



BWI-Thurgood Marshall Airport Aircraft Operations and Noise Exposure

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

Monthly Report for January 2023

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 overflowed communities in our region. The BWI Roundtable believes that the analysis of the full environmental impact of airport operations on overflowed 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

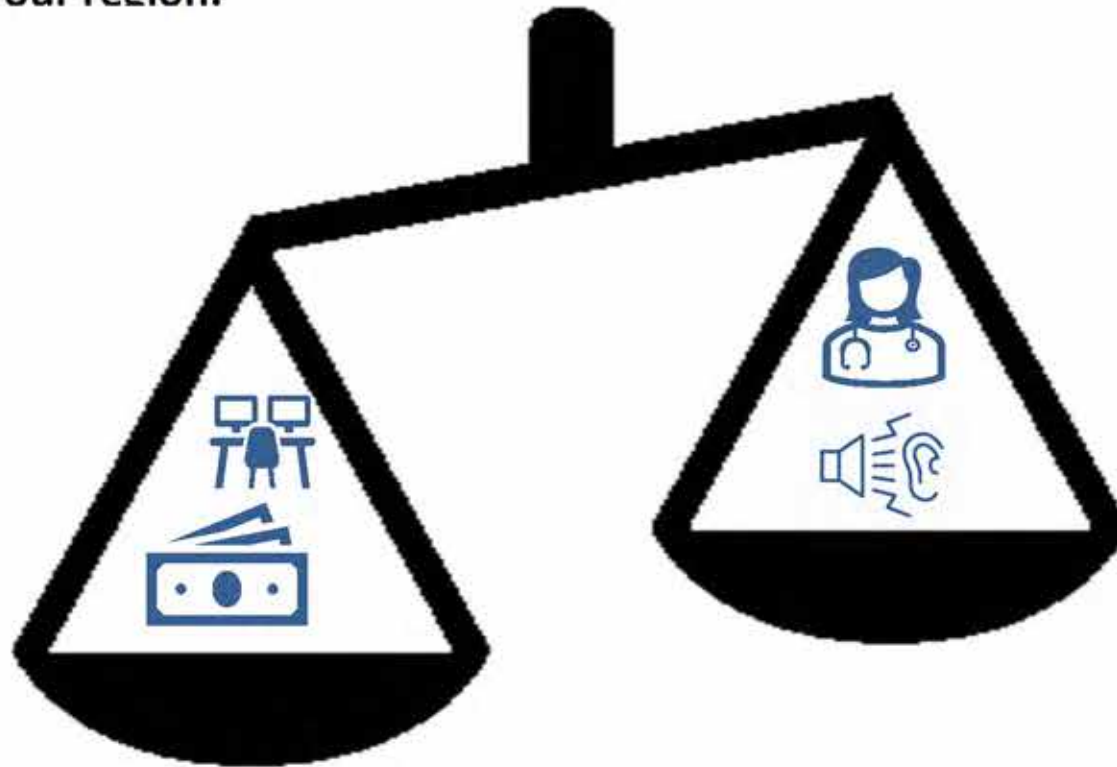
Disclaimer: The views and opinions expressed in this document are those of the BWI Roundtable and do not necessarily reflect the views or positions of the state senators who appoint voting members to the BWI Roundtable, the MDOT/MAA, the FAA, Howard or Anne Arundel County elected or appointed officials, 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
<u>Total Jobs 24,211</u> Direct 12,753 Indirect 11,458	<u>Total Jobs 82,277</u> 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

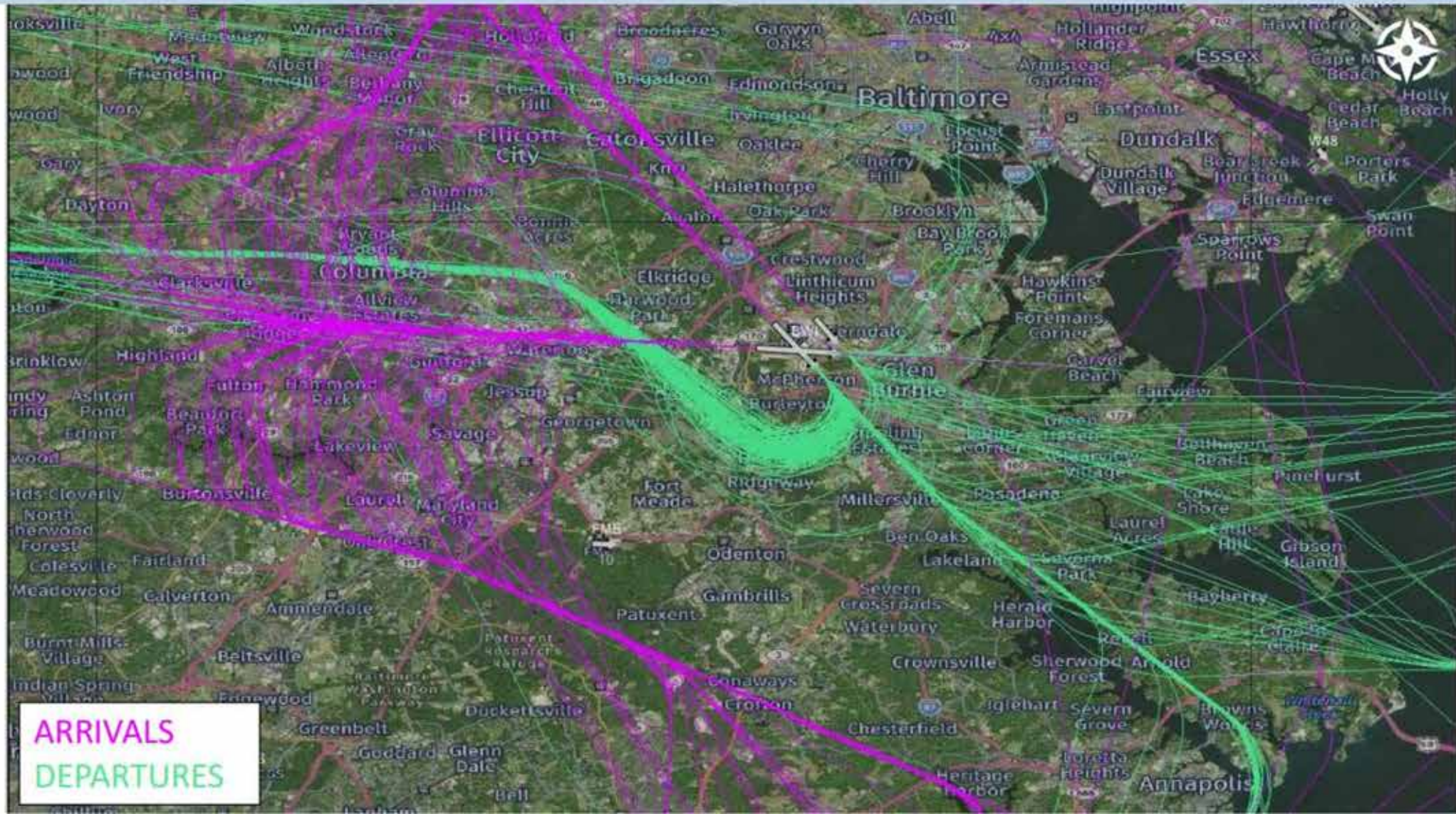
Prevailing wind speed, direction and weather factors determine the direction of air traffic flow from BWI-Marshall airport. Aircraft usually take off and land into the wind to meet safety and operational requirements.

