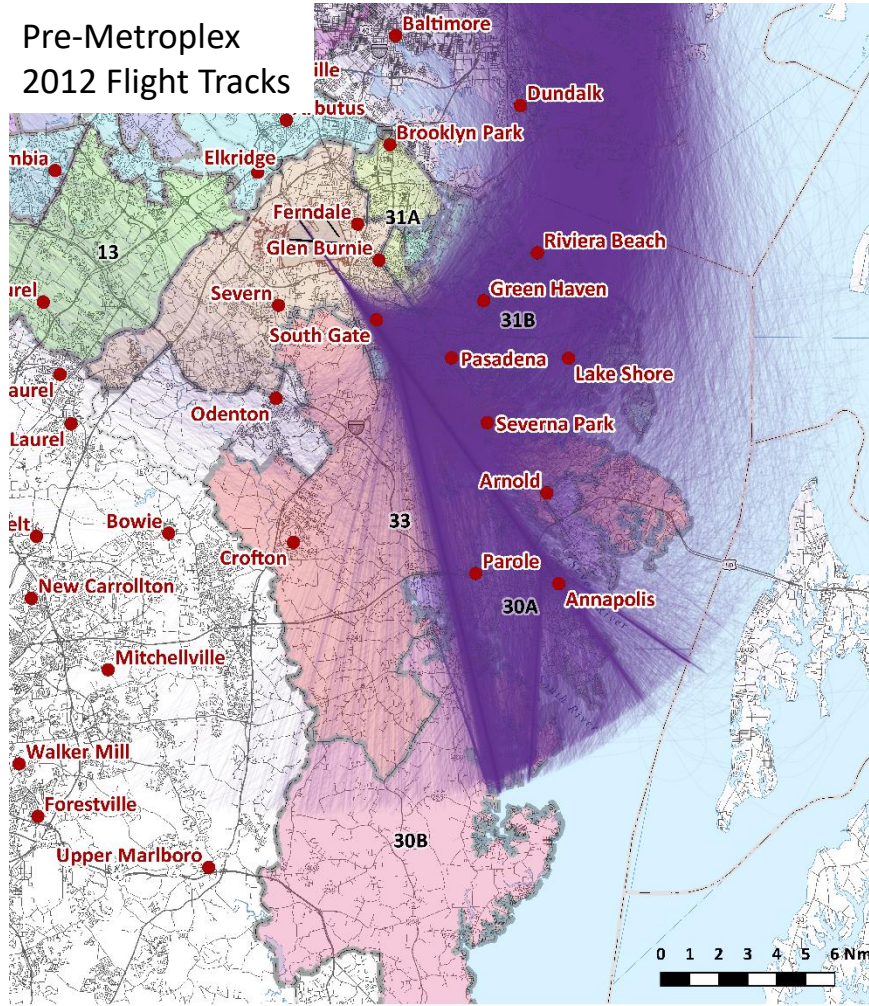


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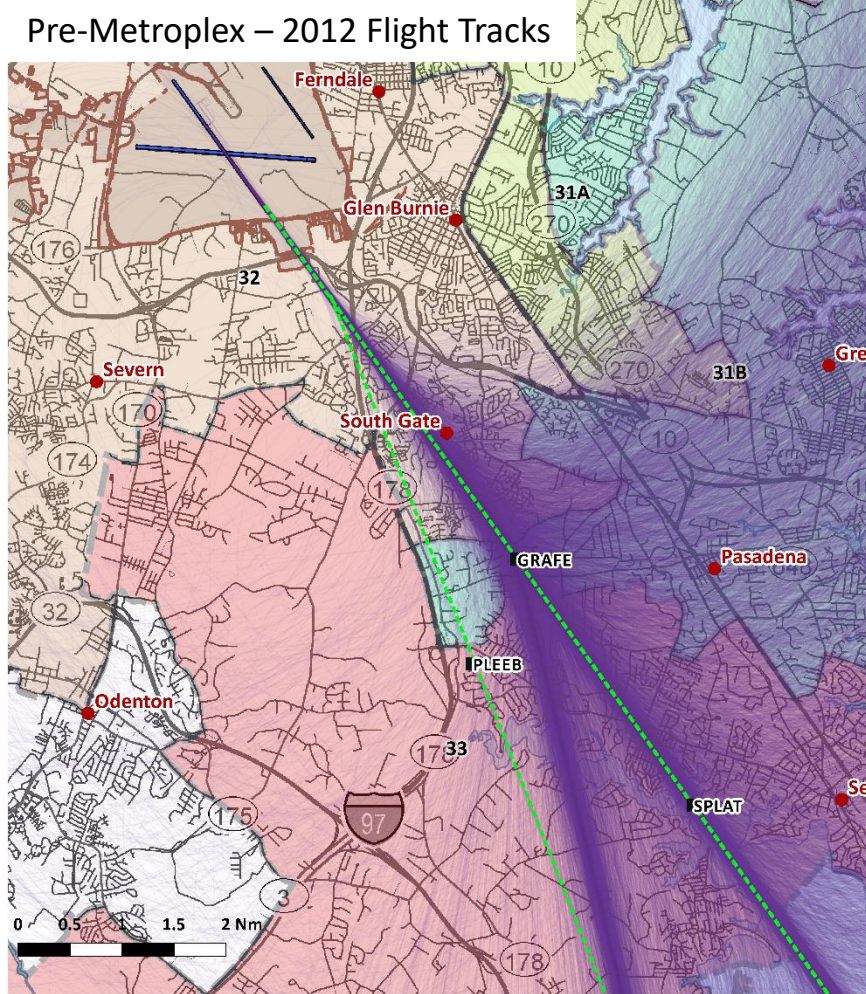
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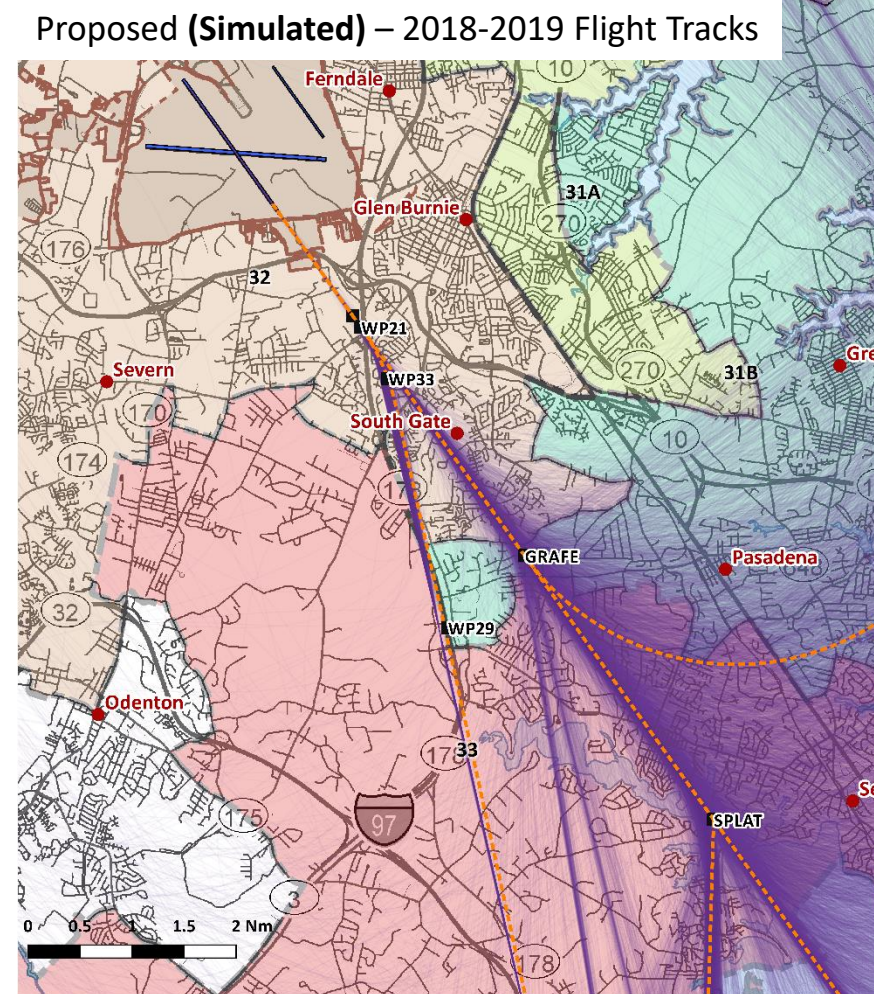
Pre-Decisional: For informational purposes only

Runway 33L Jet Arrivals – 2012 compared to 2018-2019 Proposed (Simulated)

Pre-Metroplex – 2012 Flight Tracks



Proposed (Simulated) – 2018-2019 Flight Tracks

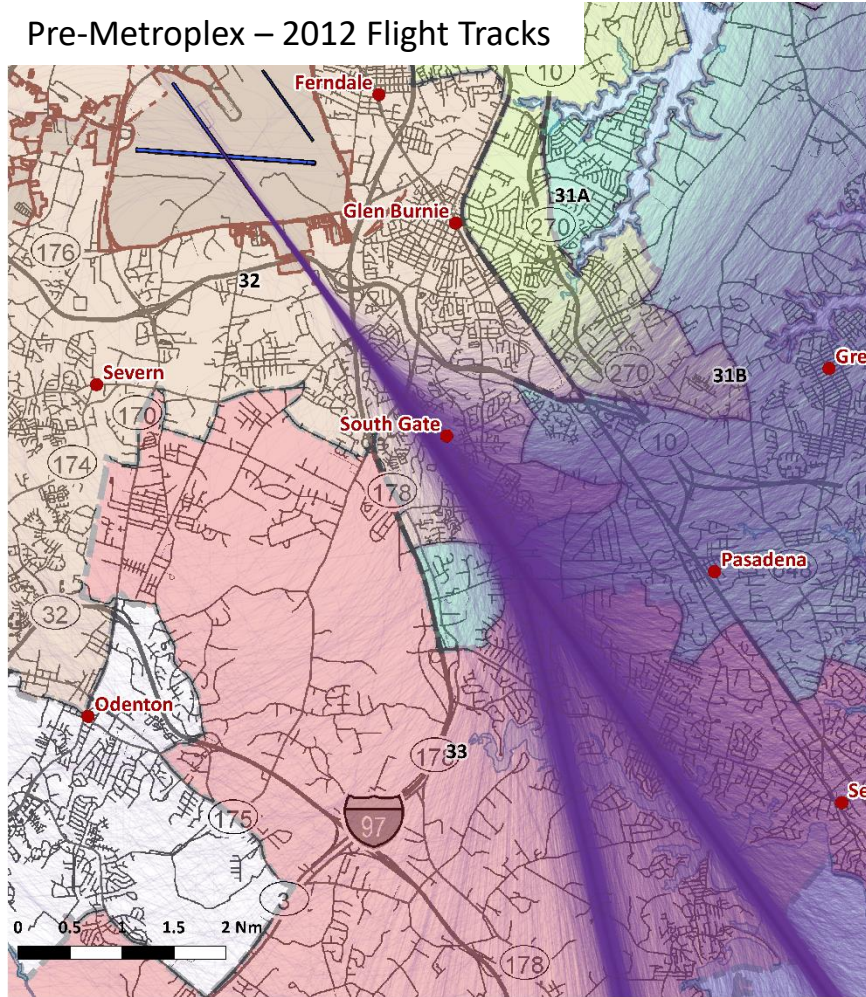


Legend

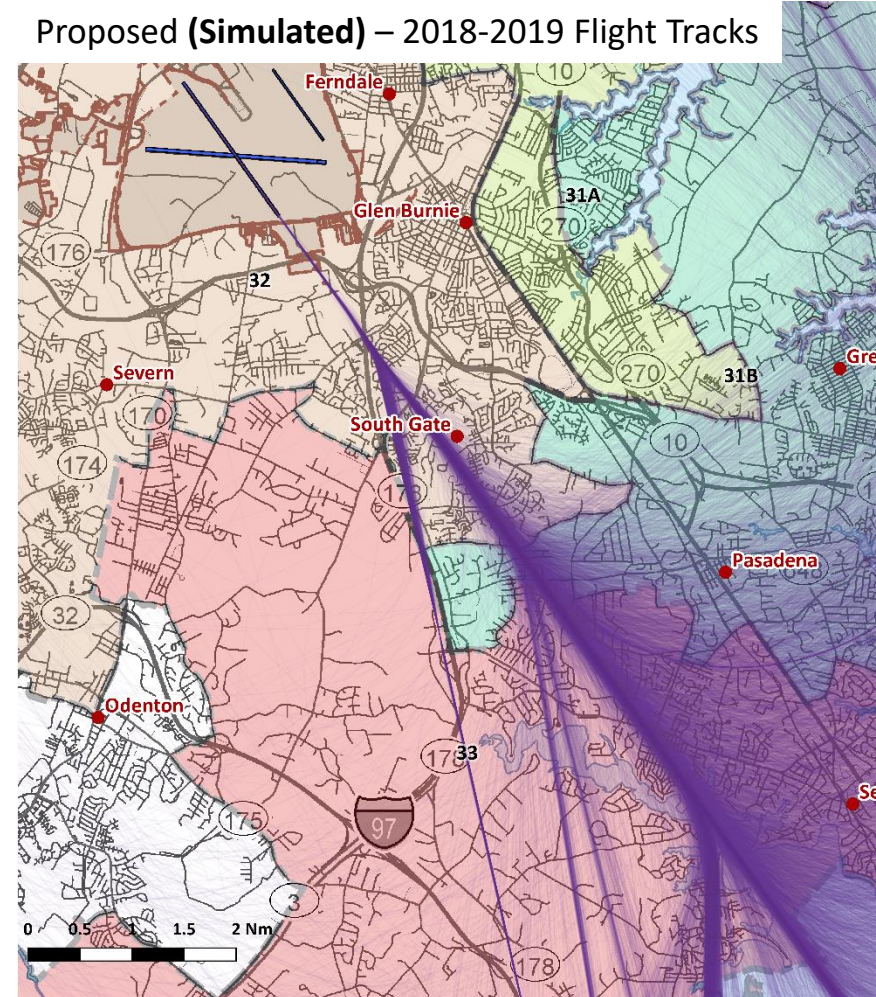
- Navigational Points
 - Proposed Arrival Procedure Changes
 - Existing Published Arrival Procedures
 - Proposed Approach Procedure Changes
 - Existing Published Approach Procedures
 - Arrival Flight Tracks
- Pre-Decisional: For informational purposes only

Runway 33L Jet Arrivals – 2012 compared to 2018-2019 Proposed (Simulated)

Pre-Metroplex – 2012 Flight Tracks



Proposed (Simulated) – 2018-2019 Flight Tracks



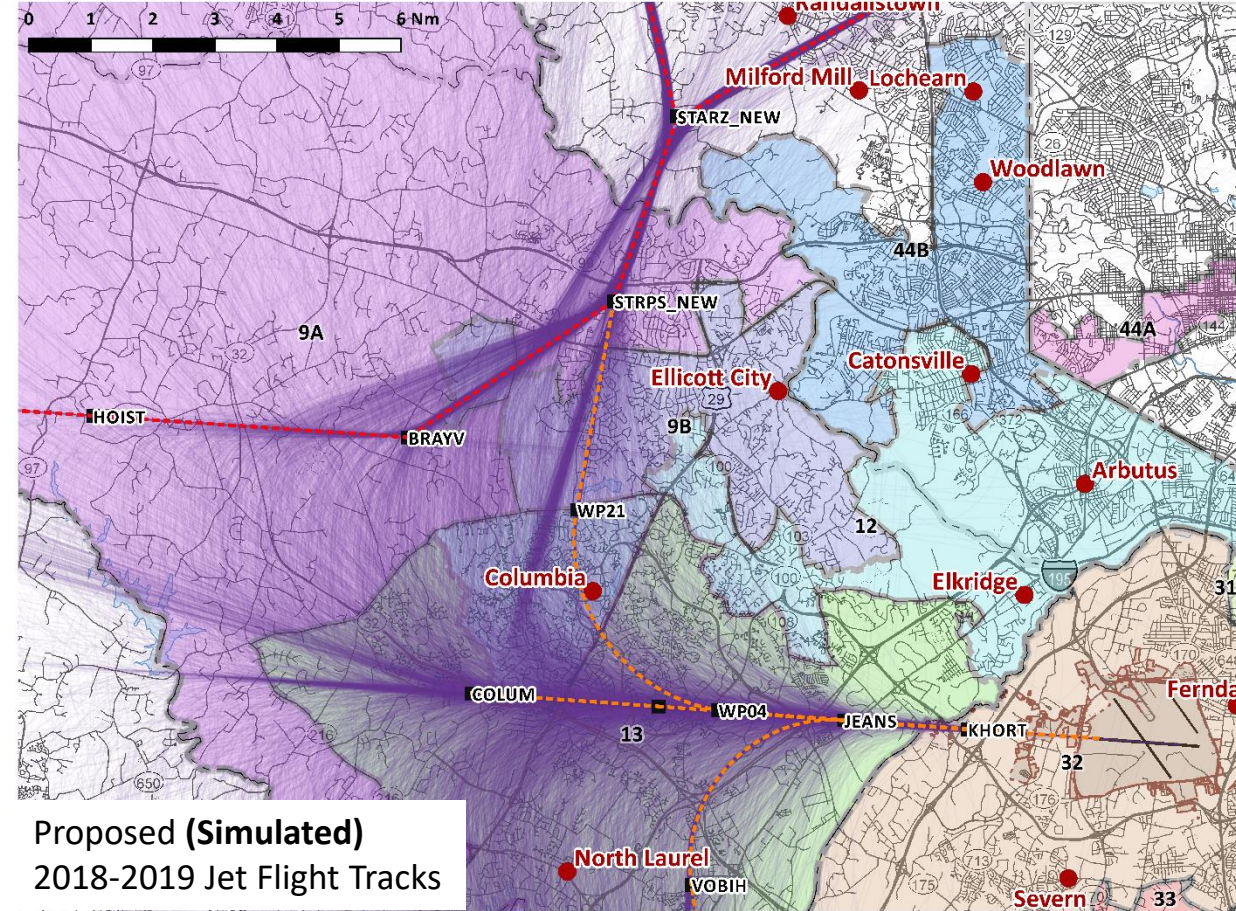
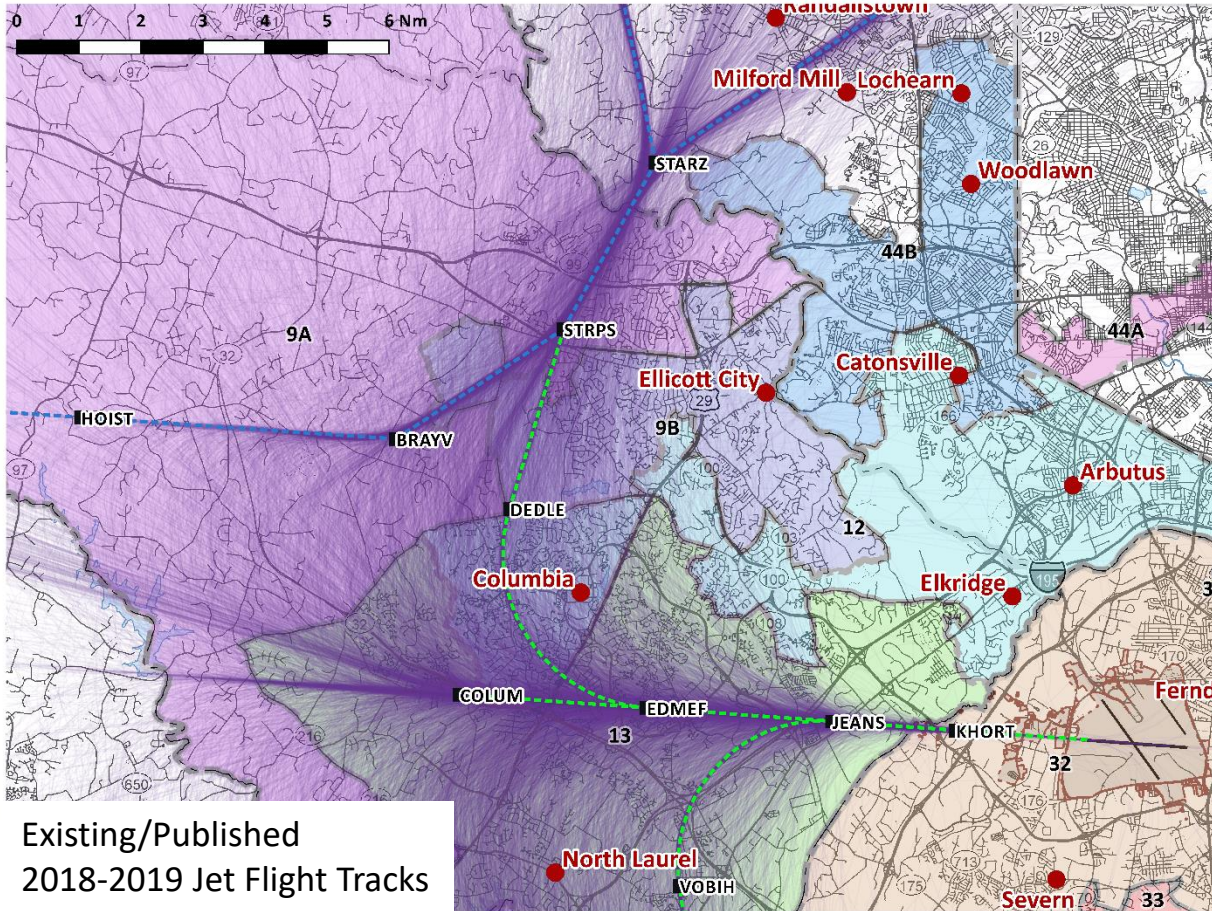
Legend

- Navigational Points
 - Proposed Arrival Procedure Changes
 - Proposed Approach Procedure Changes
 - Existing Published Arrival Procedures
 - Existing Published Approach Procedures
 - Arrival Flight Tracks
- Pre-Decisional: For informational purposes only

Runway 33L Jet Arrivals – Flight Track Analysis Summary

- Runway 33L Roundtable Technical Committee procedure changes may:
 - Shift RAVNN arrival aircraft northwest of current corridor over less densely populated areas
 - Establish RNP approach with a **continuous descent** from the RAVNN to WP21 navigational points along corridor commonly used for visual approaches while also shifting this corridor to the west over less densely populated areas
 - Establish RNAV approach transition with a **continuous descent** from the RAVNN to SPLAT navigational points along corridor commonly used for visual approaches
 - Better distribute approach operations along the final approach course by adding a third approach corridor from RAVNN to WP21 that will alleviate some traffic from flying to the GRAFE navigational point
- Overall, aircraft flight paths may shift but will largely remain heavily concentrated due to **RNAV** and **RNP (continuous descent)** procedure designs

Runway 10 Jet Arrivals – 2018-2019 compared to 2018-2019 Proposed (Simulated)

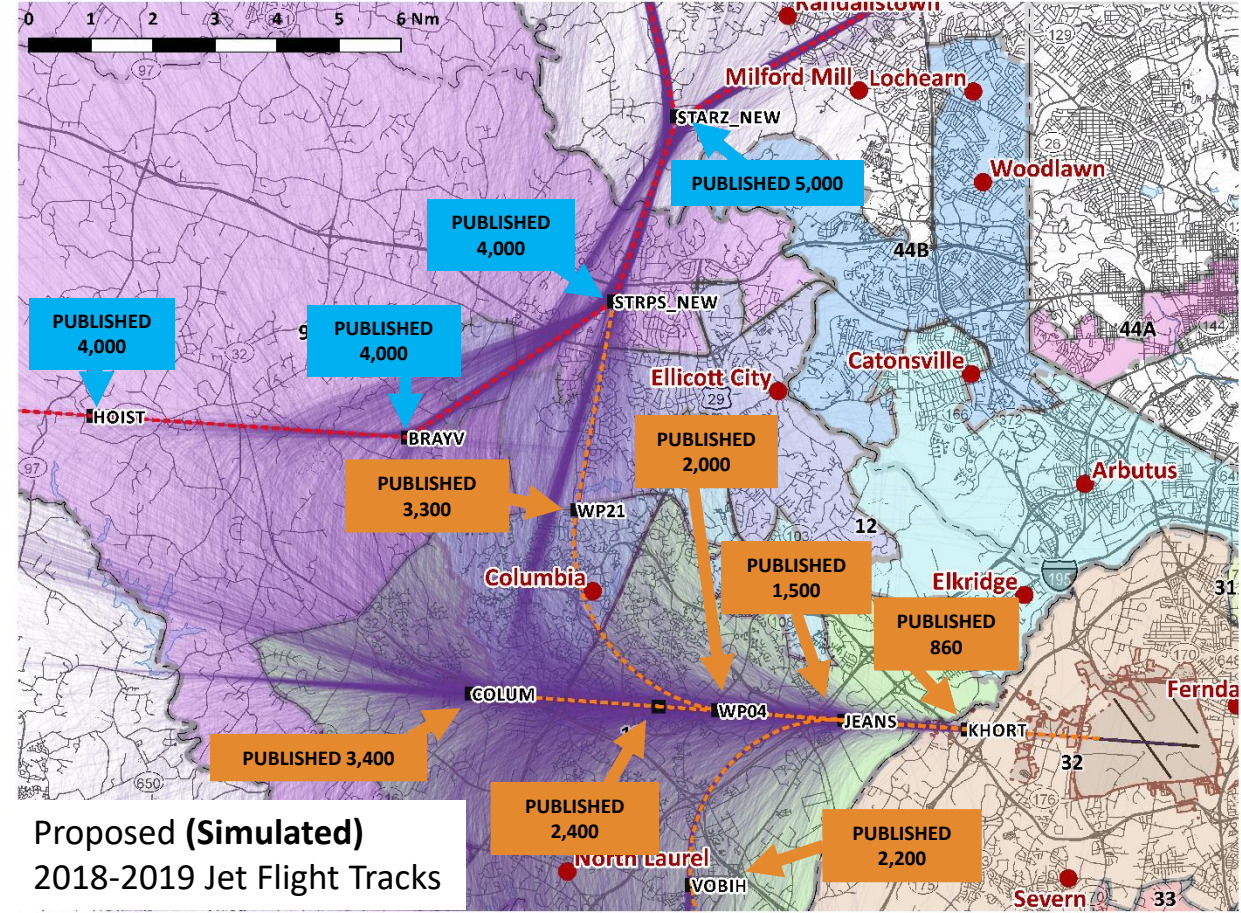
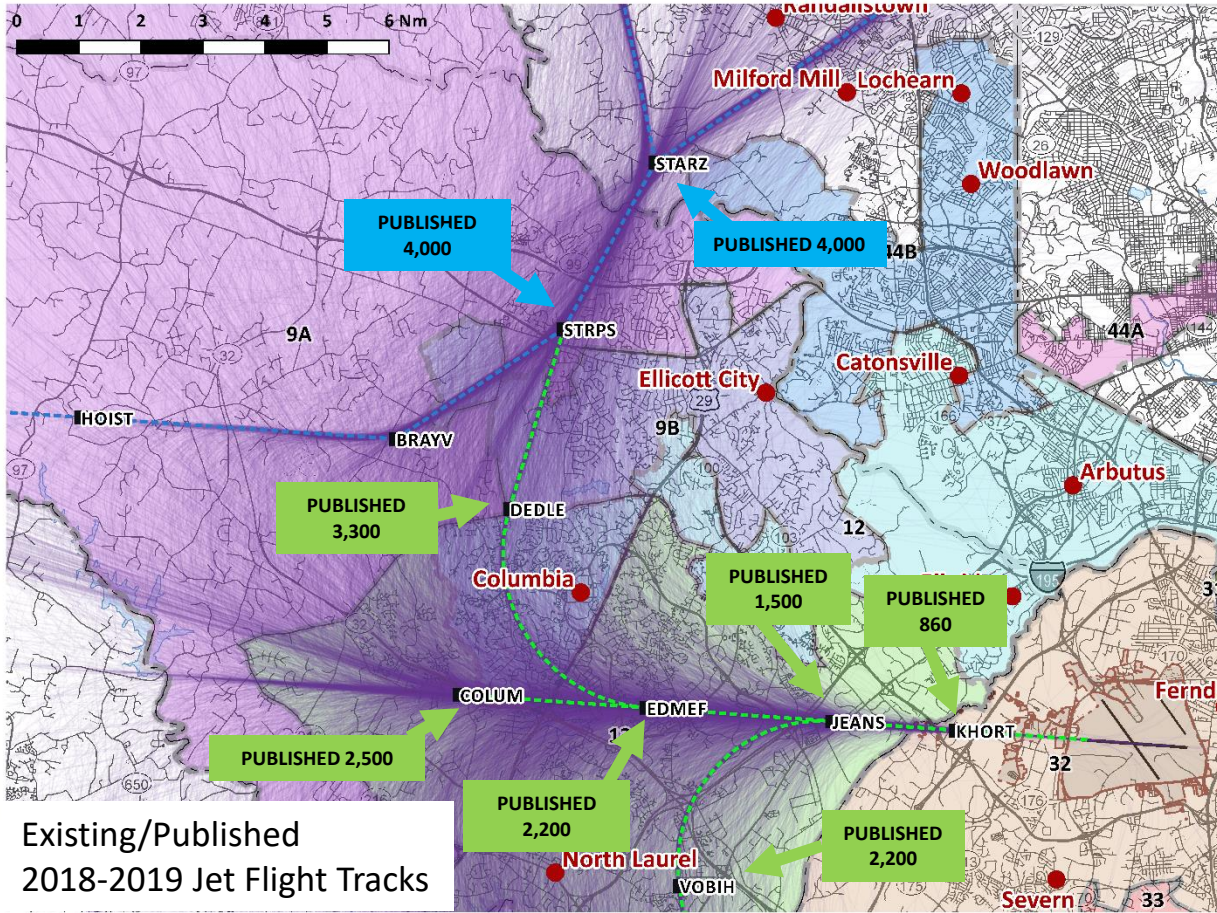


