



# ***Noise Compatibility***

**2015 Year End**

March 4, 2016

## *Disclaimer*



- Adherence to approved noise abatement measures is voluntary and subject to change based on weather, efficiency, and safety.
- The contents of this report are for informational purposes only. The information cannot be used for enforcement of any Noise Abatement Measure.

# *Noise Highlights of 2015*

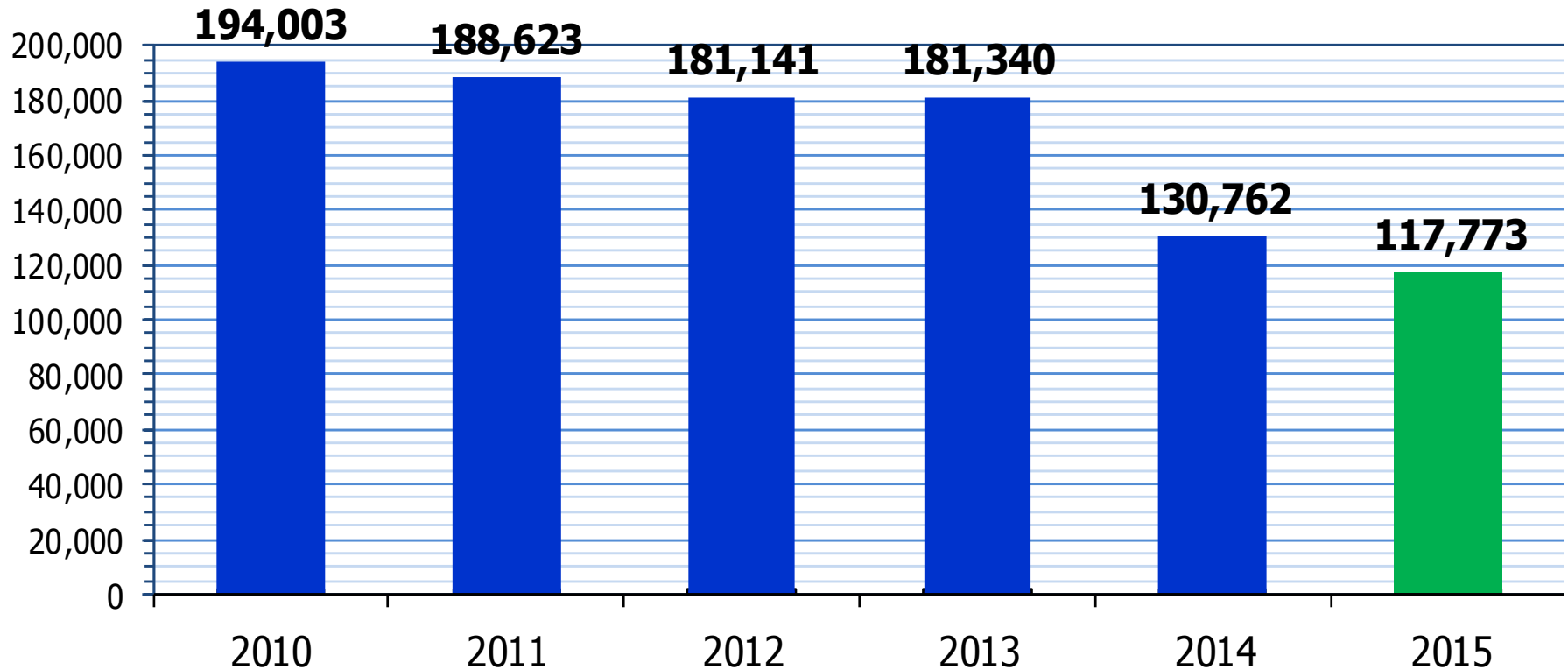


- Airport operations for Year 2015 were down 9.93%, compared to Year 2014.
- Noise Complaints for Year 2015 were down 14.75%, compared to Year 2014.
- Noise consultant, HMMH, evaluated the Noise and Operations Monitoring System and made recommendations for new equipment and software.

# Aircraft Operations



Cleveland Total Operations 2010 - 2015



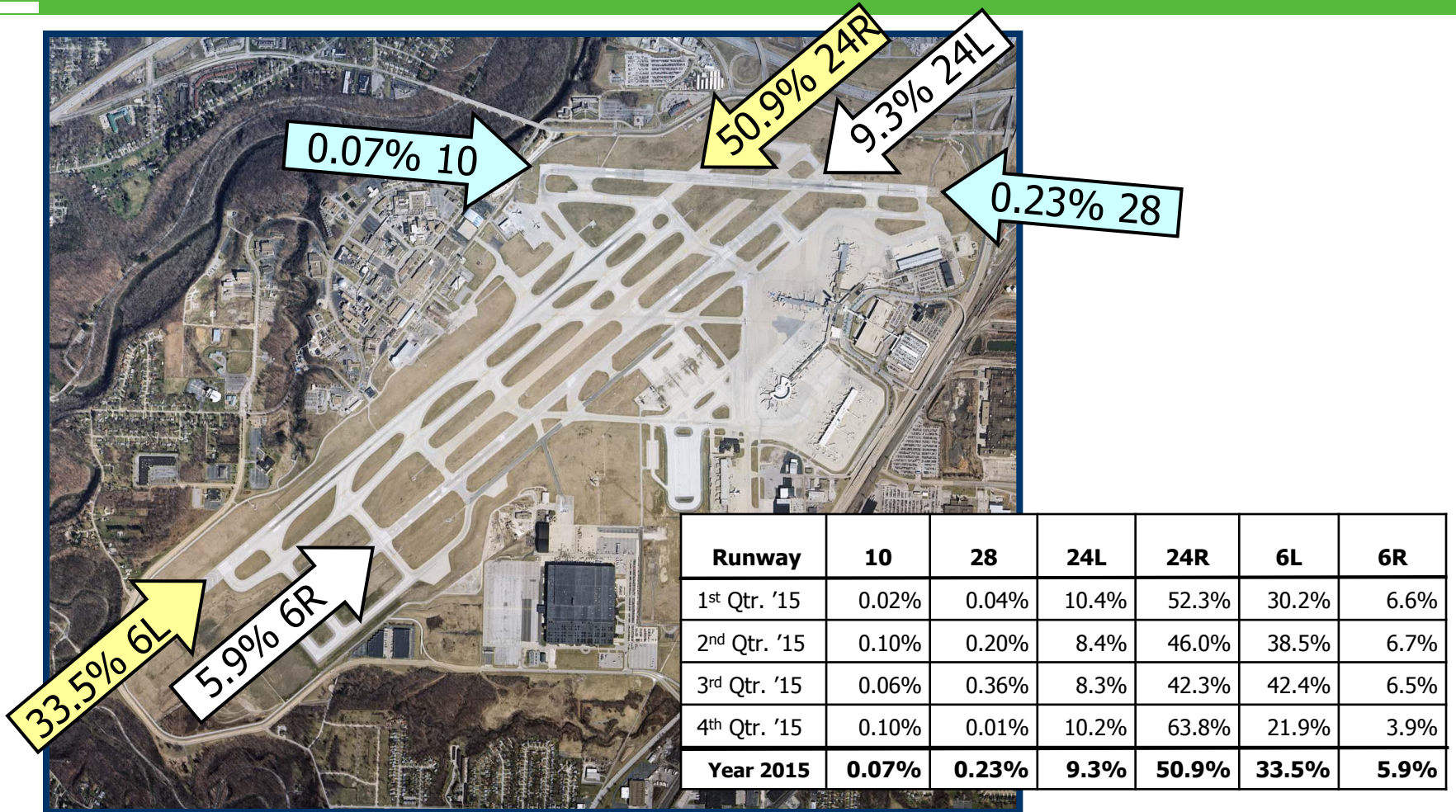
There were 117,773 landings and takeoffs in 2015; this is 9.93% below 2014.

