BWI-Thurgood Marshall Airport Aircraft Operations and Noise Exposure

Presented by DC Metroplex BWI Community Roundtable in cooperation with Vianair, Inc.

Monthly Report for September 2022

DC Metroplex BWI Community Roundtable link to Noise Exposure Monthly Reports below
https://marylandaviation.com/environmental/environmental-compliance-sustainability/dc-metroplex-bwi-community-roundtable/

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Introduction

This is a summary of a larger report (the “Monthly Report”) prepared by Vianair, Inc. (“Vianair”) for the benefit of the DC Metroplex BWI Community Roundtable (the “BWI Roundtable”).

The Monthly Reports are the first comprehensive data detailing the noise pollution generated by daily commercial jet plane operations across the entire geography of significantly overflown communities in our region. The BWI Roundtable believes that the analysis of the full environmental impact of airport operations on overflown communities has been understudied, but it is essential information in order to improve the likelihood of success in achieving balanced solutions for the complex set of stakeholders involved in airport operations.

Howard and Anne Arundel Counties hired Vianair to help analyze flight activity in and out of BWI Thurgood Marshall Airport (“BWI-Marshall”). In coordination with representatives from the two counties and support from the BWI Roundtable, Vianair developed the Monthly Report which includes the analysis of key elements (operational and acoustic) to help the wide array of stakeholders understand the existing noise exposure and to provide the ability to track changes over time.

While comprehensive, the elements in the report were selected by those who contributed to the report development (representatives from the two counties and the BWI Roundtable). This report will be published monthly, beginning with March 2022. Report content may change based on input from the contributors and/or the community. This report uses A-weighted decibels or dBA and DNL, described later within this summary report.

Definitions

Decibel (dB(A)): A unit of measurement of sound pressure adjusted for the human ear's response to particular frequencies

Day-Night Average Sound Level (DNL): A descriptor of 24-hour noise (midnight to midnight) that adds a ten-decibel (dB) nighttime penalty to noise events which occur between the hours of 10 p.m. and 7 a.m to account for the intrusive nature of noise at night. DNL is the standard metric used by the Federal Aviation Administration ("FAA") as required by federal regulation. Federal guidelines require **DNL 65** as the level of aircraft noise exposure that is incompatible with noise-sensitive applications including residential development. This metric is required by FAA and COMAR

The Noise-above (NA): A noise metric counts the number of times the noise level exceeds a specific threshold. In this report, the Number-of-Events-Above 55 metric (NA55) is calculated. NA55 quantifies the number of aircraft events resulting in noise exposure of 55 decibels or higher at each location depicted.

Day-evening-night level (Lden): It is a descriptor of noise level defined by the European Environment Agency ("EEA") and based on energy equivalent noise level (Leq) over a whole day with a penalty of 10 dB(A) for night-time noise (11.00 pm -7.00 am) and an additional penalty of 5 dB(A) for evening noise (7.00 pm -11.00 pm).

Airport Noise Zone (ANZ): An area of land surrounding the airport within which noise levels are equal to or greater than DNL 65 dBA.

Maryland Department of Transportation Maryland Aviation Administration (MDOT MAA): Operator of Baltimore/Washington International Thurgood Marshall Airport (BWI Marshall Airport).

Code of Maryland Regulations (COMAR): Requires MDOT MAA to control development in areas where noise levels are DNL 65 dBA or more..

Disclaimer and Information Sources and Disclosures

Disclaimer: The views and opinions expressed in this document are those of the BWI Roundtable and do not necessarily reflect the views or positions of the state senators who appoint voting members to the BWI Roundtable, the MDOT/MAA, the FAA, Howard or Anne Arundel County elected or appointed officials, commercial carriers or Vianair, Inc. Technical presentations prepared by Vianair Inc. are labeled with the Vianair logo.

Information Sources and Disclosures:

1. Page 7 - Economic Impact of BWI-Marshall. **Regional Economic Impact of BWI Marshal Airport, December 2017, a brochure of the Maryland Aviation Administration**. In response to a Public Information Act (PIA) request made on November 1, 2022, MDOT/MAA provided "The Economic Impact of Public Use Airports in Maryland", July 2015. The study was prepared by Martin Associates and Landrum and Brown, consultants. MDOT/MAA states that "The 2017 Economic Impact Brochure [..] is an update to the 2015 Economic Impact Report. The 2015 Economic Impact Report and Monthly BWI Statistical Report Summaries serve as the source for the 2017 Economic Impact Brochure." Once the BWI Roundtable verifies the underlying sources of the brochure's statements, we will update this section.

2. Page 7 – Commercial Aviation and Health.
   - Zafari Z and Park, J. "Projecting the health and economic burden of aircraft noise". University of Maryland School of Pharmacy, 2022

   https://www.pharmacy.umaryland.edu/media/SOP/wwwpharmacyumarylandedu/about/depts/p-shor/pdf/projecting-the-health-and-economic-burden-of-aircraft-noise-final-report.pdf
   - Quarterly Noise Reports, Maryland Aviation Administration

     https://marylandaviation.com/environmental/environmental-compliance-sustainability/quarterly-noise-reports/
   - World Health Organization: Environmental Noise Guidelines for the European Union. 2018

     https://www.euro.who.int/__data/assets/pdf_file/0008/383921/noise-guidelines-eng.pdf
   - European Environment Agency: European Noise Directive. 2018

     https://www.eea.europa.eu/airs/2018/environment-and-health/environmental-noise

Seeking Balance at BWI-Marshall Airport

The growth in operations at BWI-Marshall brings a number critically important social and economic impacts to communities surrounding the airport and to the State of Maryland, including economic development, jobs, and taxes collected. However, this also results in significant negative impacts, especially for residents of Anne Arundel and Howard counties, including stress, likely adverse health outcomes and a diminished quality of life. **Over the course of our almost six (6) years of existence, the BWI Roundtable has come to believe those impacts are unsustainably unbalanced in favor of economic impacts in our region.**

Economic Impact of BWI-Marshall

Airport-Generated	Visitor-Generated
$4.4 B Total Impact	$4.9 B Total Economic Impact
Total Jobs 24,211 Direct 12,753 Indirect 11,458	Total Jobs 82,277 Direct 46,857 Indirect 35,420
$1.6 B Total Earnings	$2.5 B Total Earnings
$175.4 M Total State/Local Taxes	$416.5 M Total State/Local Taxes

State taxes are estimated to be $336.3 million and Local taxes are estimated to be $255.7 million

Commercial Aviation and Health

University of Maryland- Baltimore study shows over $800 million (2022 dollars) in health costs over 30-years from current BWI-Marshall operations

123,133 BWI-Marshall noise complaints (230 individuals) during 2nd Quarter of 2022. The airport received a total of 620,276 noise complaints in 2021.

The World Health Organization recommends aircraft noise levels in Europe to below 45 dB during the day (40 dB at night). Higher levels of noise is associated with adverse health effects.

55 dB Lden is the EU threshold for excess exposure defined in the Environmental Noise Directive

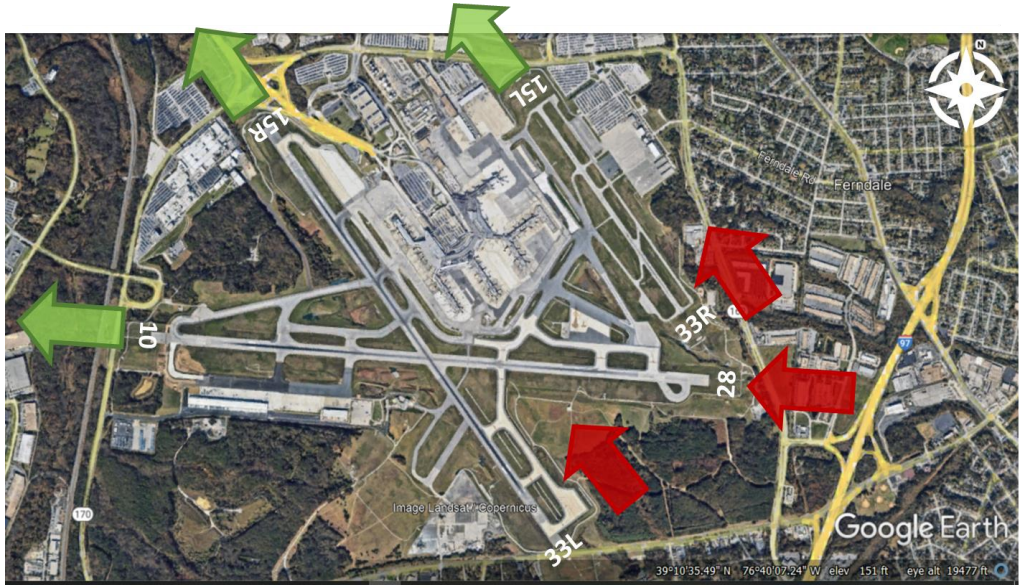
FAA has adopted 65 dBA DNL as the threshold of significant noise exposure, below which residential land uses are compatible