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

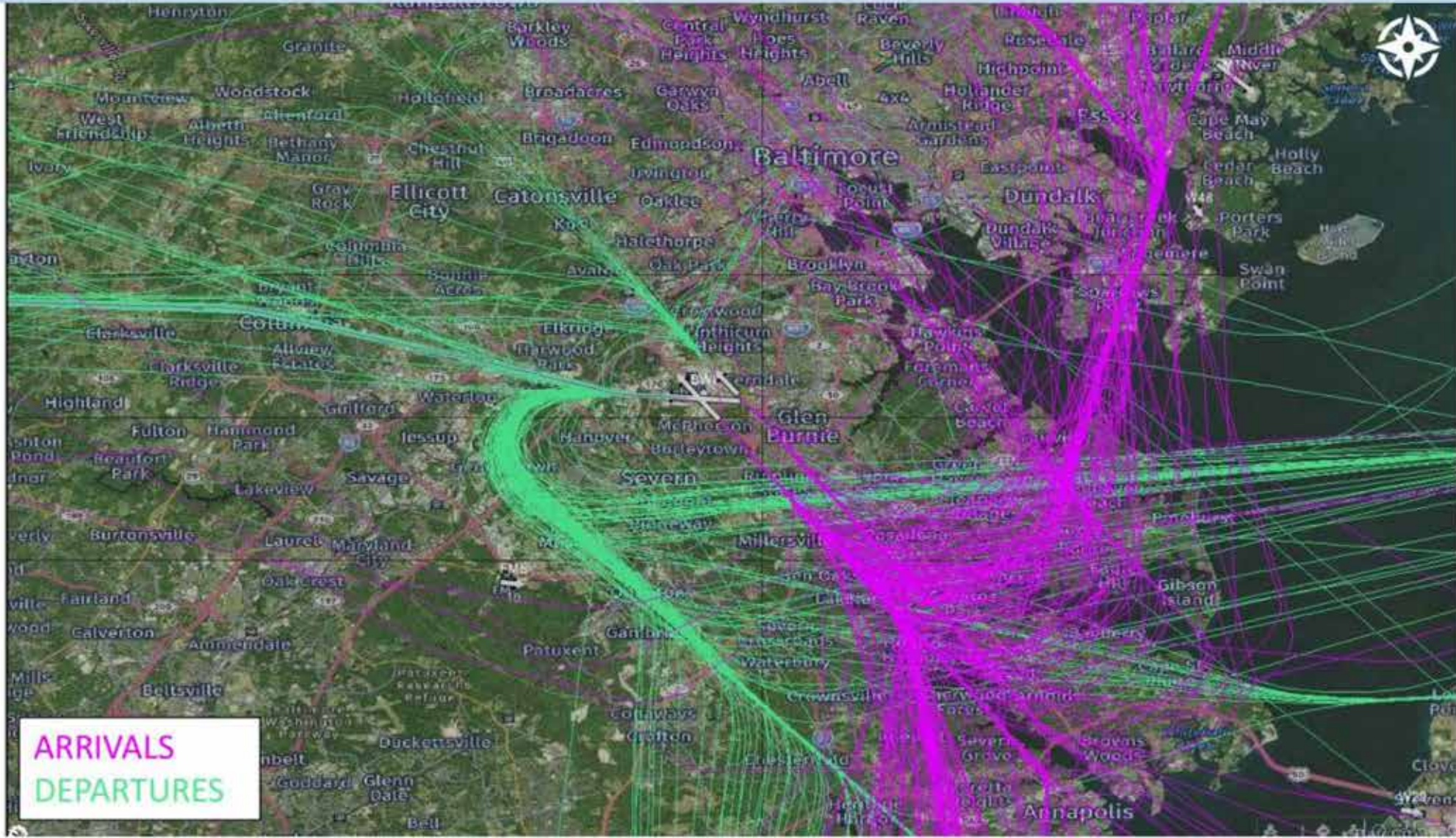
During **WEST FLOW** conditions (winds from the north or west), aircraft arrive and depart toward the west. This includes runways 33L, 33R, and 28. The following slides are intended to illustrate arrival and departure flight paths across the region during sample EAST and WEST flows days.