Legend

- Navigational Points
- Proposed Arrival Procedure Changes
- Existing Published Arrival Procedures
- Existing Published Approach Procedures
- Proposed Approach Procedure Changes
- Arrival Flight Tracks

Pre-Decisional: For informational purposes only

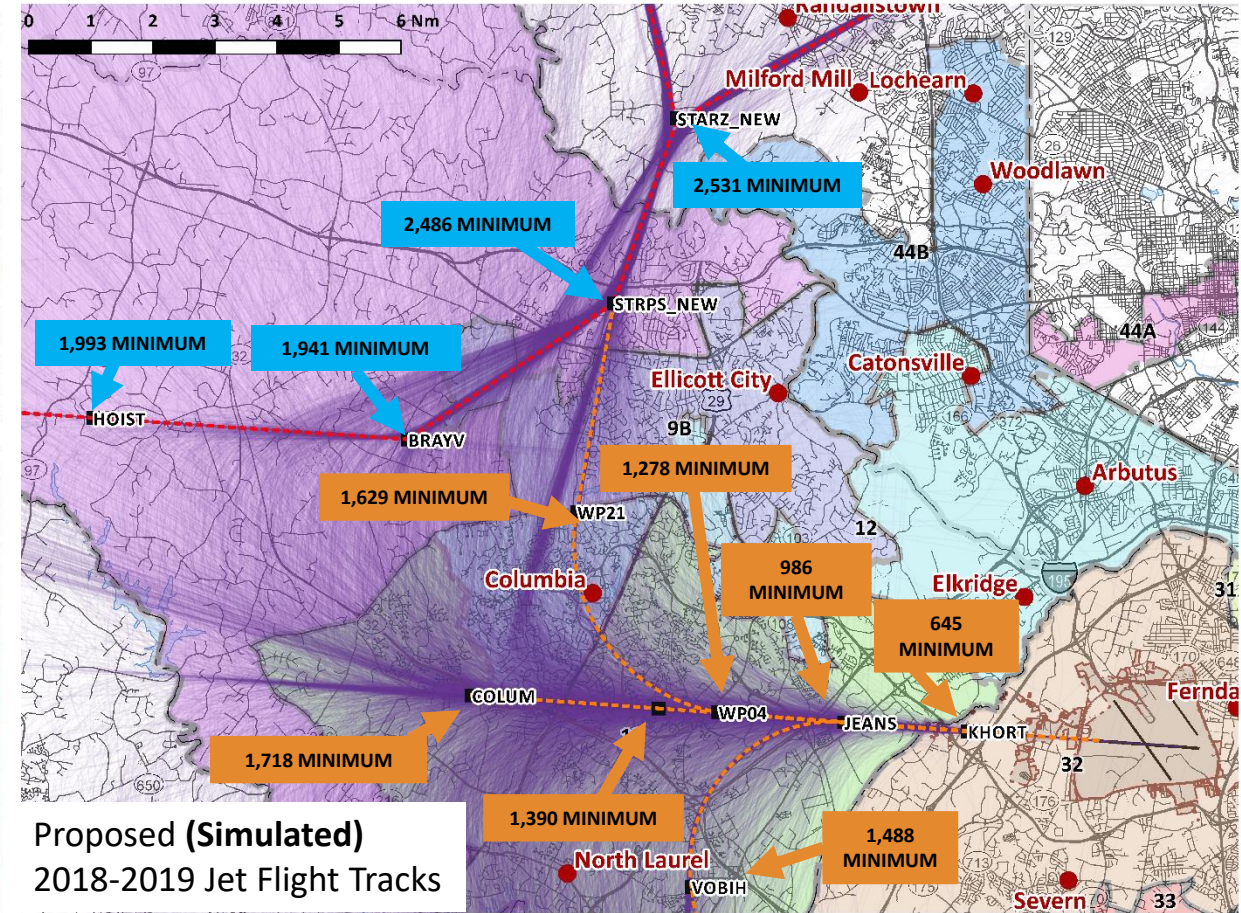
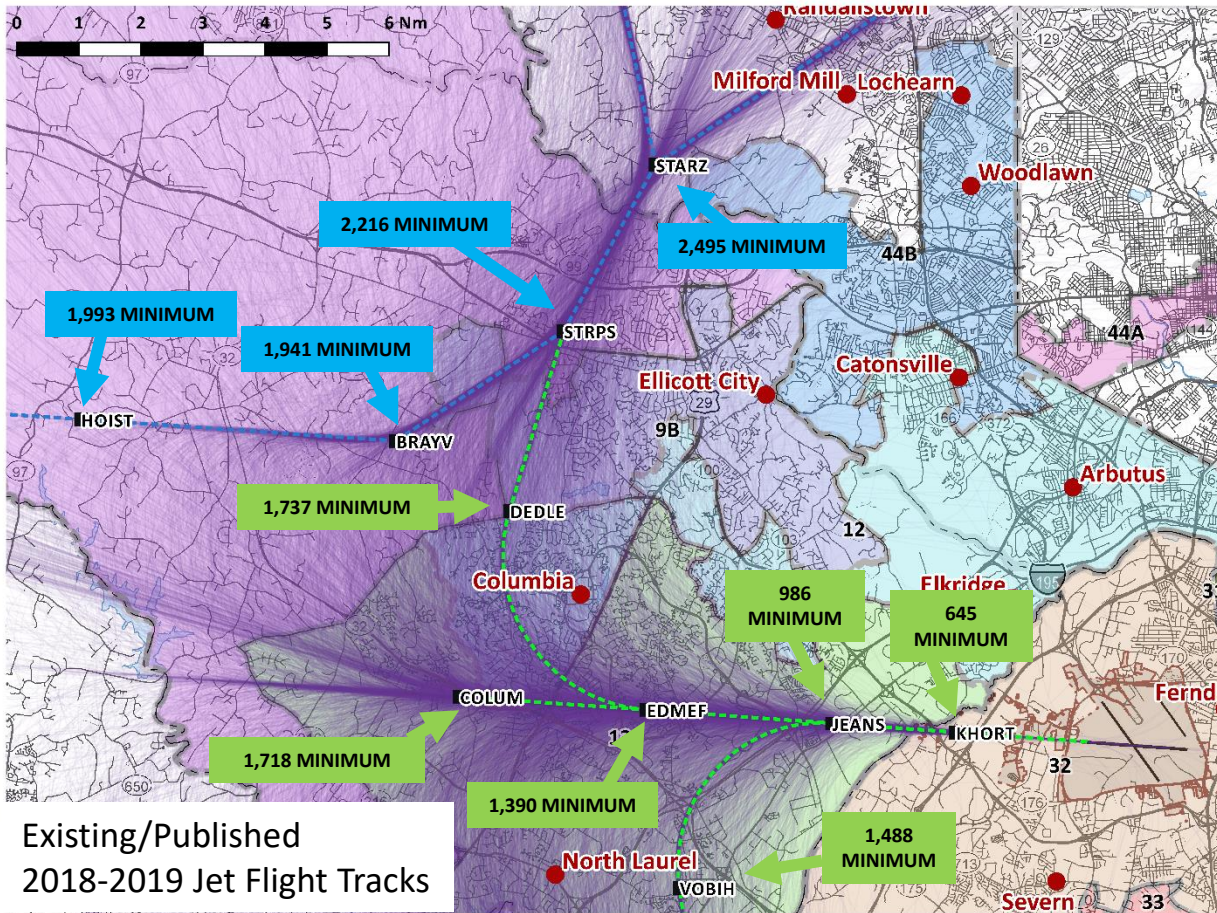
Runway 10 Jet Arrivals – 2018-2019 compared to 2018-2019 Proposed (Simulated)



Legend

- Navigational Points
 - Proposed Arrival Procedure Changes
 - Existing Published Arrival Procedures
 - Existing Published Approach Procedures
 - Proposed Approach Procedure Changes
 - Arrival Flight Tracks
- Pre-Decisional: For informational purposes only

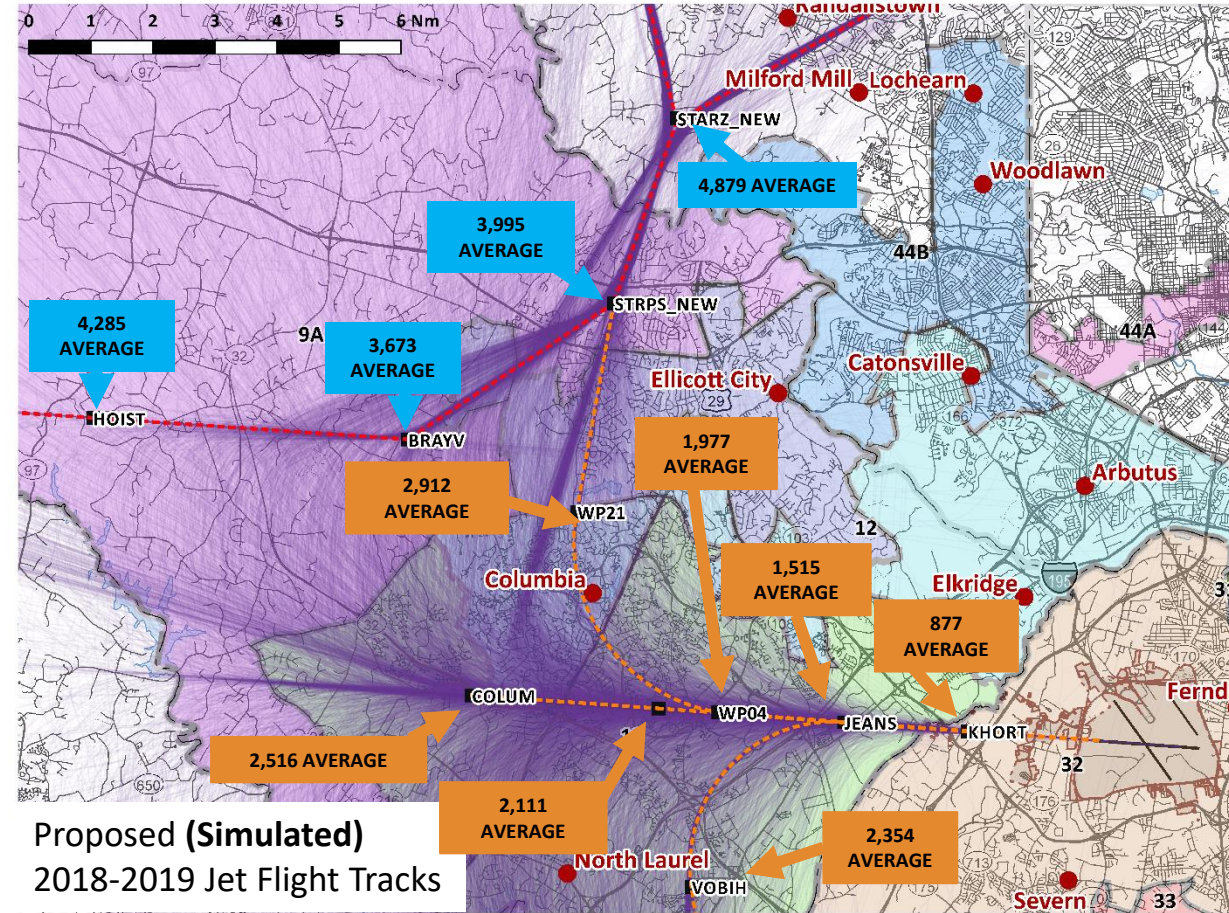
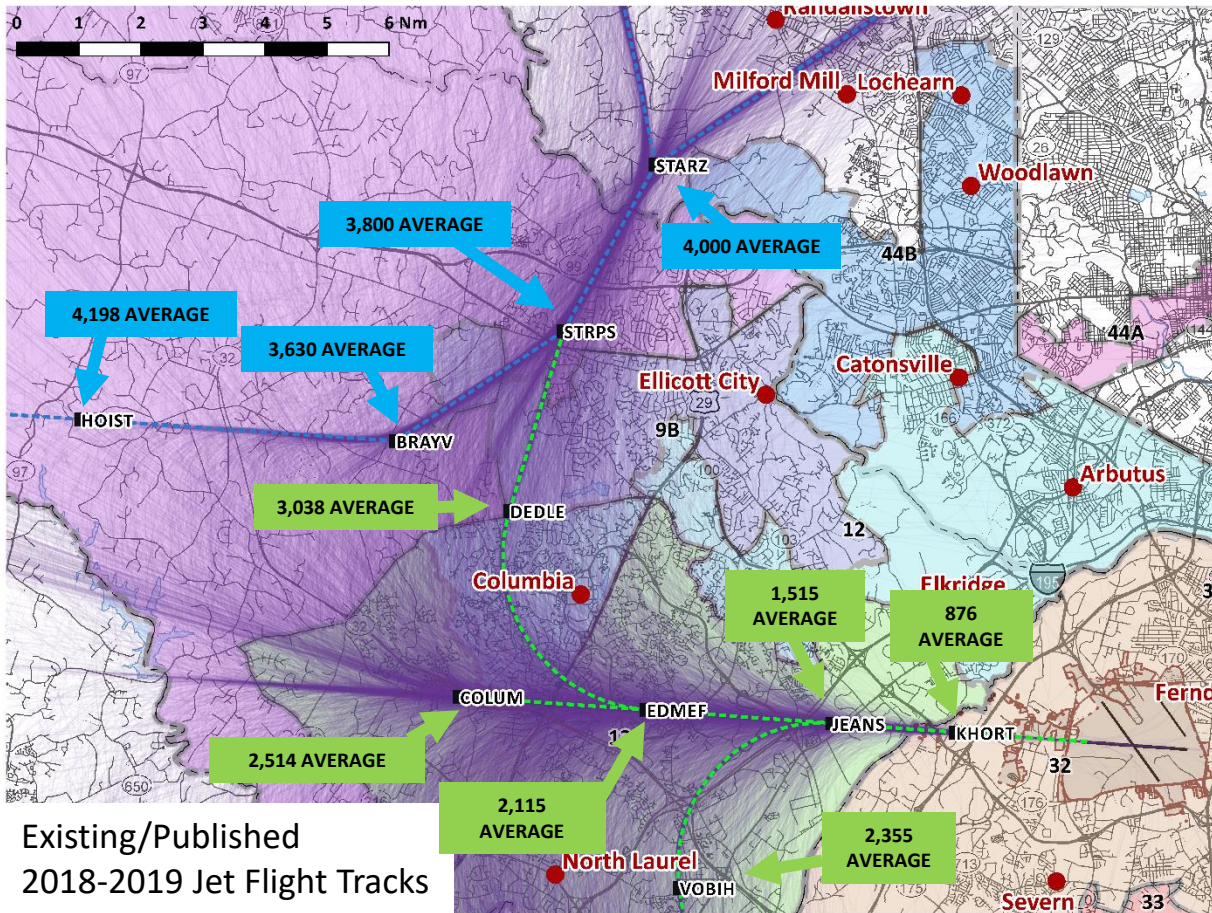
Runway 10 Jet Arrivals – 2018-2019 compared to 2018-2019 Proposed (Simulated)



Legend

- Navigational Points
 - Proposed Arrival Procedure Changes
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 - Proposed Approach Procedure Changes
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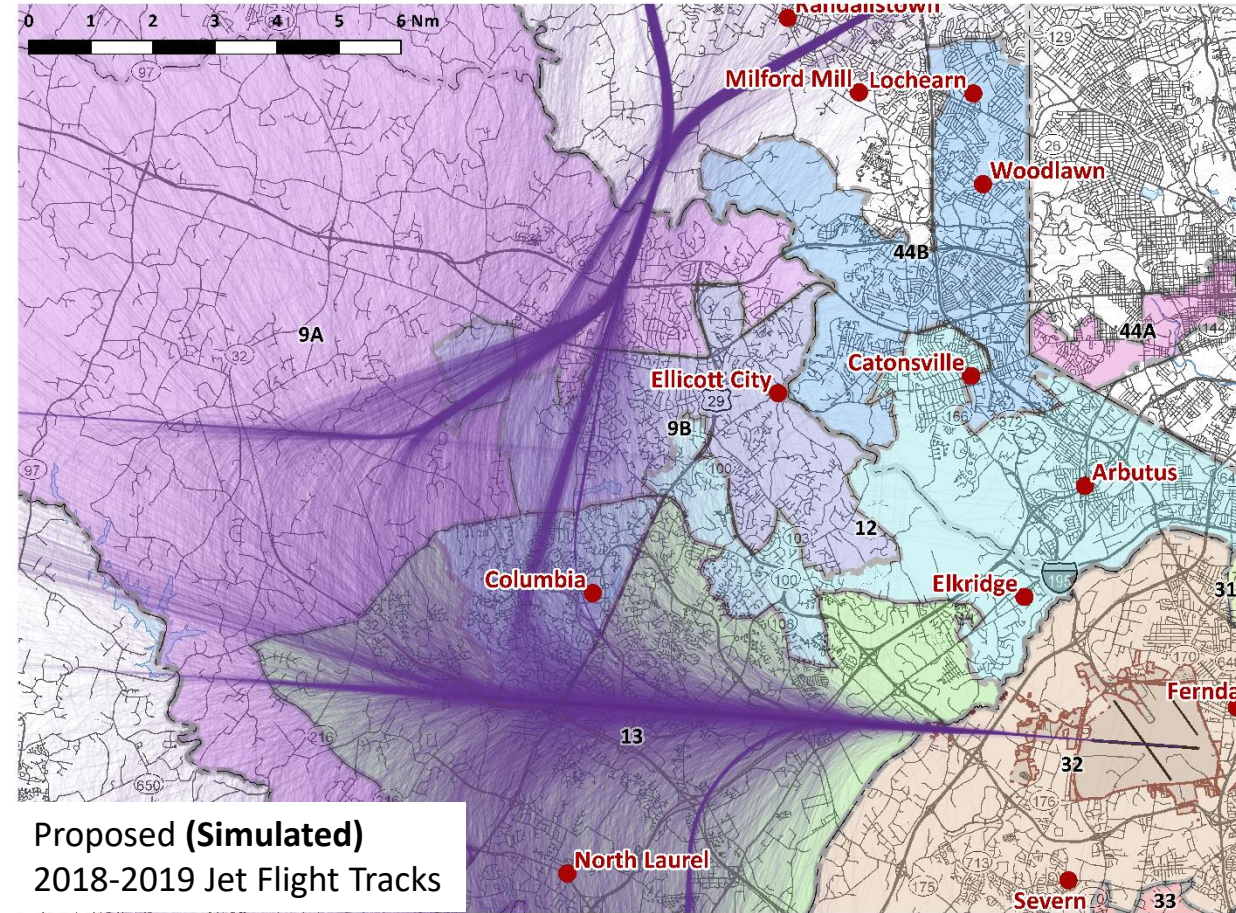
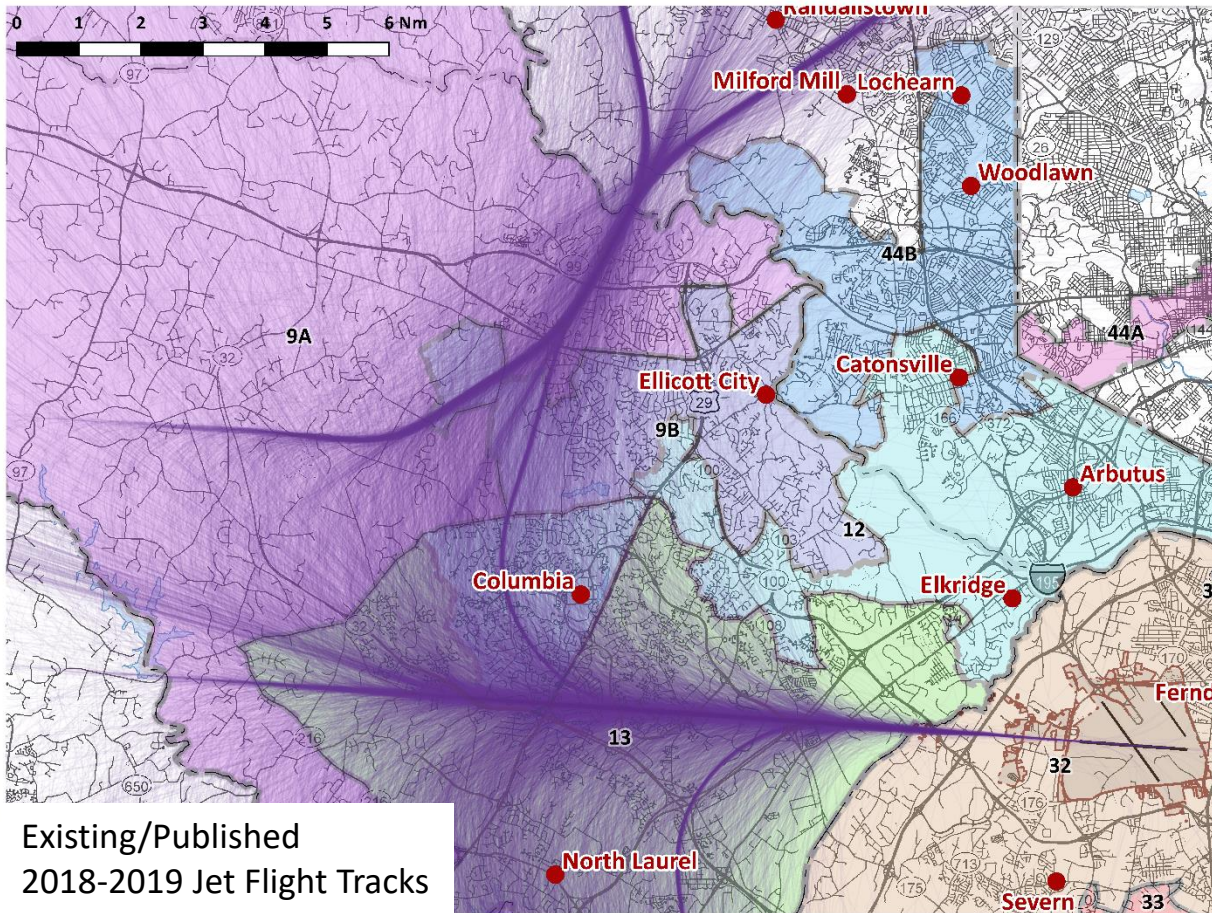
Runway 10 Jet Arrivals – 2018-2019 compared to 2018-2019 Proposed (Simulated)



Legend

- Navigational Points
 - Proposed Arrival Procedure Changes
 - Existing Published Arrival Procedures
 - Existing Published Approach Procedures
 - Proposed Approach Procedure Changes
 - Arrival Flight Tracks
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Runway 10 Jet Arrivals – 2018-2019 compared to 2018-2019 Proposed (Simulated)

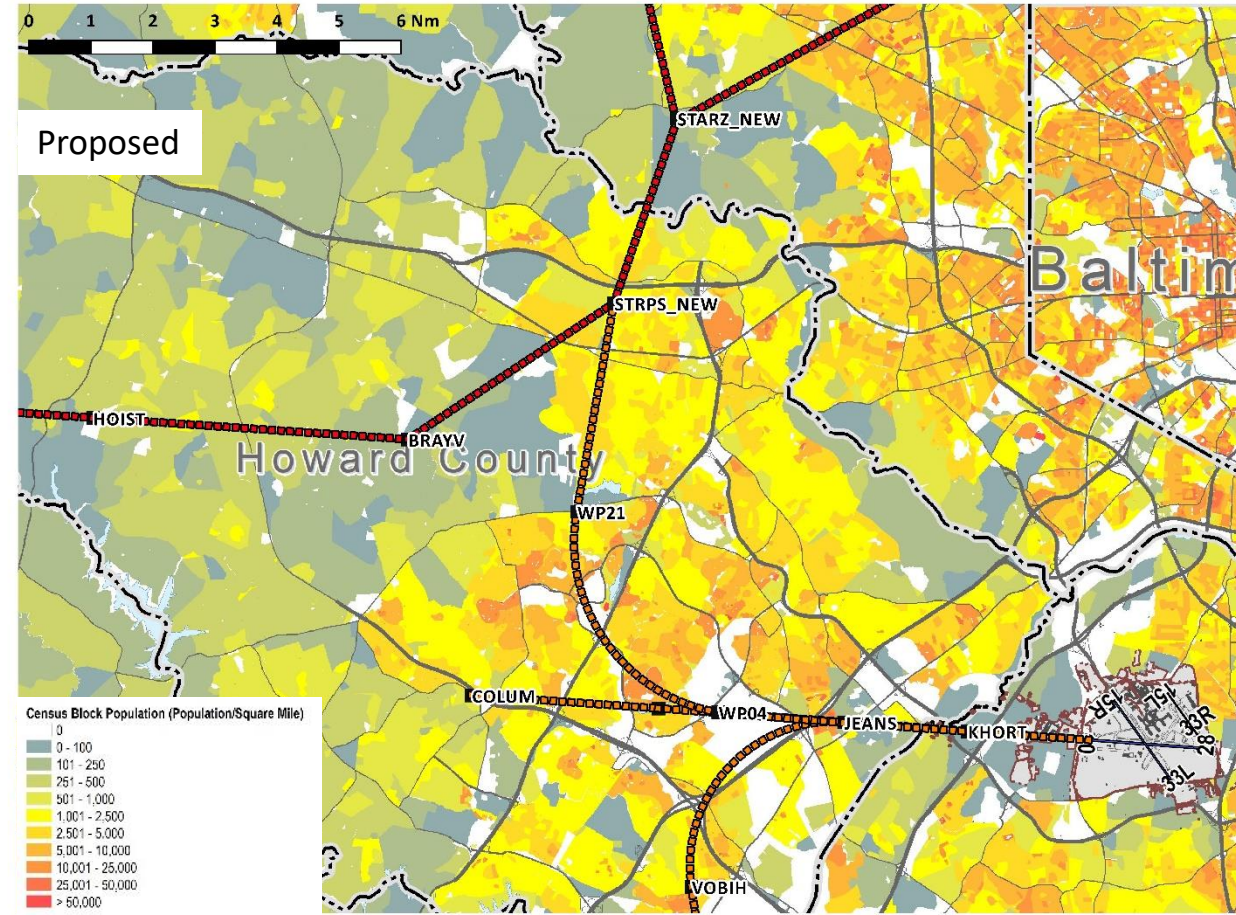
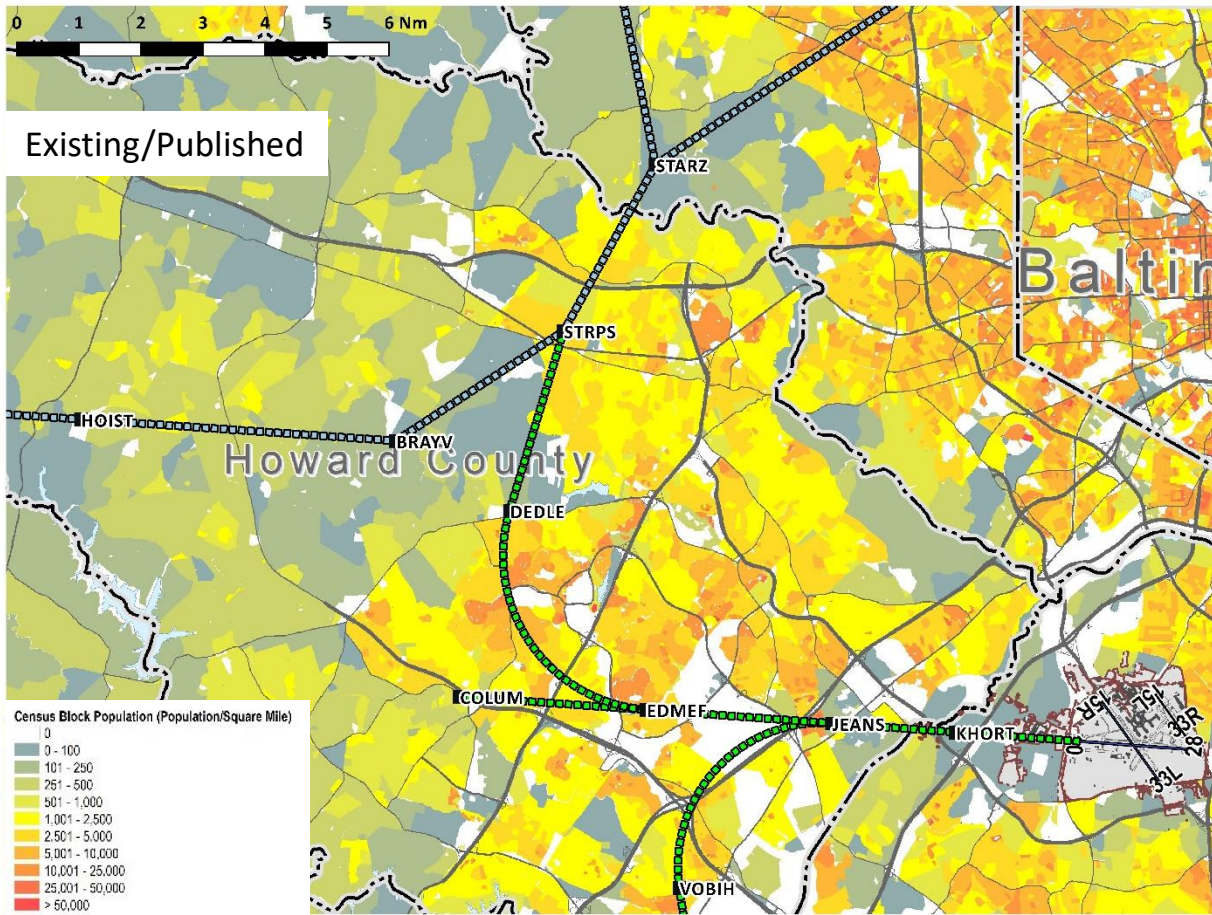