## Landings & Takeoffs

	Year 2015		Year 2014	
Commercial				
-Stage 2 with hush kit	138	0.12%	74	0.06%
-Heavy (incl. all B757s)	2,292	1.95%	2,498	1.91%
-MD80 series	5,312	4.51%	1,873	1.43%
-Other Stage 3	67,267	57.12%	56,191	42.97%
-Regional Jet	25,045	21.27%	41,236	31.54%
-Turboprop	5,146	4.37%	17,431	13.33%
Air Taxi	3,108	2.64%	2,424	1.85%
General Aviation	9,261	7.86%	8,814	6.74%
Military	204	0.17%	221	0.17%
<b>Total</b>	<b>117,773</b>	<b>100.00%</b>	<b>130,762</b>	<b>100.00%</b>

All aircraft above are Stage 3 certified with the exception of some Military and 0.9% of General Aviation (GA) aircraft, excluding helicopters. Stage 2 GA accordingly is 0.07% of the overall fleet. A hush kit reduces noise enough to meet Stage 3 levels, but well short of the noise level typical of aircraft originally manufactured as Stage 3.

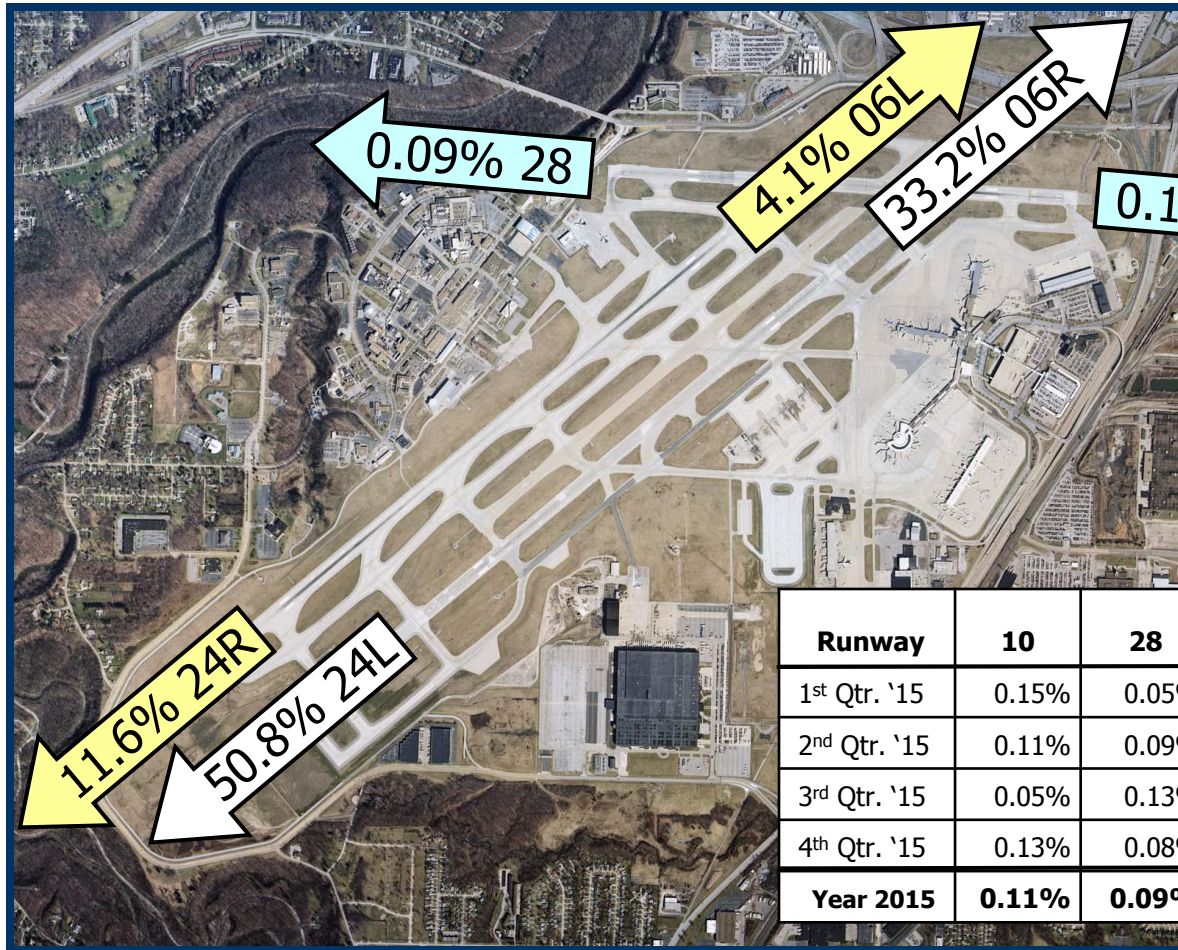
# Runway Use: Year 2015 Arrivals



Totals may be less than 100%, as helicopter operations do not use runways.



# Runway Use: Year 2015 Departures



Runway	10	28	24L	24R	6L	6R
1 <sup>st</sup> Qtr. '15	0.15%	0.05%	51.6%	11.9%	3.9%	32.4%
2 <sup>nd</sup> Qtr. '15	0.11%	0.09%	48.7%	8.9%	3.0%	39.2%
3 <sup>rd</sup> Qtr. '15	0.05%	0.13%	42.6%	11.8%	7.4%	37.9%
4 <sup>th</sup> Qtr. '15	0.13%	0.08%	60.9%	14.0%	2.0%	22.9%
<b>Year 2015</b>	<b>0.11%</b>	<b>0.09%</b>	<b>50.8%</b>	<b>11.6%</b>	<b>4.1%</b>	<b>33.2%</b>

Totals may be less than 100%, as helicopter operations do not use runways.