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

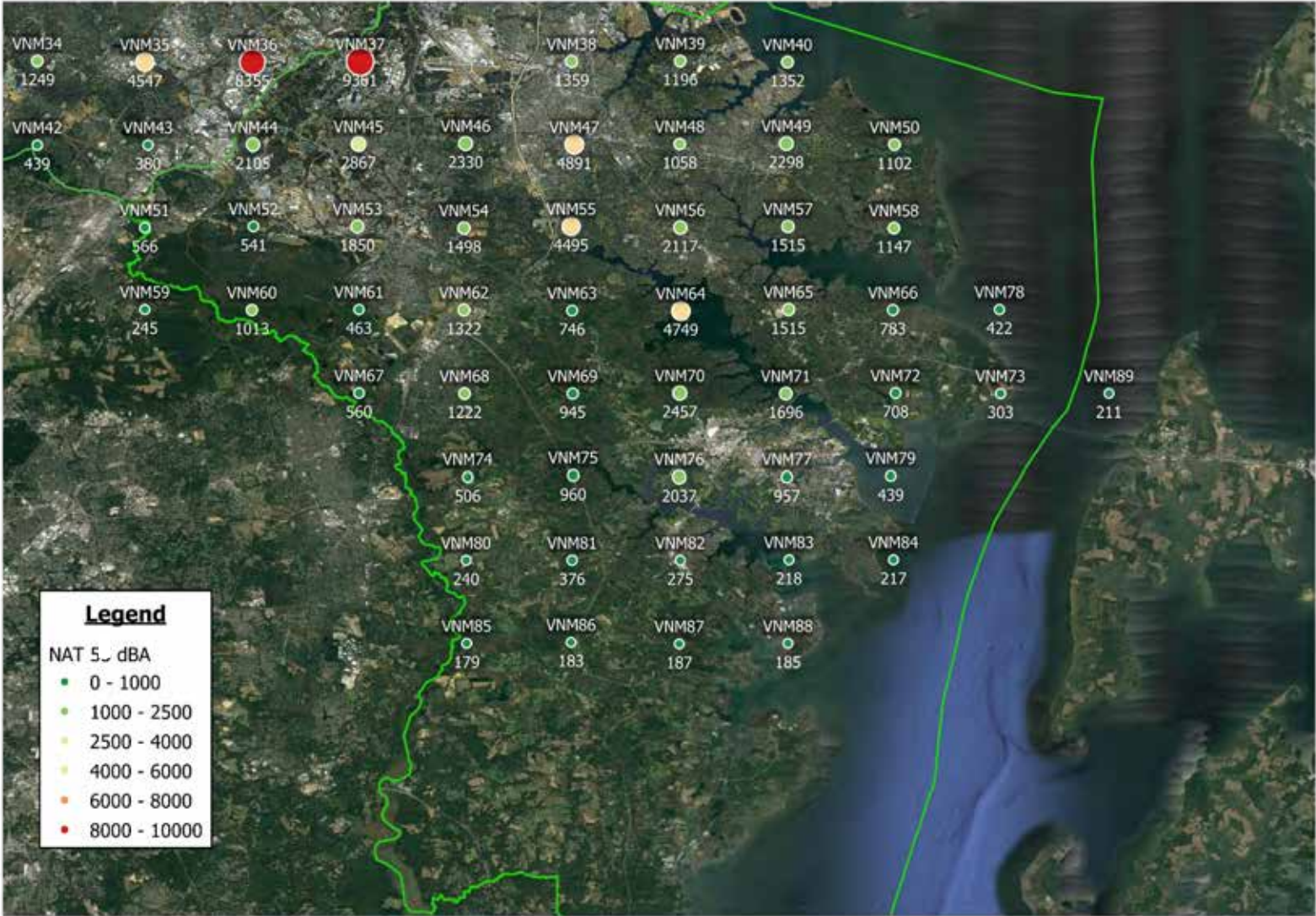


Visual representation of daily traffic patterns over the Baltimore region during West Flow operations at BWI-Marshall



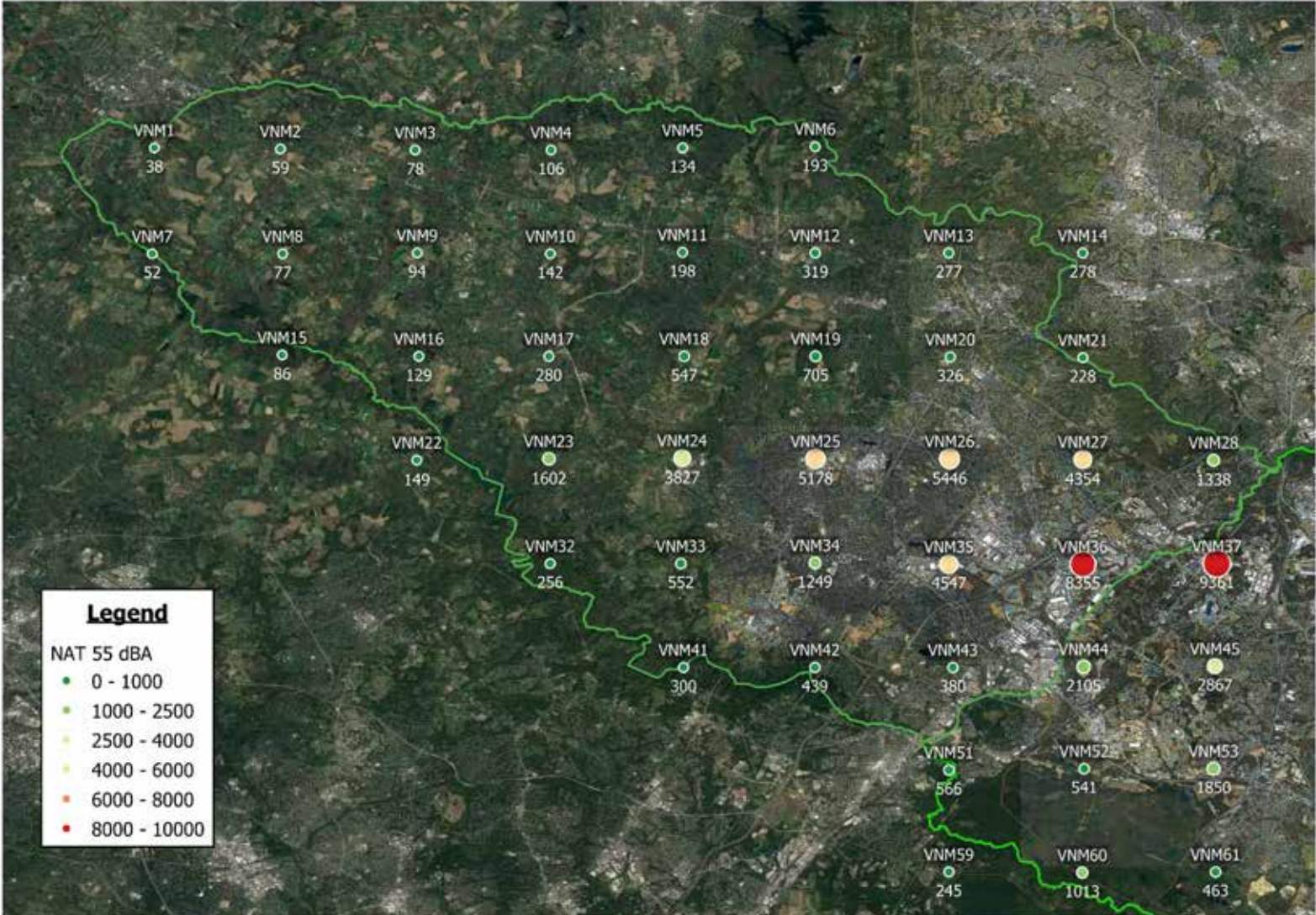
Noise Exposure – Number of Events Above 55 dBA