Legend

- Navigational Points
- Proposed Arrival Procedure Changes
- Existing Published Arrival Procedures
- Proposed Approach Procedure Changes
- Existing Published Approach Procedures
- Arrival Flight Tracks

Pre-Decisional: For informational purposes only

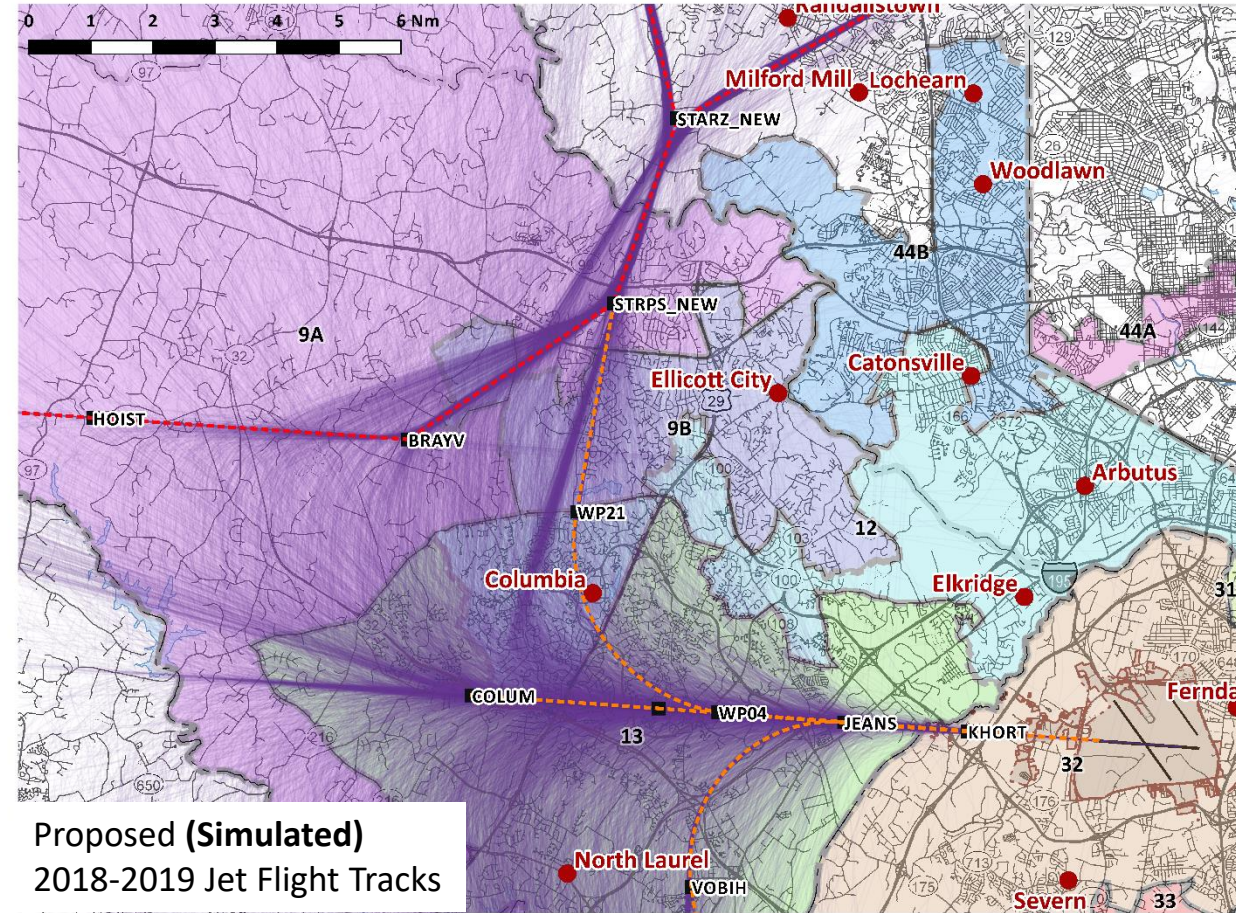
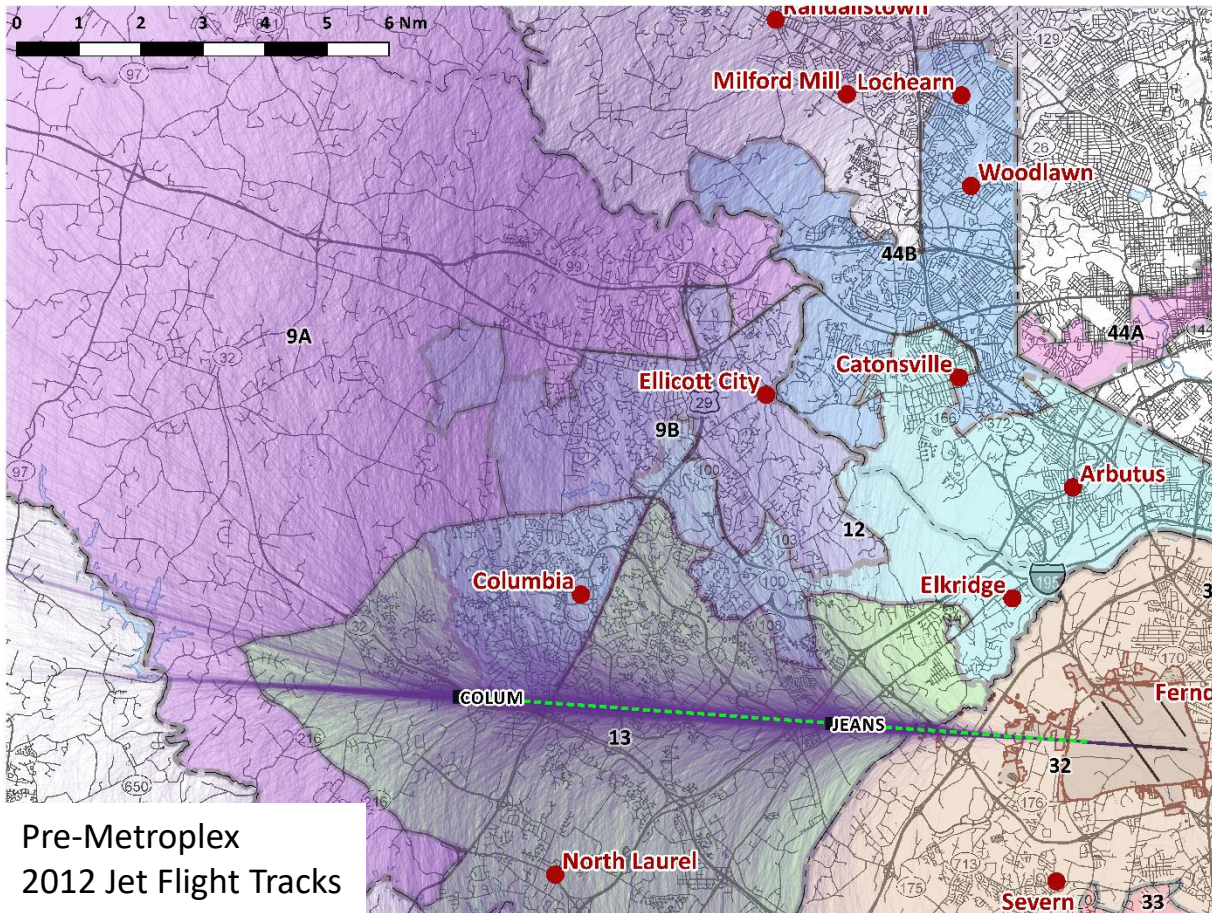
Runway 10 Arrivals/Approaches – Population 2019 Published compared to Proposed



Legend

- Navigational Points
 - Existing Published Arrival Procedures
 - Proposed Arrival Procedure Changes
 - Existing Published Approach Procedures
 - Proposed Approach Procedure Changes
 - Arrival Flight Tracks
- Pre-Decisional: For informational purposes only

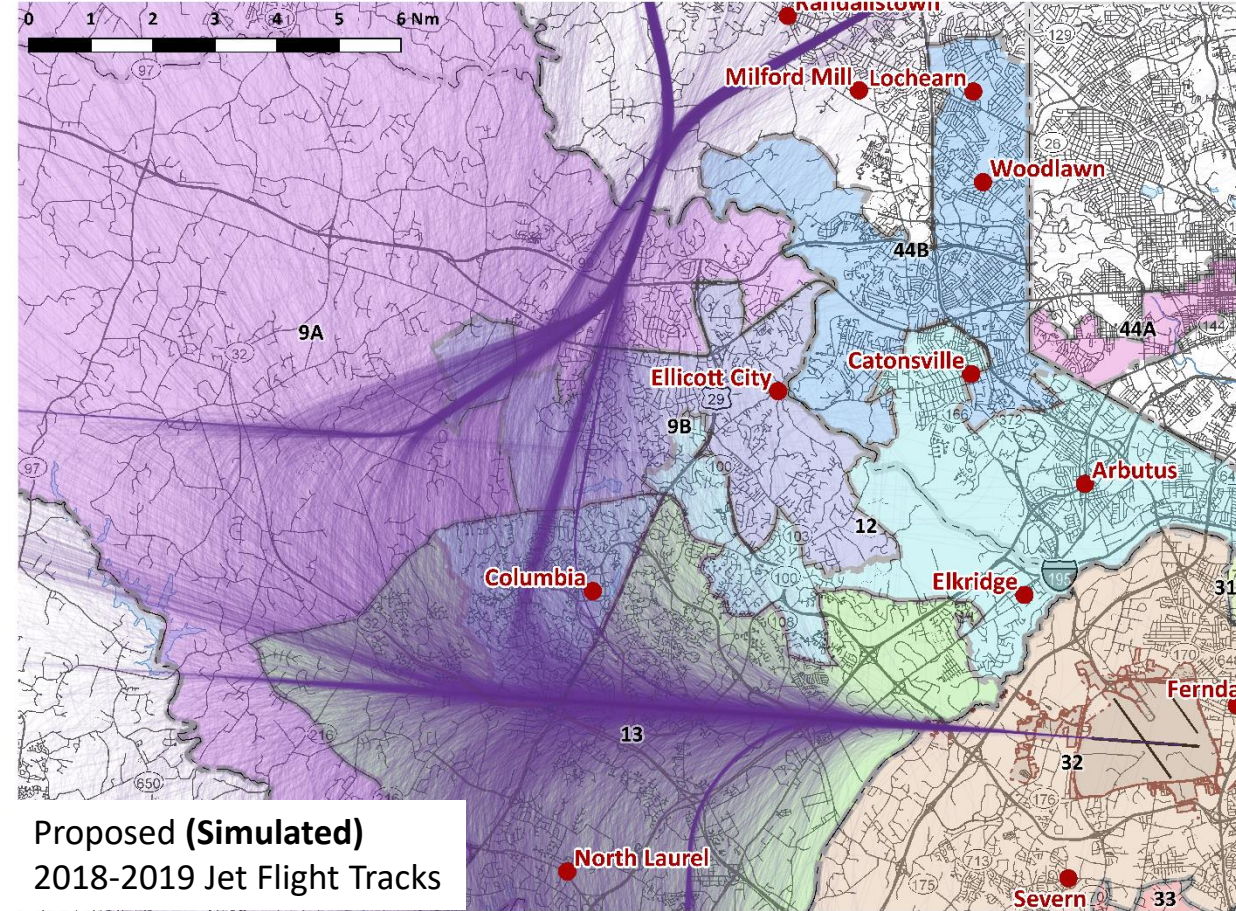
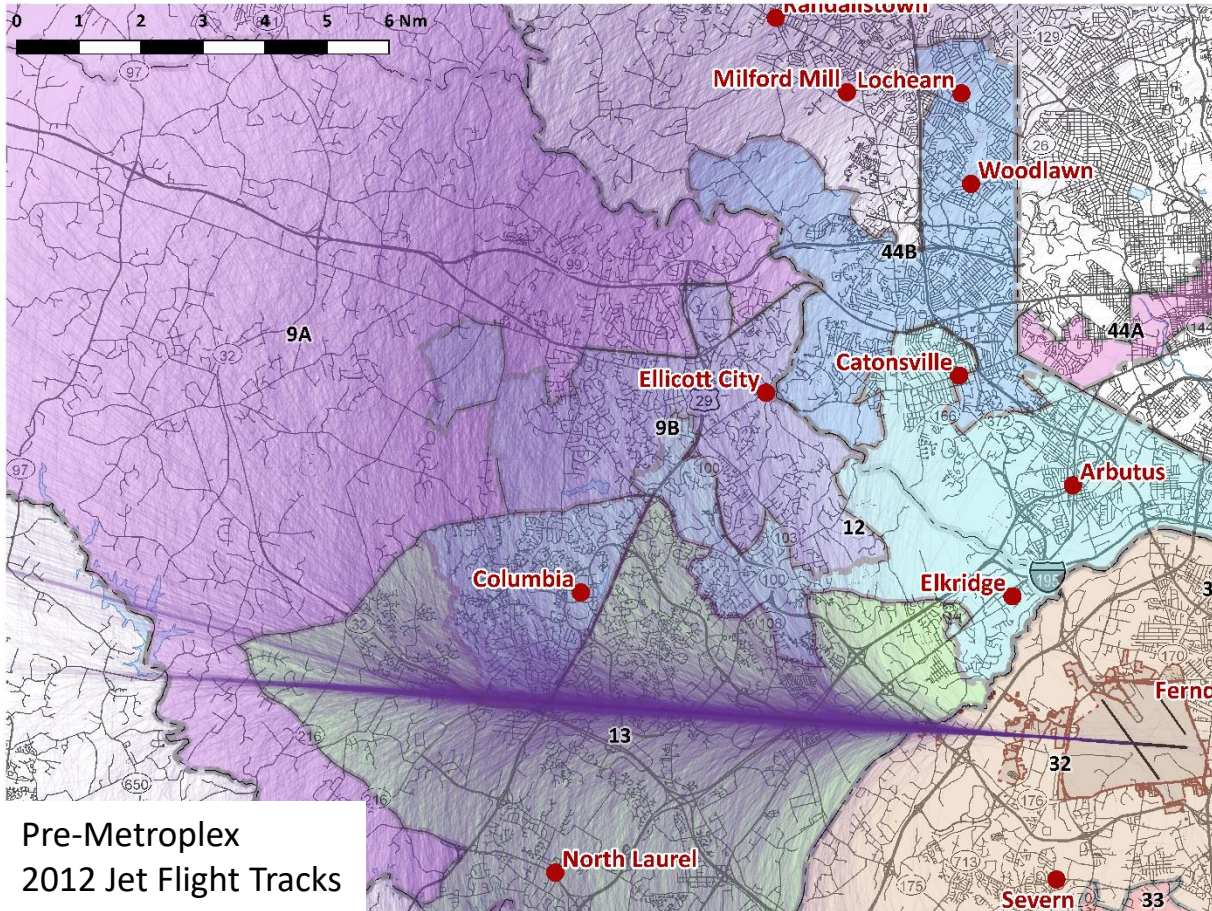
Runway 10 Jet Arrivals – 2012 compared to 2018-2019 Proposed (Simulated)



Legend

- Navigational Points
 - Existing Published Arrival Procedures
 - Proposed Arrival Procedure Changes
 - Existing Published Approach Procedures
 - Proposed Approach Procedure Changes
 - Arrival Flight Tracks
- Pre-Decisional: For informational purposes only

Runway 10 Jet Arrivals – 2012 compared to 2018-2019 Proposed/Simulated



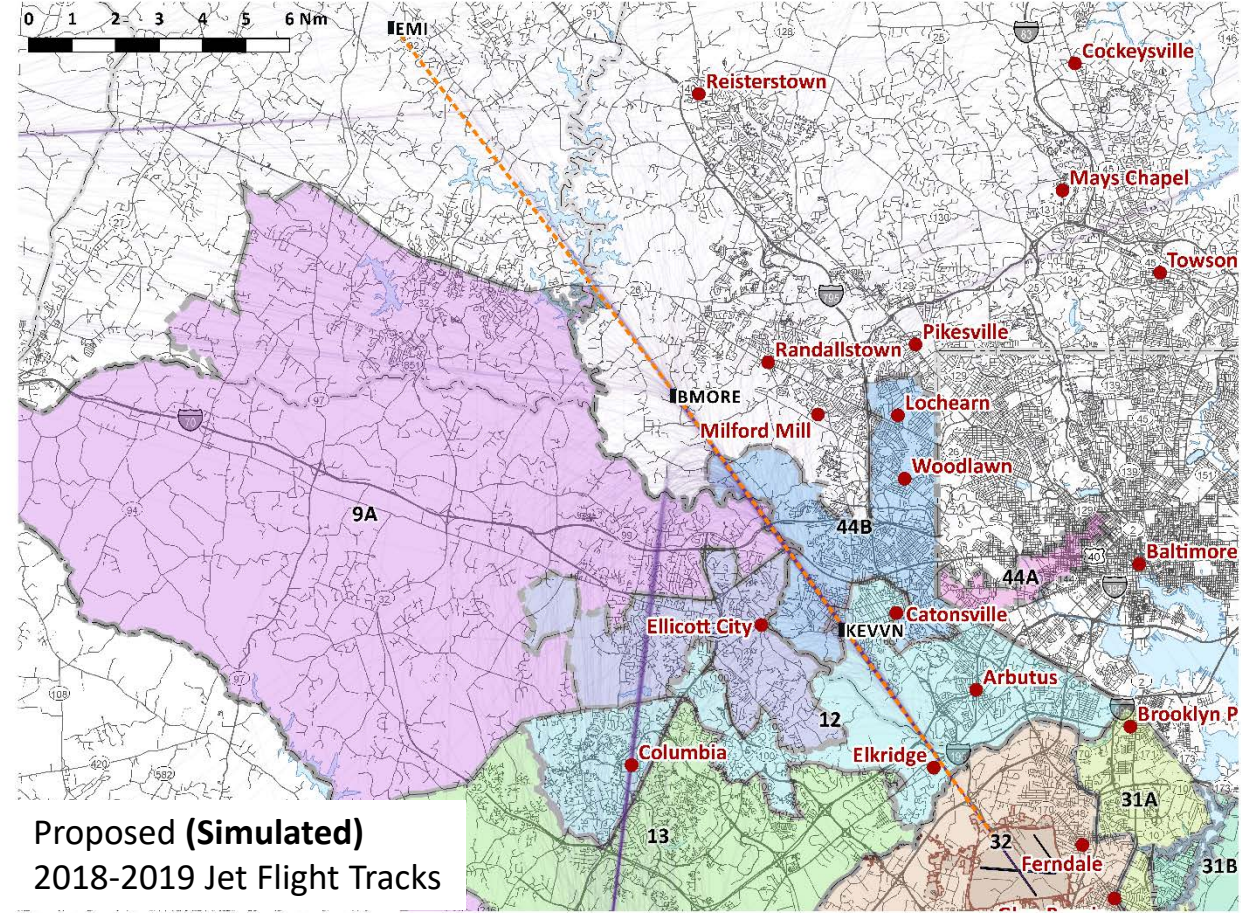
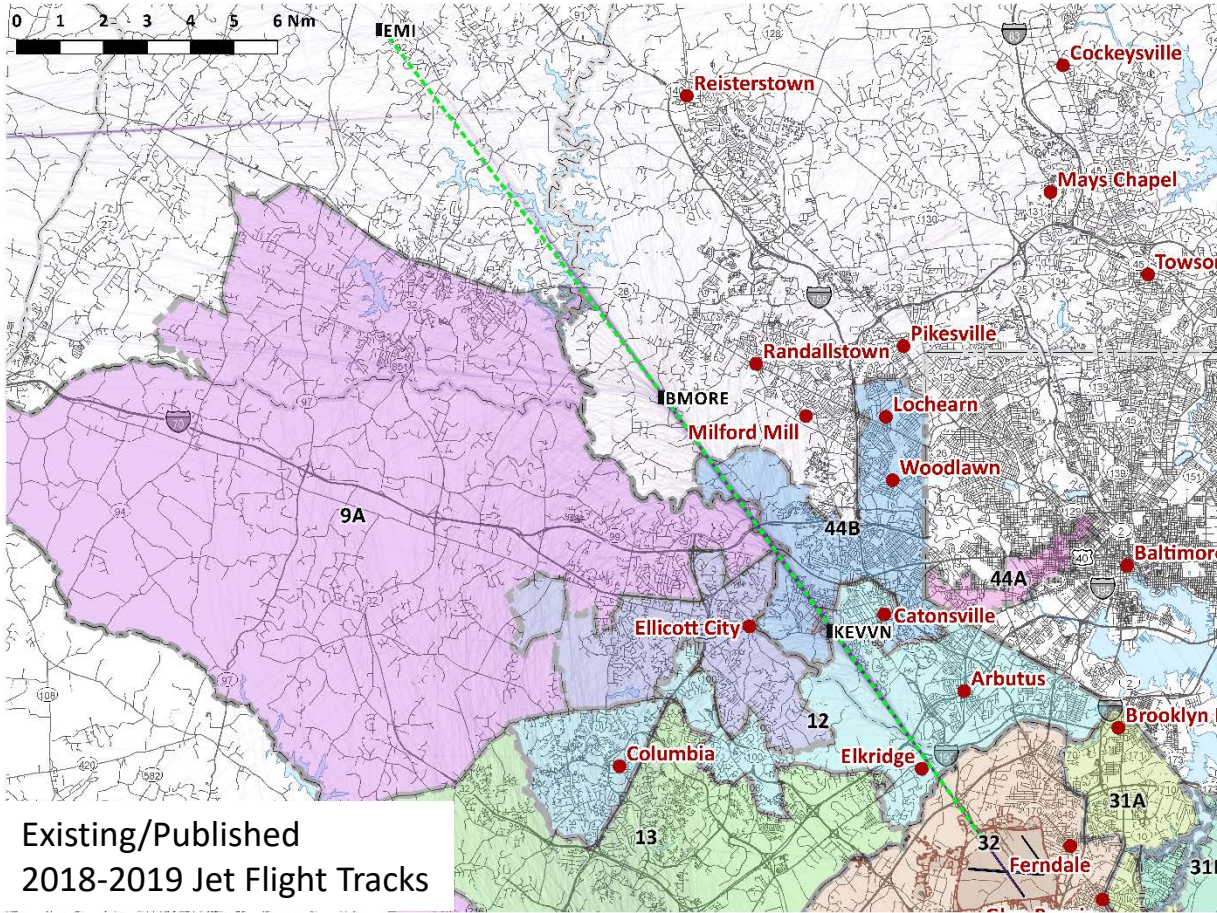
Legend

- Navigational Points
 - Proposed Arrival Procedure Changes
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 - Arrival Flight Tracks
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Runway 10 Jet Arrivals – Flight Track Analysis Summary

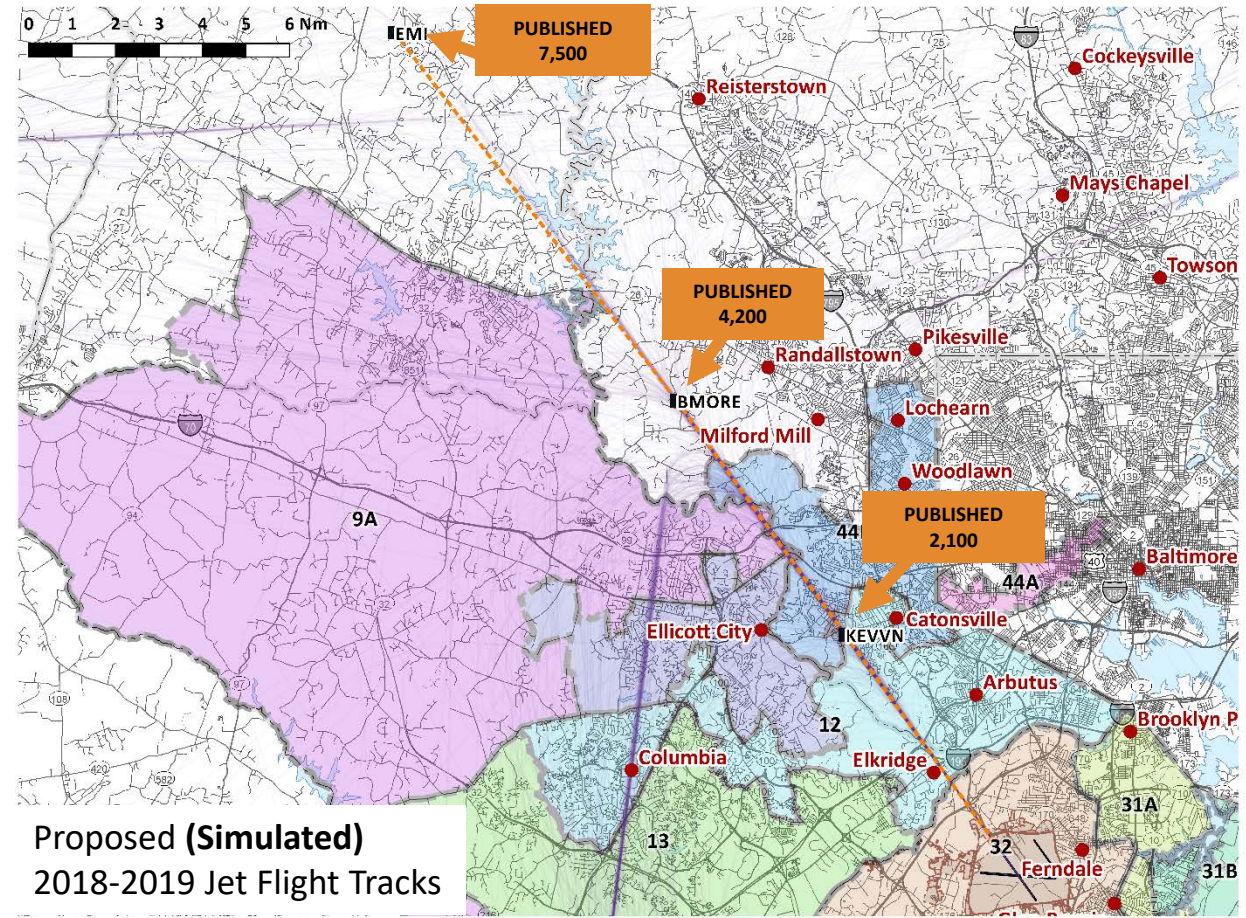
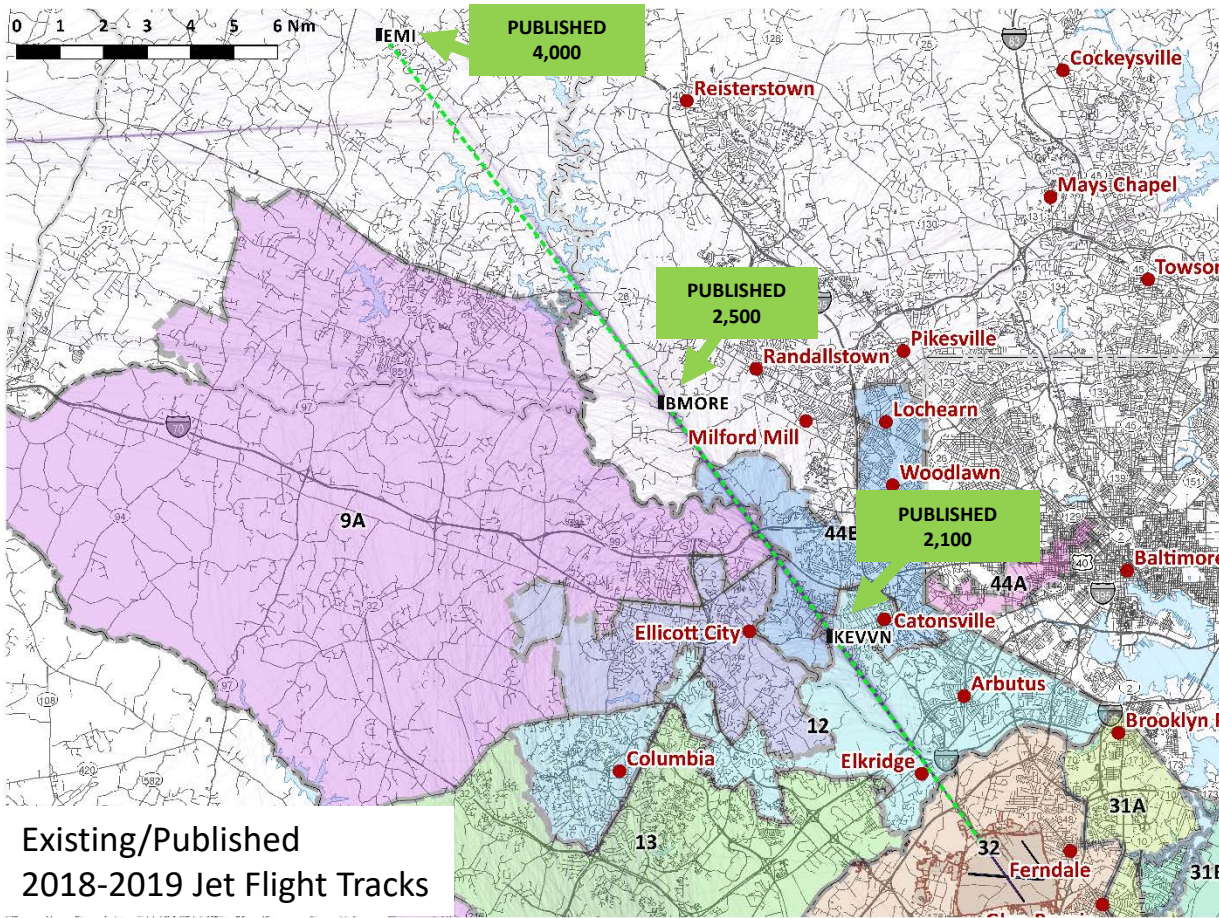
- Runway 10 Roundtable Technical Committee proposed arrival procedure changes may:
 - Shift flight paths closer to the airport away from western portions of Columbia affected by departures under all BWI Marshall operating configurations utilizing a RNP approach with a **continuous descent**
 - Increase aircraft altitudes slightly north of Columbia and east of Ellicott City as they fly to the west on the downwind for sequencing by air traffic control
- Overall, aircraft flight paths may shift but will remain heavily concentrated due to RNAV and RNP procedure design

