

ACR Baseline Figure Changes and Slate Recommendation Analysis: Noise Abatement Departure Profiles (NADPs)

For ACR Review, Understanding, and Discussion

June 19, 2019



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2018 Baseline Operations Analysis Figure Changes

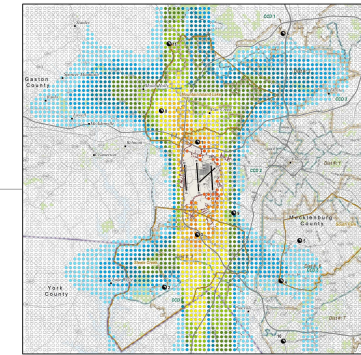


Figure changes requested by the ACR at the 2019 April and May ACR meetings



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ACR Requests of the CLT Technical Consultant – 2018 Baseline

- ACR requested baseline analysis figure changes for more ease of seeing differences for better review and interpretation
- Develop a new figure showing the average daily number of aircraft overflights at grid analysis points
- Correct population counts

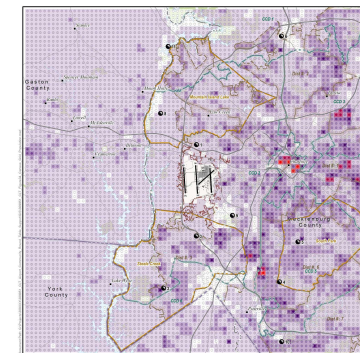


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2010 US Census Population Levels at Grid Analysis Points

Population Interval	Count of Grid Points
0	323
1-200	4,578
201-400	1,154
401-600	186
601-800	39
801-1000	16
Greater than 1,000	5
Total	6,301
Total Grid Population	736,785



CLT
CHARLOTTE DOUGLAS INTERNATIONAL AIRPORT

Population at CLT Grid Analysis Points

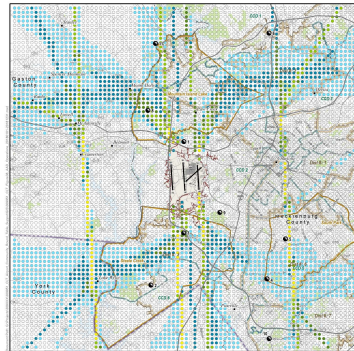
- Legend:
 - County Boundary
 - City Boundary
 - Highway
 - Major Road
 - Water Feature
 - Water
 - Water Stream
 - Charlotte Landmarks:
 - Bank of America Stadium
 - Charlotte Motor Speedway
 - Charlotte-Mecklenburg Convention Center
 - Charlotte-Mecklenburg Cultural Center
 - Charlotte-Mecklenburg Library
 - Charlotte-Mecklenburg Police Department
 - Charlotte-Mecklenburg Fire Department
 - Charlotte-Mecklenburg Water Department
 - Charlotte-Mecklenburg Sewer Department
 - Charlotte-Mecklenburg Public Works Department
 - Charlotte-Mecklenburg Parks and Recreation Department
 - Charlotte-Mecklenburg Animal Services Department
 - Charlotte-Mecklenburg Health Department
 - Charlotte-Mecklenburg Housing Department
 - Charlotte-Mecklenburg Planning and Zoning Department
 - Charlotte-Mecklenburg Economic Development Department
 - Charlotte-Mecklenburg Information Technology Department
 - Charlotte-Mecklenburg Human Resources Department
 - Charlotte-Mecklenburg Finance Department
 - Charlotte-Mecklenburg Administration Department

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Average Daily Aircraft Overflights: 2018 Baseline Operations

Overflight Interval (Operations)	Count of Grid Points	Count of Population
Less than 5	3,645	449,595
6-15	1,615	171,642
16-30	544	61,702
31-60	168	18,040
61-120	215	22,935
121-240	114	12,871
241-360	0	0
Greater than 360	0	0
Total	6,301	736,785

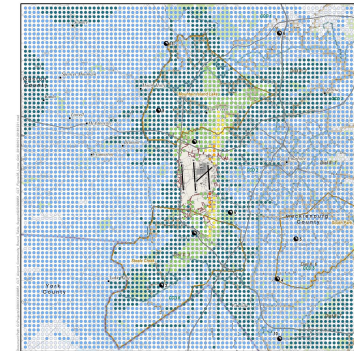


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Lmax Noise Analysis: 2018 Baseline Operations

Lmax Interval (dB)	Count of Grid Points	Count of Population
Less Than 60.0	0	0
60.1-70.0	197	23,014
70.1 – 80.0	4,177	511,064
80.1 – 90.0	1,635	172,082
90.1 – 100.0	247	26,882
100.1 – 110.0	37	3,593
110.1 – 120.0	7	150
120.1 – 130.0	1	0
130.1 – 140.0	0	0
140.1 – 150.0	0	0
Total	6,301	736,785

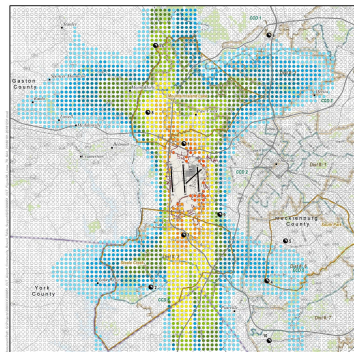


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Number of Events Above Analysis (N70): 2018 Baseline Operations