Anne Arundel County - VNM Grid



Noise Exposure – Number of Events Above 55 dBA

Howard County - VNM Grid

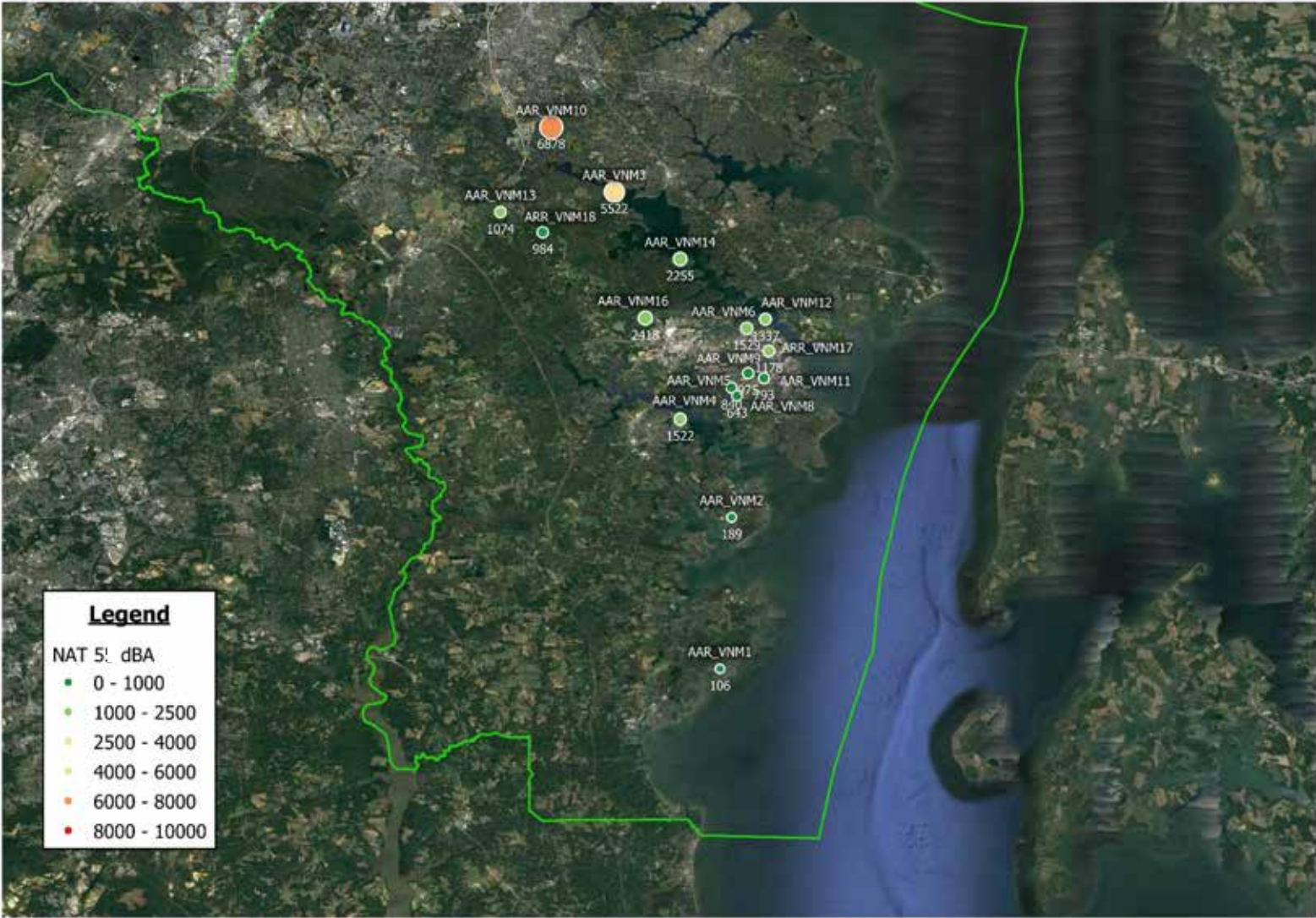


Noise Exposure – Full Grid, All Flows

Name	Number-of-Events-Above 55dBA (Total)	Daily Average	DNL	Name	Number-of-Events-Above 55dBA (Total)	Daily Average	DNL	Name	Number-of-Events-Above 55dBA (Total)	Daily Average	DNL
VNM1	38	1	21.85	VNM31	402	13	51.82	VNM61	463	15	42.34
VNM2	59	2	28.26	VNM32	256	8	37.1	VNM62	1322	43	45.81
VNM3	78	3	27.5	VNM33	552	18	48.3	VNM63	746	24	49.72
VNM4	106	3	30.17	VNM34	1249	40	49.85	VNM64	4749	153	58.95
VNM5	134	4	42.21	VNM35	4547	147	54.52	VNM65	1515	49	66.56
VNM6	193	6	39.03	VNM36	8355	270	56.8	VNM66	783	25	49.69
VNM7	52	2	23.63	VNM37	9361	302	68.86	VNM67	560	18	40.49
VNM8	77	2	24.81	VNM38	1359	44	55.87	VNM68	1222	39	43.06
VNM9	94	3	31.8	VNM39	1196	39	49.85	VNM69	945	30	45.17
VNM10	142	5	34.06	VNM40	1352	44	50.2	VNM70	2457	79	50.02
VNM11	198	6	36.12	VNM41	300	10	44.35	VNM71	1696	55	49.55
VNM12	319	10	38.97	VNM42	439	14	46.77	VNM72	708	23	49.74
VNM13	277	9	39.85	VNM43	380	12	43.73	VNM73	303	10	48.49
VNM14	278	9	54.98	VNM44	2105	68	50.38	VNM74	506	16	38.12
VNM15	86	3	25.55	VNM45	2867	92	51.51	VNM75	960	31	44.23
VNM16	129	4	30.64	VNM46	2330	75	56.45	VNM76	2037	66	45.08
VNM17	280	9	38.12	VNM47	4891	158	64.97	VNM77	957	31	43.47
VNM18	547	18	44.27	VNM48	1058	34	54.87	VNM78	422	14	40.45
VNM19	705	23	43.53	VNM49	2298	74	54.16	VNM79	439	14	42.12
VNM20	326	11	47.9	VNM50	1102	36	48.81	VNM80	240	8	36.23
VNM21	228	7	44.12	VNM51	566	18	44.34	VNM81	376	12	36.48
VNM22	149	5	31.05	VNM52	541	17	42.29	VNM82	275	9	34.55
VNM23	1602	52	42.87	VNM53	1850	60	49.59	VNM83	218	7	33.37
VNM24	3827	123	49.69	VNM54	1498	48	53.21	VNM84	217	7	35.55
VNM25	5178	167	53.1	VNM55	4495	145	55.59	VNM85	179	6	34
VNM26	5446	176	53.58	VNM56	2117	68	62.22	VNM86	183	6	30.77
VNM27	4354	140	50.05	VNM57	1515	49	58.89	VNM87	187	6	29.89
VNM28	1338	43	49.44	VNM58	1147	37	48.16	VNM88	185	6	29.4
VNM29	590	19	56.8	VNM59	245	8	37.09	VNM89	211	7	35.69
VNM30	285	9	50.07	VNM60	1013	33	44.03				