Runway 15R Jet Arrivals – 2018-2019 compared to 2018-2019 Proposed (Simulated)



- Legend**
- Navigational Points
 - Proposed Arrival Procedure Changes
 - Existing Published Arrival Procedures
 - Proposed Approach Procedure Changes
 - Existing Published Approach Procedures
 - Arrival Flight Tracks
- Pre-Decisional: For informational purposes only

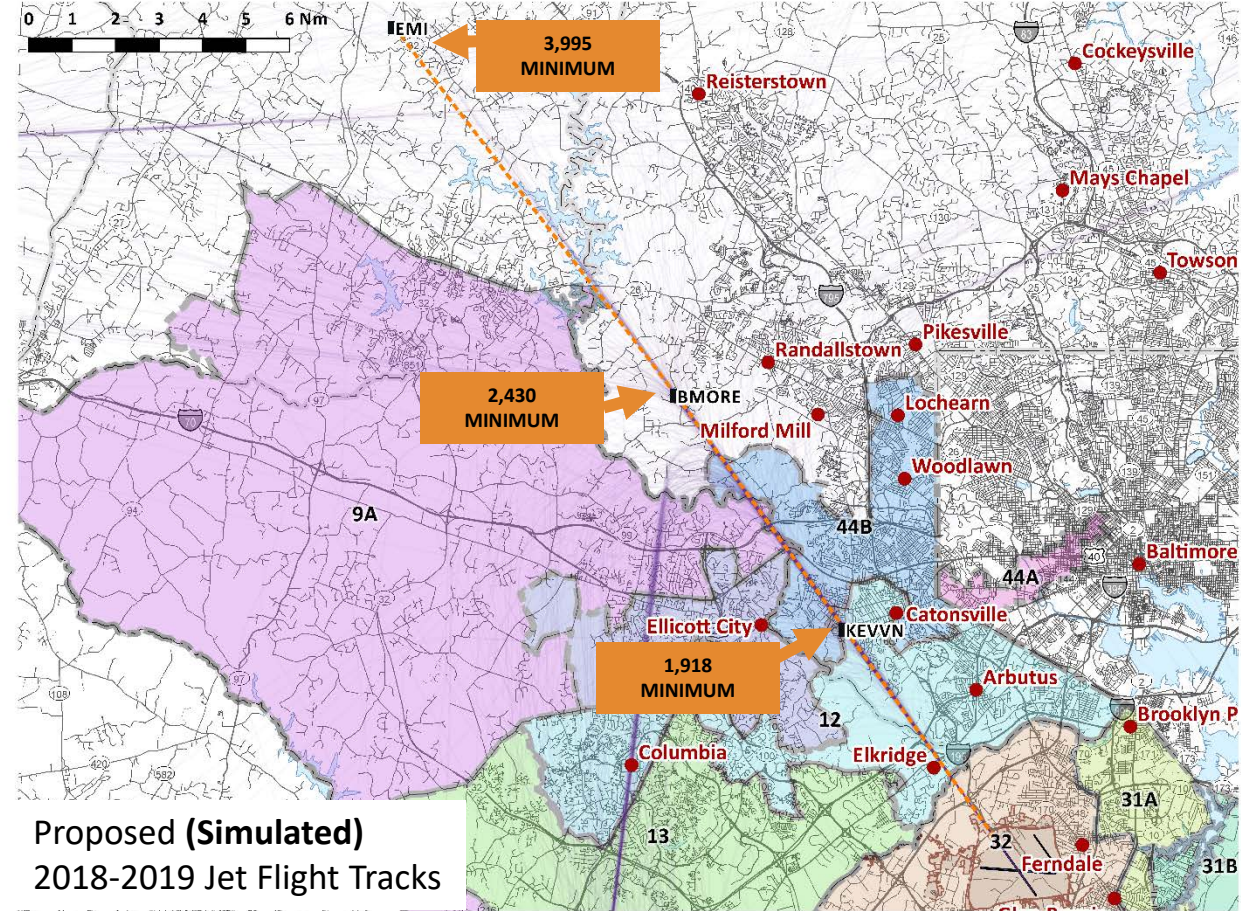
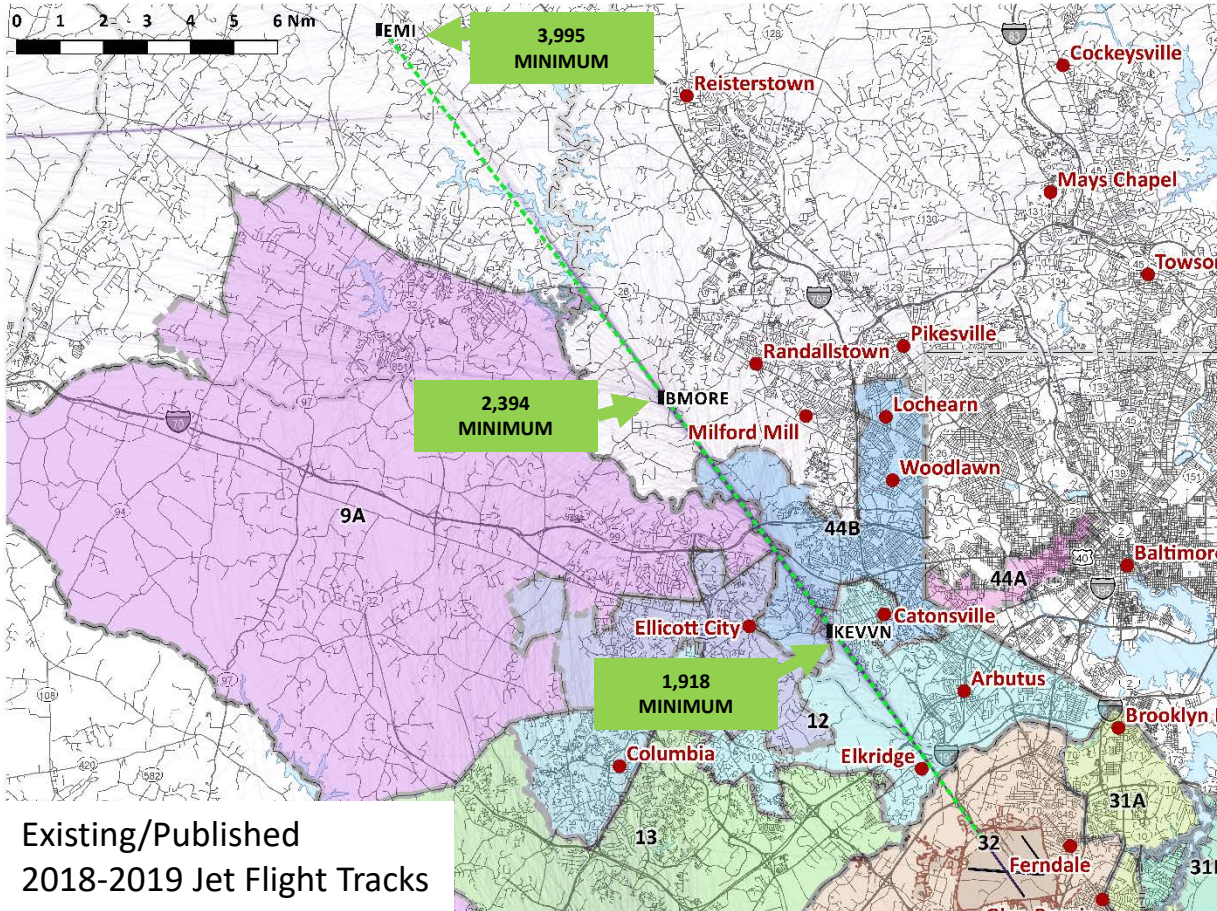
Runway 15R Jet Arrivals – 2018-2019 compared to 2018-2019 Proposed (Simulated)



Legend

- Navigational Points
 - Proposed Arrival Procedure Changes
 - Existing Published Arrival Procedures
 - Proposed Approach Procedure Changes
 - Existing Published Approach Procedures
 - Arrival Flight Tracks
- Pre-Decisional: For informational purposes only

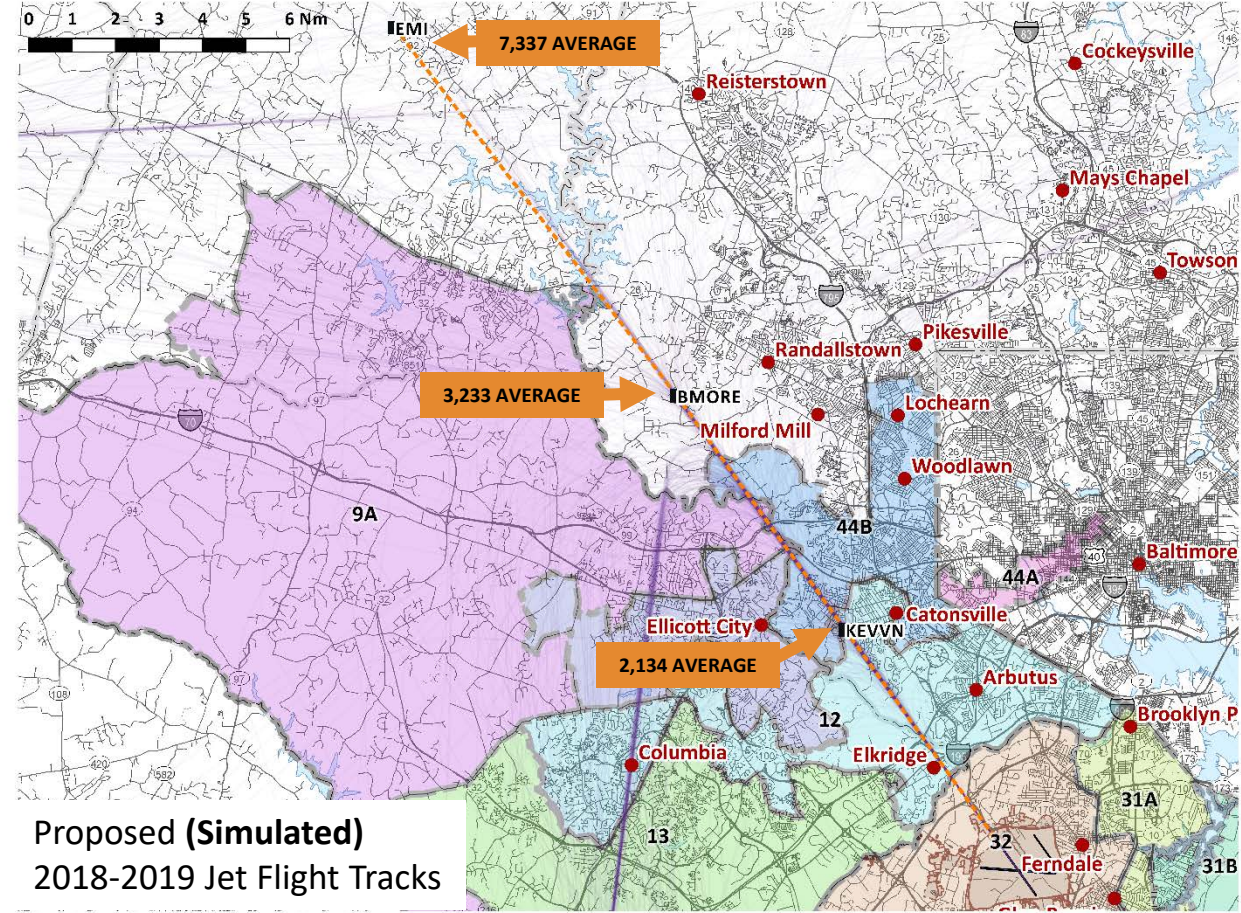
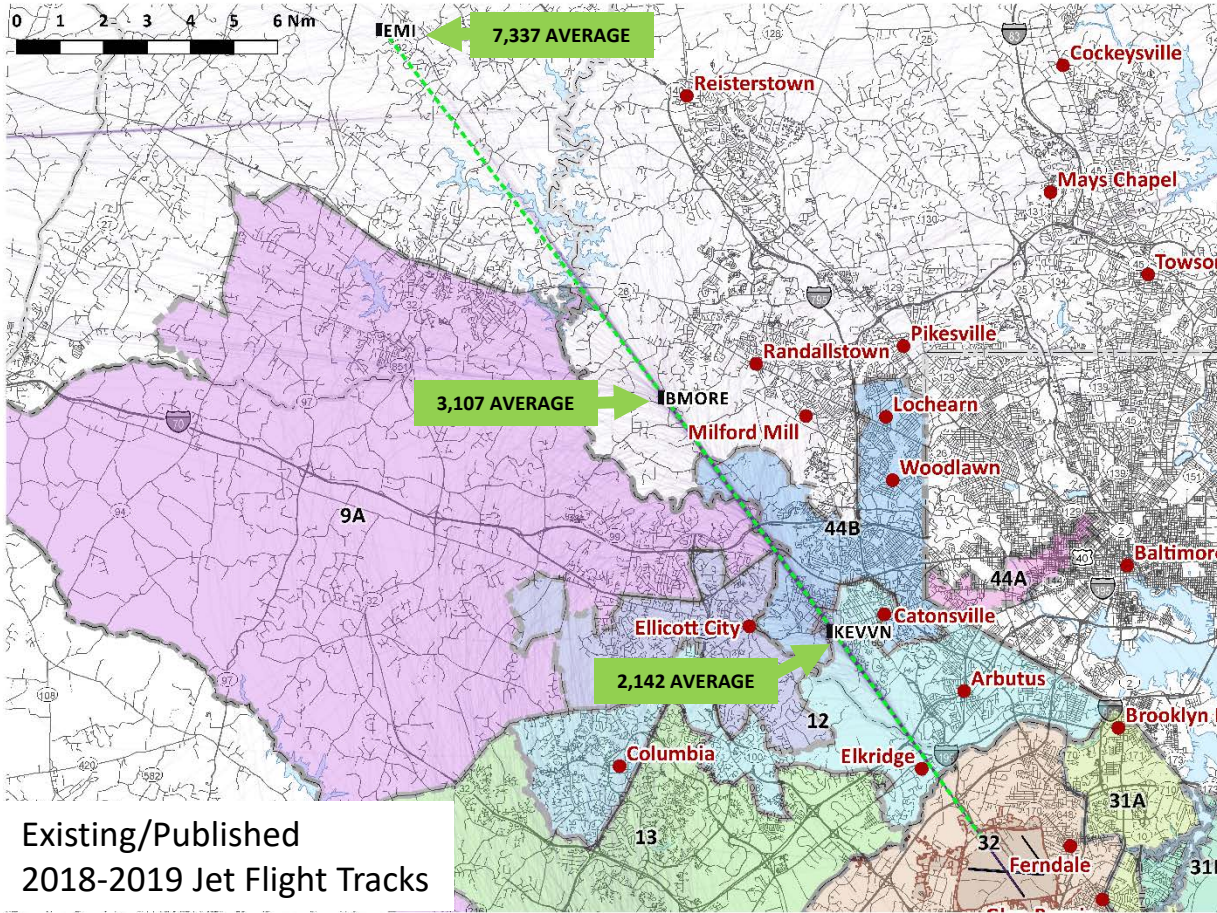
Runway 15R Jet Arrivals – 2018-2019 compared to 2018-2019 Proposed (Simulated)



Legend

- Navigational Points
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 - Proposed Approach Procedure Changes
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 - Arrival Flight Tracks
- Pre-Decisional: For informational purposes only

Runway 15R Jet Arrivals – 2018-2019 compared to 2018-2019 Proposed (Simulated)

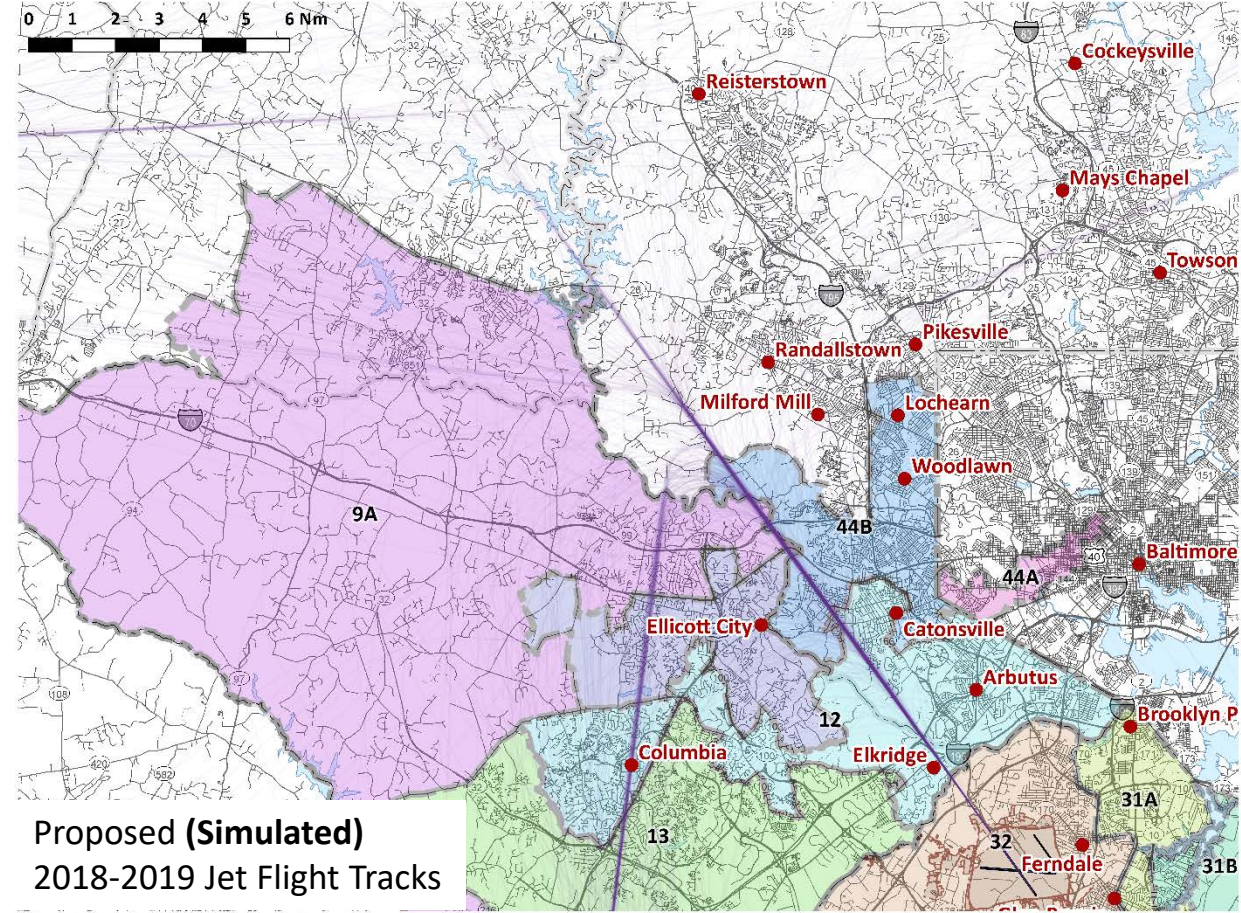
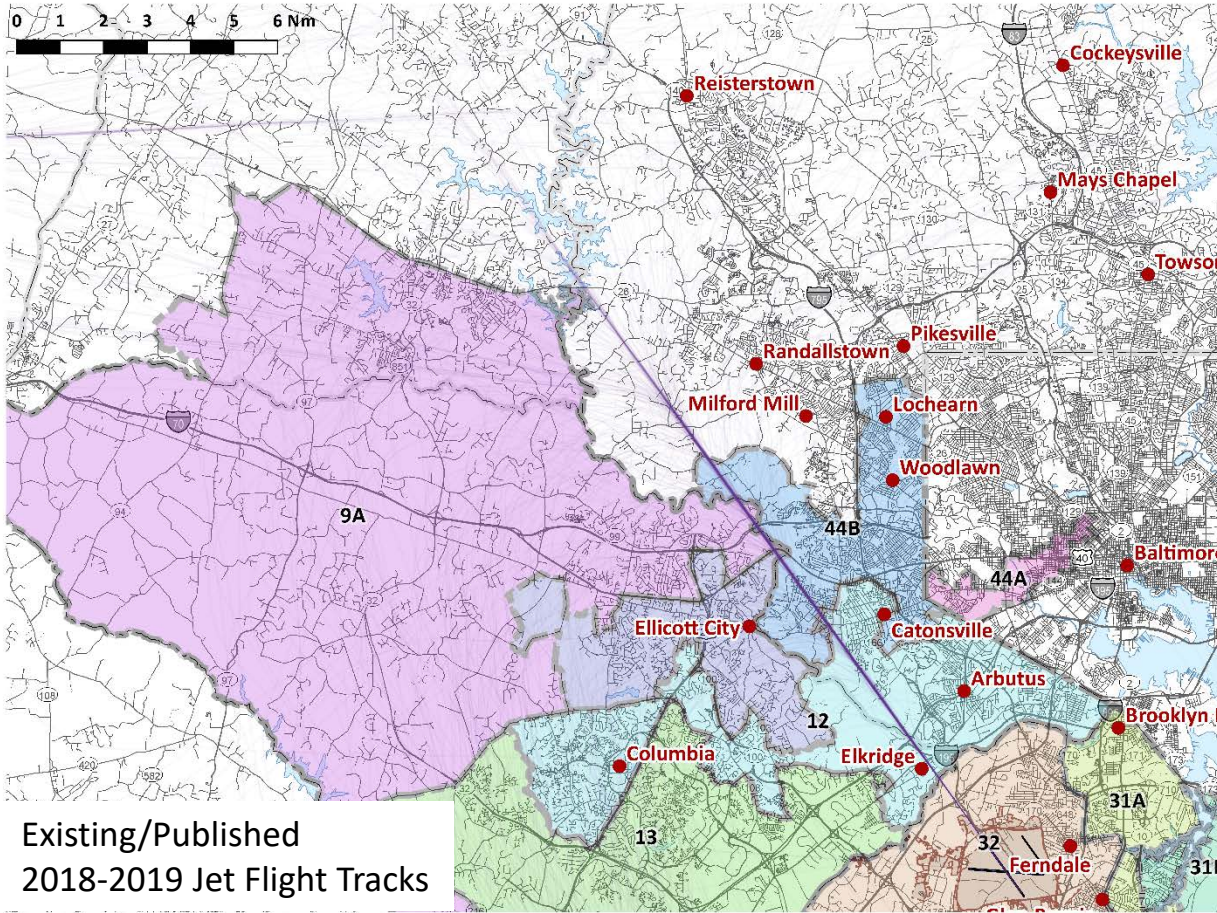


Legend

- Navigational Points
- Proposed Arrival Procedure Changes
- Existing Published Arrival Procedures
- Proposed Approach Procedure Changes
- Existing Published Approach Procedures
- Arrival Flight Tracks

Pre-Decisional: For informational purposes only

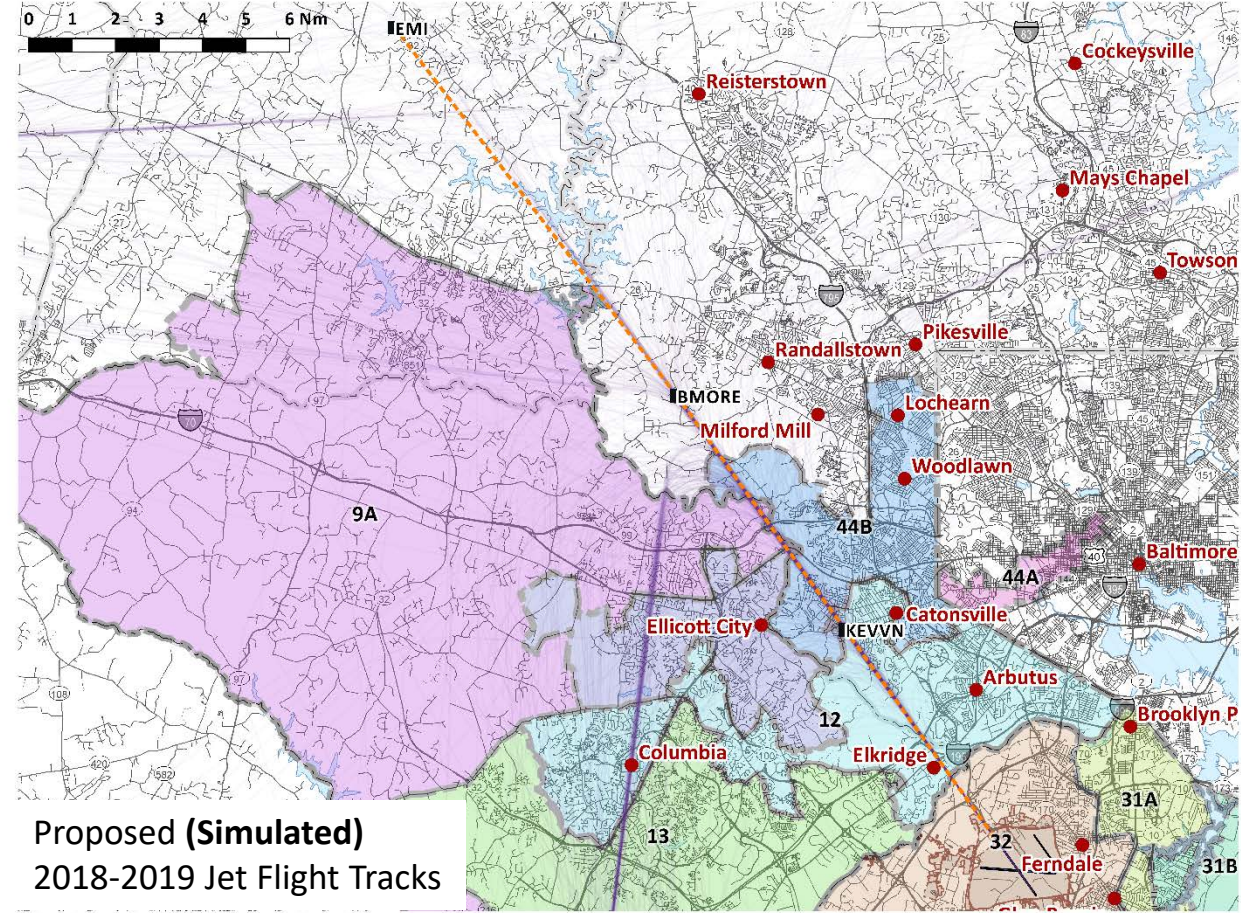
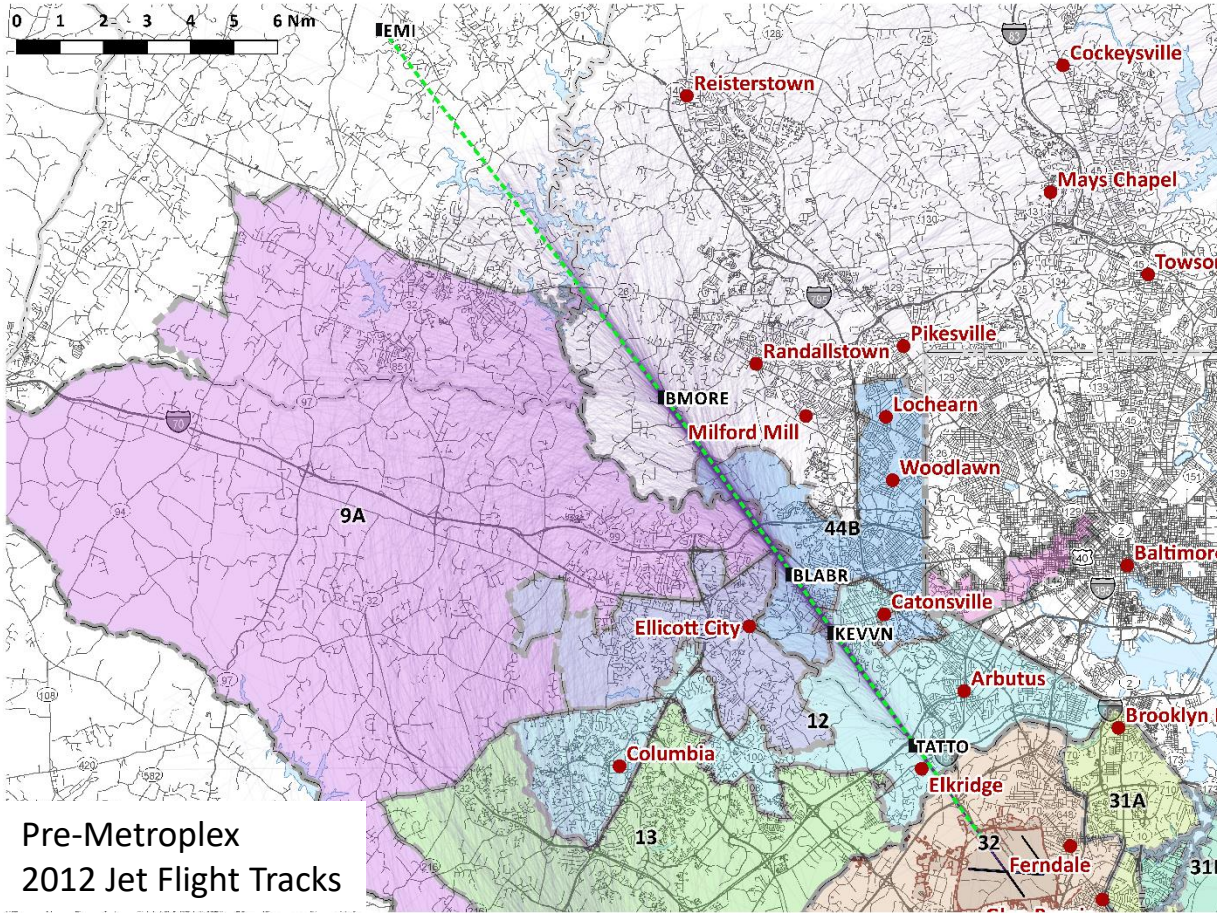
Runway 15R Jet Arrivals – 2018-2019 compared to 2018-2019 Proposed (Simulated)