# Departure Headings, 4<sup>th</sup> Qtr: Day-time

## Jet Departures, 6:00 a.m. to 11:00 p.m.

A voluntary measure of the Noise Compatibility Program calls for jets departing between 6:00 a.m. and 11:00 p.m. from Runways 6L and 6R to take magnetic headings between 360° and 35° when turning left and between 65° and 95° when turning right until the jet is either 5 mi. away from the airport or has gained an altitude of 5,000 ft. above Mean Sea Level (MSL).

Another voluntary measure of the Noise Compatibility Program calls for jets departing between 6:00 a.m. and 11:00 p.m. from Runways 24L and 24R to take magnetic headings between 190° and 220° when turning left and between 250° and 280° when turning right until the jet is either 5 mi. away from the airport or has gained an altitude of 5,000 ft. MSL.

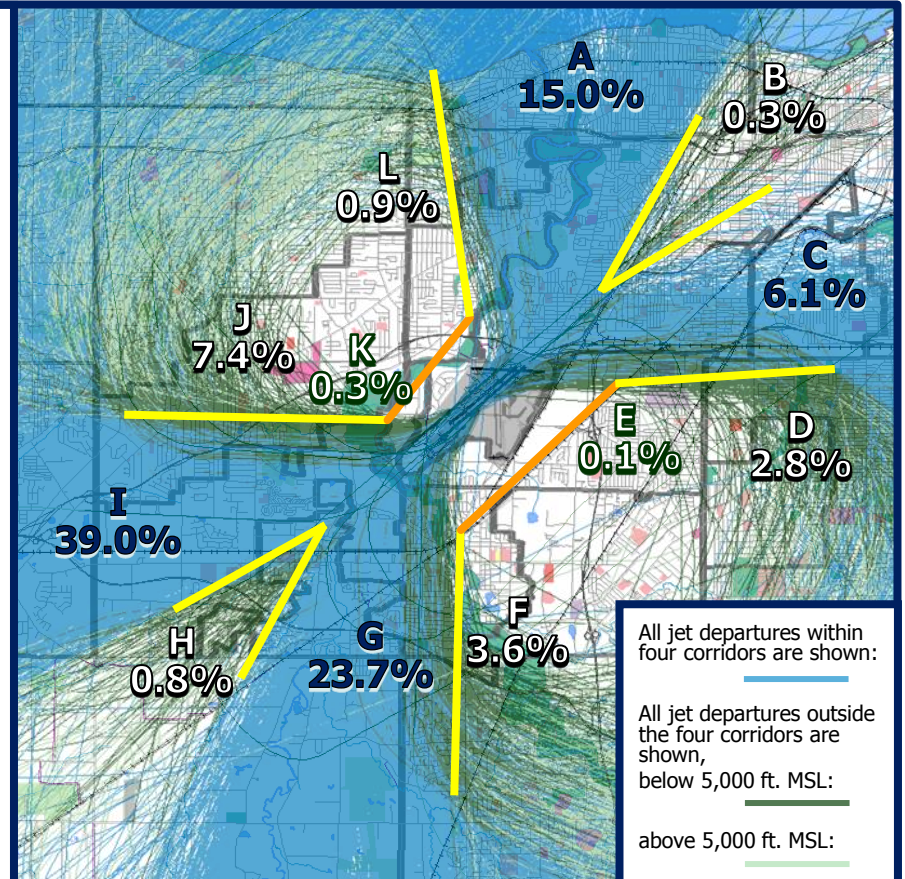
### **83.8% within corridors**

- A. 15.0%:** north corridor, including flights crossing the corridor boundaries above 5,000 ft. MSL
- C. 6.1%:** east corridor, including flights crossing the corridor boundaries above 5,000 ft. MSL
- G. 23.7%:** south corridor, including flights crossing the corridor boundaries above 5,000 ft. MSL
- I. 39.0%:** west corridor, including flights crossing the corridor boundaries above 5,000 ft. MSL

### **16.2% outside corridors**

- B. 0.3%:** flights crossing inner boundaries below 5,000 ft. MSL and then exiting between the north and east corridors
- D. 2.8%:** flights crossing the south boundary below 5,000 ft. MSL
- E. 0.1%:** flights turning south before entering the corridor
- F. 3.6%:** flights crossing the east boundary below 5,000 ft. MSL
- H. 0.8%:** flights crossing inner boundaries below 5,000 ft. MSL and then exiting between the west and south corridors
- J. 7.4%:** flights crossing the north boundary below 5,000 ft. MSL
- K. 0.3%:** flights turning north before entering the corridor
- L. 0.9%:** flights crossing the west boundary below 5,000 ft. MSL

(Percentages do not include Rwy 10/28 departures)





# Departure Headings, 4<sup>th</sup> Qtr: Night-time

## Jet Departures, 11:00 p.m. to 6:00 a.m.

A voluntary measure of the Noise Compatibility Program calls for jets departing between 11:00 p.m. and 6:00 a.m. from Runways 6L and 6R to take headings of roughly 095° to 100° until reaching an altitude of 5,000 ft. MSL.

Another voluntary measure of the Noise Compatibility Program calls for jets departing between 11:00 p.m. and 6:00 a.m. from Runways 24L and 24R to take headings between 200° and 220° until reaching an altitude of 5,000 ft. MSL.