BWI Airport Noise Zone is noise above 65 dBA DNL

Runway Use

BWI has six runways: 10, 15R, 15L, 28, 33R, and 33L. Runway selection is based primarily on wind direction. BWI operates in two flows. When winds are out of the east or south, aircraft will arrive and depart in an **EAST FLOW** and when winds are out of the west or north, aircraft will arrive and depart in a **WEST FLOW**. Aircraft noise levels vary when below an aircraft landing or taking-off. Runway use also influences routes to and from the airport, which also affects aircraft noise for communities below.

EAST FLOW



WEST FLOW

East and West Flow

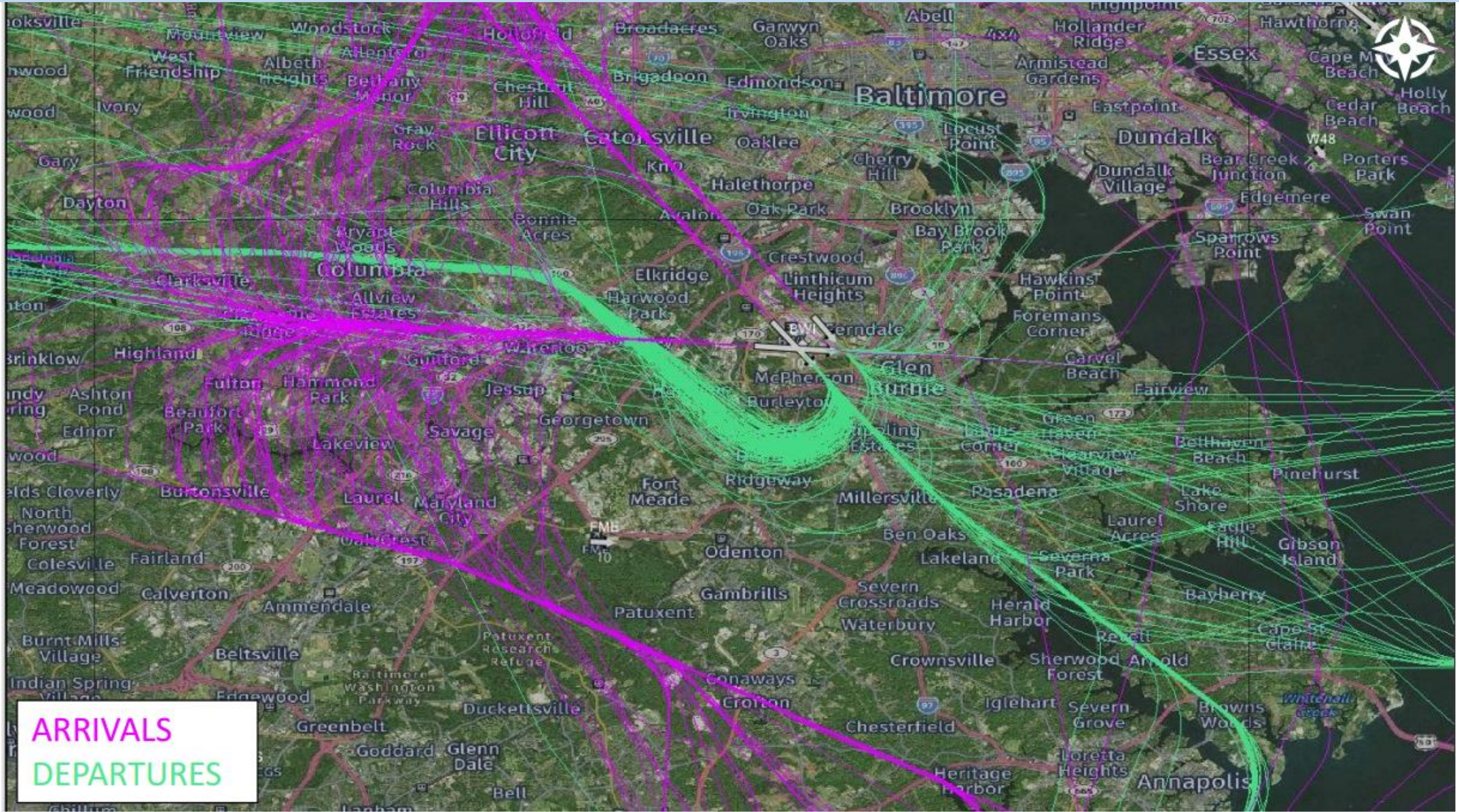
Prevailing wind speed, direction and weather factors determine the direction of air traffic flow from BWI-Marshall airport. Aircraft usually take off and land into the wind to meet safety and operational requirements.

During **EAST FLOW** conditions (winds from the south or east), aircraft arrive and depart toward the east. This includes runways 15L, 15R, and 10.

During **WEST FLOW** conditions (winds from the north or west), aircraft arrive and depart toward the west. This includes runways 33L, 33R, and 28. The following slides are intended to illustrate arrival and departure flight paths across the region during sample EAST and WEST flows days.

The next two pages illustrate a typical East Flow day and a typical West Flow day at the airport. Sample days were analyzed by Vianair and then depicted as all arrivals and departures consistent with a specific flow on a given day. While these flight patterns are typical, they may vary on other days based on operational conditions.

Visual representation of daily traffic patterns over the Baltimore region during East Flow operations at BWI-Marshall



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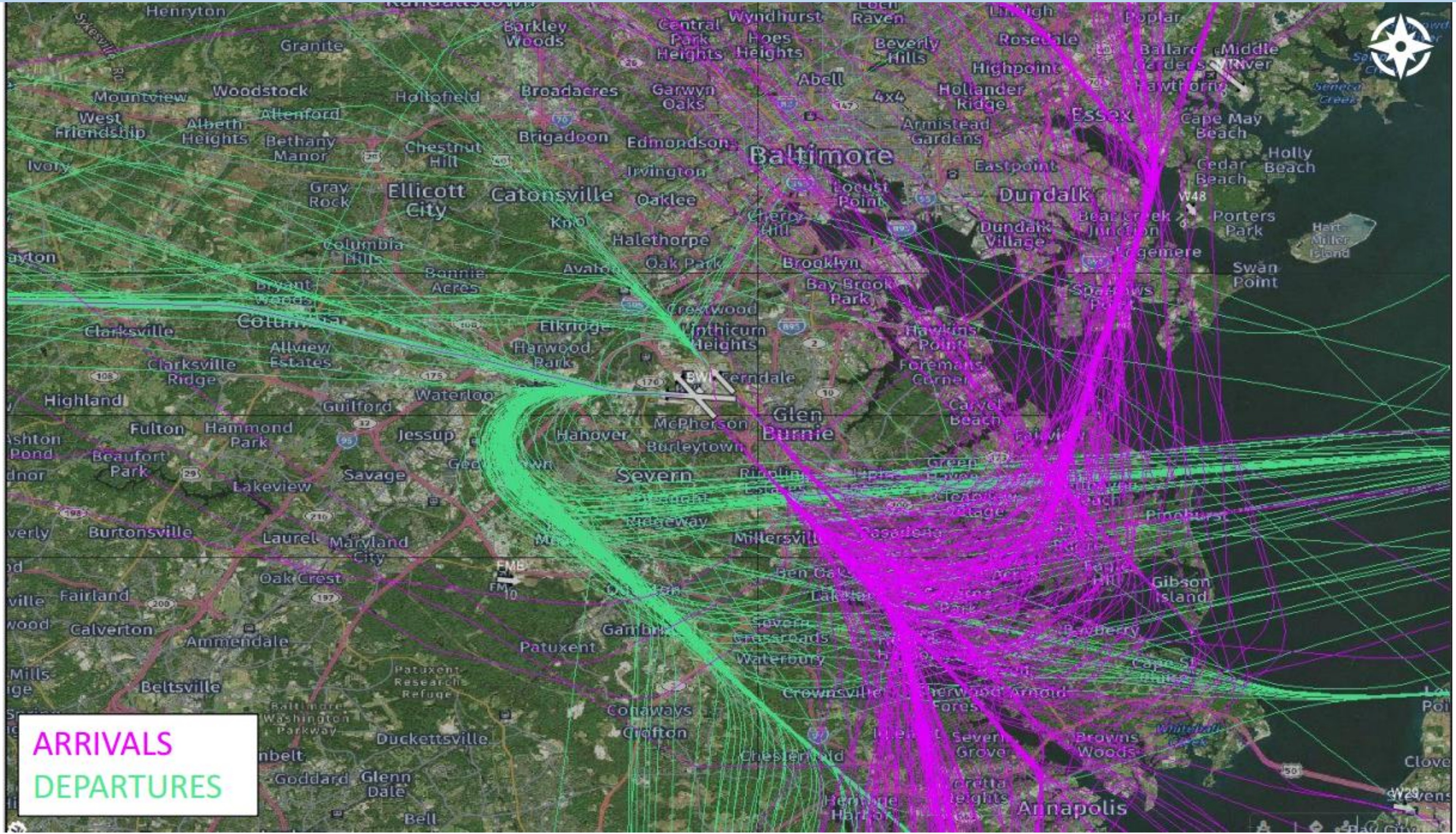
Visual representation of daily traffic patterns over the Baltimore region during West Flow operations at BWI-Marshall