Legend

- Navigational Points
 - Proposed Arrival Procedure Changes
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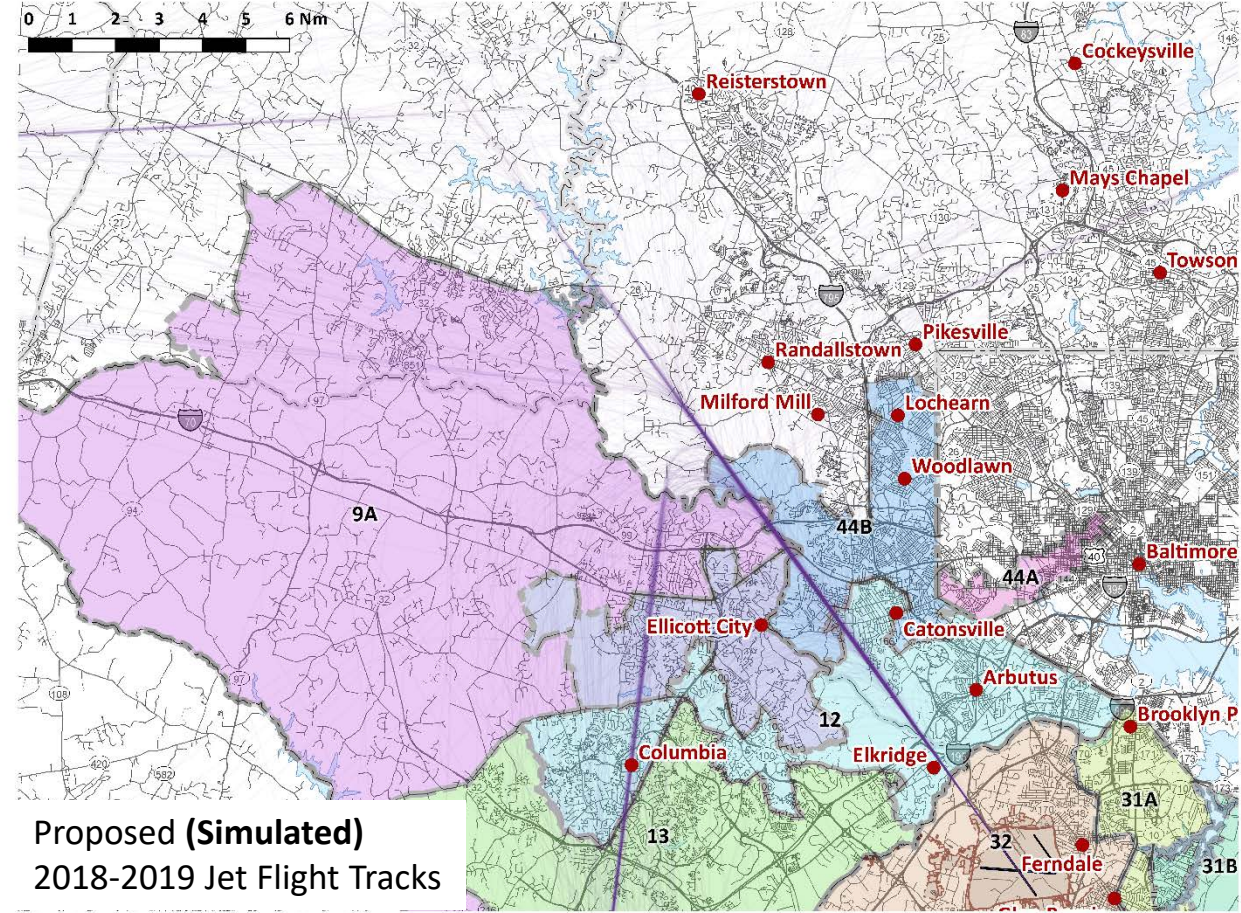
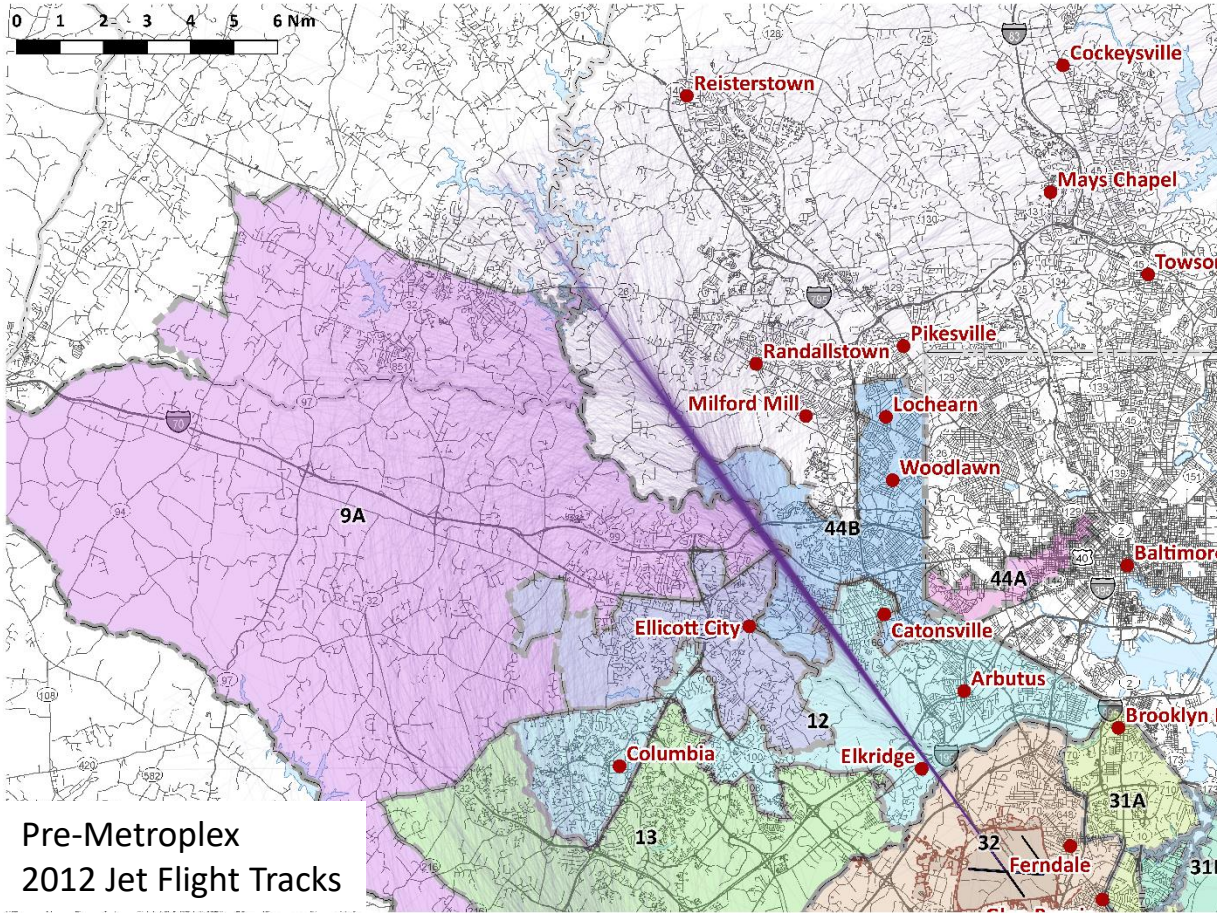
Runway 15R Jet Arrivals – 2012 compared to 2018-2019 Proposed (Simulated)



Legend

- Navigational Points
 - Proposed Arrival Procedure Changes
 - Existing Published Arrival Procedures
 - Proposed Approach Procedure Changes
 - Existing Published Approach Procedures
 - Arrival Flight Tracks
- Pre-Decisional: For informational purposes only

Runway 15R Jet Arrivals – 2012 compared to 2018-2019 Proposed (Simulated)



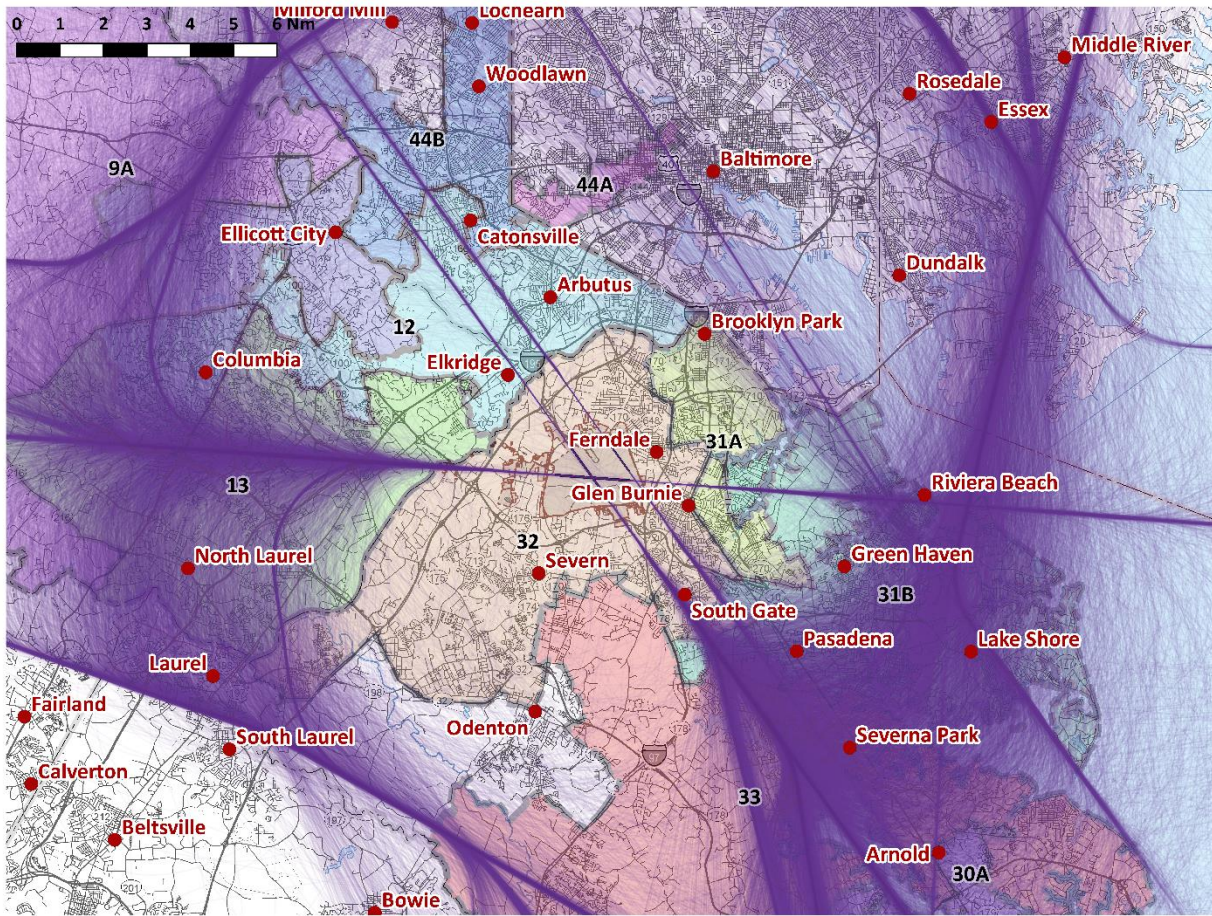
Legend

- Navigational Points
 - Proposed Arrival Procedure Changes
 - Existing Published Arrival Procedures
 - Proposed Approach Procedure Changes
 - Existing Published Approach Procedures
 - Arrival Flight Tracks
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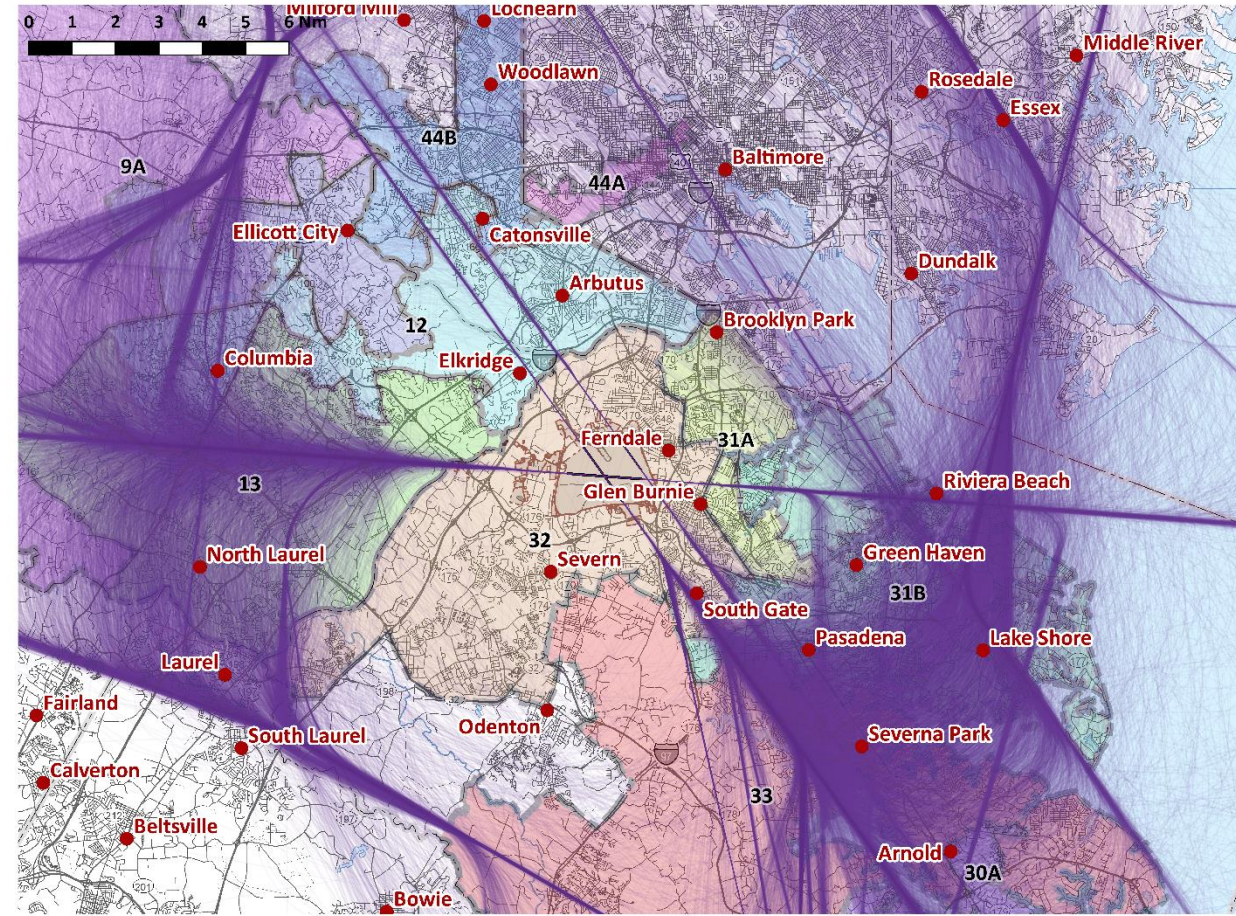
Runway 15R Jet Arrivals – Flight Track Analysis Summary

- Runway 15R Roundtable Technical Committee proposed procedure changes may:
 - Increase aircraft altitudes along the Runway 15R final approach course west of Milford Hill utilizing a RNP approach with a **continuous descent**
 - Lateral flight paths are not anticipated to change, although our analysis assumed aircraft would fly a single corridor before making an approach due to the uncertainty of vectoring/sequencing by air traffic control

All Jet Arrivals – 2018-2019 compared to 2018-2019 Proposed (Simulated)



2018-2019 Existing arrival flight tracks

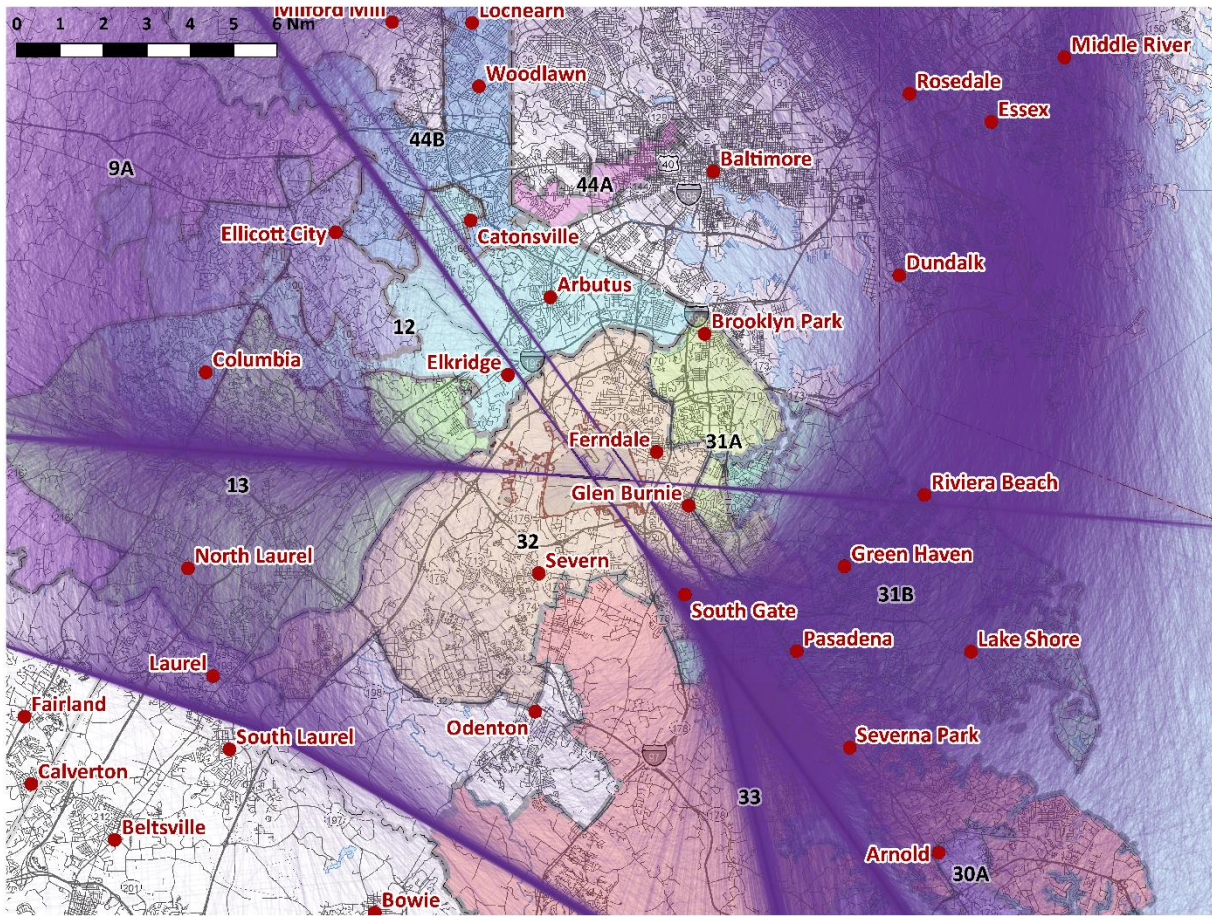


2018-2019 Proposed (Simulated) arrival flight tracks

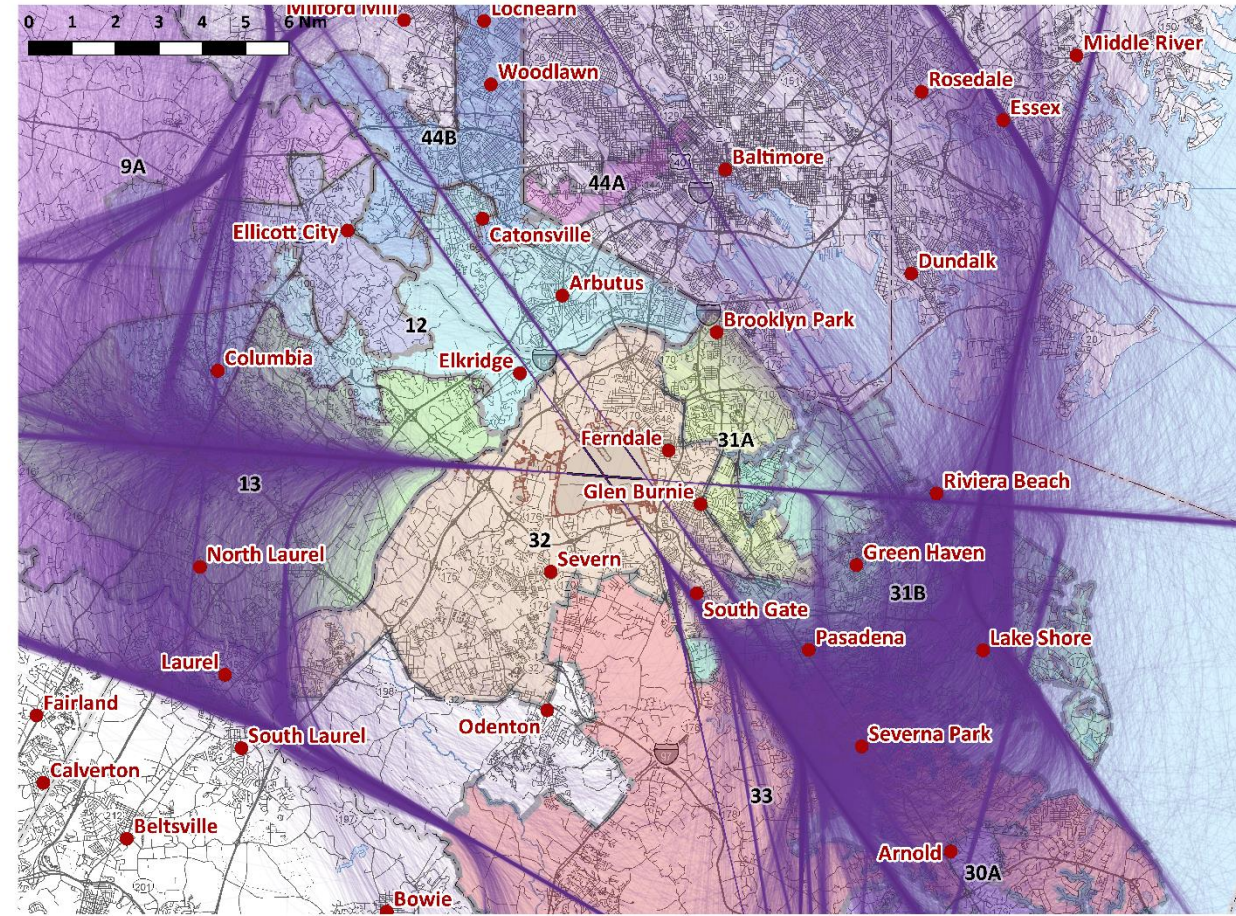
Legend

— Arrival Flight Tracks

All Jet Arrivals – 2012 compared to 2018-2019 Proposed (Simulated)



2012 Pre-Metroplex arrival flight tracks

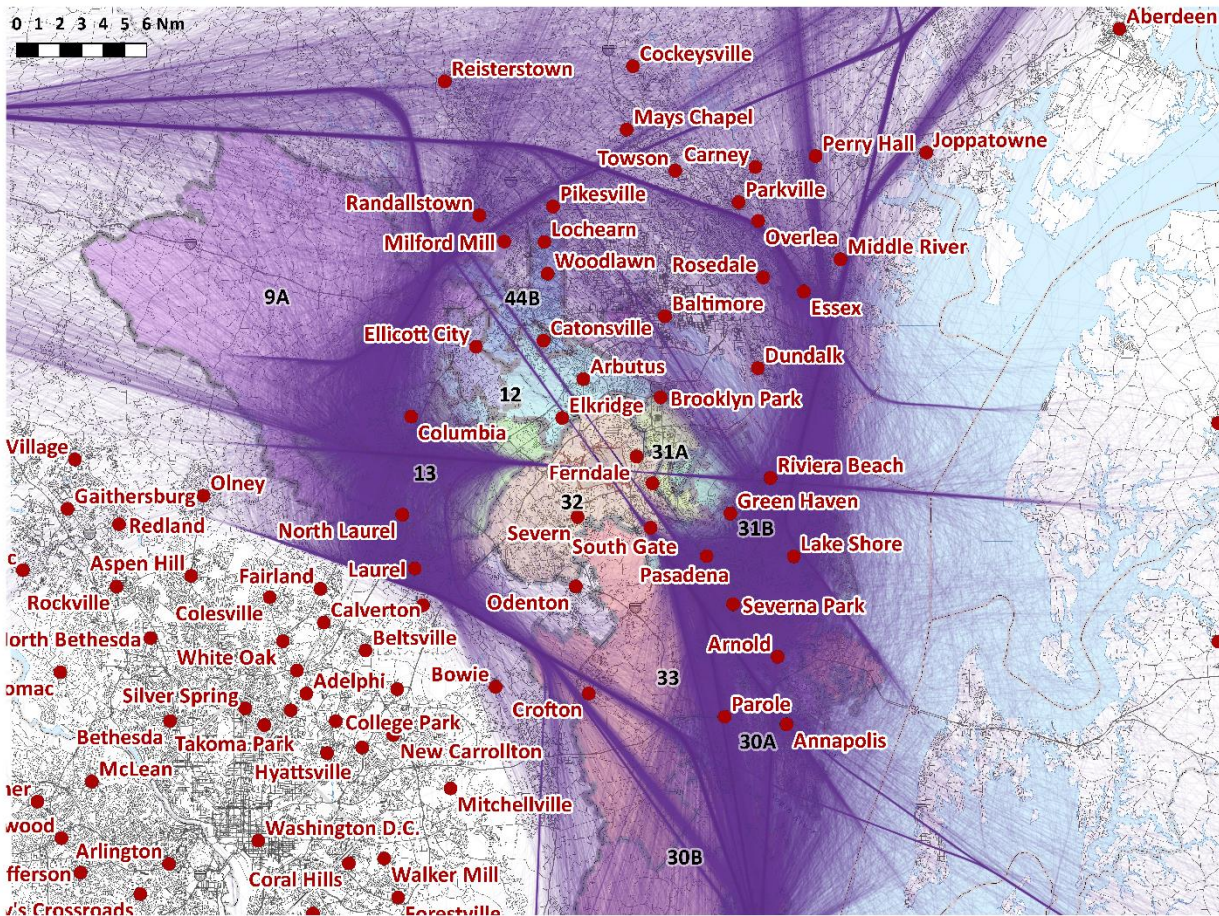


2018-2019 Proposed (Simulated) arrival flight tracks

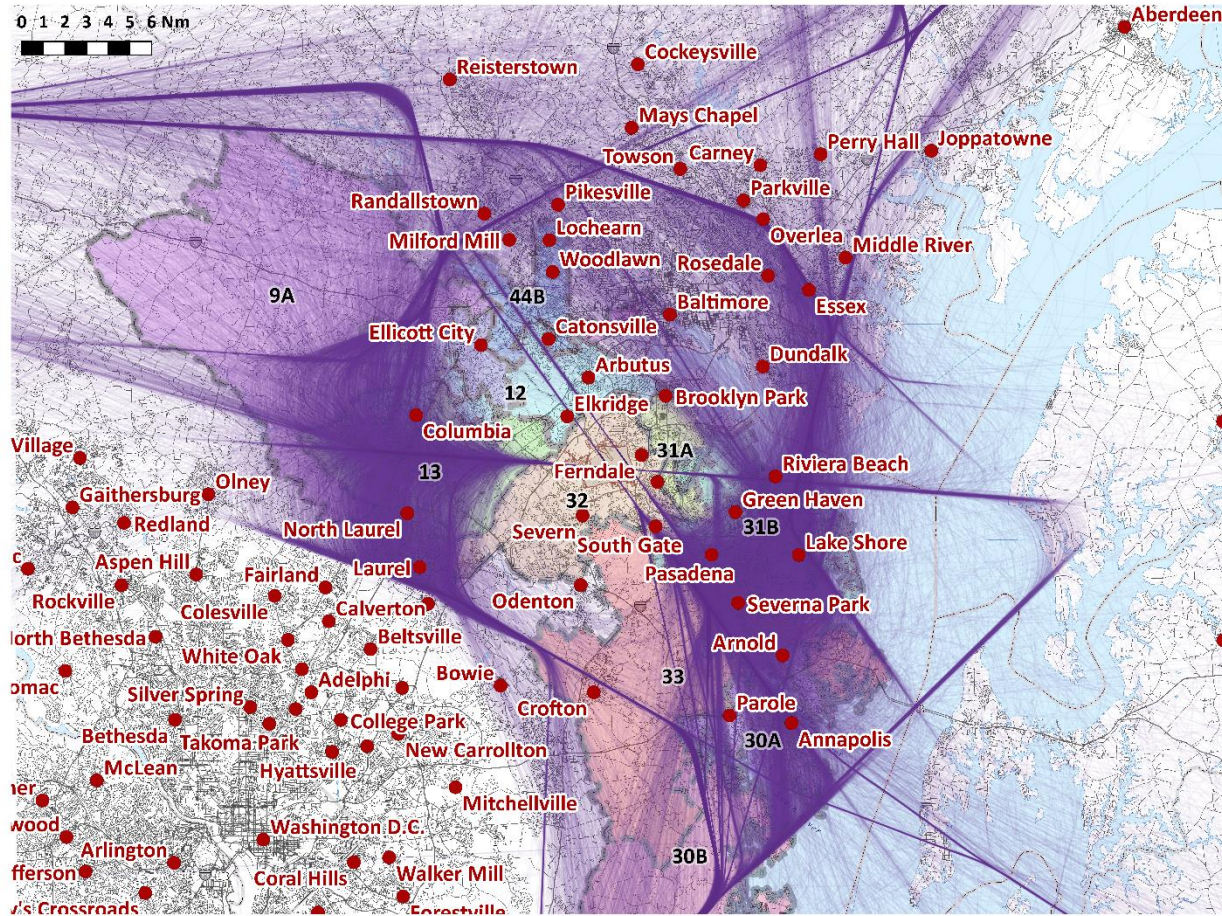
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— Arrival Flight Tracks