### 60.3 % within corridors

**A. 11.4%:** 095 corridor, including flights crossing the 095 corridor boundaries above 5,000 ft. MSL

**F. 48.9%:** 200 corridor, including flights crossing the corridor boundaries above 5,000 ft. MSL

### 39.7 % outside corridors

**B. 6.1%:** flights crossing the south boundary below 5,000 ft. MSL

**C. 0.0%:** flights turning south before entering the 095 corridor

**D. 0.5%:** flights departing south without entering the 200 corridor

**E. 9.3%:** flights crossing the east boundary below 5,000 ft. MSL

**G. 12.2%:** flights crossing the west boundary below 5,000 ft. MSL

**H. 4.5%:** flights departing southwest without entering the corridor

**I. 4.5%:** flights departing west without entering the corridor

**J. 1.3%:** flights departing north, not east with the 095 corridor

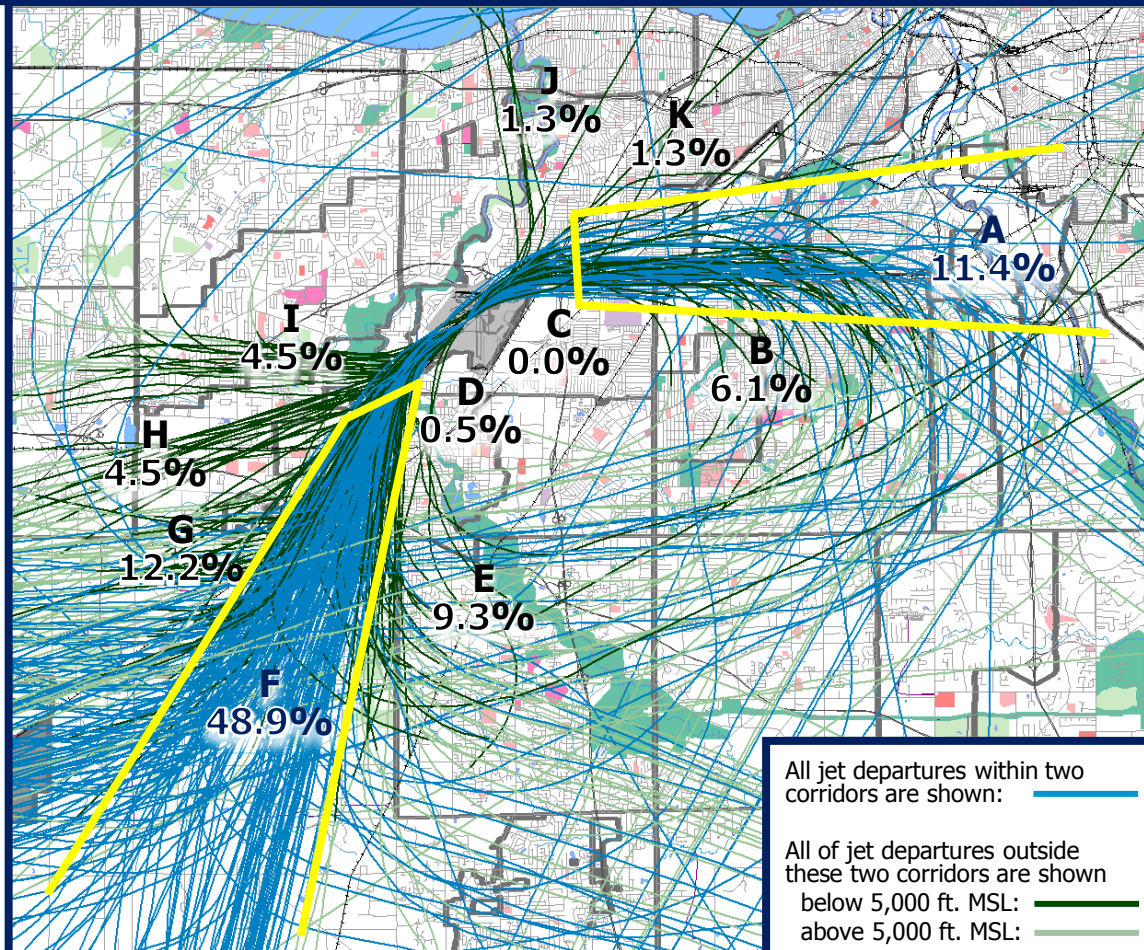
**K. 1.3%:** flights crossing the north boundary below 5,000 ft. MSL

(There was one Rwy 10 and no Rwy 28 jet departures between 11:00 p.m. and 6:00 a.m. during the quarter.)

The percentage of departures on each runway from 11:00 p.m. to 6:00 a.m. during the quarter were as follows:

Rwy	10	28	24L	24R	6L	6R
For jets:	0.3%	0.0%	69.9%	10.0%	0.5%	19.3%
For all aircraft:	0.2%	0.0%	69.7%	10.0%	0.5%	19.1%

**91.2% of Jet Departures from Rwy 6L/6R are on the preferred Rwy, 6R.**





# Arrival Headings, 4<sup>th</sup> Qtr: Night-time

## Arrivals, 10:00 p.m. to 6:59 a.m.

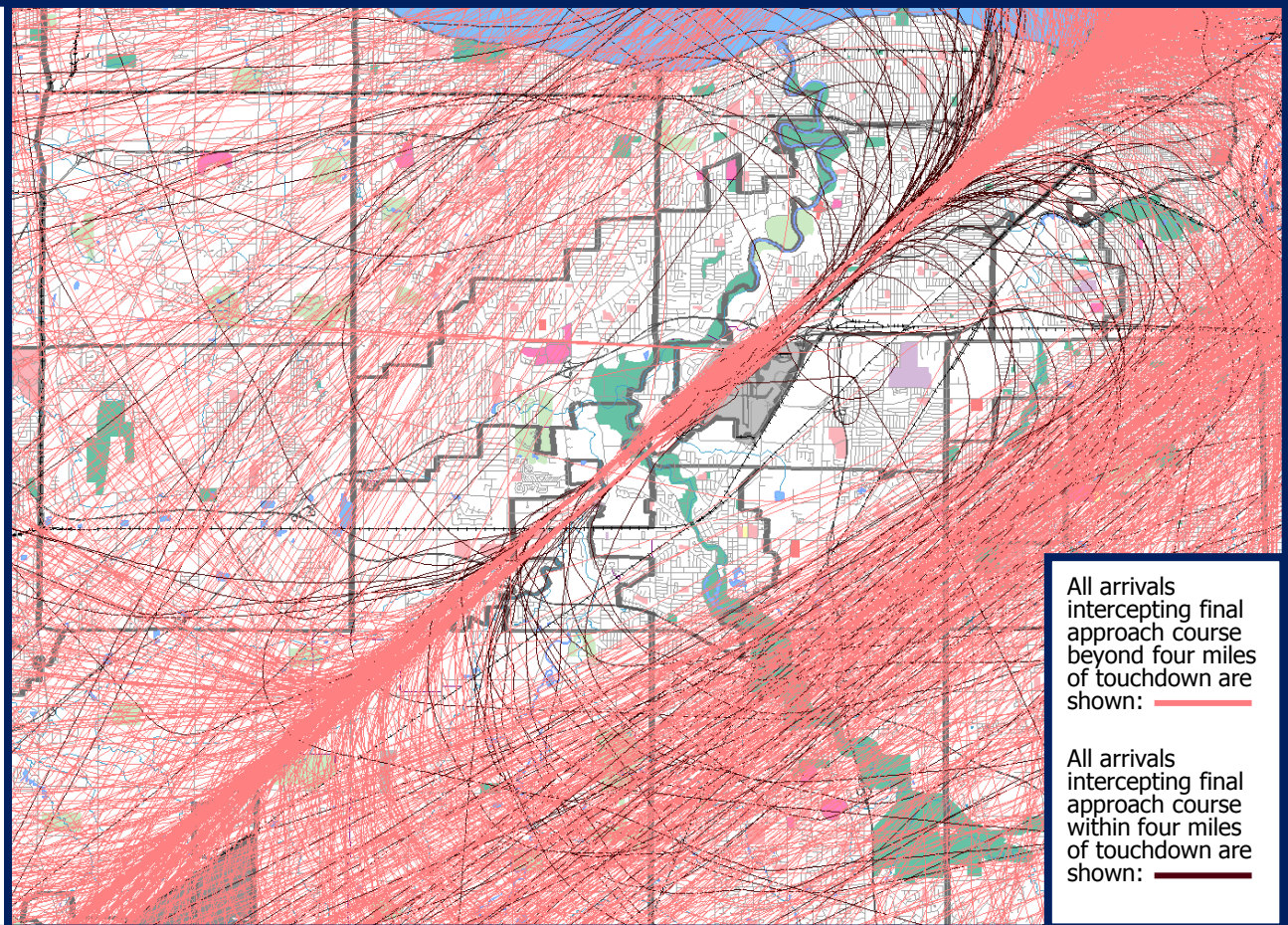
A voluntary measure of the Noise Compatibility Program calls for all aircraft arriving between 10:00 p.m. and 6:59 a.m., wind and weather permitting, to intercept final approach course no closer than four miles before touchdown.