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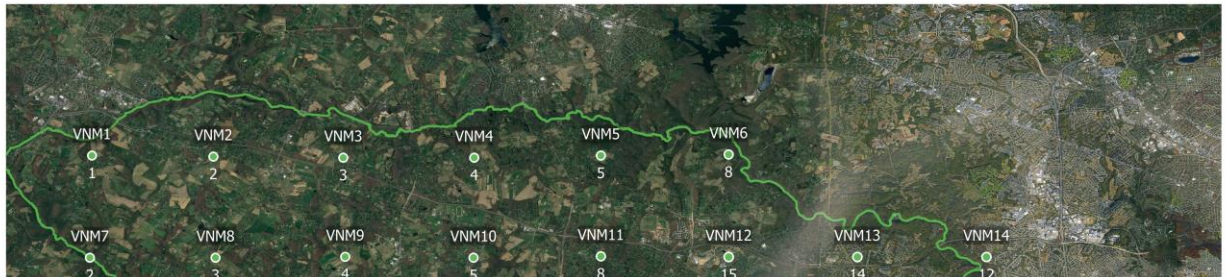
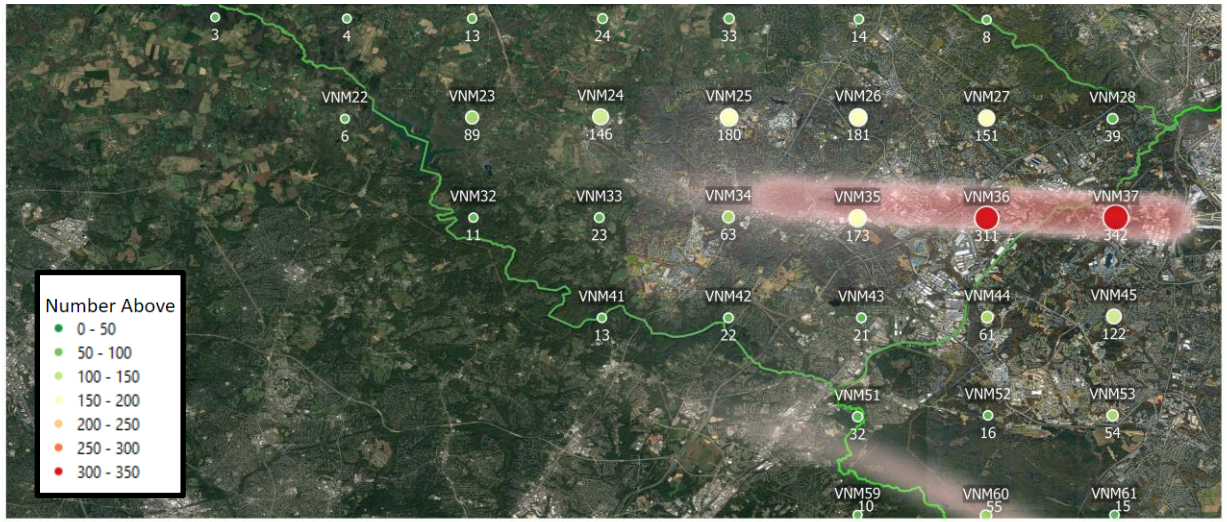
Flight Track Density and Noise Exposure (Number of Events Above 55 dBA, Daily Average)

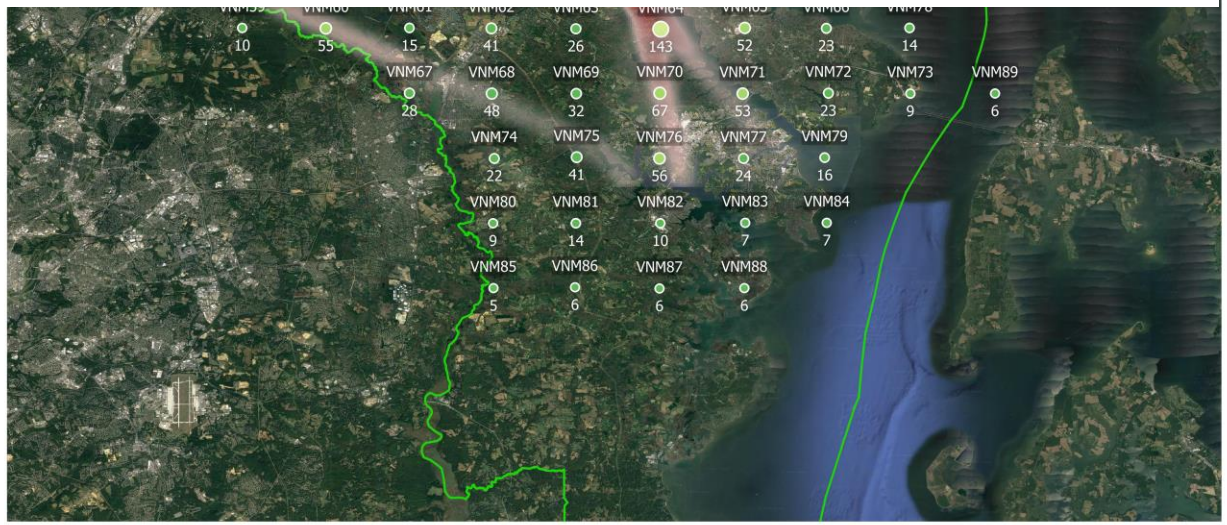
ALL ARRIVALS

East and West Flow Combined



The two graphics will be combined into a single ARRIVALS graphic with both counties and the NA55 grid and flight density heatmap.