All Jet Arrivals – 2018-2019 compared to 2018-2019 Proposed (Simulated)



2018-2019 Existing arrival flight tracks

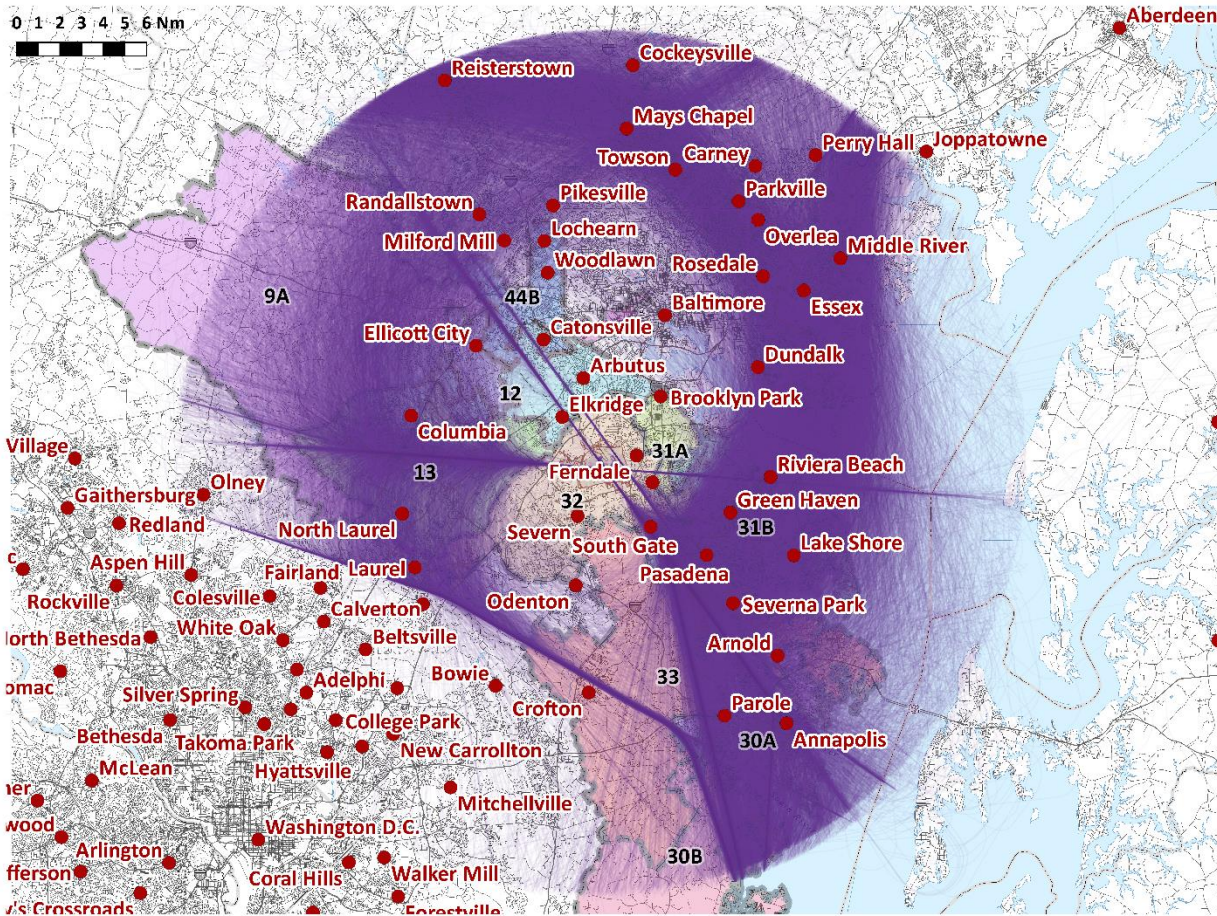


2018-2019 Proposed (Simulated) arrival flight tracks

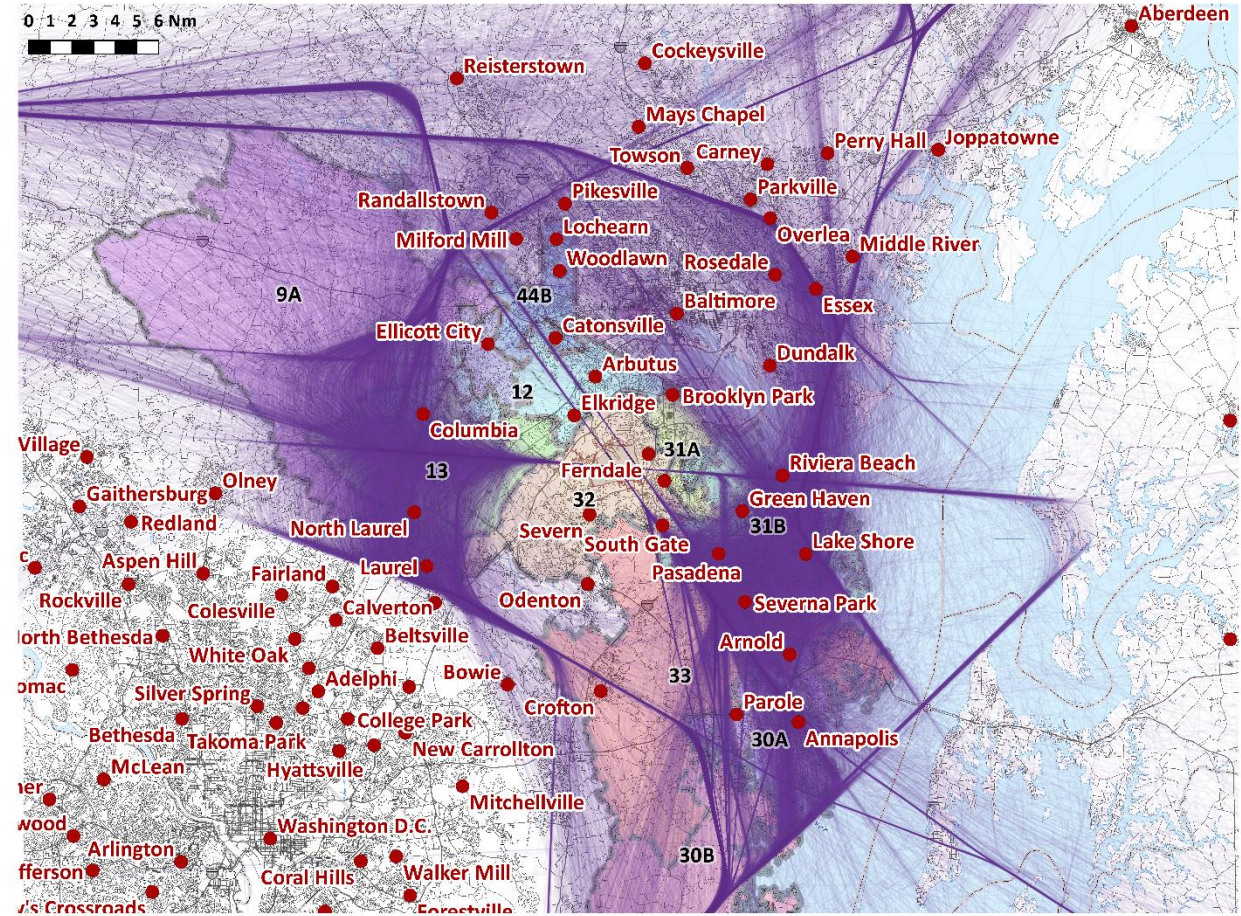
Legend

— Arrival Flight Tracks

All Jet Arrivals – 2012 compared to 2018-2019 Proposed (Simulated)



2012 Pre-Metroplex arrival flight tracks



2018-2019 Proposed (Simulated) arrival flight tracks

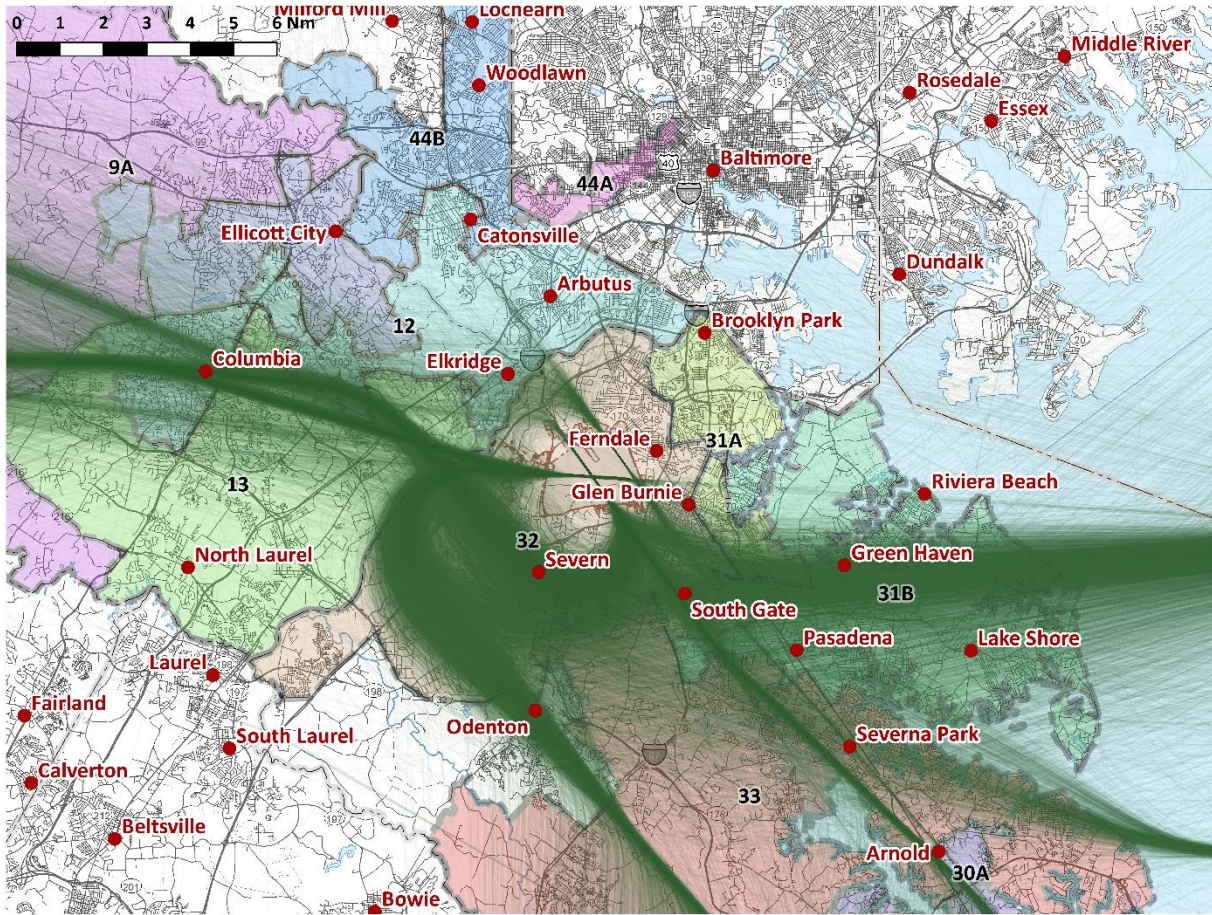
Legend

— Arrival Flight Tracks

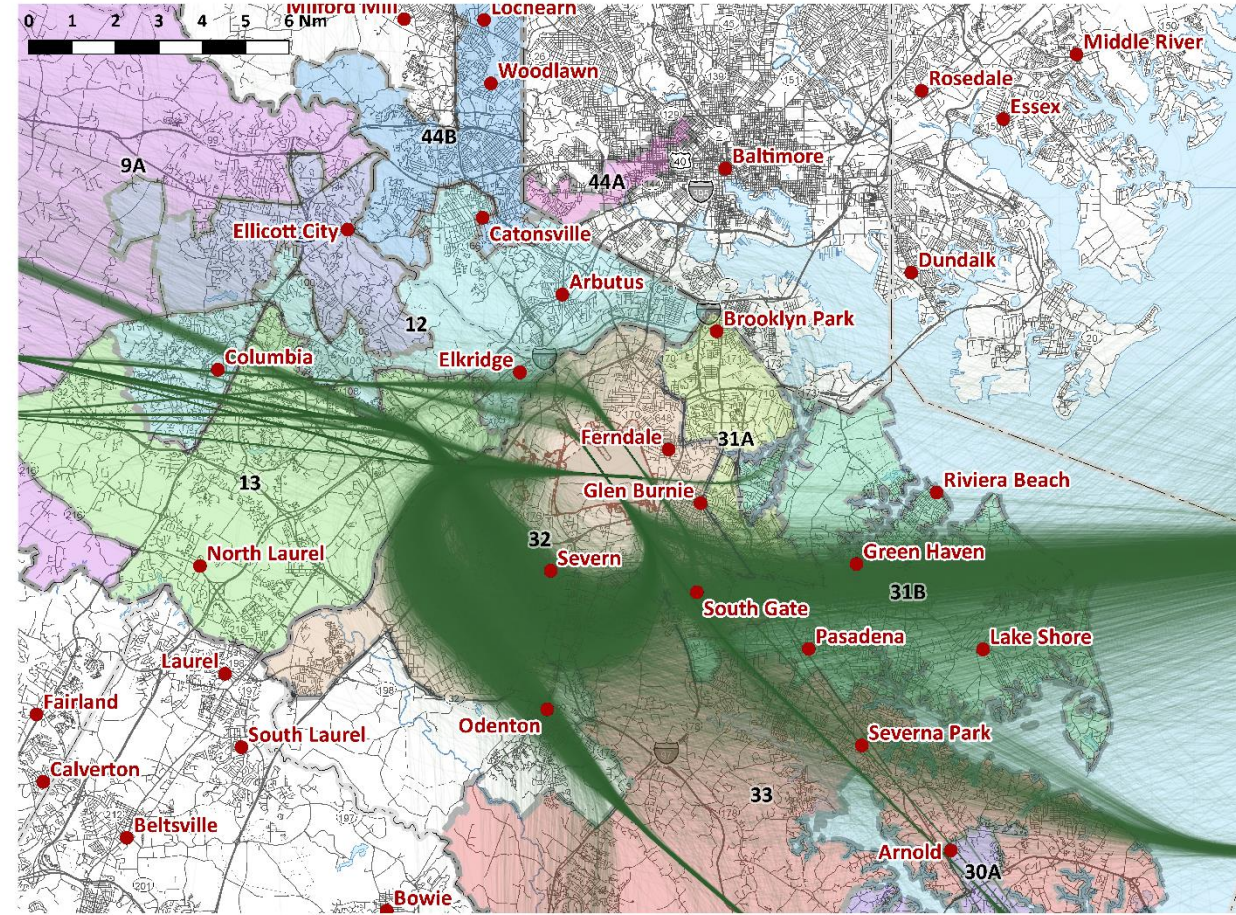
All Jet Arrivals – Flight Track Analysis Summary

- Proposed Roundtable Technical Committee arrival and approach procedure changes may:
 - Shift some arrivals to Runway 33L over less densely populated areas along corridors currently used for visual approaches, better distribute operations, and facilitate **continuous aircraft descents** at higher altitudes with reduced power settings
 - Facilitate **continuous aircraft descents** for some aircraft within the existing Runway 33L arrival corridor west of Annapolis between the South and Severn Rivers that allow for descents at higher altitudes and reduced power settings
 - Shift some arrivals to Runway 10 to the east closer to the airport away from western portions of Columbia and increase aircraft altitudes on arrival and on approach that facilitate **continuous aircraft descents**
 - Increase the altitudes of some arrivals to Runway 15R and **facilitate continuous aircraft descents**
- Proposed FAA April 2018 FAA arrival procedure changes may:
 - Shift the flight paths of Runway 28 arrivals to the north as aircraft turn to the downwind leg near Wildwood Beach

All Jet Departures – 2018-2019 compared to 2018-2019 Proposed (Simulated)



2018-2019 Existing departure flight tracks

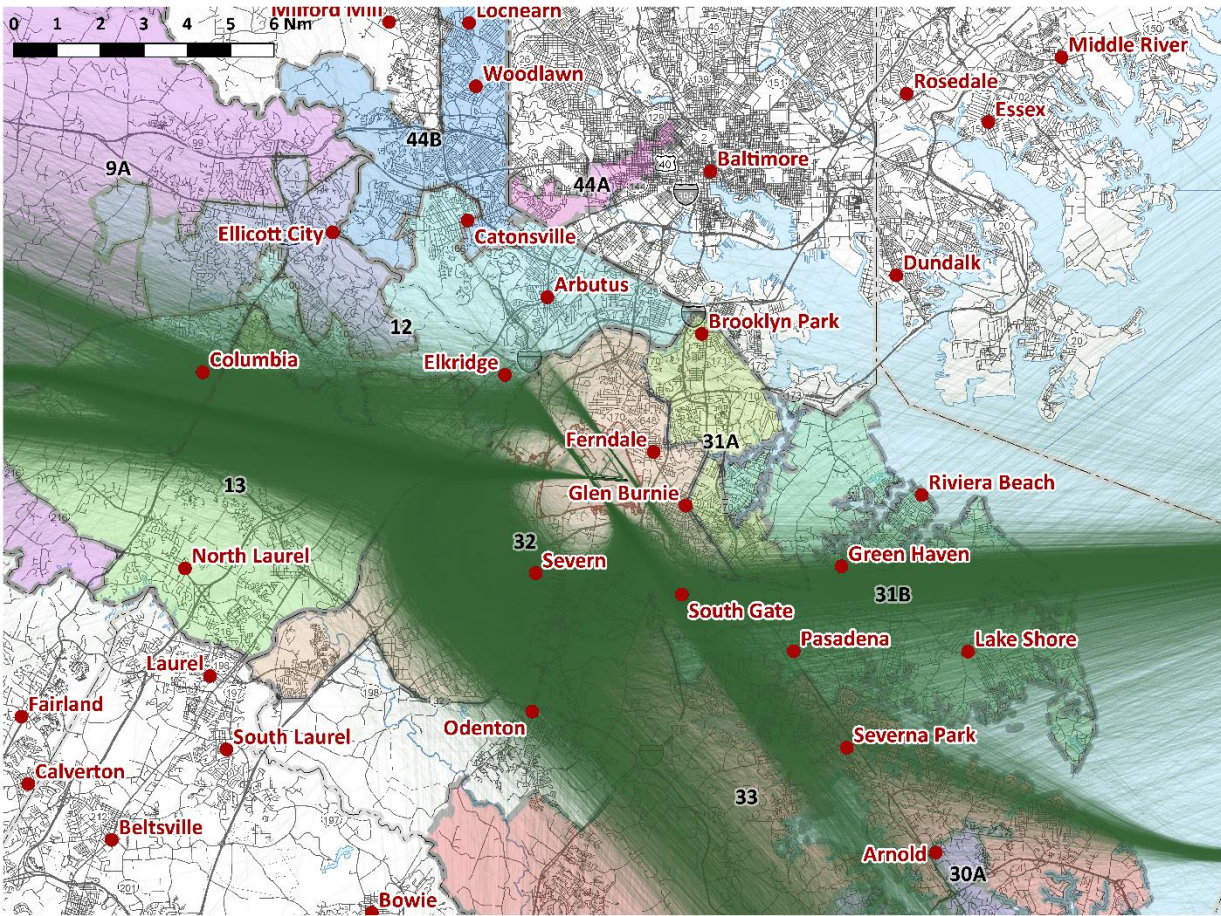


2018-2019 Proposed (Simulated) departure flight tracks

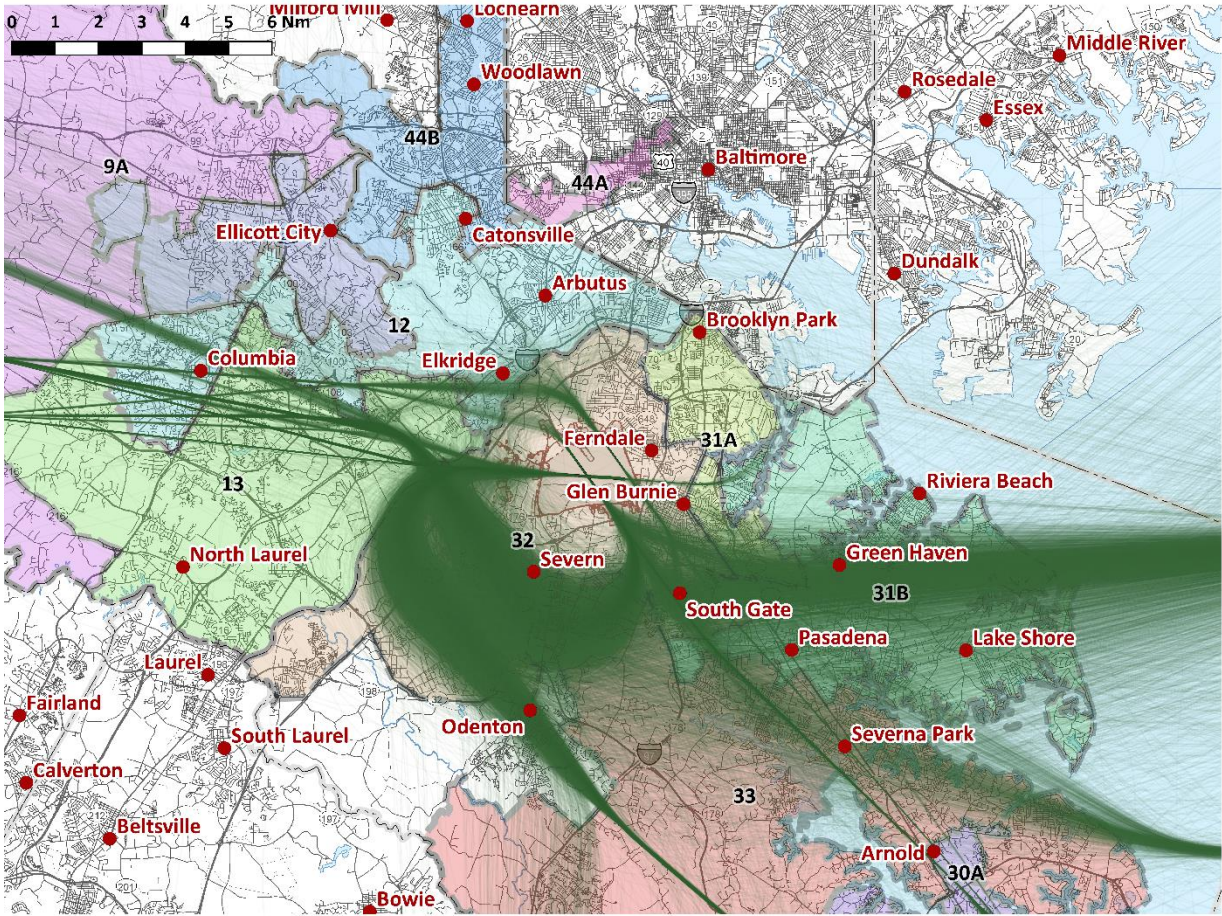
Legend

— Departure Flight Tracks

All Jet Departures – 2012 compared to 2018-2019 Proposed (Simulated)



2012 Pre-Metroplex departure flight tracks



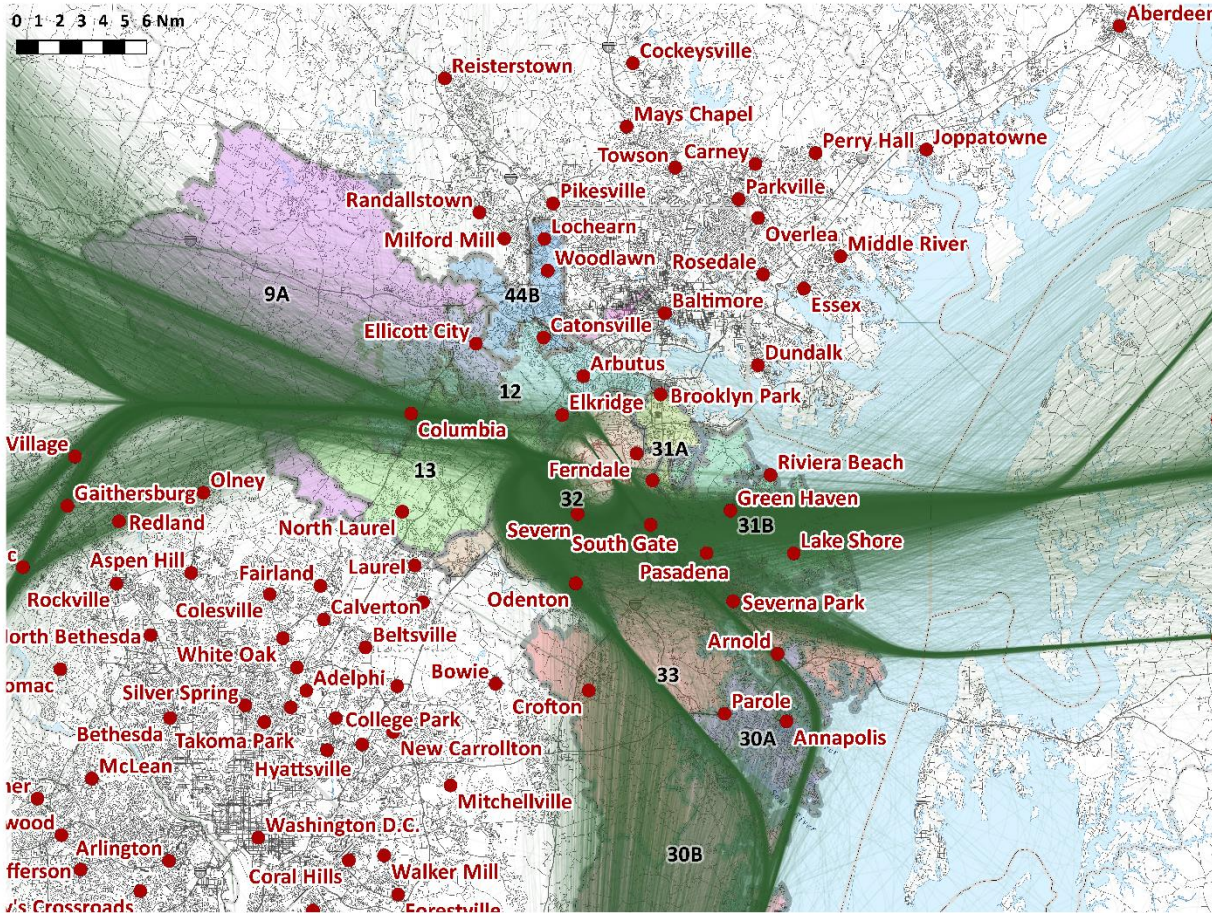
2018-2019 Proposed (Simulated) departure flight tracks