**95.2% beyond four miles and  
4.8% within four miles**


There is no comparable NCP measure regarding day-time arrivals.

Runway use by all arriving aircraft from 10:00 p.m. to 6:59 a.m. during the quarter was as follows:

<b>Rwy</b>	<b>Percentage of Arrivals</b>	
	<b>Jets</b>	<b>All Aircraft</b>
<b>10</b>	0.2%	0.2%
<b>28</b>	0.0%	0.0%
<b>24L</b>	12.1%	12.3%
<b>24R</b>	61.5%	61.3%
<b>6L</b>	20.1%	19.9%
<b>6R</b>	6.1%	6.2%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>

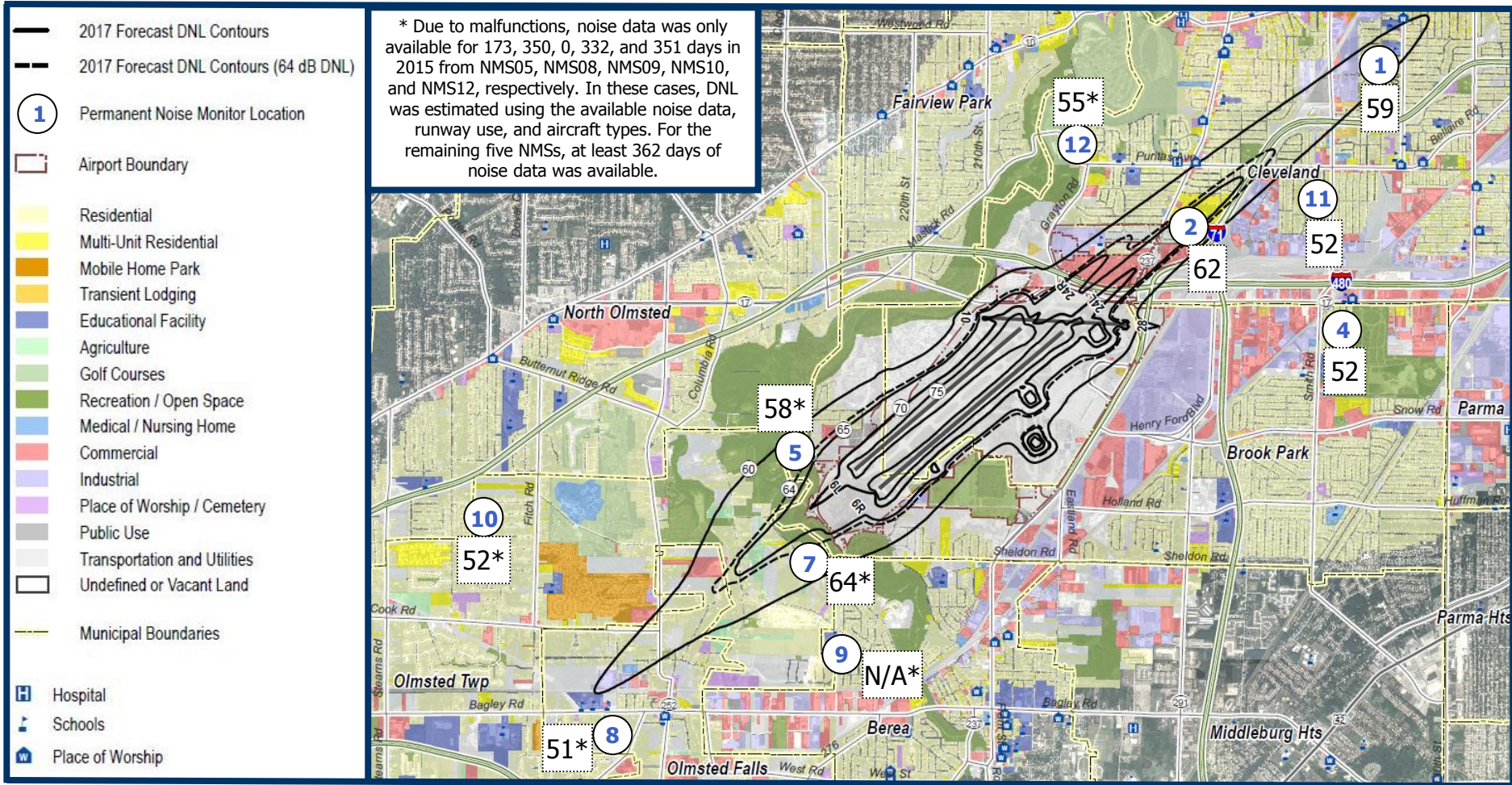


All arrivals intercepting final approach course beyond four miles of touchdown are shown: 