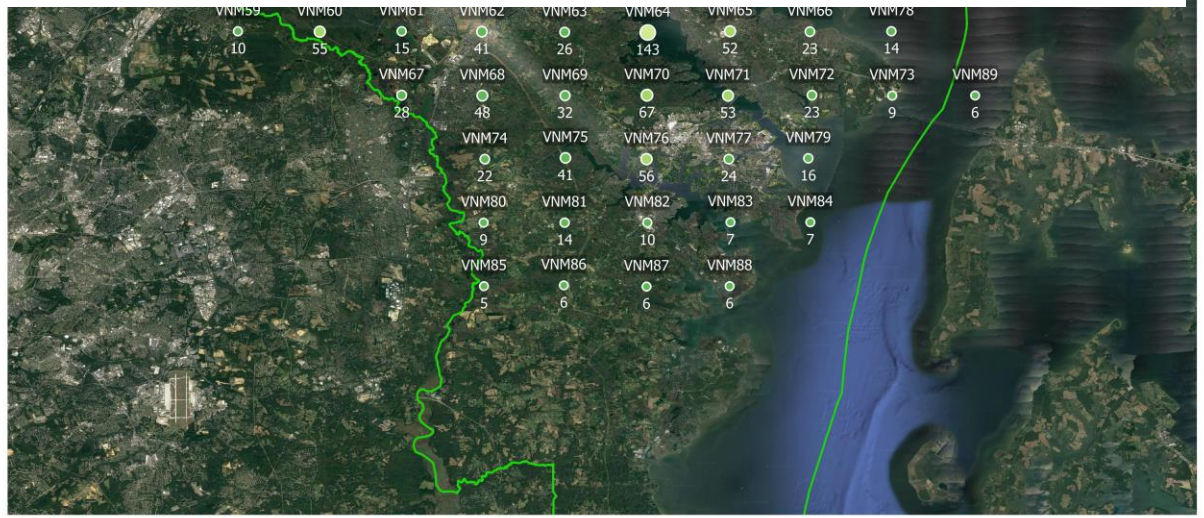


Flight Track Density and Noise Exposure (Number of Events Above 55 dBA, Daily Average)

ALL DEPARTURES

East and West Flow Combined

The two graphics will be combined into a single DEPARTURES graphic with both counties and the NA55 grid and flight density heatmap.

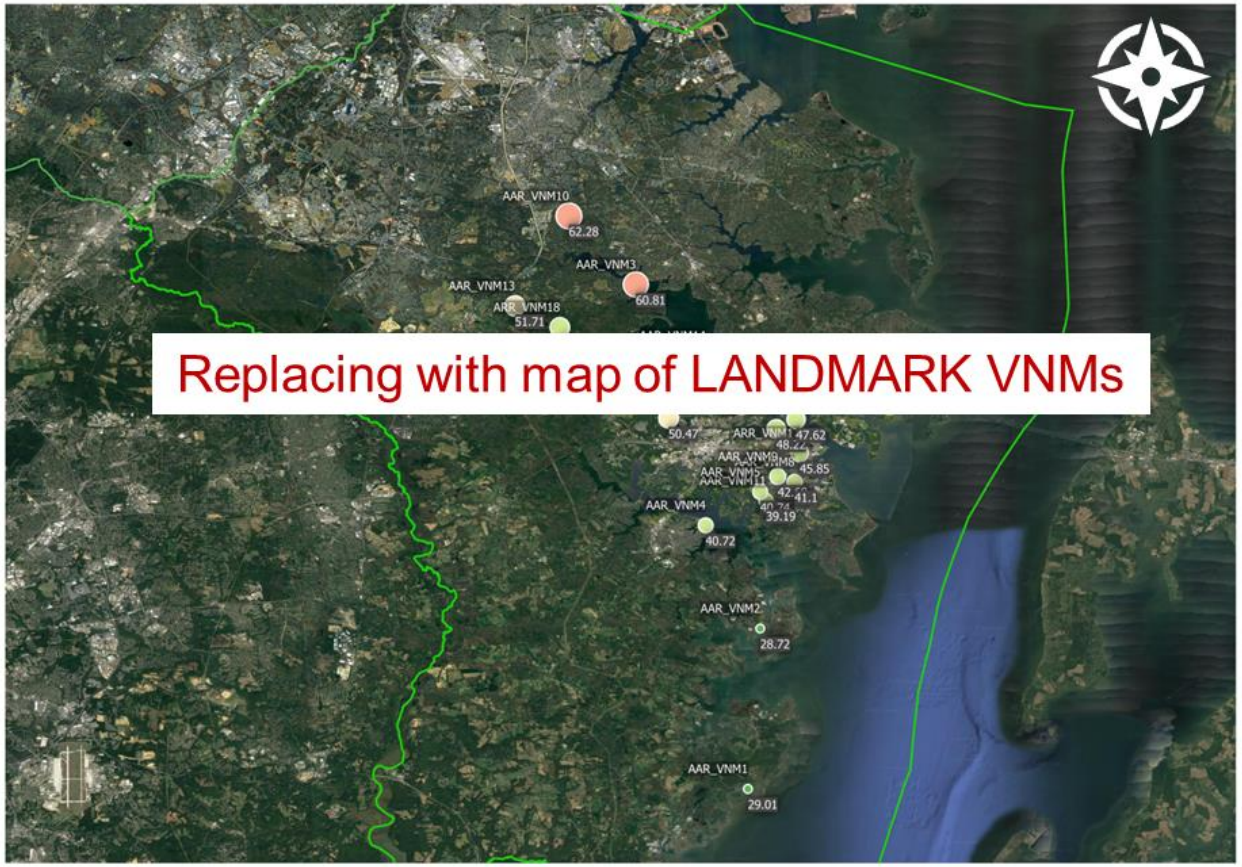


Anne Arundel County - Noise Exposure (Number of Events Above 55 dBA, Daily Average)

County Landmark Virtual Noise Monitors

Number of Events Above 55 dBA					DNL
Name	Location	Daily Average	Monthly Events	YTD	Monthly
AAR_VNM1	RAVNN	3	103	858	29.0
AAR_VNM2	JETNA	6	182	1,642	28.7
AAR_VNM3	Arden on the Severn	171	5,121	29,465	60.8
AAR_VNM4	London Public House	39	1,165	7,787	40.7
AAR_VNM5	Annapolis Middle School	22	650	4,999	40.7
AAR_VNM6	West Annapolis Elementary	44	1,318	8,546	48.2
AAR_VNM7	Herald Harbor	2	56	482	31.3
AAR_VNM8	Eastport Terrace	20	588	4,539	41.1
AAR_VNM9	Truxton Park	24	709	5,379	42.7
AAR_VNM10	Shipley's Choice Elementary	220	6,603	38,661	62.3
AAR_VNM11	Robinwood	17	510	4,164	39.2
AAR_VNM12	Wardour Bluffs	41	1,217	8,061	47.6
AAR_VNM13	Millersville Elementary School	37	1,113	8,364	51.7
AAR_VNM14	Sherwood Forest	71	2,137	12,485	53.2
ARR_VNM15	Brookeville, Montgomery County	4	126	1,687	32.1
AAR_VNM16	Rolling Knolls	66	1,986	12,803	50.5
ARR_VNM17	Maryland State House	34	1,022	6,947	45.9
ARR_VNM18	I-97 and MD 178 Crownsville	33	1,000	7,582	49.9