Legend

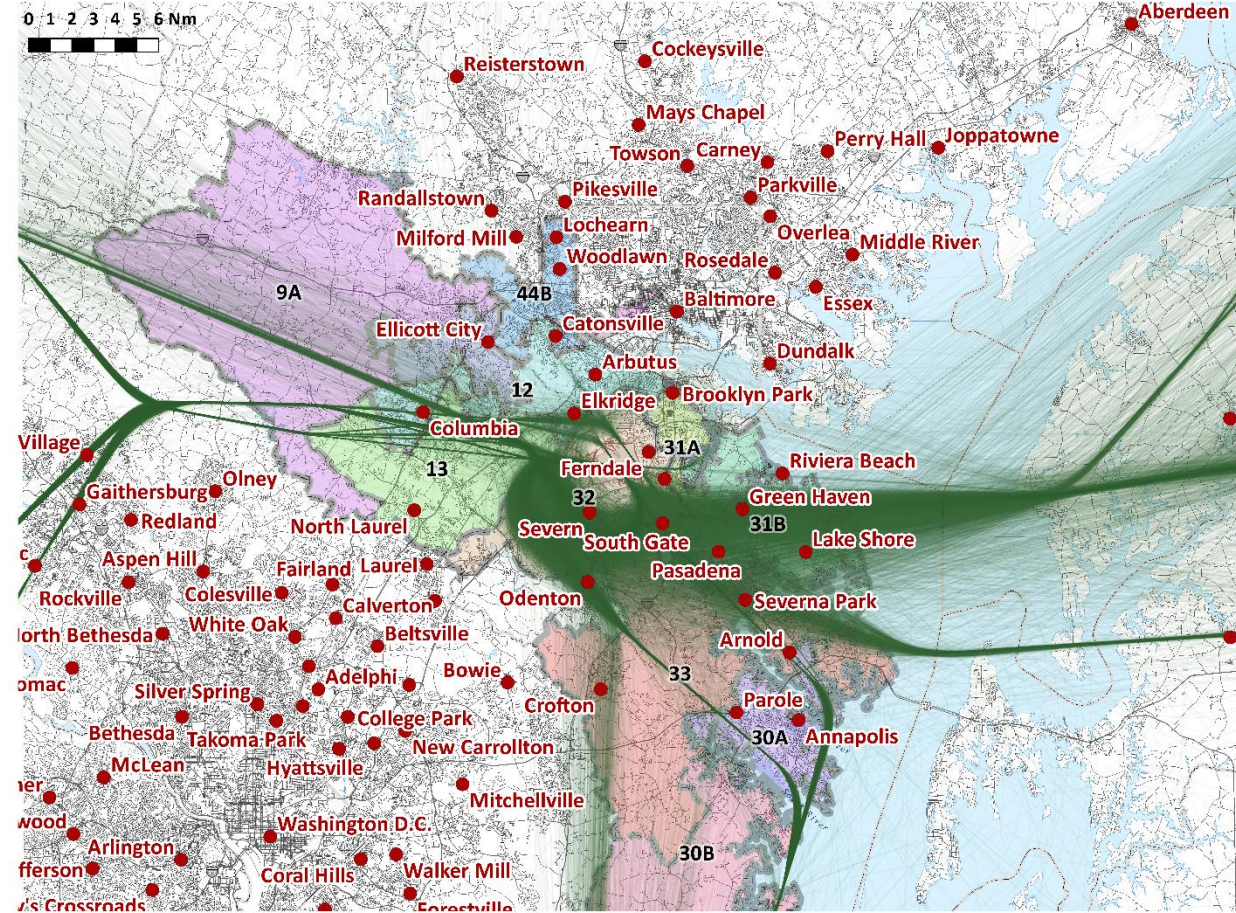
— Departure Flight Tracks



All Jet Departures – 2018-2019 compared to 2018-2019 Proposed (Simulated)



2018-2019 Existing departure flight tracks

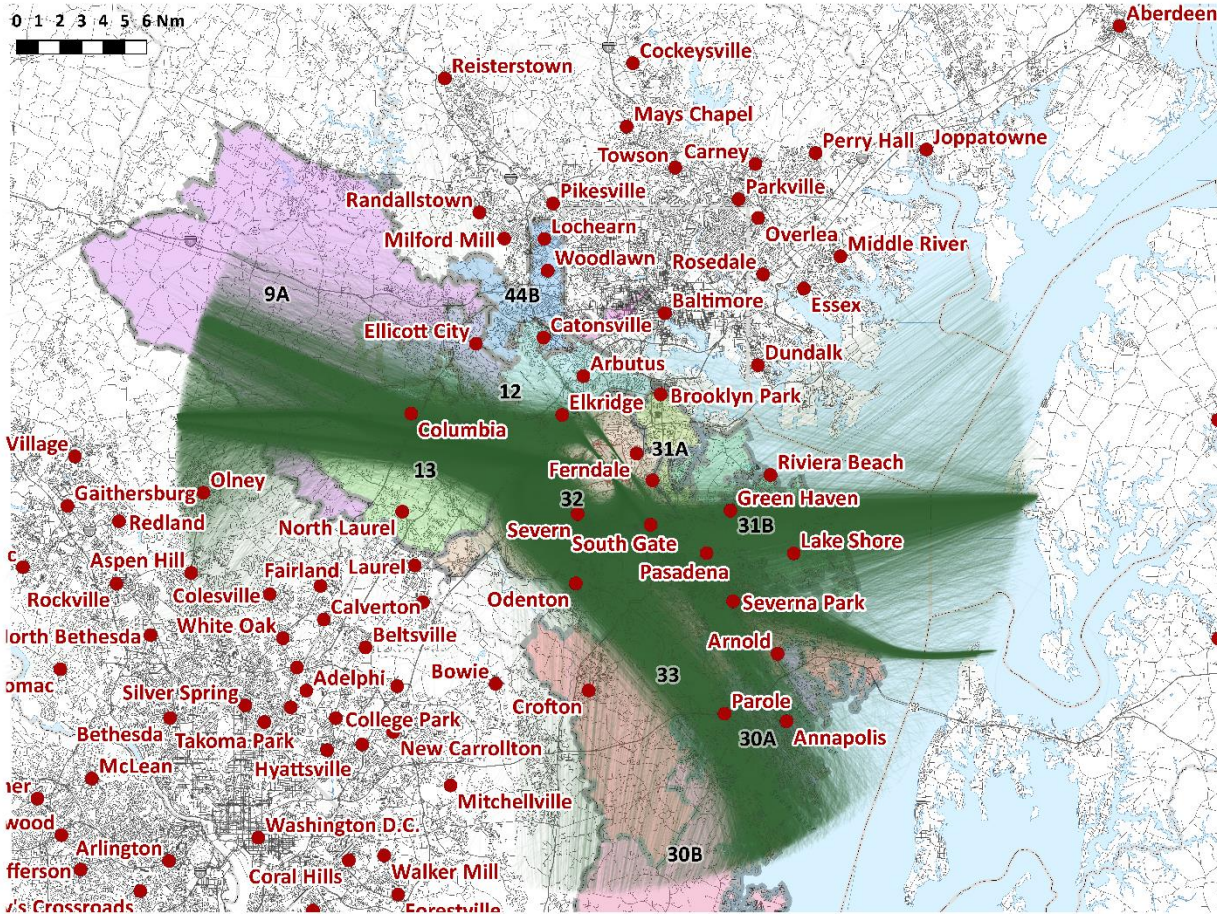


2018-2019 Proposed (Simulated) departure flight tracks

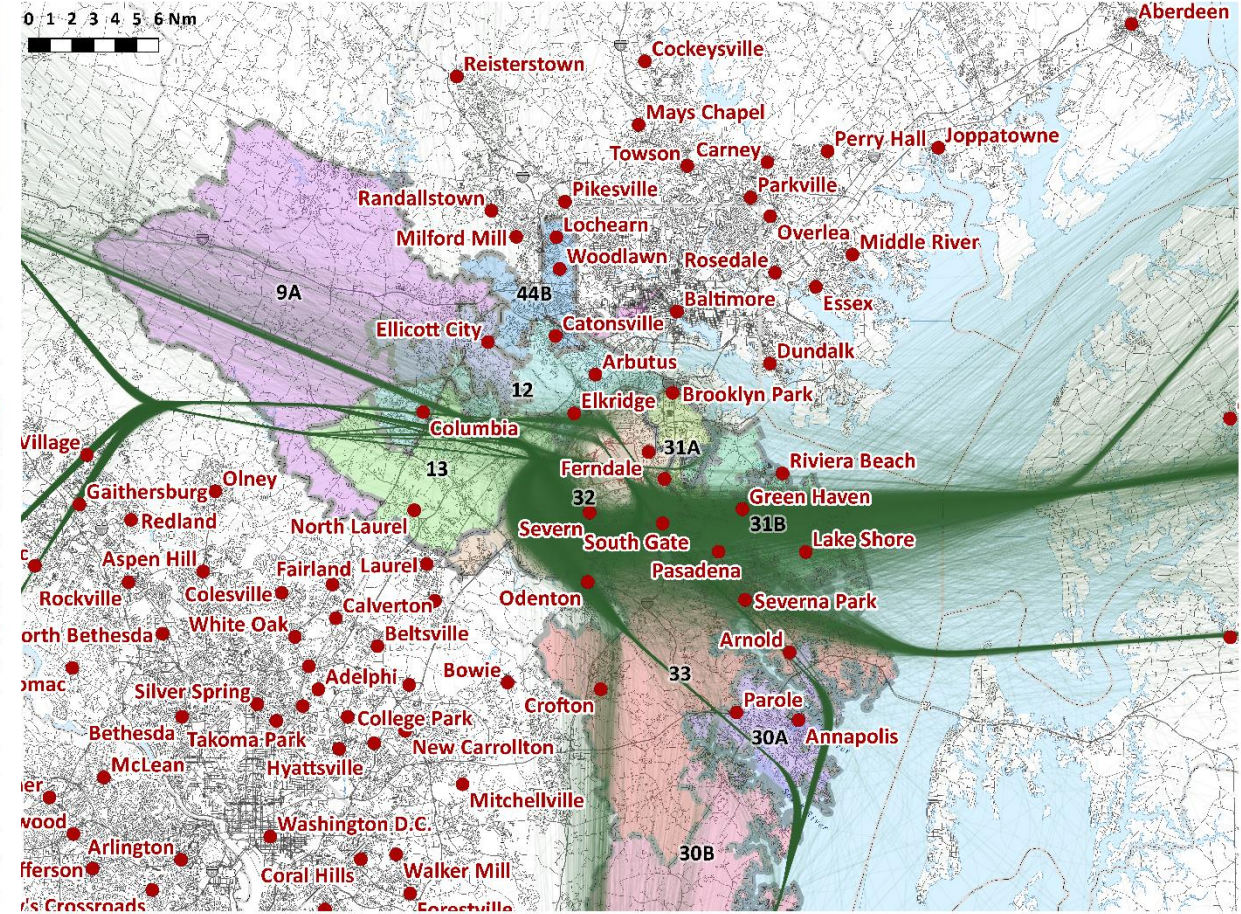
Legend

— Departure Flight Tracks

All Jet Departures – 2012 compared to 2018-2019 Proposed (Simulated)



2012 Pre-Metroplex departure flight tracks



2018-2019 Proposed (Simulated) departure flight tracks

Legend

— Departure Flight Tracks

All Jet Departures – Flight Track Analysis Summary

- Proposed April 2018 FAA procedures for Runways 15R and 28 may:
 - Shift Runway 15R initial Jet departure turns southeast of 2012 and 2018-2019 turn locations
 - Increase dispersion of Runway 15R initial Jet departure turns relative to 2018-2019, but will not return dispersion to 2012 levels
 - Shift flight paths for both runways closer to 2012 historical locations to the west and south of Elkridge and Columbia
 - Shift Runway 28 southbound departures over the Annapolis peninsula at altitudes of 8,000 – 9,000 feet MSL. However, the Roundtable has requested the FAA reconsider this proposed change
- Minor changes to aircraft altitude profiles
- Proposed FAA procedures may marginally increase the concentration of Runway 33L and 33R Jet departures



Noise Analysis of April 2018 and Roundtable Technical Committee Proposed Procedure Changes

Noise Analysis – Overview

- Developed noise modeling inputs from radar flight track data samples used in flight track analysis for 2012, 2018-2019, and 2018-2019 proposed (simulated) operations flying the April 2018 FAA and Roundtable Technical Committees proposed procedure changes
- Noise analysis includes **all operations** from each data sample
 - Arrivals and departures
 - All aircraft types (Jet, Piston/Turbine Propeller, and Helicopters)

Noise Analysis – Overview

- Adjusted operations to ensure arrival and departure operations are equal, and then scaled to match FAA recorded operations at BWI Marshall from FAA Air Traffic Activity Data System (ATADS) based on Tower Category
 - Modeled 2012 (123 days) operations: 89,719
 - Modeled 2018-2019 (120 days) operations: 85,862
- 2018-2019 operations proposed (simulated) to fly April 2018 FAA and Roundtable proposed procedures utilized same inputs as baseline 2018-2019 data sample with the exception of changes to aircraft flight tracks
- Fed inputs into Aviation Environmental Design Tool (AEDT) Version 2d SP2
- Generated noise results
 - Day-Night Average Sound Level (DNL)
 - Contours, uniform grid, and US Census Block centroids
 - Population counts from 2010 US Census and 2016 American Community Survey (ACS) 5-Year Estimates

Modeled DNL Contours - 2012

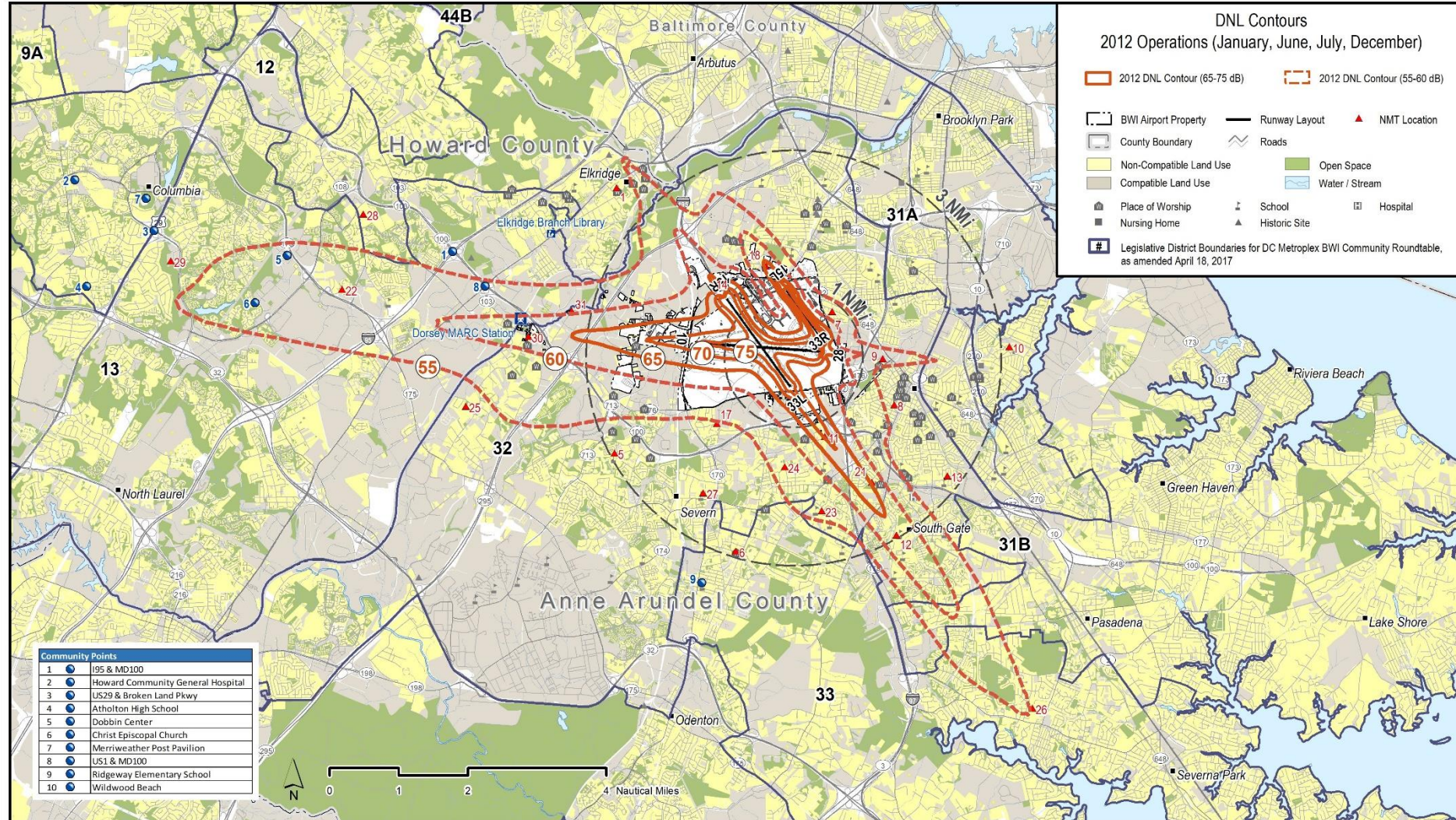
2010 US Census

Contour Range	Population	Households
55-60 dB	44,704	17,778
60-65 dB	9,805	4,034
65-70 dB	1,041	420
70-75 dB	25	8
75+ dB	0	0
Total	55,575	22,240

2016 ACS

5-Year Estimates

Contour Range	Population	Households
55-60 dB	52,204	20,675
60-65 dB	10,054	4,378
65-70 dB	2,162	820
70-75 dB	191	74
75+ dB	7	2
Total	64,618	25,949



Modeled DNL Contours – 2018-2019

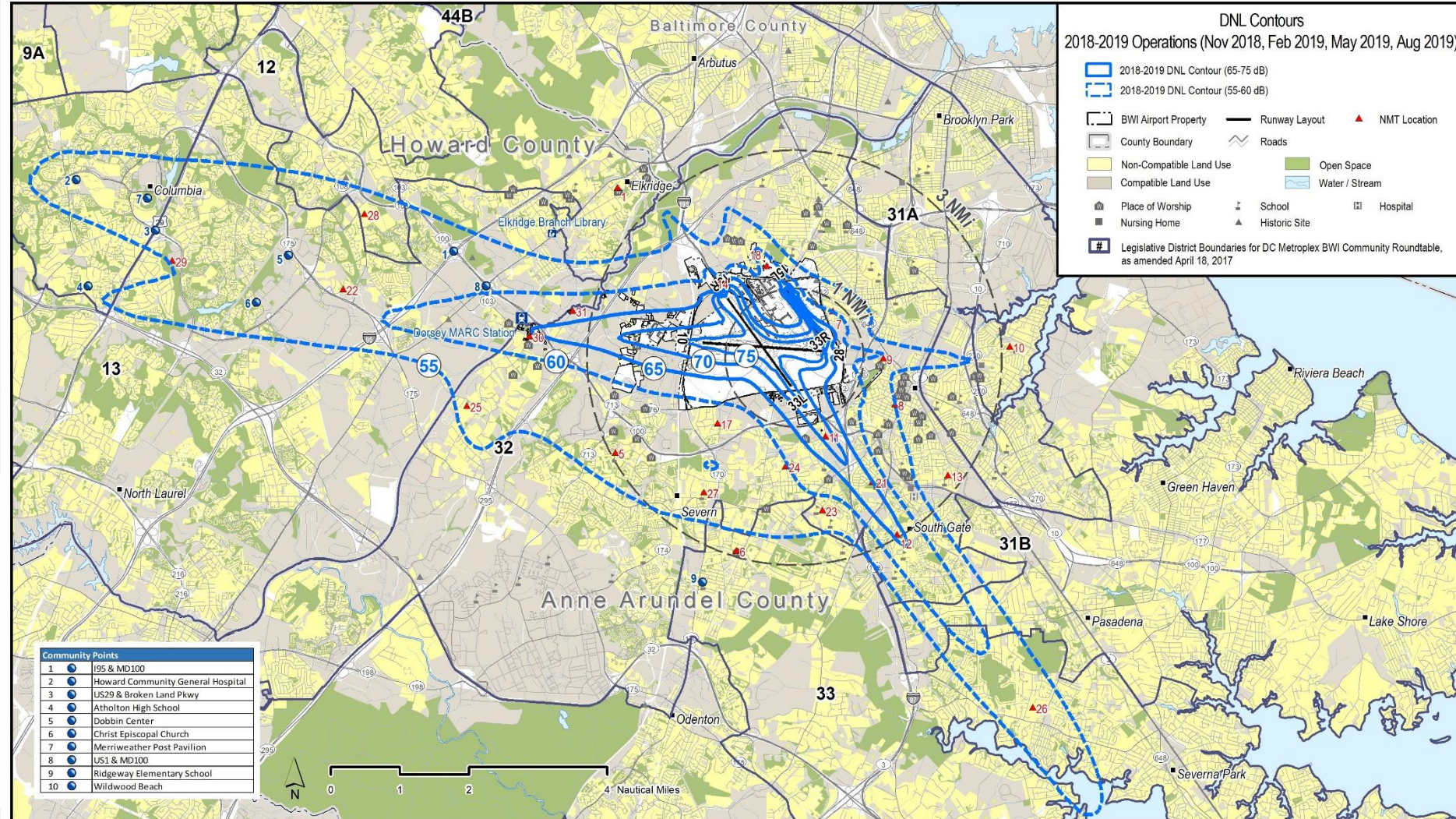
2010 US Census

Contour Range	Population	Households
55-60 dB	102,133	41,413
60-65 dB	16,273	6,566
65-70 dB	2,496	1,019
70-75 dB	60	22
75+ dB	0	0
Total	120,962	49,020

2016 ACS

5-Year Estimates

Contour Range	Population	Households
55-60 dB	111,668	44,396
60-65 dB	16,531	6,709
65-70 dB	3,692	1,583
70-75 dB	410	159
75+ dB	18	7
Total	132,319	52,854



Modeled DNL Contours – 2018-2019 Proposed (Simulated)

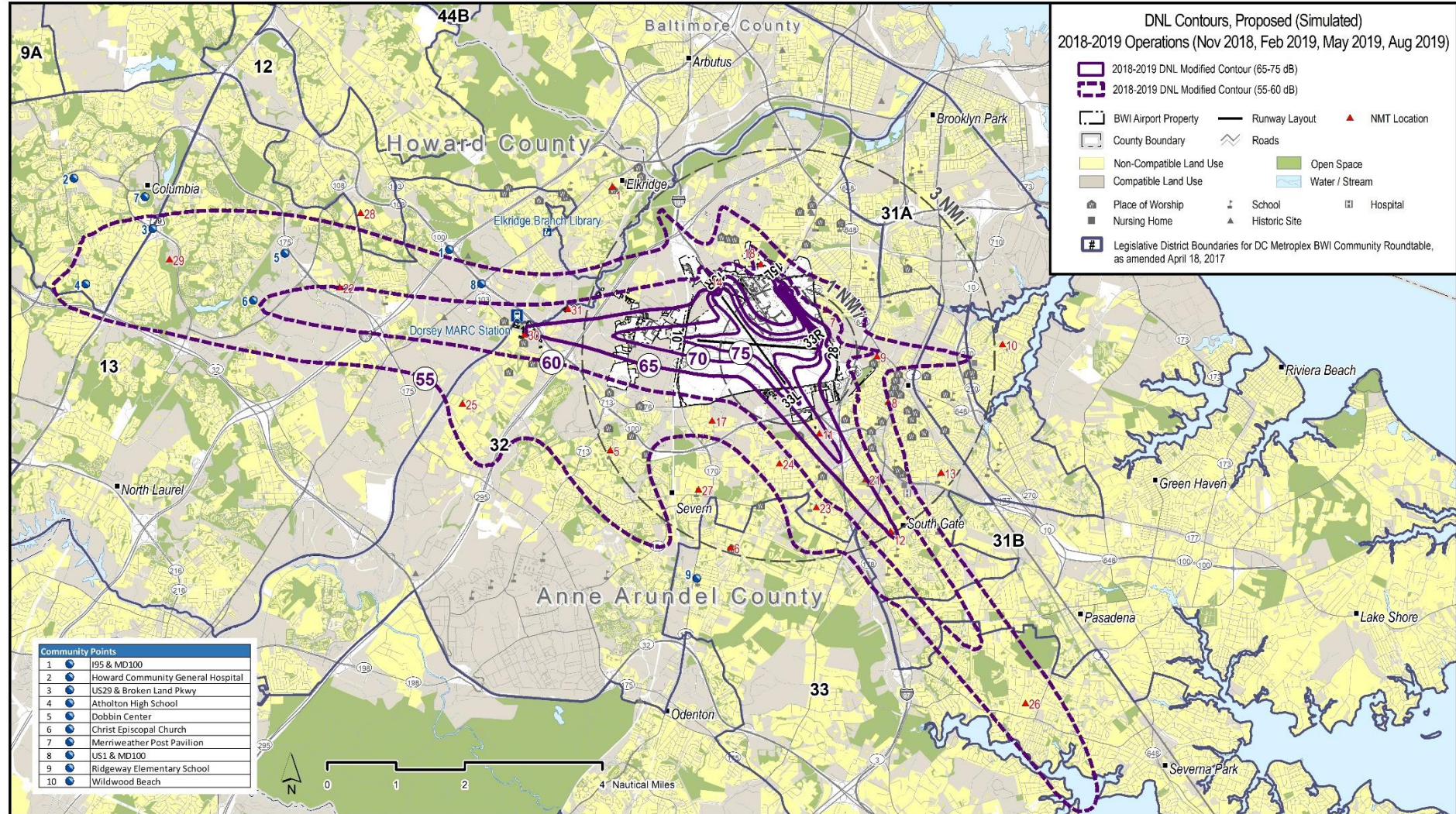
2010 US Census

Contour Range	Population	Households
55-60 dB	79,856	30,933
60-65 dB	18,901	7,706
65-70 dB	2,524	1,028
70-75 dB	61	23
75+ dB	0	0
Total	101,342	39,690

2016 ACS

5-Year Estimates

Contour Range	Population	Households
55-60 dB	87,615	34,138
60-65 dB	19,678	8,075
65-70 dB	3,654	1,554
70-75 dB	427	166
75+ dB	18	7
Total	111,392	43,940



Modeled DNL Contours – 2018-2019 Proposed (Simulated) Compared to 2018-2019

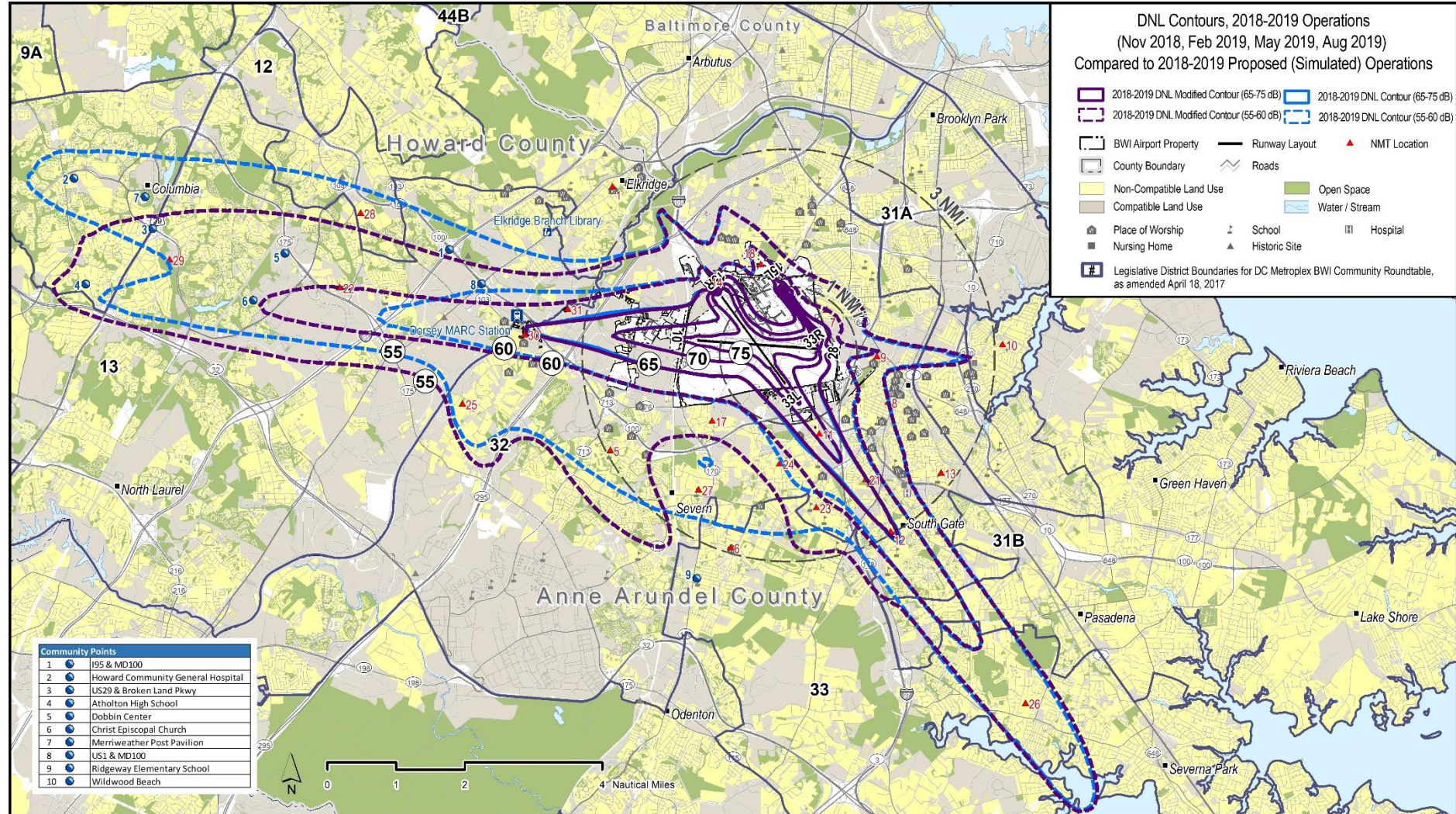
2010 US Census

Contour Range	Population Difference	Households Difference
55-60 dB	-22,277	-10,480
60-65 dB	2,628	1,140
65-70 dB	28	9
70-75 dB	1	1
75+ dB	0	0
Total	-19,620	-9,330