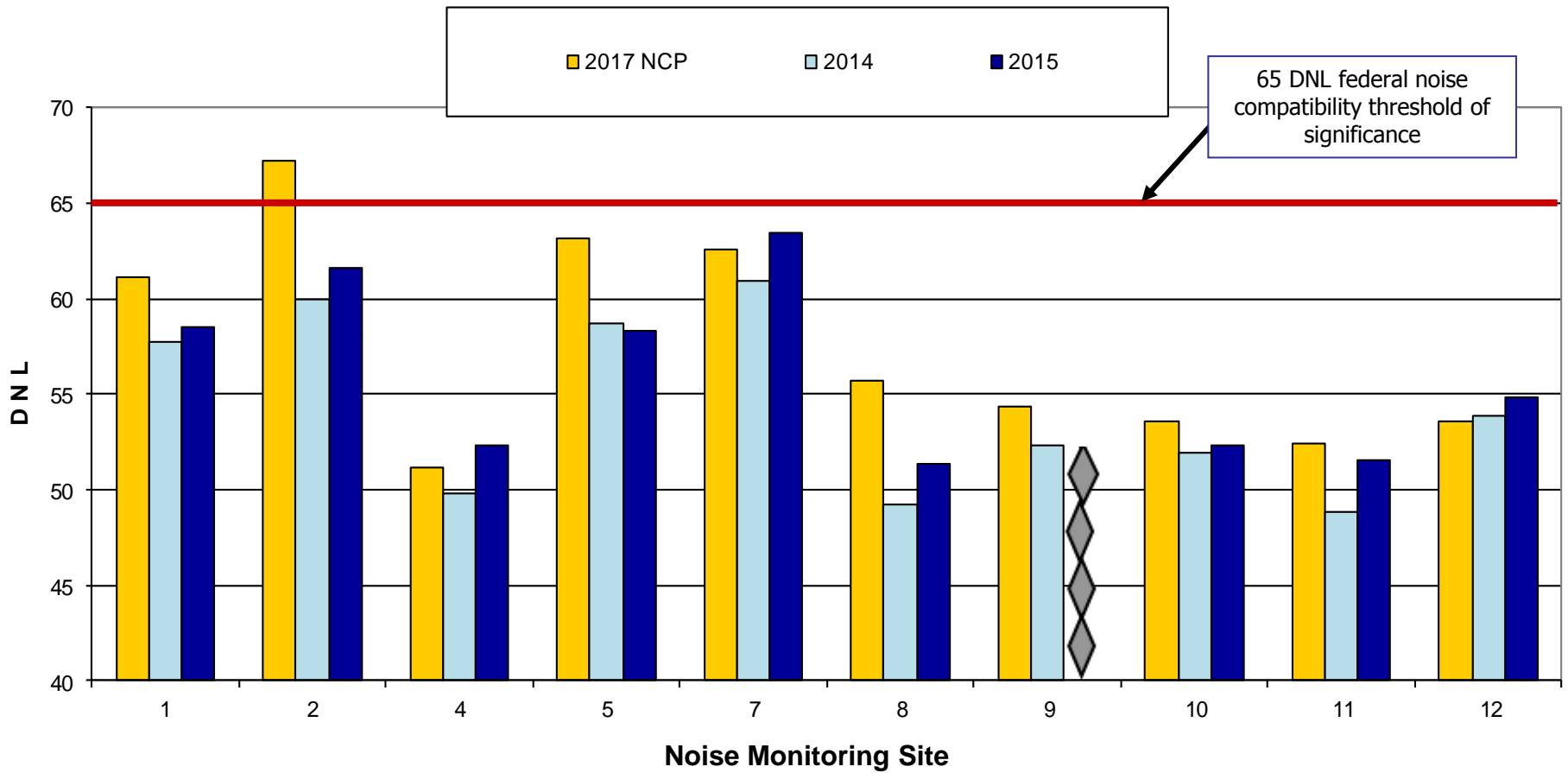
All arrivals intercepting final approach course within four miles of touchdown are shown: 