For 2022, year-to-date ("YTD") begins in March

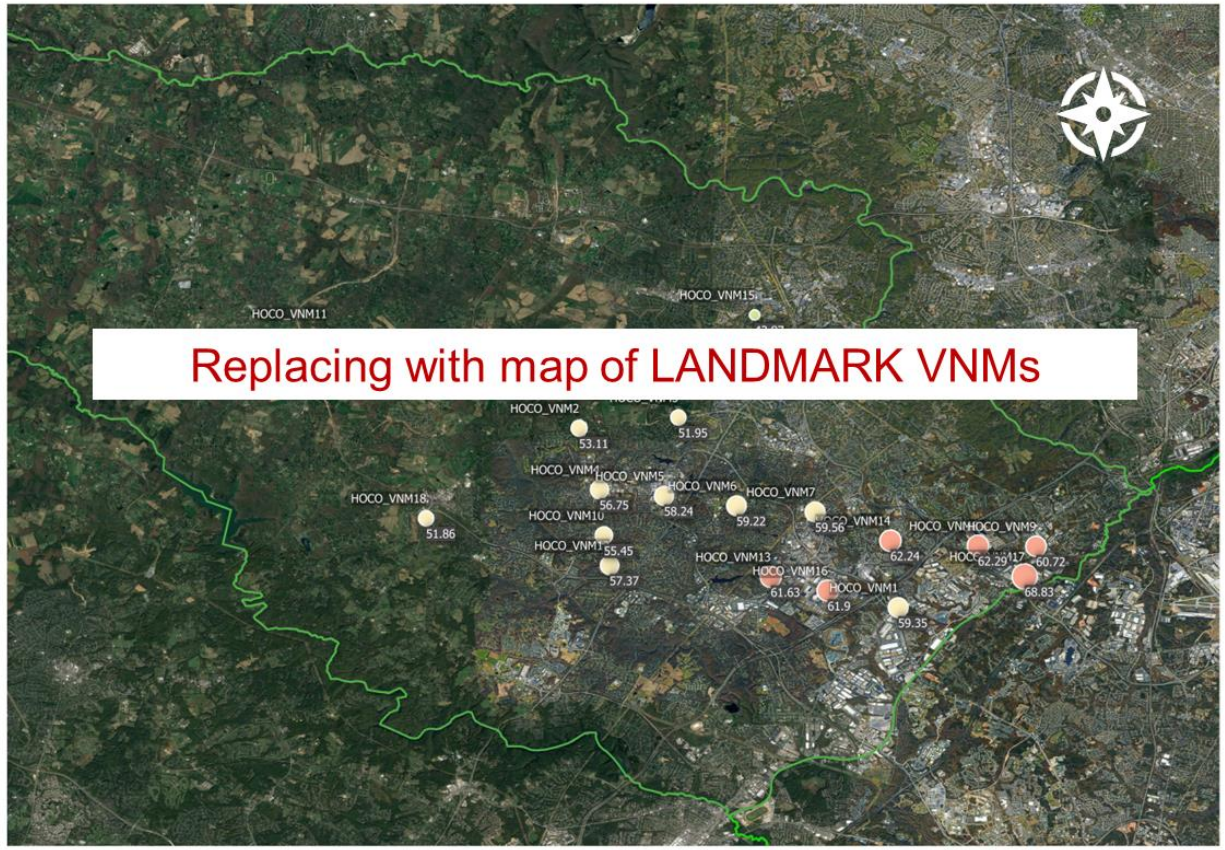


Howard County - Noise Exposure (Number of Events Above 55 dBA, Daily Average)

County Landmark Virtual Noise Monitors

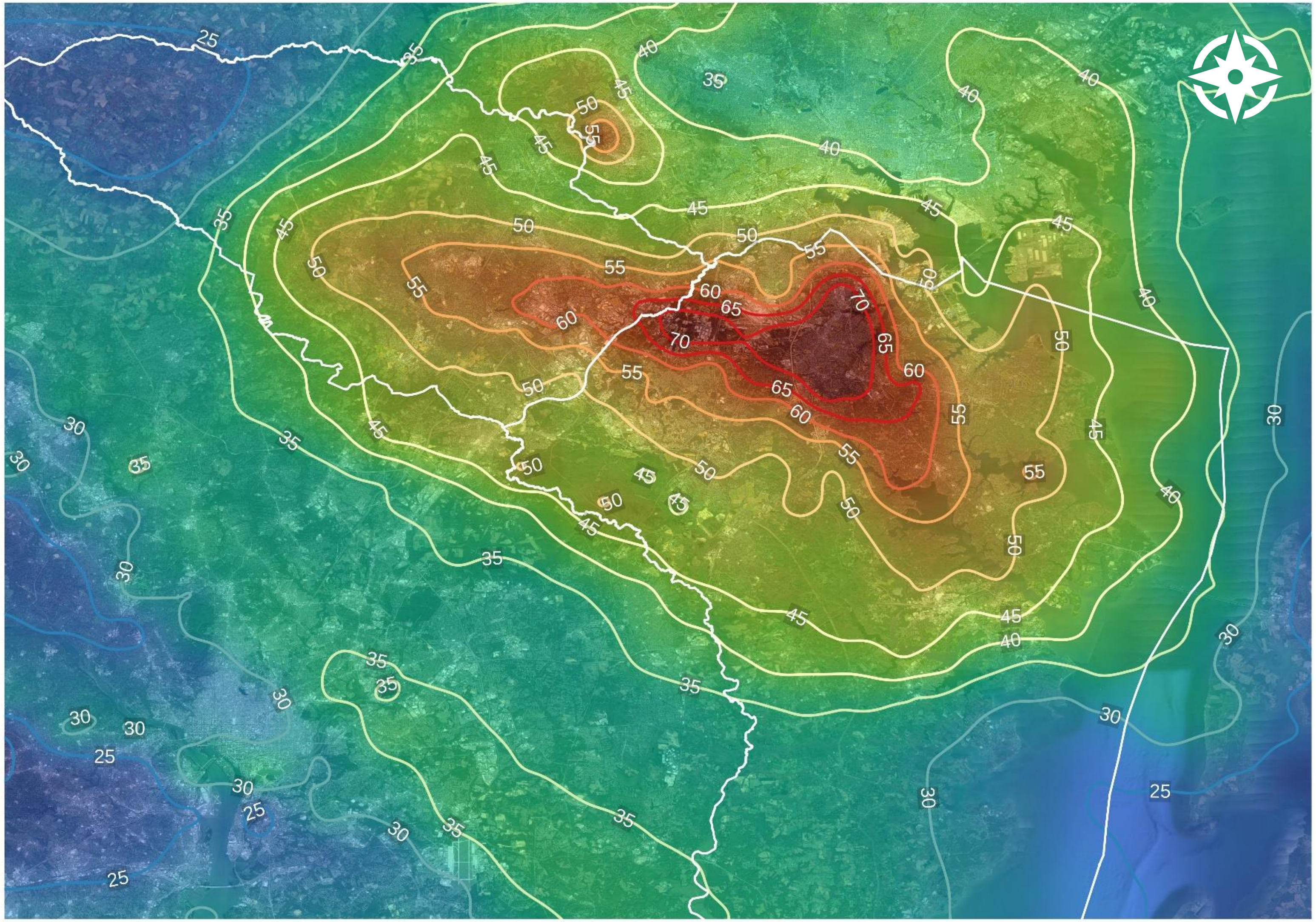
Number-of-Events-Above 55 dBA					DNL
Name	Location	Daily Average	Monthly Events	YTD	Monthly
HOCO_VNM1	Howard Square Apartments	295	8,855	54,786	59.4
HOCO_VNM2	HCPSS Administration Campus	154	4,613	32,499	53.1
HOCO_VNM3	Centennial Park	137	4,097	30,529	52.0
HOCO_VNM4	HoCo General Hospital	180	5,405	37,880	56.8
HOCO_VNM5	Merriweather Post Pavilion	186	5,592	39,215	58.2
HOCO_VNM6	Oakland Mills HS	190	5,689	40,292	59.2
HOCO_VNM7	Long Reach HS	188	5,654	40,402	59.6
HOCO_VNM8	Troy Park	231	6,930	49,929	62.3
HOCO_VNM9	Harwood Park N'hood	236	7,069	50,468	60.7
HOCO_VNM10	Abiding Savior Lutheran	189	5,671	39,857	55.5
HOCO_VNM11	Tridelphia Ridge ES	13	400	3,785	40.9
HOCO_VNM12	Atholton HS	169	5,057	36,342	57.4
HOCO_VNM13	Christ Church Episcopal	238	7,128	42,832	61.6
HOCO_VNM14	Mayfield Woods MS	192	5,765	41,353	62.2
HOCO_VNM15	Manor Woods ES	13	380	4,246	43.9
HOCO_VNM16	Gateway Site	241	7,240	44,124	61.9
HOCO_VNM17	Oxford Square Neighborhood	341	10,223	62,385	68.8
HOCO_VNM18	St. Louis Catholic	123	3,692	25,384	51.9