Noise Exposure – Number of Events Above 55 dBA

Anne Arundel County - Landmark Locations



Noise Exposure – Number of Events Above 55 dBA

Howard County - Landmark Locations



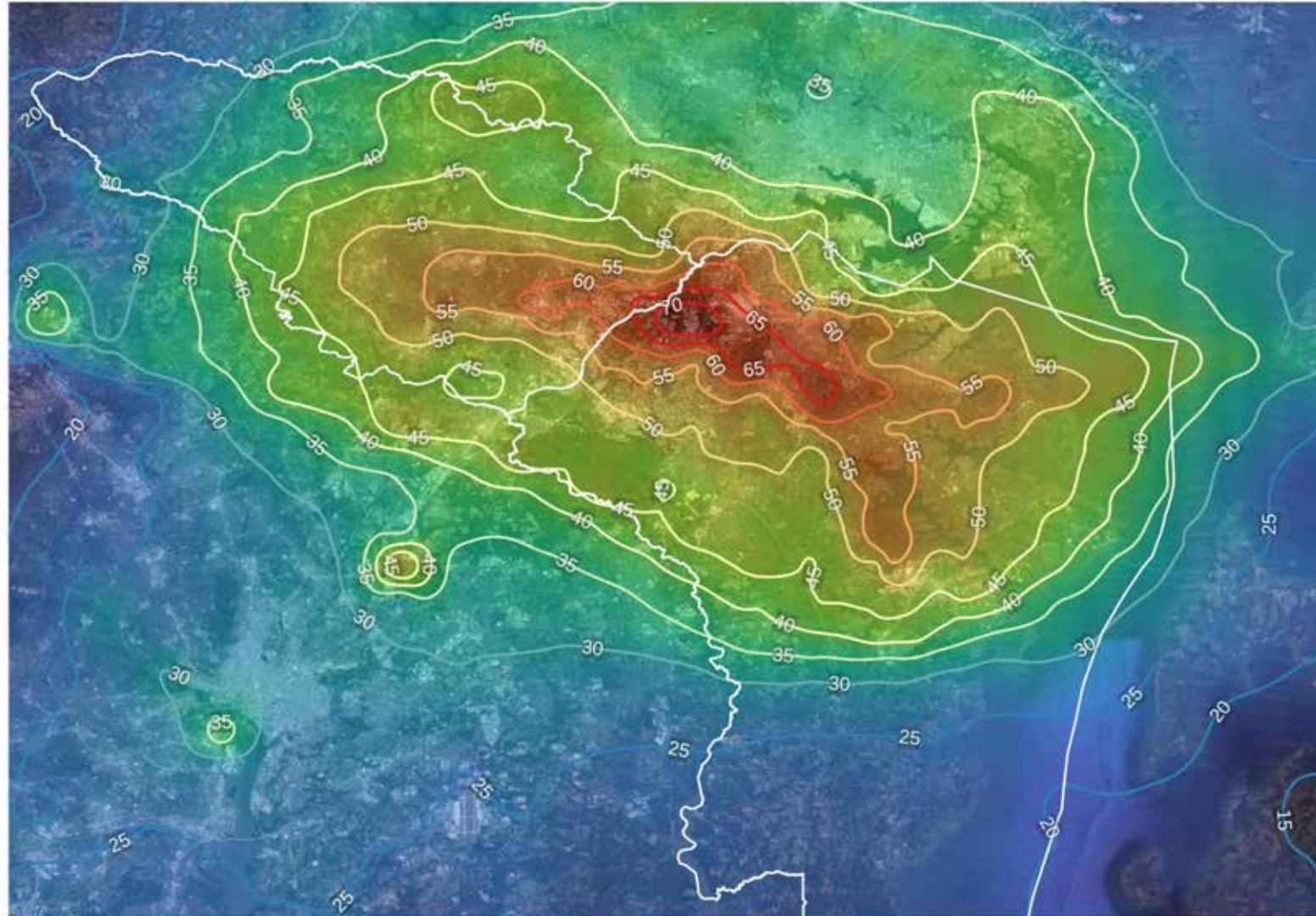
Monthly Noise Exposure – Landmark Locations

All Flows

Name	Description	Number-of-Events-Above 55dBA (Total)	Daily Average	DNL	Name	Description	Number-of-Events-Above 55dBA (Total)	Daily Average	DNL
AAR_VNM1	RAVNN	106	3	28.05	HOCO_VNM1	Howard Square Apartments	7791	251	55.44
AAR_VNM2	JETNA	189	6	29.57	HOCO_VNM2	HCPSS Administration Campus	4057	131	49.49
AAR_VNM3	Arden on the Severn	5522	178	64.38	HOCO_VNM3	Centennial Park	3812	123	48.26
AAR_VNM4	London Public House	1522	49	40.34	HOCO_VNM4	HoCo General Hospital	5157	166	53.04
AAR_VNM5	Annapolis Middle School	840	27	41.62	HOCO_VNM5	Merriweather Post Pavillion	5379	174	54.37
AAR_VNM6	West Annapolis Elementary	1529	49	47.63	HOCO_VNM6	Oakland Mills HS	5608	181	55.45
AAR_VNM7	Herald Harbor	74	2	29.98	HOCO_VNM7	Long Reach HS	5720	185	56.26
AAR_VNM8	Eastport Terrace	793	26	42.35	HOCO_VNM8	Troy Park	7273	235	59.28
AAR_VNM9	Truxton Park	975	31	43.15	HOCO_VNM9	Harwood Park N'hood	7476	241	58.17
AAR_VNM10	Shipley's Choice Elementary	6878	222	62.25	HOCO_VNM10	Abiding Savior Lutheran	4831	156	52.45
AAR_VNM11	Robinwood	643	21	39.79	HOCO_VNM11	Tridelphia Ridge ES	300	10	38.19
AAR_VNM12	Wordour Bluffs	1337	43	48.34	HOCO_VNM12	Atholton HS	4418	143	54.15
AAR_VNM13	Millersville Elementary School	1074	35	49.17	HOCO_VNM13	Christ Church Episcopal	6002	194	59.83
AAR_VNM14	Sherwood Forest	2255	73	53.06	HOCO_VNM14	Mayfield Woods MS	5893	190	59.02
AAR_VNM15	Brookeville, Montgomery county	119	4	30.89	HOCO_VNM15	Manor Woods ES	280	9	38.58
AAR_VNM16	Rolling Knolls	2418	78	48.58	HOCO_VNM16	Gateway Site	6104	197	60.56
AAR_VNM17	Maryland State House	1178	38	46.19	HOCO_VNM17	Oxford Square Neighborhood	9315	300	65.27
AAR_VNM18	I-97 and MD 178 Crownsville	984	32	50.98	HOCO_VNM18	St. Louis Catholic	2994	97	50.41