# Aircraft Noise – DNL by Noise Monitoring Site



# DNL: Year 2015 vs. Year 2014

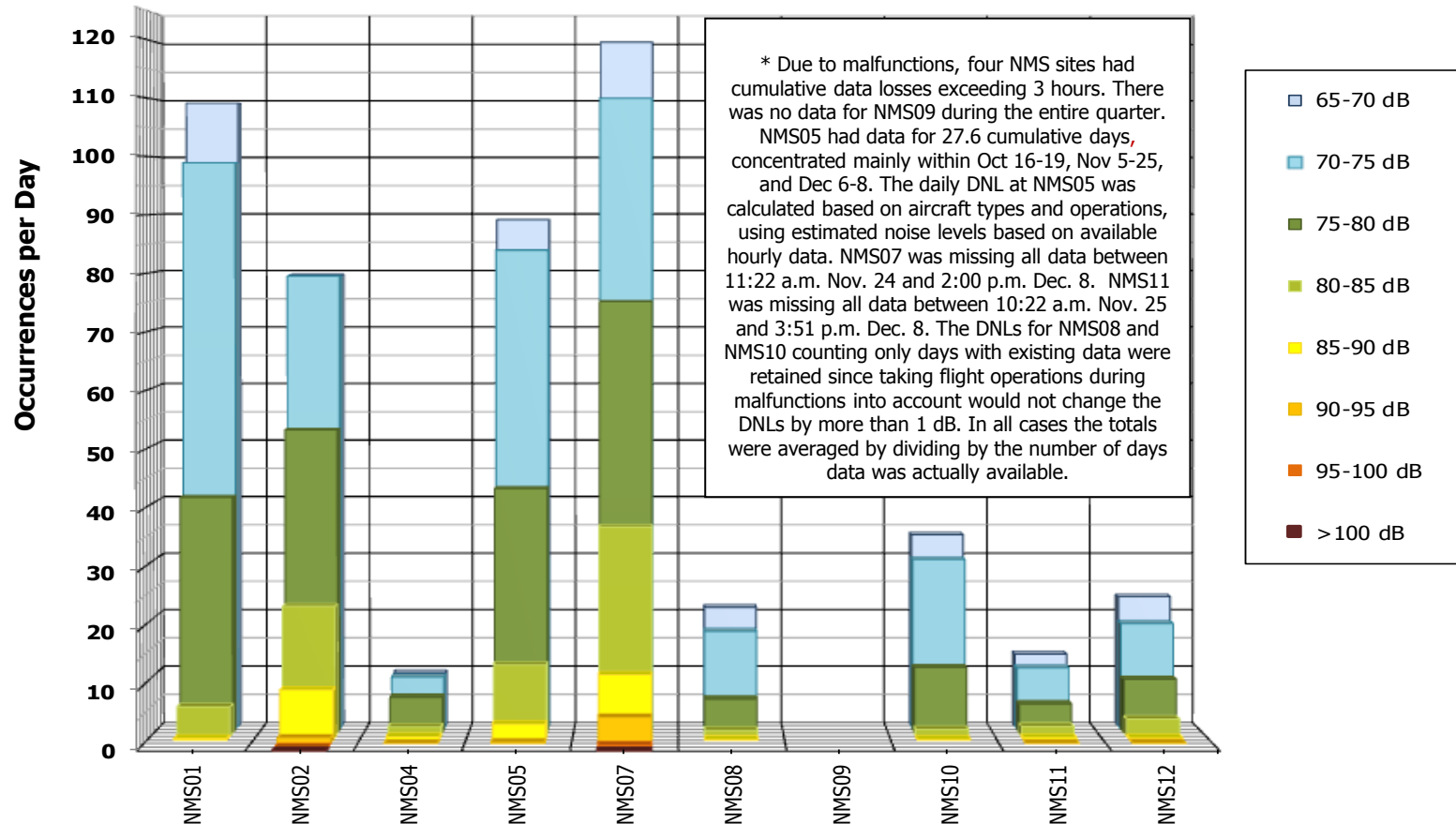


\* Due to malfunctions, noise data was only available for 173, 350, 0, 332, and 351 days in 2015 from NMS05, NMS08, NMS09, NMS10, and NMS12, respectively. In these cases, DNL was estimated using the available noise data, runway use, and aircraft types. For the remaining five NMSs, at least 362 days of noise data was available.



# Average Daily Number of Aircraft Noise Occurrences Above Each 5 dB Increment

## 4<sup>th</sup> Qtr. Noise Event Lmax Distribution



## Top 3 Lmaxs at each NMS, (1 of 2)

<b>NMS</b>	<b>Lmax (dB)</b>	<b>Aircraft</b>	<b>Operation</b>	<b>Time and date</b>	<b>Sound Exposure Level (dB)<sup>1</sup></b>	<b>Duration (sec)</b>
NMS01	89.6	MD-88	Arrival on Rwy 24R	11/12/15 10:14 PM	96.3	30.5
NMS01	89.4	MD-88	Arrival on Rwy 24R	12/10/15 8:34 PM	94.5	28.5
NMS01	89.4	MD-88	Arrival on Rwy 24L	10/19/15 8:42 PM	93.7	23.0
NMS02	100.0	Boeing 727-200	Departure off Rwy 6R	11/28/15 7:20 AM	106.3	41.5
NMS02	100.0	Boeing 727-200	Departure off Rwy 6R	11/21/15 2:23 PM	105.0	29.5
NMS02	96.1	Boeing 727-200	Departure off Rwy 6R	11/28/15 2:10 AM	101.7	37.5
NMS04	90.8	MD-88	Departure off Rwy 6R	10/25/15 3:33 PM	98.2	27.0
NMS04	90.0	MD-88	Departure off Rwy 6R	10/1/15 3:36 PM	96.8	31.5
NMS04	90.0	MD-88	Departure off Rwy 6R	11/29/15 3:37 PM	96.8	29.5
NMS05 <sup>2</sup>	92.4	MD-11	Departure off Rwy 6L	12/7/15 10:46 PM	101.8	44.5
NMS05 <sup>2</sup>	92.3	DC 9-10	Departure off Rwy 24R	11/18/15 11:37 AM	98.2	30.0
NMS05 <sup>2</sup>	91.3	MD-88	Departure off Rwy 24R	11/18/15 1:01 PM	99.2	32.0
NMS07 <sup>3</sup>	100.7	Boeing 727-200	Departure off Rwy 24R	11/24/15 4:12 AM	106.9	38.0
NMS07 <sup>3</sup>	99.0	Boeing 727-200	Departure off Rwy 24L	11/5/15 10:30 AM	105.4	37.5
NMS07 <sup>3</sup>	98.6	Boeing 727-200	Departure off Rwy 24L	12/9/15 3:56 PM	104.9	71.5

<sup>1</sup> Sound Exposure Level is a measure that takes into account all noise over the entire duration of an event.

<sup>2</sup> Due to equipment malfunctions, data for NMS05 is available for a cumulative total of 27.6 days of the quarter.

<sup>3</sup> Due to equipment malfunctions, data for NMS07 is available for a cumulative total of 77.9 days of the quarter.

## Top 3 Lmaxs at each NMS, (2 of 2)

NMS	Lmax (dB)	Aircraft	Operation	Time and date	Sound Exposure Level (dB) <sup>1</sup>	Duration (sec)
NMS08	88.4	MD-83	Departure off Rwy 24L	12/7/15 2:42 PM	95.9	40.5
NMS08	88.3	MD-88	Departure off Rwy 24L	10/16/15 8:05 AM	95.1	32.0
NMS08 <sup>2</sup>	87.7	MD-88	Departure off Rwy 24L	10/16/15 3:39 PM	93.7	29.5
NMS10	89.4	MD-83	Departure off Rwy 24R	11/11/15 11:34 AM	96.1	30.0
NMS10	86.5	DC 9-30	Departure off Rwy 24L	11/6/15 10:22 PM	93.5	39.0
NMS10 <sup>3</sup>	86.3	Boeing 727-200	Departure off Rwy 24L	12/2/15 1:47 PM	94.2	36.5
NMS11 <sup>4</sup>	90.5	MD-83	Departure off Rwy 6R	10/6/15 5:56 AM	98.8	43.0
NMS11 <sup>4</sup>	89.5	MD-88	Departure off Rwy 6R	10/25/15 1:10 PM	95.1	33.0
NMS11 <sup>4</sup>	89.2	MD-88	Departure off Rwy 6R	11/10/15 8:04 AM	97.1	35.5
NMS12	92.2	MD-82	Departure off Rwy 6R	10/27/15 4:15 PM	98.0	35.0
NMS12	92.2	MD-83	Departure off Rwy 6R	12/28/15 7:55 PM	97.6	33.0
NMS12	91.9	MD-83	Departure off Rwy 6R	10/27/15 7:13 PM	97.5	25.5

<sup>1</sup> Sound Exposure Level is a measure that takes into account all noise over the entire duration of an event.

<sup>2</sup> Due to equipment malfunctions, data for NMS09 is unavailable for the entire quarter.

<sup>3</sup> A Lmax of 86.4 dB for a CRJ-9 departing Rwy 24L would be third highest of the quarter for NMS10, but apparently included significant non-aircraft noise and was thus excluded.

<sup>4</sup> Due to equipment malfunctions, data for NMS11 is available for a cumulative total of 78.8 days of the quarter.