For 2022, year-to-date ("YTD") begins in March



Noise Exposure – DNL Contours

Howard and Anne Arundel Counties



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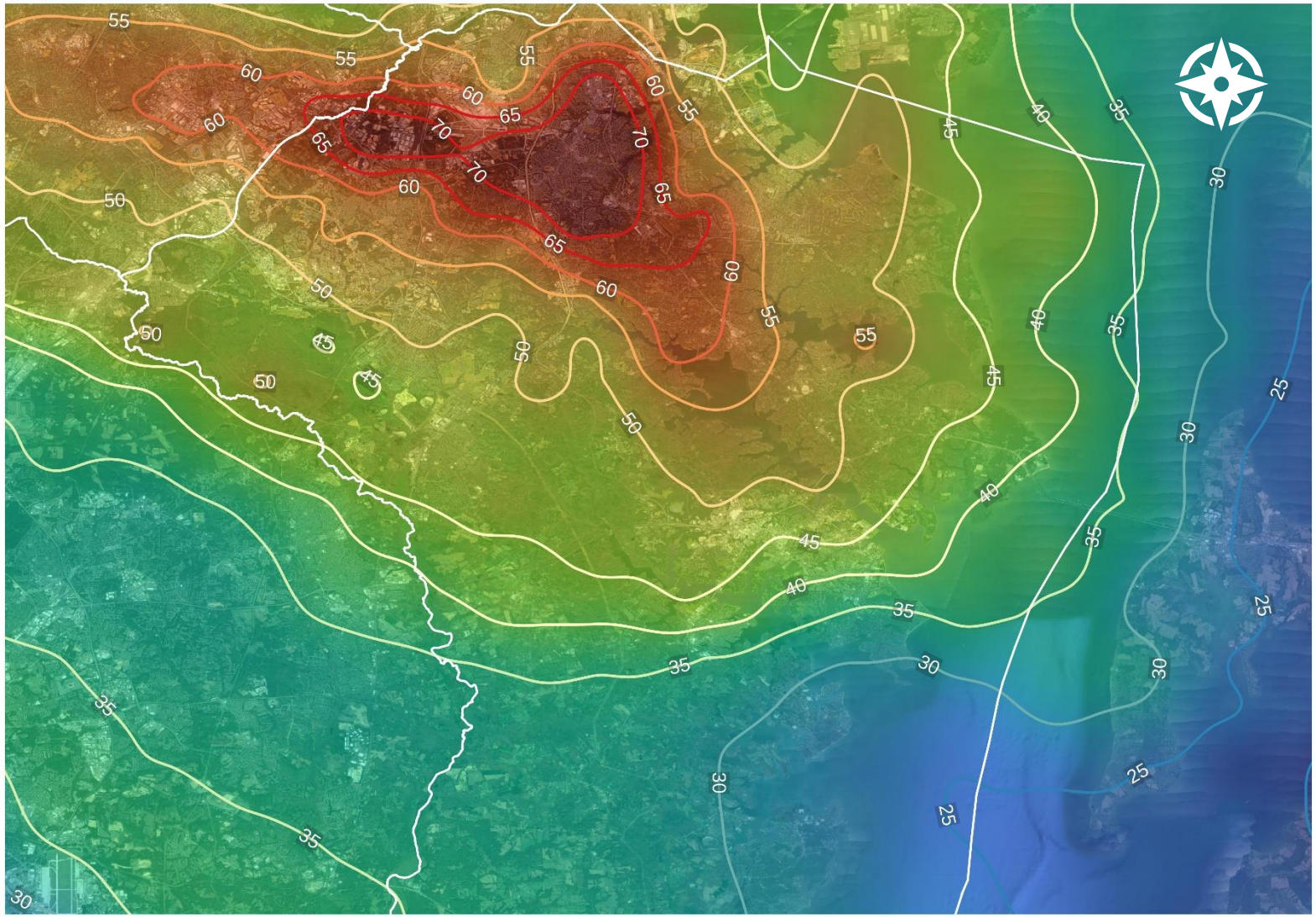
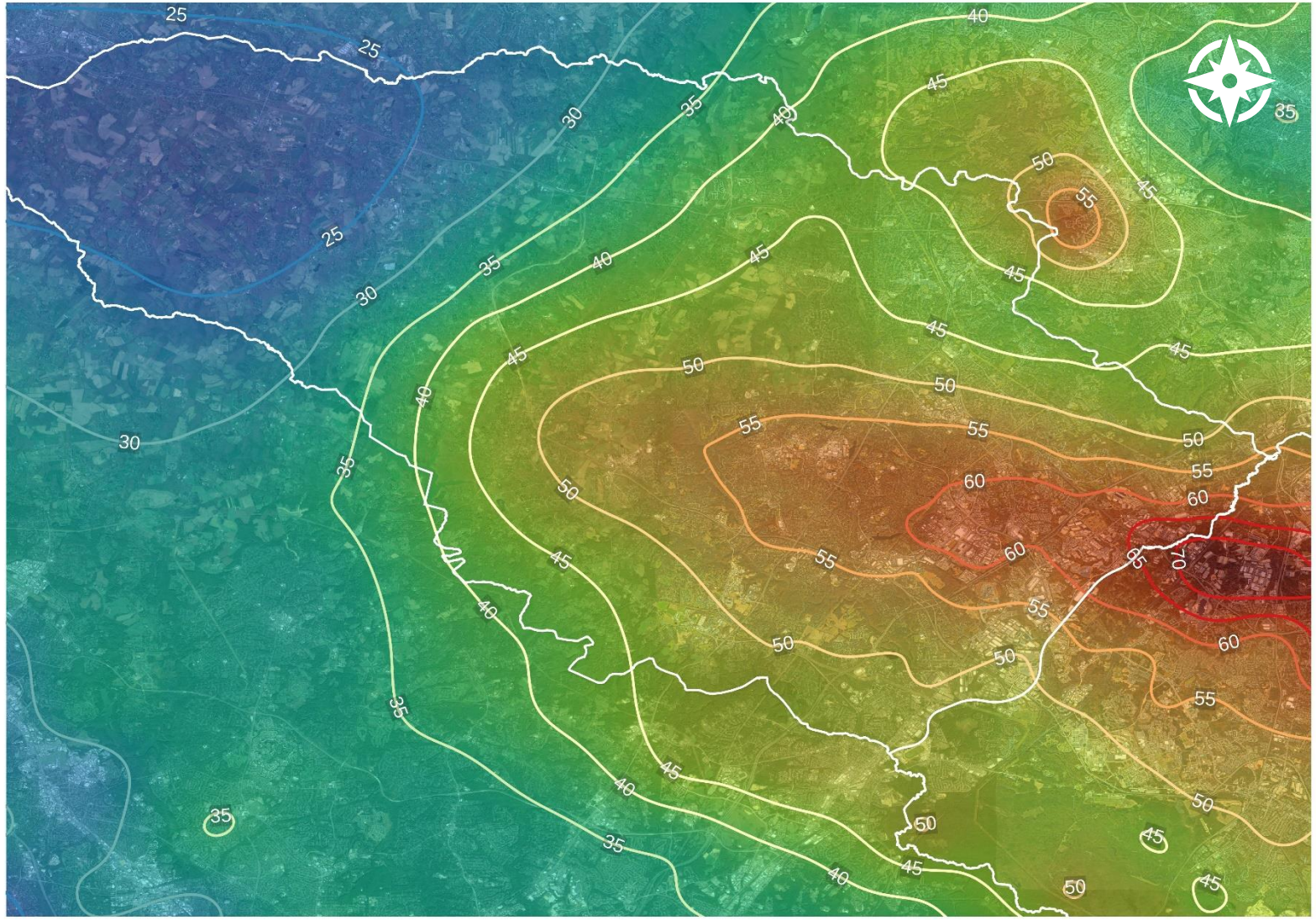
Noise Exposure – DNL Contours