Noise Exposure – DNL Contours

Howard and Anne Arundel Counties



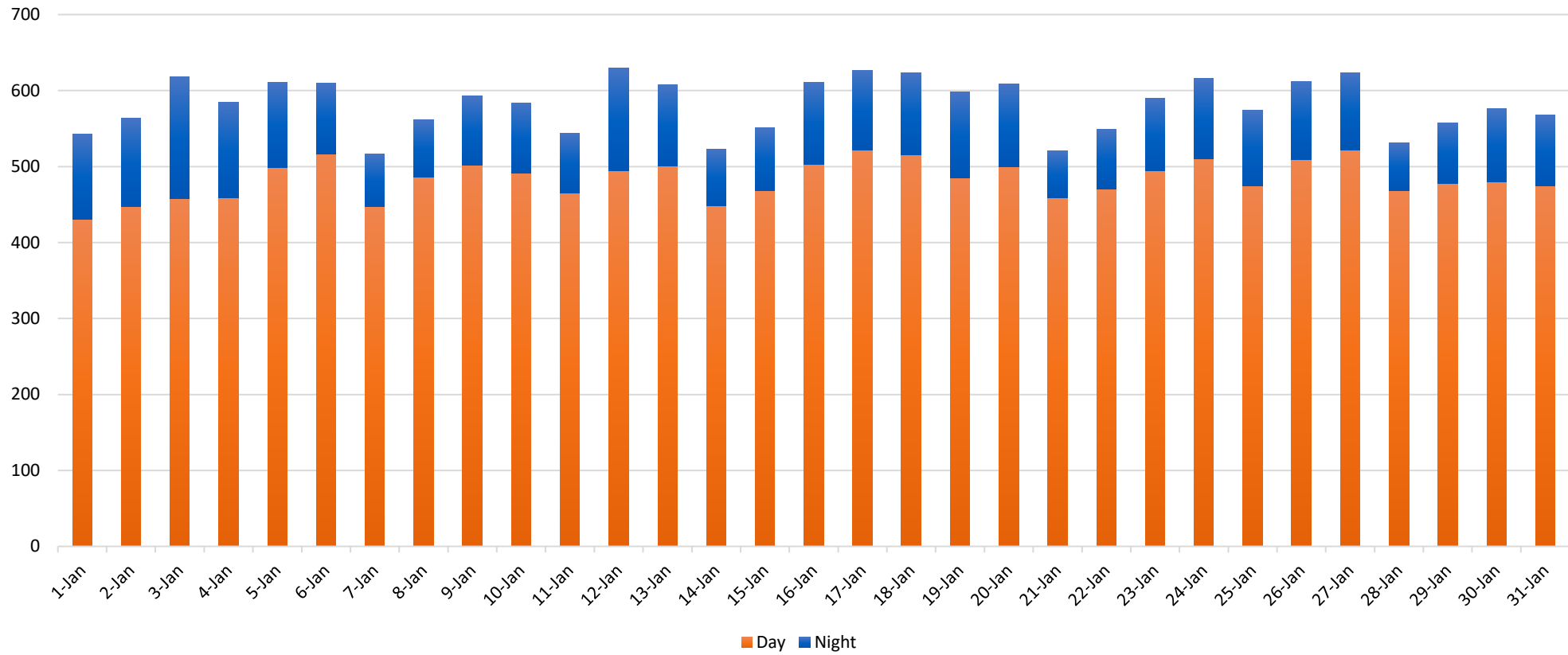
Flight Track Density – Heat Map



Monthly Operations

January 2023

Daily Operations (Day vs. Night)