# Noise Complaints



City	1 <sup>st</sup> Qtr.	2 <sup>nd</sup> Qtr.	3 <sup>rd</sup> Qtr.	4 <sup>th</sup> Qtr.	2015 Calls	%	2014 Calls	%	2015 Callers	%	2014 Callers	%
Berea	0	0	0	0	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Brook Park	0	0	0	0	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Cleveland	10	5	11	9	35	34.0%	67	54.9%	11	28.2%	15	35.7%
Cleveland Heights	0	0	0	0	0	0.0%	1	0.8%	0	0.0%	1	2.4%
Columbia Station	0	1	2	0	3	2.9%	2	1.6%	1	2.6%	1	2.4%
Fairview Park	1	3	4	1	9	8.7%	19	15.6%	7	17.9%	15	35.7%
Lakewood	0	0	1	0	1	1.0%	0	0.0%	1	2.6%	0	0.0%
Olmsted Falls	1	1	9	8	19	18.4%	3	2.5%	6	15.4%	2	4.8%
Olmsted Twp.	0	2	8	9	19	18.4%	3	2.5%	4	10.3%	2	4.8%
Parma	0	0	2	0	2	1.9%	0	0.0%	1	2.6%	0	0.0%
Rocky River	0	5	7	1	13	12.6%	25	20.5%	6	15.4%	4	9.5%
Strongsville	0	0	1	0	1	1.0%	0	0.0%	1	2.6%	0	0.0%
Westlake	0	0	0	0	0	0.0%	2	1.6%	0	0.0%	2	4.8%
Valley City	0	0	1	0	1	1.0%	0	0.0%	1	2.6%	0	0.0%
<b>Totals</b>	<b>12</b>	<b>17</b>	<b>46</b>	<b>28</b>	<b>103</b>	<b>100.0%</b>	<b>122</b>	<b>100.0%</b>	<b>39</b>	<b>100.0%</b>	<b>42</b>	<b>100.0%</b>

Totals may not add to 100.0%, due to rounding.





Noise Hotline – (216) 898-5220

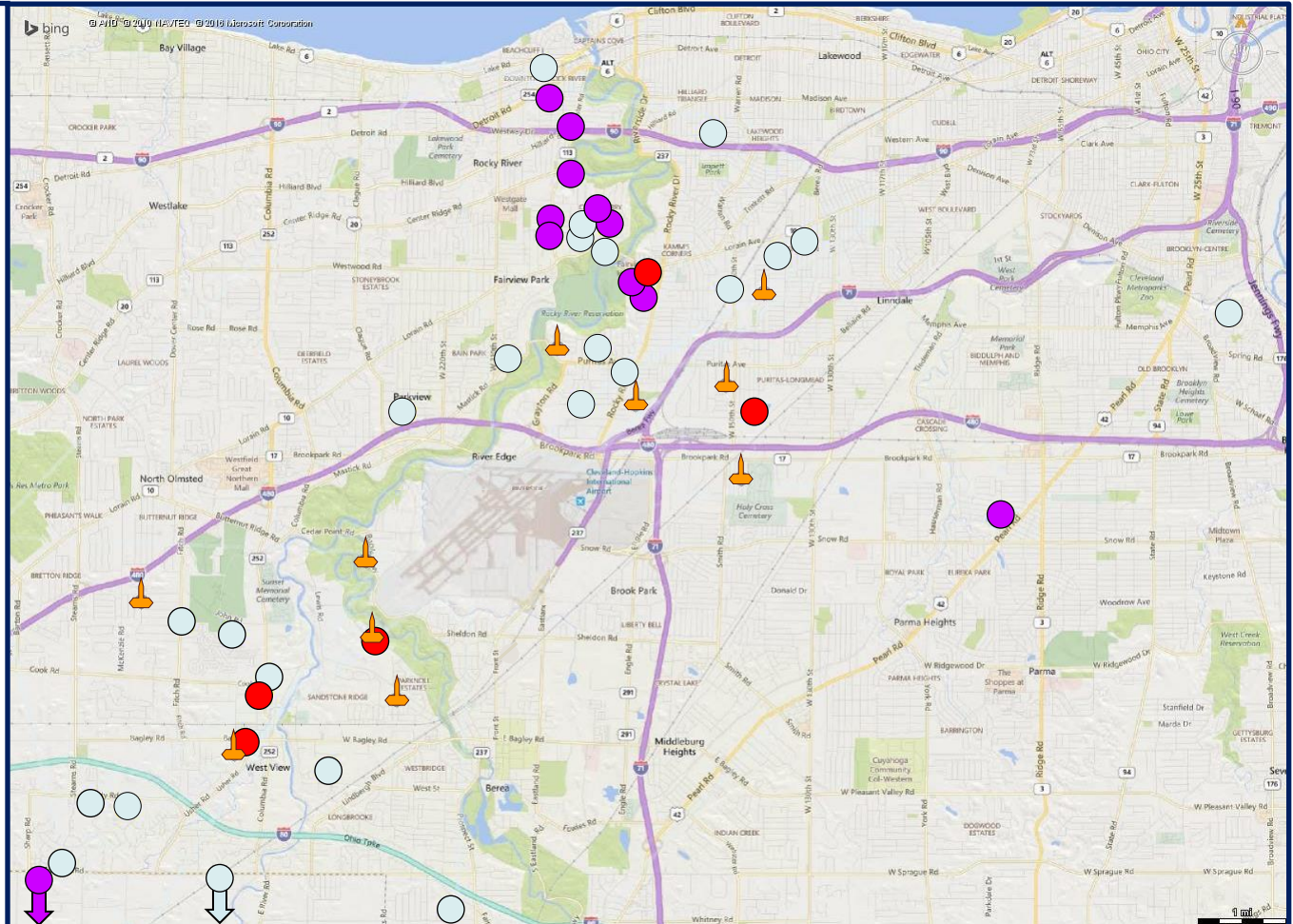


# Complaint Map

## LEGEND

Complaints per household

-  1 complaint
-  2 to 5 complaints
-  6 or more complaints
-  Noise Monitoring Station



# 2016 Forward Plan



- Continue implementation of Part 150 measures that obtained FAA approval.
- Continue coordination with the Air Traffic Control Tower.
- Maintain dialogue with the FAA regarding the Cleveland-Detroit Metroplex airspace plan.
- Will be seeking proposals to upgrade/replace Noise and Operations Monitoring System.
- Runway 6L/24R at Cleveland Hopkins International Airport could be closed for two weeks for construction sometime between August and November, 2016. Intermittent closures of Taxiways C, N, P, R, and T will occur during this period.
- No construction is planned for Burke Lakefront Airport (BKL) in 2016.
- Labor Day weekend air show to be held at BKL featuring the U. S. Navy Blue Angels.

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