Anne Arundel County



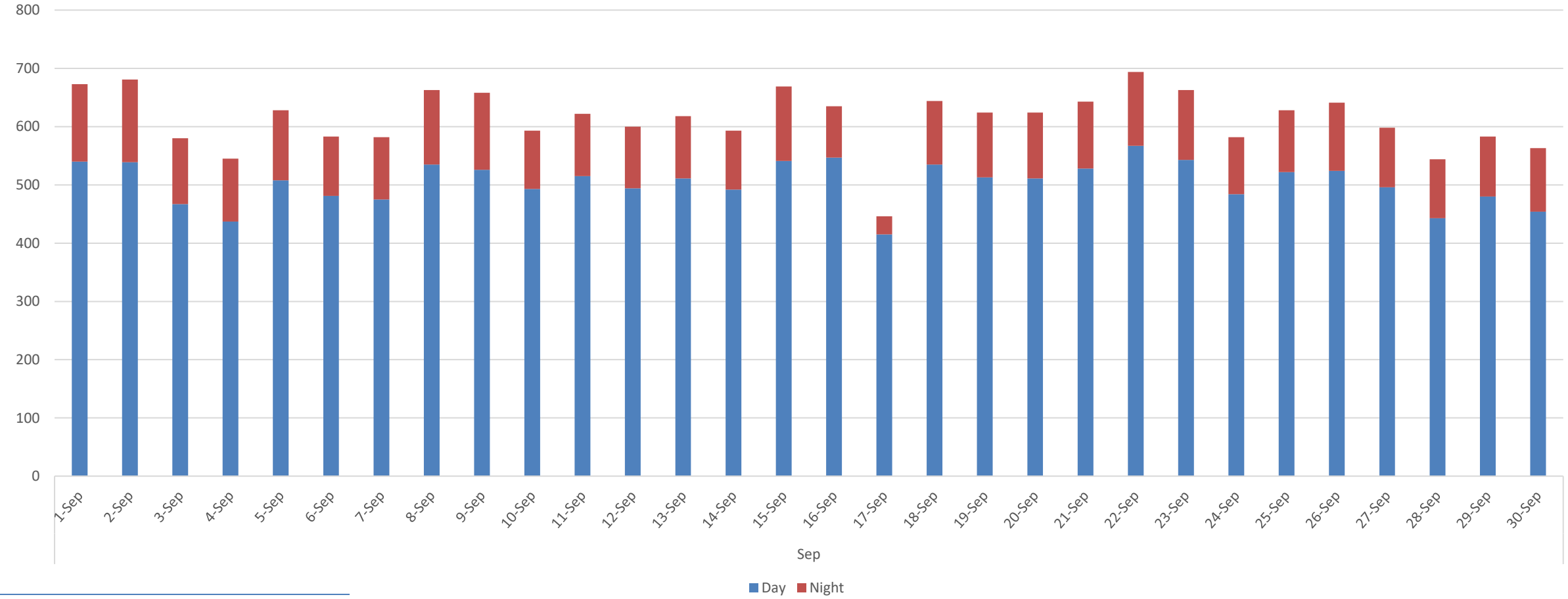
Noise Exposure – DNL Contours

Howard County



Monthly Operations

September 2022



"Nighttime Hours" are from 10PM - 7AM

YTD Cumulative Operations (Mar – Sep)---000,000 TBD	
Total Monthly Operations	18,400
Average Daily Operations	613

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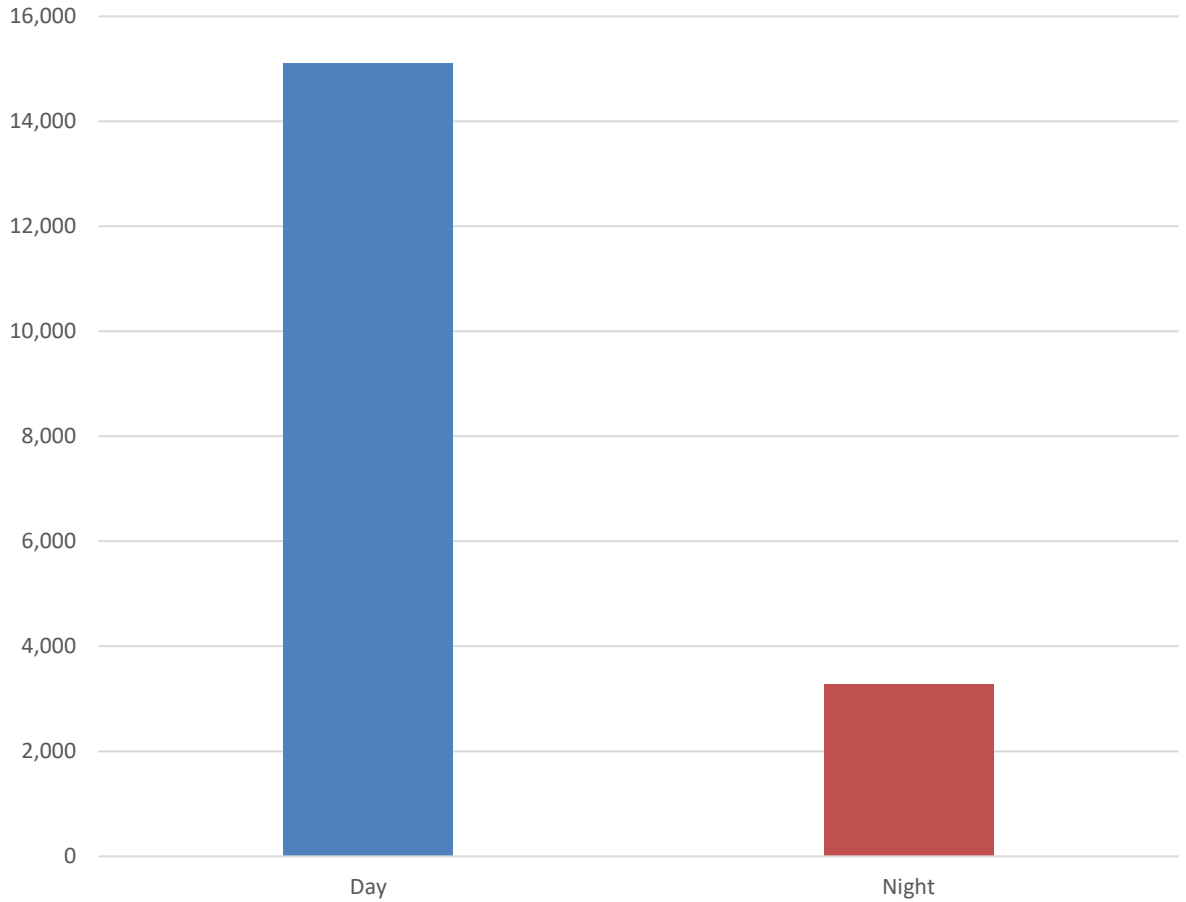
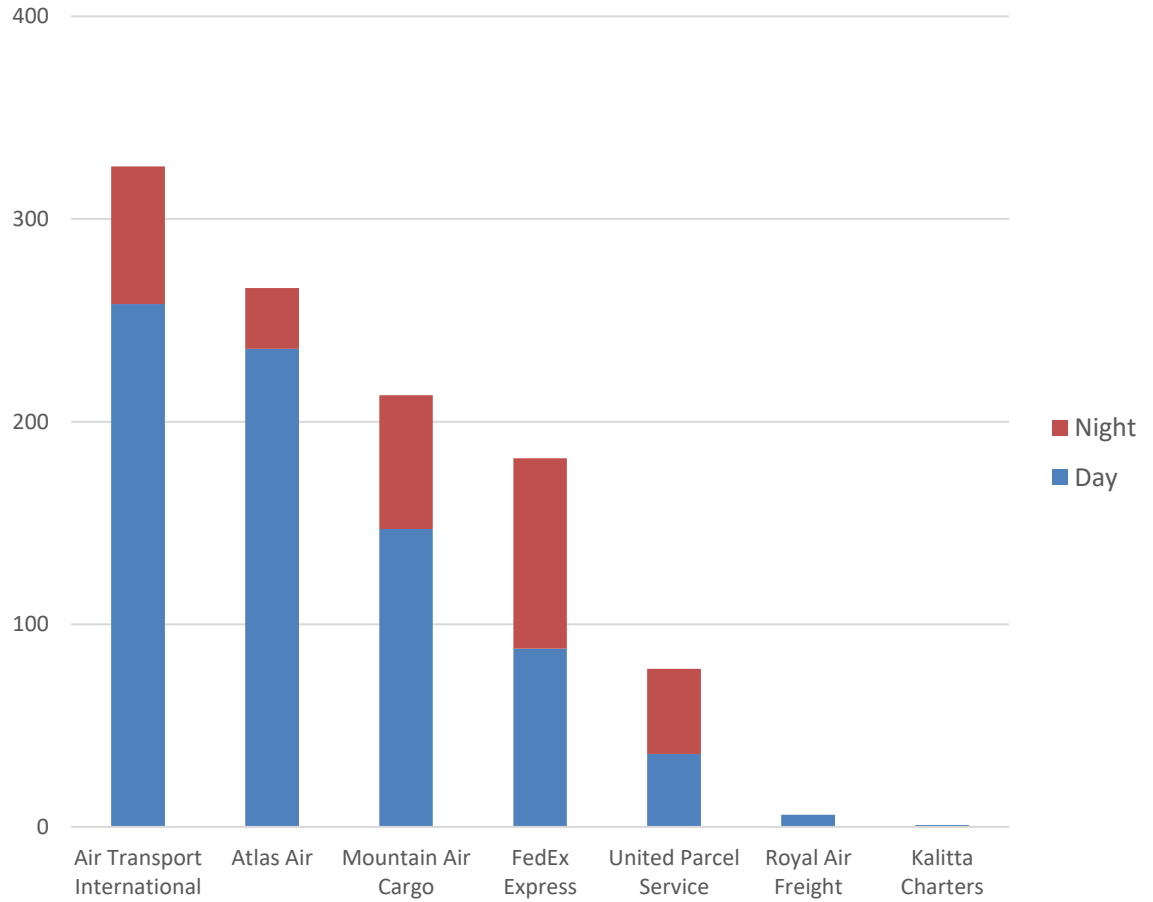
Monthly Operations – Daytime versus Nighttime