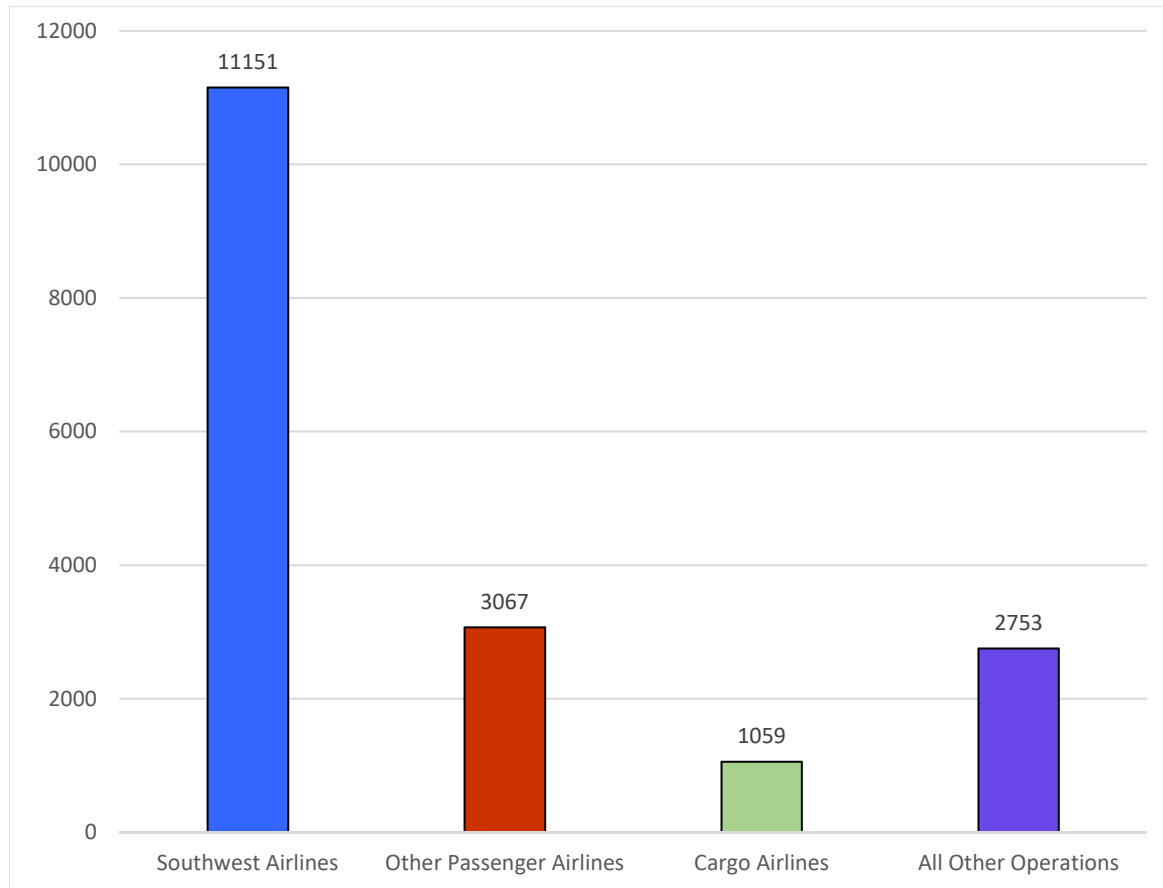


"Nighttime Hours" are from 10PM - 7AM

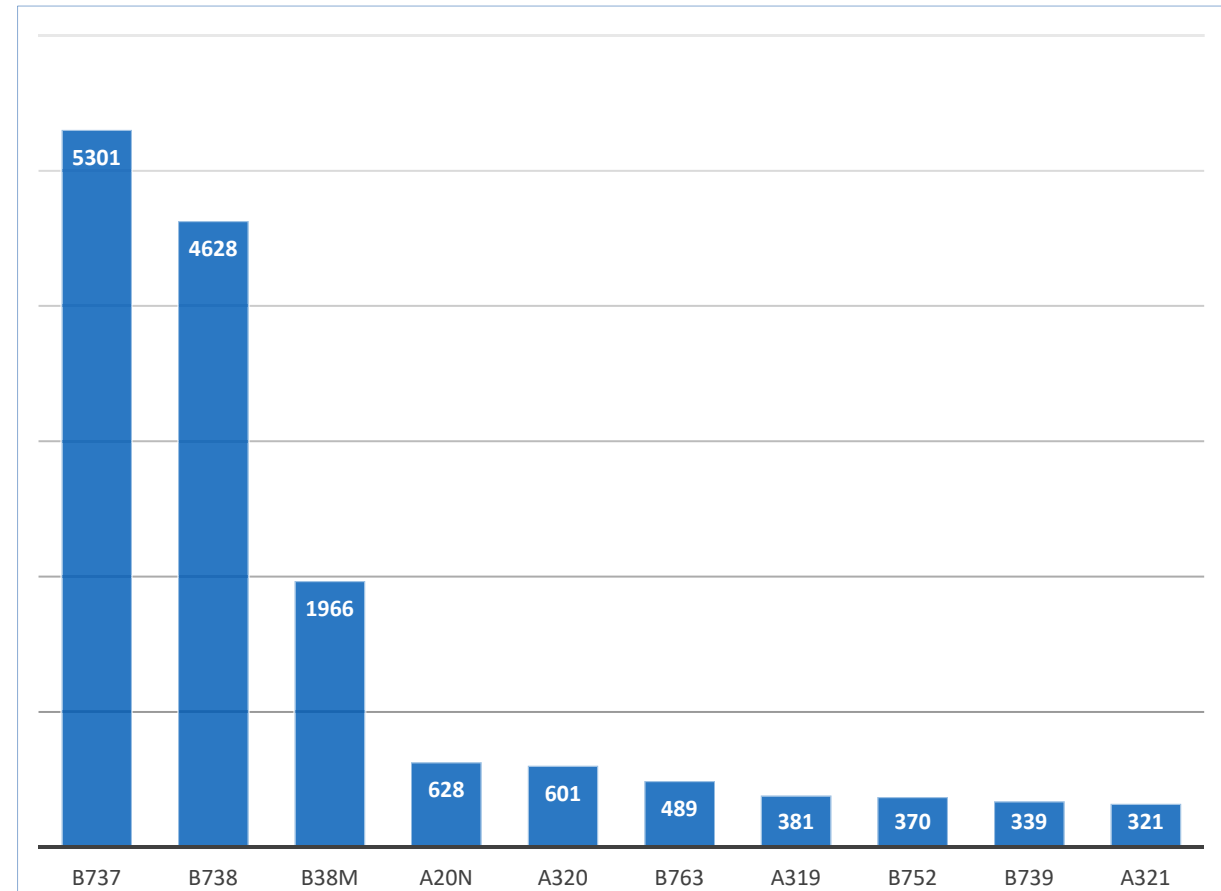
Aircraft Operations

January 2023

Southwest vs. All Other Operations



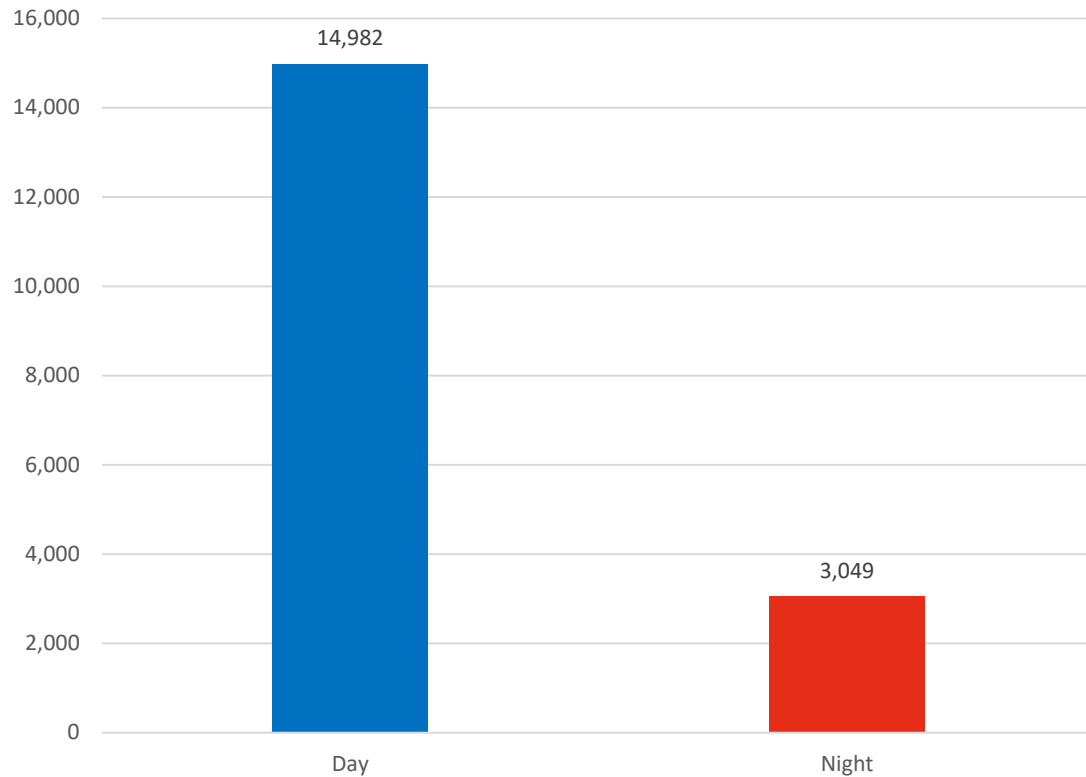
Total Operations by Aircraft Type (Top 10 Aircraft)