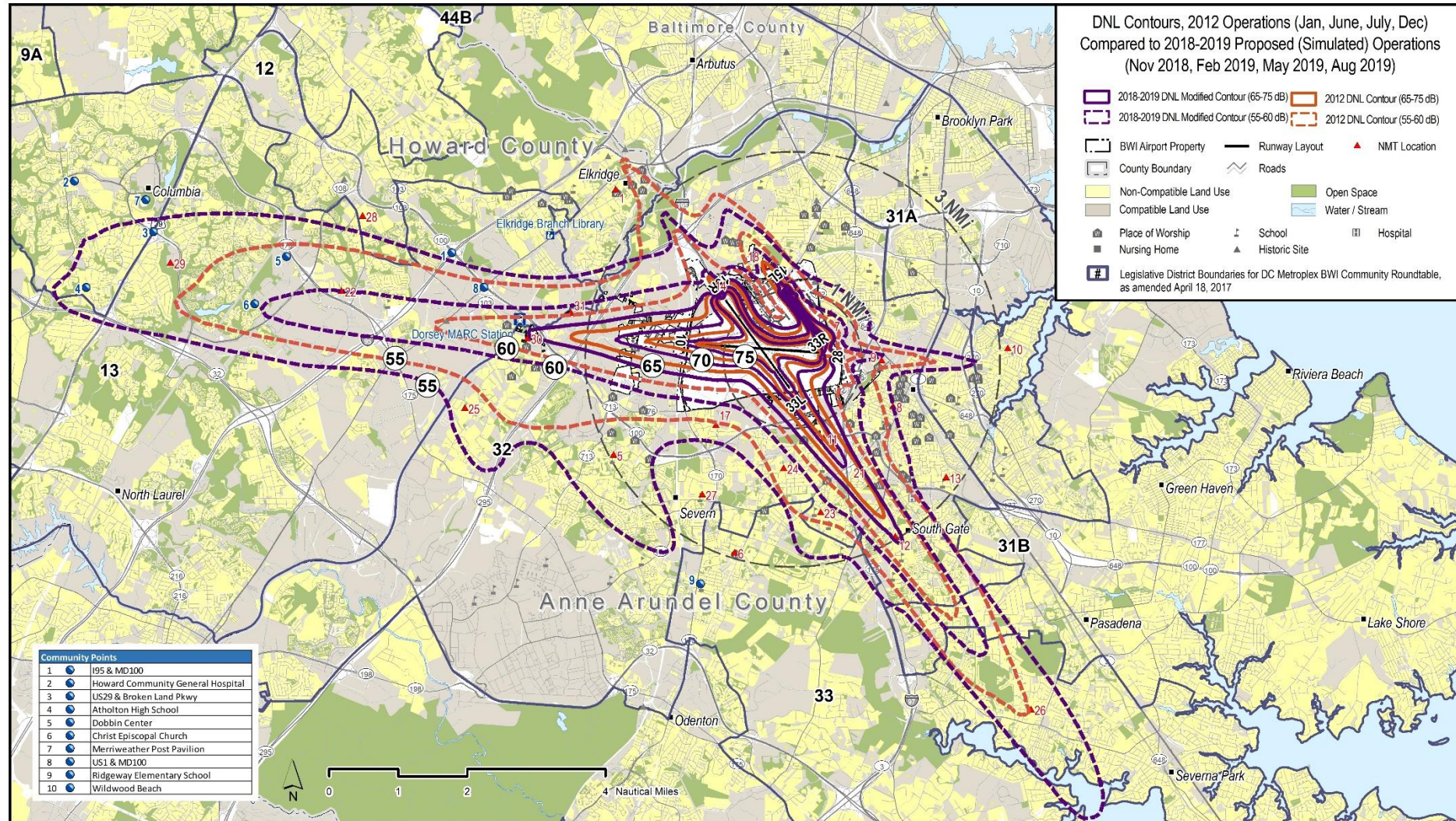
2016 ACS

5-Year Estimates

Contour Range	Population Difference	Households Difference
55-60 dB	-24,053	-10,258
60-65 dB	3,147	1,366
65-70 dB	-38	-29
70-75 dB	17	7
75+ dB	0	0
Total	-20,927	-8,914



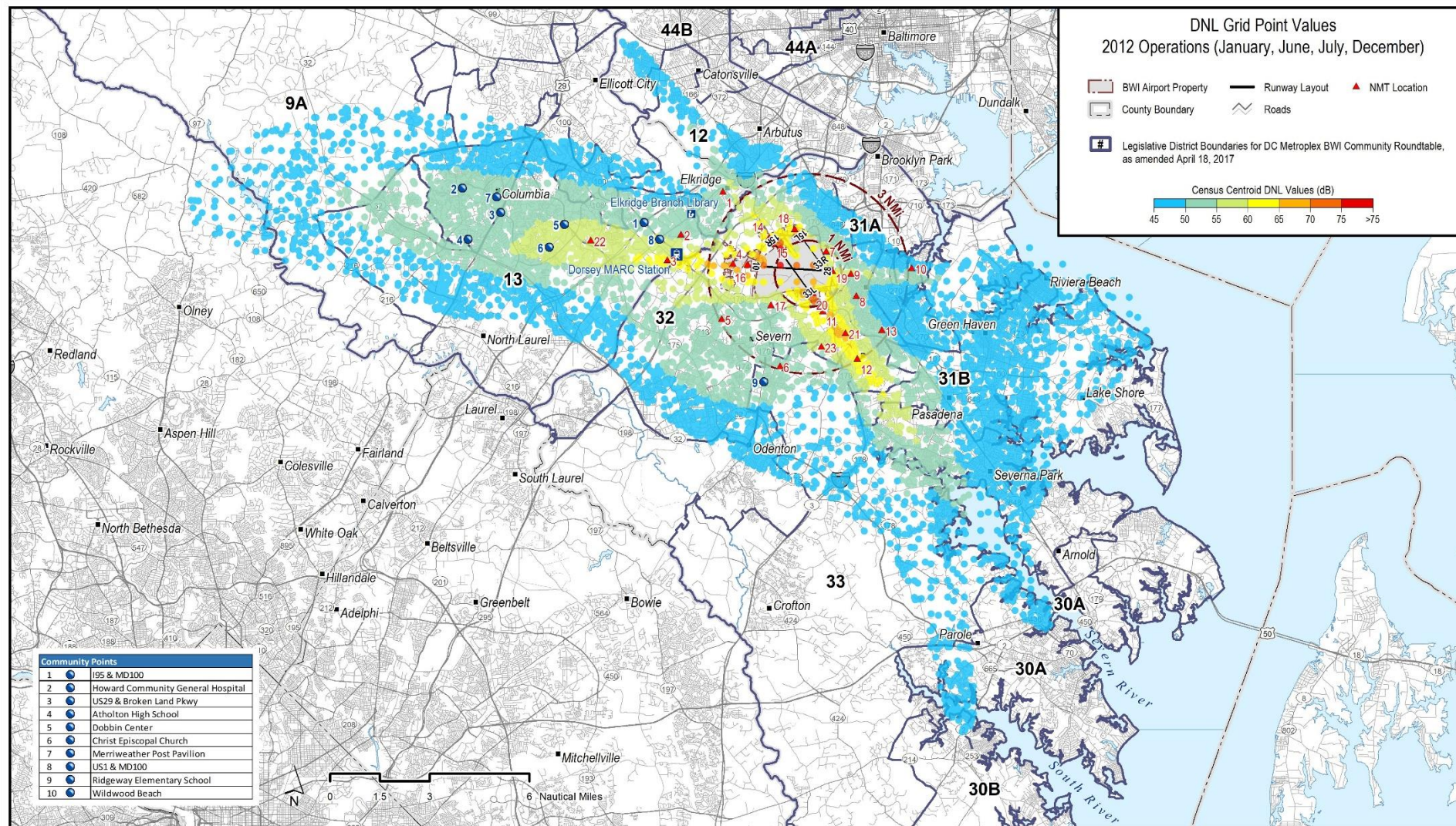
Modeled DNL Contours – 2018-2019 Proposed (Simulated) Compared to 2012



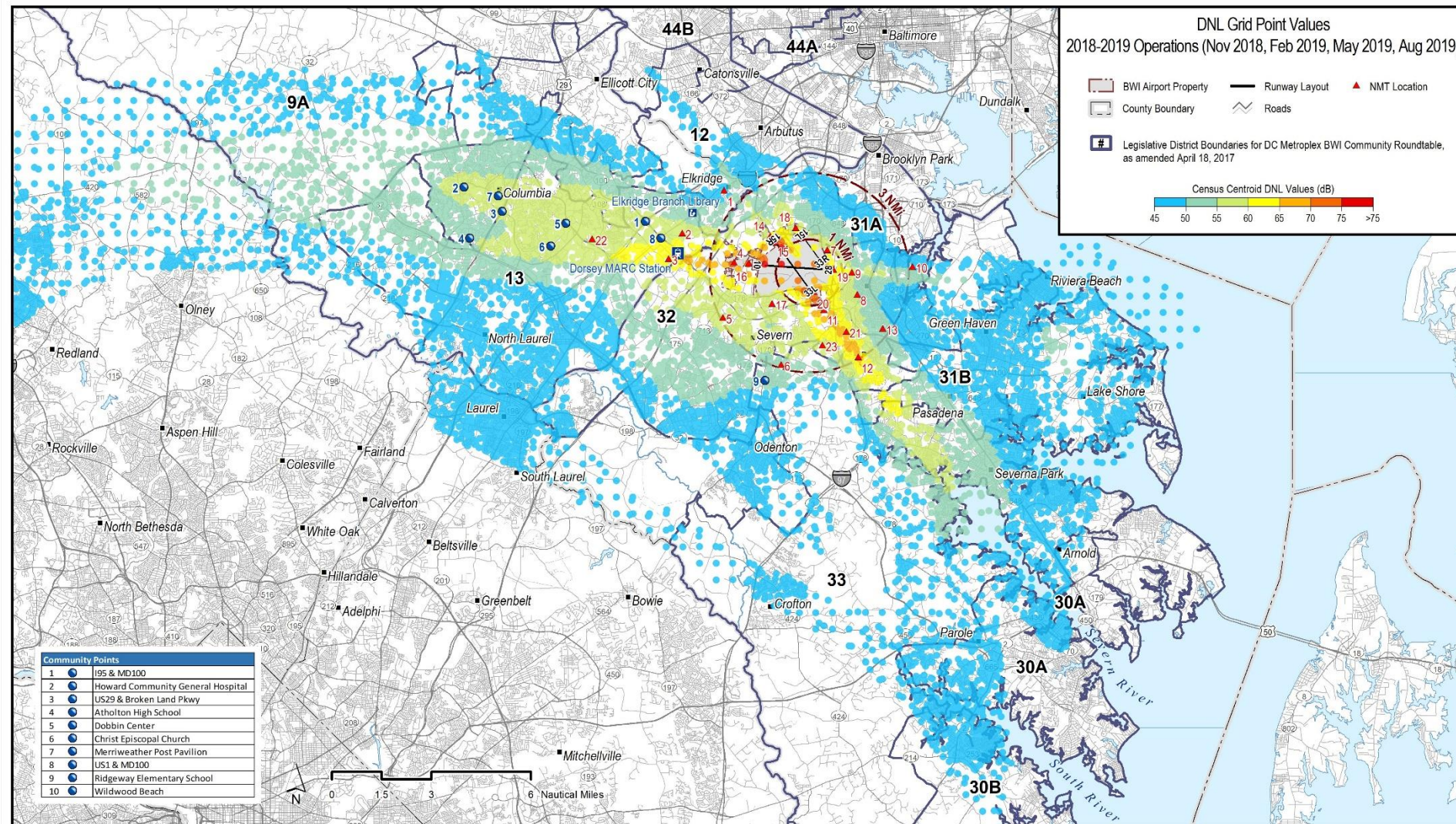
Noise Analysis – Modeled DNL Contour Summary

- Proposed FAA and Roundtable Technical Committee proposed procedures may:
 - Slightly change the 65 dB DNL and greater contours
 - Shift the 65 dB DNL and greater contours west of the airport to the south due to changes in Runway 28 departures
 - Shift the 65 dB DNL and greater contours southeast of the airport to the northeast due to changes in Runway 15R departures and 33L arrivals
 - Shift the 55 and 60 dB DNL contours west of the airport associated with Runway 28 departures and Runway 10 arrivals further to the south away from Columbia and Elkridge towards the historical location of 55 and 60 dB DNL contours in 2012
 - Shift the 55 and 60 dB DNL contours southeast of the airport associated with Runway 15R departures and Runway 33L arrivals further to the south and west away from Elmhurst towards Severn

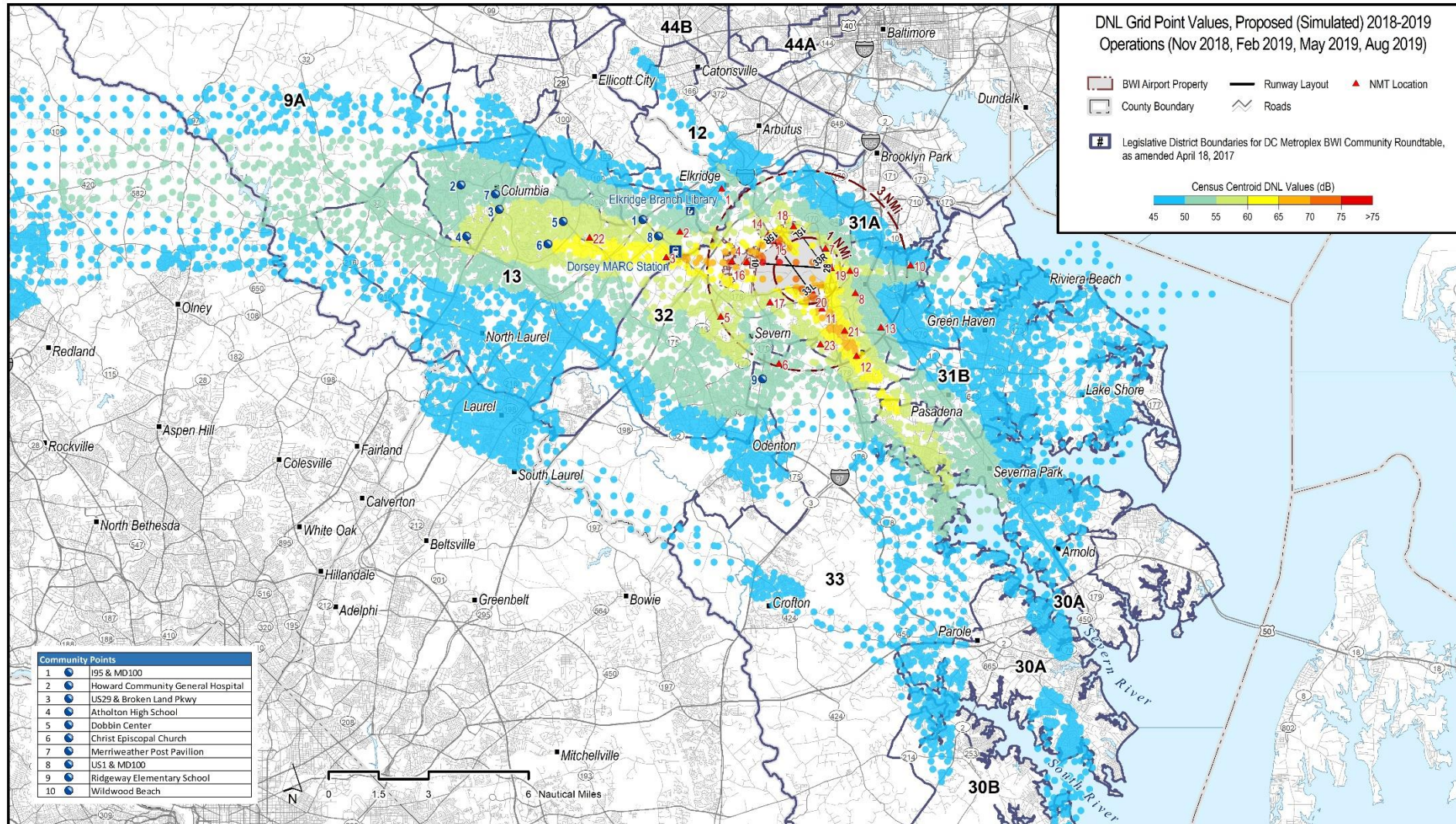
Modeled DNL Grid Points - 2012



Modeled DNL Grid Points – 2018-2019

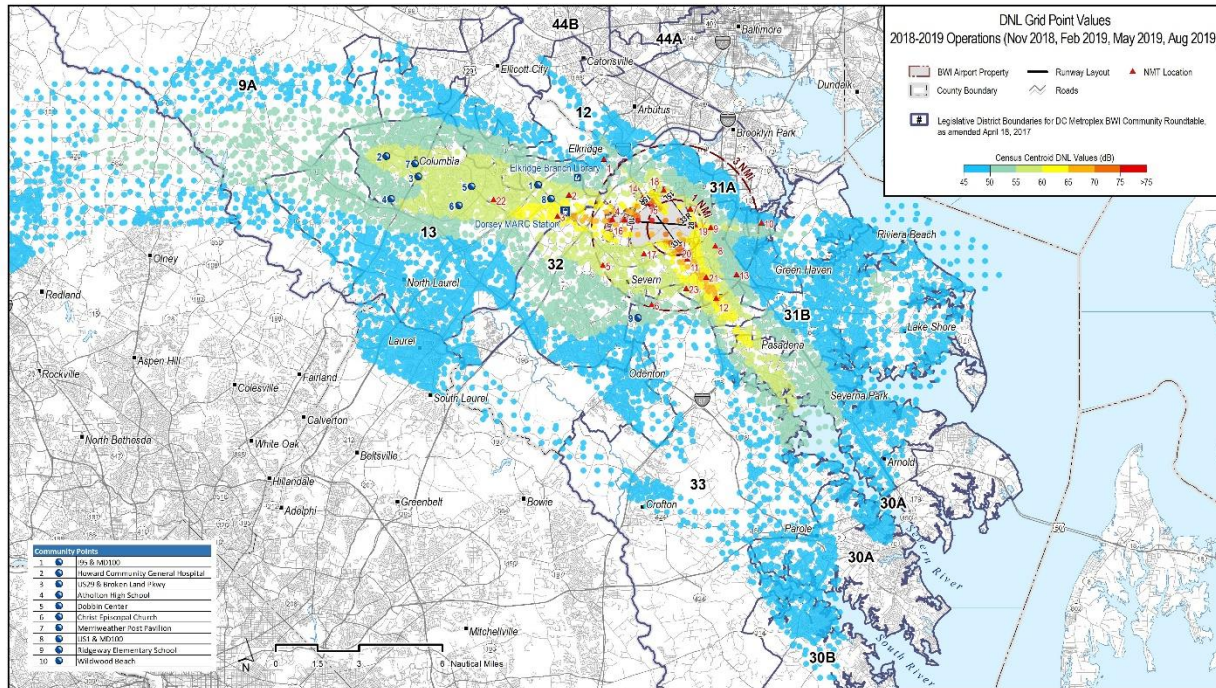


Modeled DNL Grid Points – 2018-2019 Proposed (Simulated)

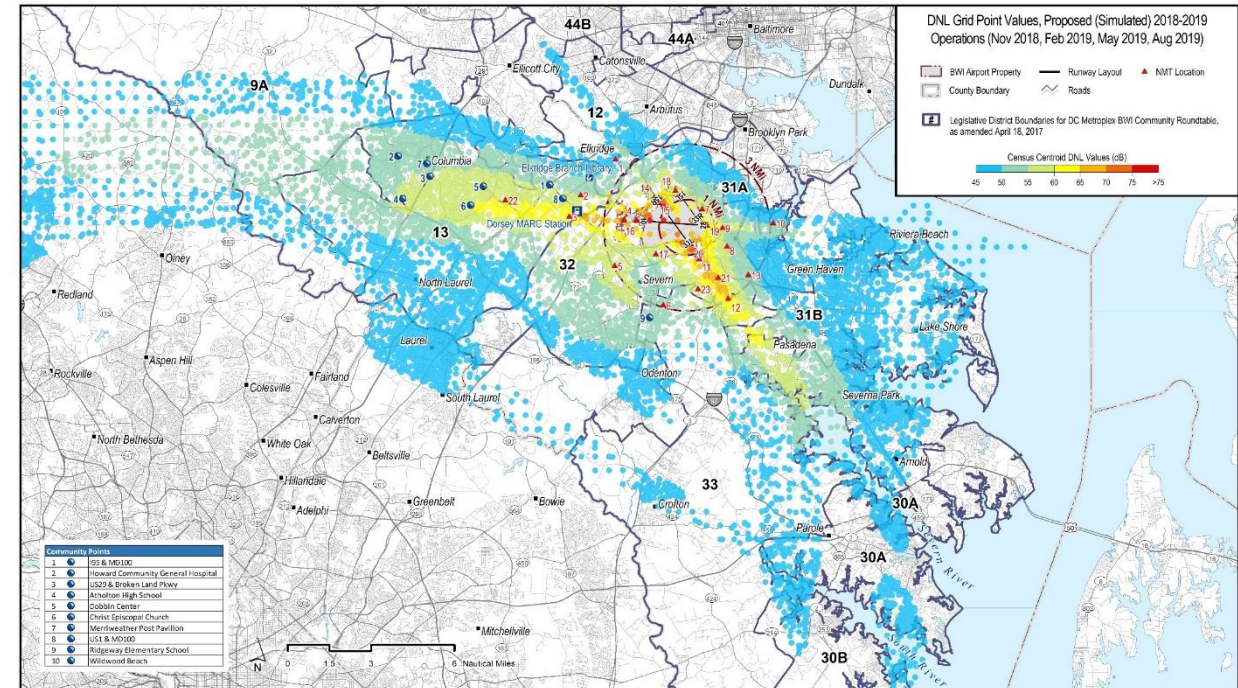


Modeled DNL Grid Points – Comparison

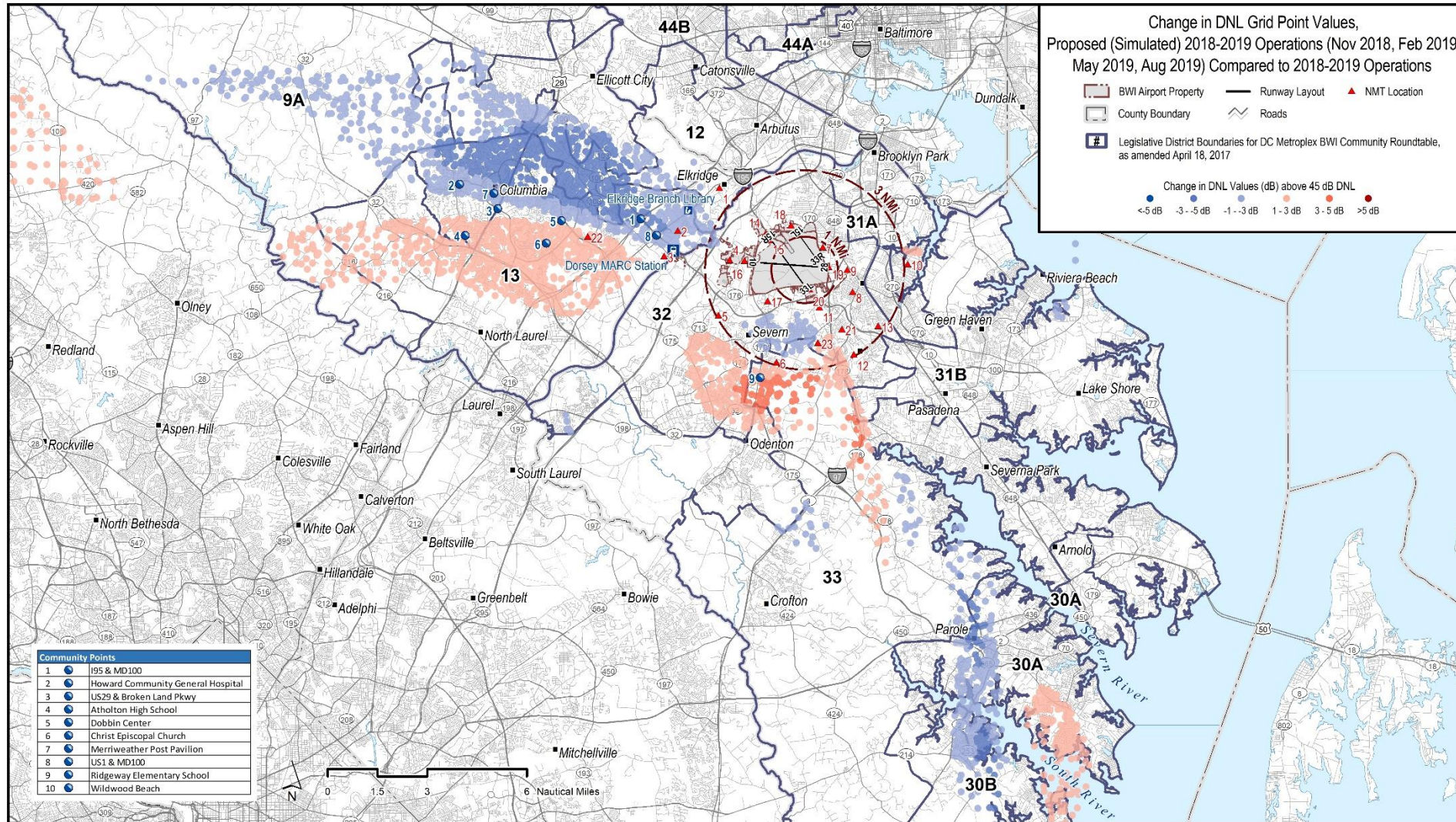
2018-2019



2018-2019 Proposed (Simulated)



Modeled DNL Grid Points – 2018-2019 Proposed (Simulated) Compared to 2018-2019



Noise Analysis – Summary

- None of the observed noise increases or decreases meet the FAA criteria for reportable changes defined under FAA Order 1050.1F, “Environmental Impacts: Policies and Procedures”
 - (+/-) 1.5 dB change within 65 dB DNL
 - (+/-) 3 dB change within 60 dB DNL
 - (+/-) 5 dB change within 45 dB DNL
- Proposed FAA departure procedures may:
 - Slightly decrease noise over and north of Columbia, and increase noise south of Columbia over Guilford due to shifting south of Runway 15R and 28 westbound departures
 - Slightly decrease noise over northern areas of Severn and Elmhurst, and increase noise in the southern areas of Severn approaching Odenton due to shifting south of the westbound Runway 15R departure turn
 - Slightly increase noise over the Annapolis peninsula associated with southbound Runway 28 departure changes. However, this increase may not be realized if the FAA considers the Roundtables request not to move forward with these changes

Noise Analysis – Summary

- Proposed Roundtable Technical Committee arrival and approach procedures may:
 - Slightly decrease noise west of Columbia and over Elkridge due to shifting to the east of some Runway 10 arrivals and continuous descents for Runway 15R arrivals
 - Slightly decrease noise along a corridor from south to north from the South River to the Severn River west of Annapolis due to continuous descents for Runway 33L arrivals
 - Slightly increase noise along a corridor from south to north from Crownsville to Millersville along Interstate 97 due to the creation of an RNP approach for Runway 33L arrivals from the RAVNN to WP 21 navigational points

Next Steps

Planning and Meeting Schedule Moving Forward

- **Tonight**
 - Solicit feedback from Roundtable members
 - Determine if an additional Roundtable meeting is required in December to resolve any open questions/concerns
 - Vote on motion to support submittal of Roundtable Technical Committee proposed procedure changes to the FAA
- **December**
 - TBD December Roundtable meeting (if necessary) to resolve any open questions/concerns
 - Assemble/submit final submittal package to FAA for consideration at the next PBN Working Group meeting scheduled for late-winter/early-spring of 2020
 - Letter from Roundtable
 - Procedure design data files assembled by the MDOT MAA representing proposed procedure changes for provision to FAA

Discussion