September 2022

All Operations



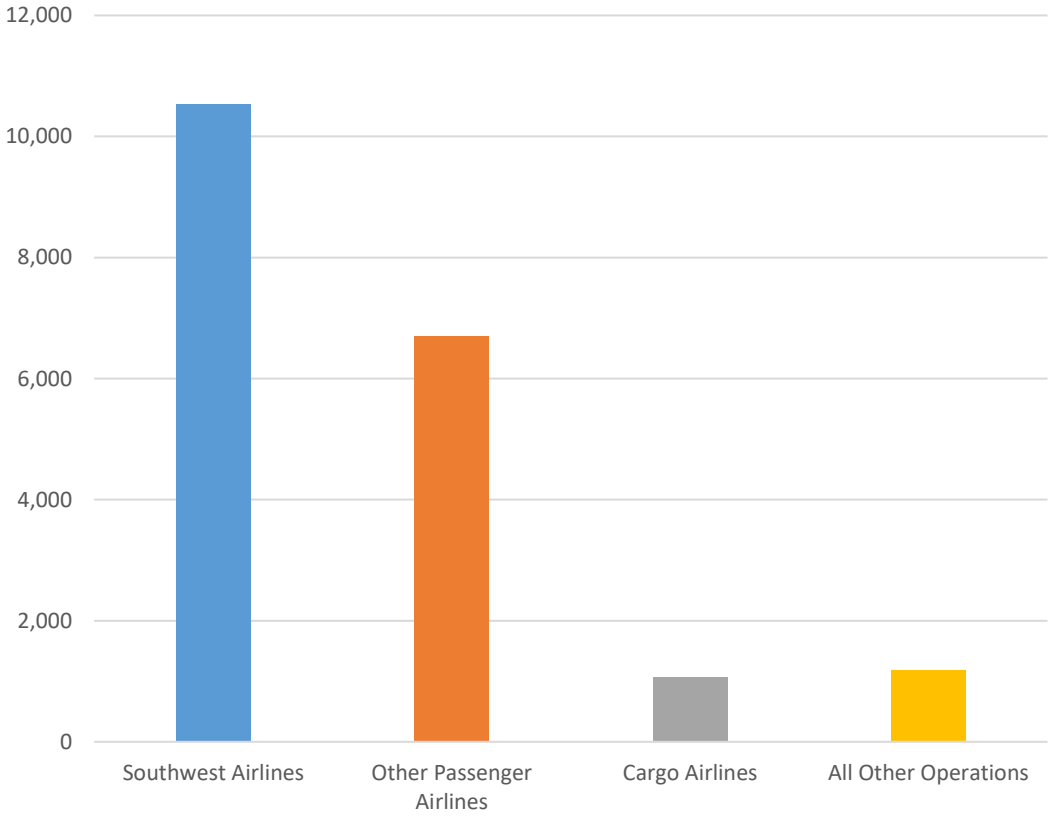
Cargo Operations



Aircraft Operations

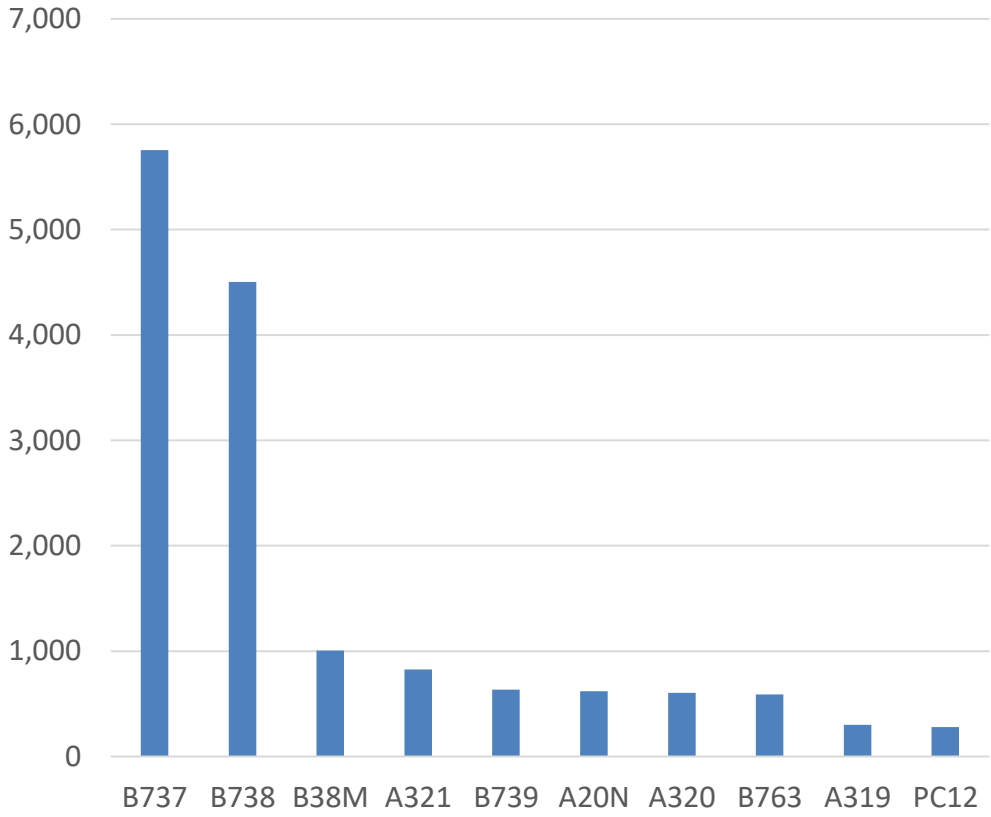
September 2022

Southwest Airlines vs. All Other Operators



Operations by Aircraft Type

(Top 10 Aircraft)



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Aircraft Noise Basics

The scale below is intended to provide a basic understand of noise levels which are expressed in decibels (dB or dBA). As indicated, the typical sound level for people speaking (3 ft apart) is 64-65 decibels. While aircraft noise at 65 dBA is equivalent on this chart to normal human speech at 3 ft, its characteristics are very different. A moving aircraft causes friction and turbulence, which triggers sound waves. Generally, the faster the aircraft is flying, the more turbulence and friction will occur. When the aircraft's landing gear and flaps are used, more noise is made because more resistance is being created.

Source: Fundamentals of Noise and Sound. (n.d.). Retrieved July 2022, from https://www.faa.gov/regulations_policies/policy_guidance/noise/basics

Why the DNL metric is controversial

In September 2021, the General Accounting Office of the United States Government (GAO) published a review of the FAA's implementation of the precision flight path component of NextGen, which is call Performance Based Navigation (PBN). That analysis showed that because DNL combines the effects of several components of noise into a single metric, it does not provide a clear picture of the flight activity or associated noise levels at a given location. For example, 100 flights per day can yield the same DNL as one flight per day at a higher decibel level, due to the averaging effect of FAA's metric.

Flights per day, by decibel (dB) level	Day-Night Average Sound Level
1 flight per day at 114.4 dB	65 dB
100 flights per day at 94.4 dB	65 dB

Note: For more details, see fig. 1 in GAO-22-105844.

Source: GAO analysis of Federal Aviation Administration information. | GAO-22-105844

The GAO's analysis and other research demonstrate the limitations of FAA relying solely on DNL to identify potential noise problems. This illustrates why communities often view DNL as a "permissive" measure, designed to allow increased airplane operations.

For More Information …

For more information about the contents of this report or
for questions about the DC Metroplex BWI Community Roundtable

Please visit:

https://marylandaviation.com/environmental/environmental-compliance-sustainability/dc-metroplex-bwi-community-roundtable/