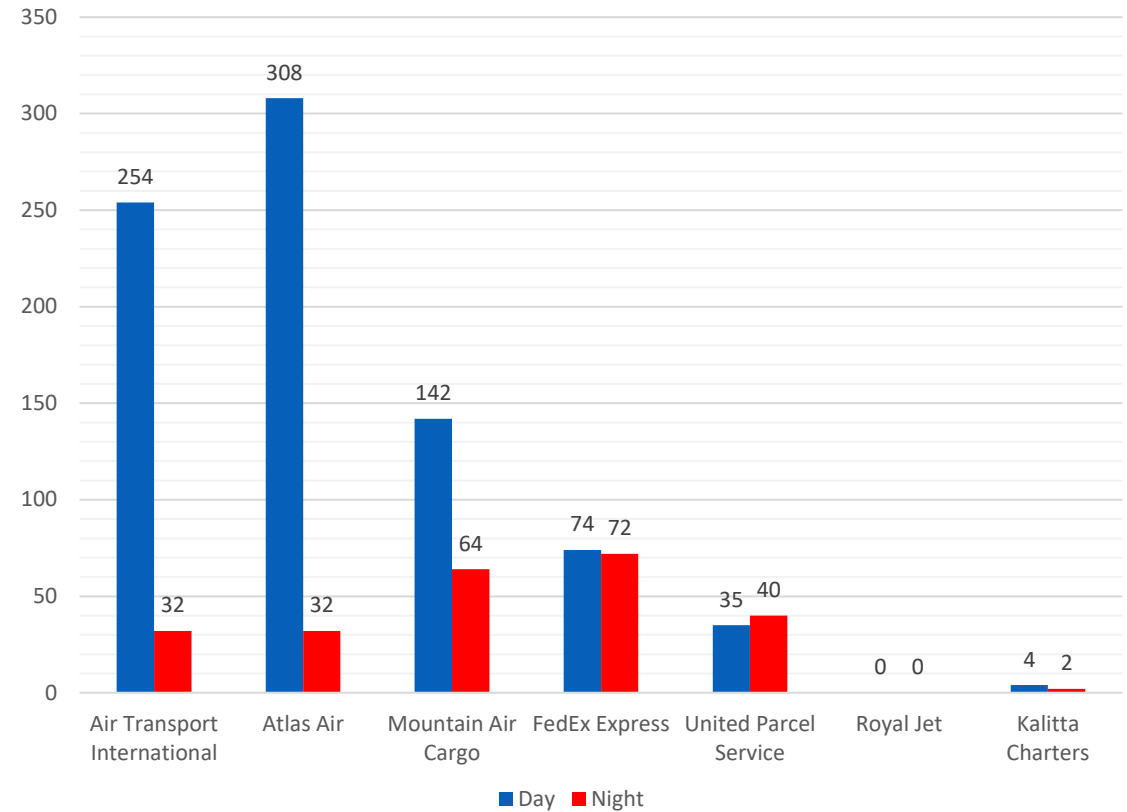
Monthly Operations – Daytime versus Nighttime

January 2023

Monthly Operations - Day vs. Night



Top Cargo Operations – Daytime vs. Nighttime





Aircraft Noise Basics

Noise is defined as “unwanted sound.” There are many ways to measure noise. Two common metrics will be used in these reports: Day-Night Level (DNL) and Number-of-Events-Above (NA).

DNL is the standard metric used by the Federal Aviation Administration as required by federal regulation. Federal guidelines recommend **DNL 65** as the level of aircraft noise exposure that is incompatible with noise-sensitive applications including residential development. A problem with DNL is it is difficult for the public to understand and doesn't seem to reflect what residents experience on a daily basis.

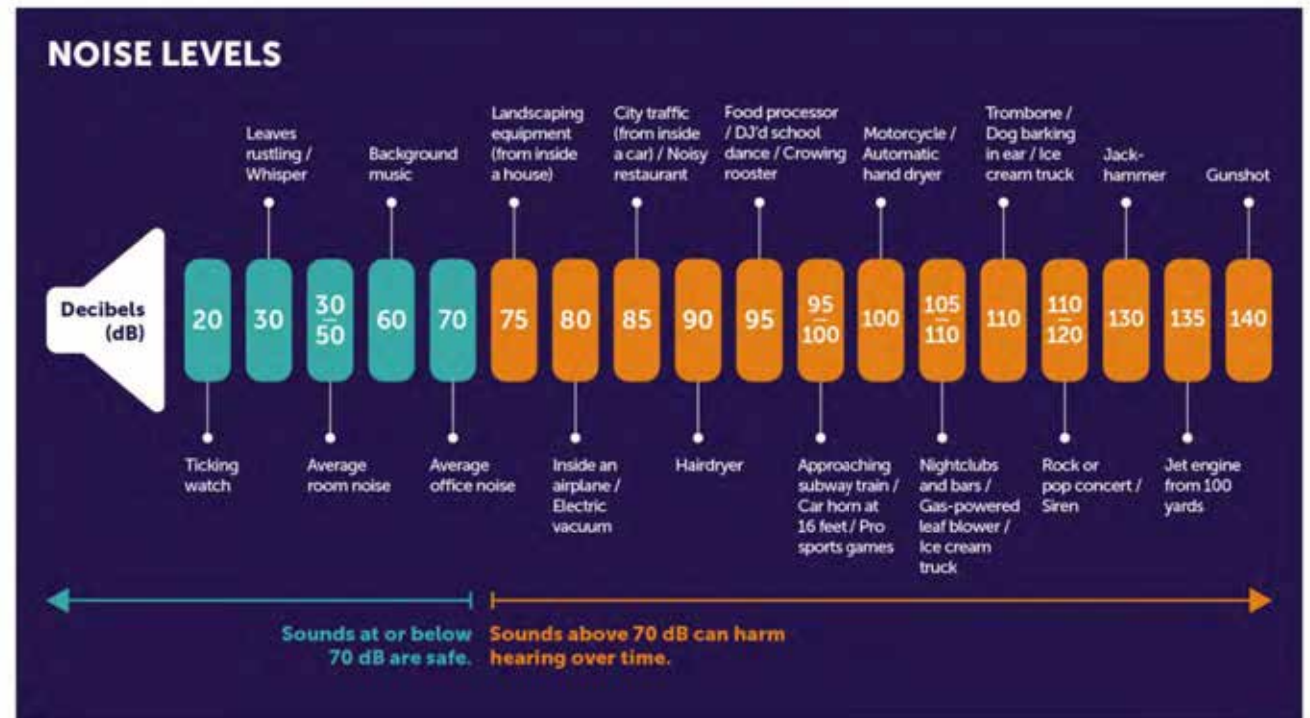
The NA noise metric counts the number of times the noise level exceeds a specific threshold. In this report, the Number-of-Events-Above 55 metric (NA55) is calculated. NA55 quantifies the number of aircraft events resulting in noise exposure of 55 decibels or higher at each location depicted.

Noise Basics

The scale below is intended to provide a basic understand of noise levels which are expressed in decibels (dB or dBA). The purpose of the chart is to provide examples of noise/sound level associated with common events. This is intended to provide the reader with a basic understanding or context of “how loud” 55, 65, 75, etc., decibels is.



It is worth noting, noise (sound) exposure and noise annoyance are different. Noise exposure is based on acoustics and represents a measure of sound energy a person is exposed to. Annoyance is based on an individual’s response to the noise exposure.

An Individual’s response (annoyed, highly annoyed, not annoyed, etc.), vary based many factors. Furthermore, sound exposure at a specific level (i.e. 65 db) may be perceived differently based on the source of the noise (i.e. music at 65 decibels vs. aircraft noise at 65 decibels. The source of the sound and the individual’s perception of the source is one of the many factors that contribute to our reaction.



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/>