N70 Interval (Events)	Count of Grid Points	Count of Population
25 or Less	3,568	442,625
26-50	913	105,207
51-75	437	56,609
76-100	315	29,842
101-150	339	37,893
151-200	280	24,352
201-300	217	22,099
301-400	147	13,834
401-500	68	4,022
Greater than 500	17	302
Total	6,301	736,785

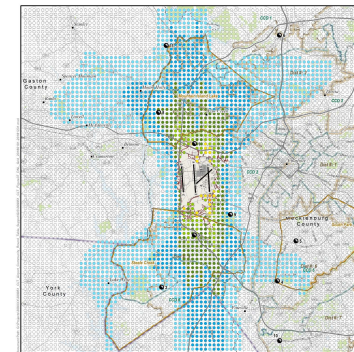


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DNL (DNL 45 dB and greater) Noise Analysis: 2018 Baseline Operations

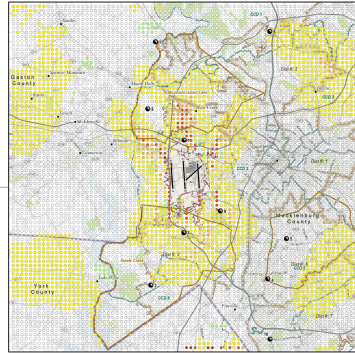
DNL Interval (dB)	Count of Grid Points	Count of Population
Less than 45	3,885	491,620
45.1-50.0	1,425	148,933
50.1-55.0	613	62,380
55.1-60.0	268	26,856
60.1-65.0	89	6,532
65.1-70.0	19	458
70.1-75.0	2	6
Greater than 75	0	0
Total	6,301	736,785



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ACR Slate Recommendation Analysis: Noise Abatement Departure Profiles (NADPs)



Slate recommendation adopted by ACR at March 2019 meeting



ACR Slate Recommendation – Noise Abatement Departure Profiles

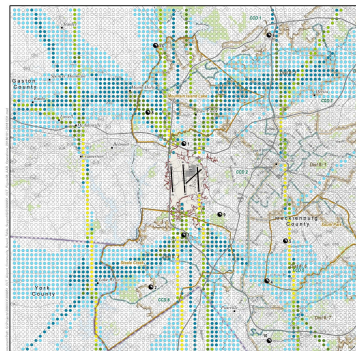
- Model and generate noise results for calendar year 2018 aircraft operations modified for all departure aircraft to utilize NADP1 or NADP2 (where NADP profiles are available in the noise model)
- Compare NADP results to calendar year 2018 baseline operations to evaluate changes in noise and population exposure expected by implementing NADP1 or NADP2



Average Daily Aircraft Overflights: 2018 Operations with NADP1 and NADP2

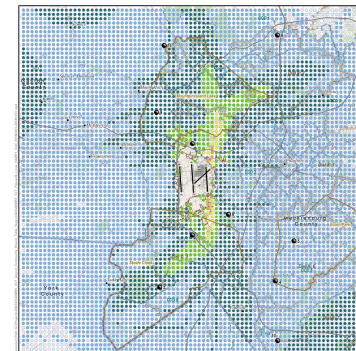
Overflight Interval (Operations)	Count of Grid Points	Count of Population
Less than 5	3,645	449,595
6-15	1,615	171,642
16-30	544	61,702
31-60	168	18,040
61-120	215	22,935
121-240	114	12,871
241-360	0	0
Greater than 360	0	0
Total	6,301	736,785

* No changes from 2018 baseline, 2018 baseline Figure shown

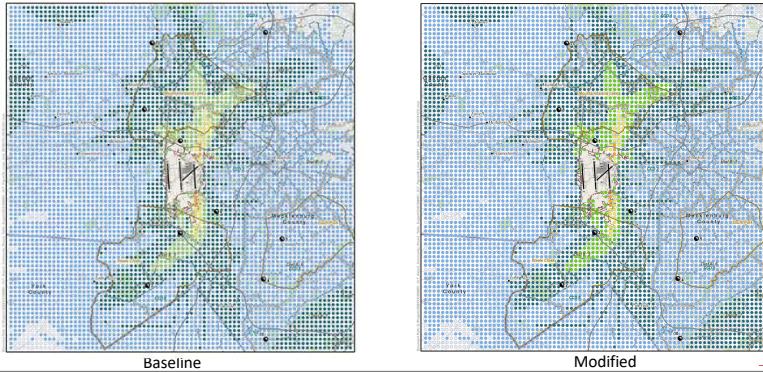


Lmax Noise Analysis: 2018 Operations with NADP1

Lmax Interval (dB)	Count of Grid Points	Count of Population
Less Than 60.0	0	0
60.1-70.0	186	20,763
70.1 – 80.0	4,231	516,450
80.1 – 90.0	1,593	168,993
90.1 – 100.0	246	26,836
100.1 – 110.0	37	3,593
110.1 – 120.0	7	150
120.1 – 130.0	1	0
130.1 – 140.0	0	0
140.1 – 150.0	0	0
Total	6,301	736,785



Lmax Noise Analysis: 2018 Operations with NADP1 Compared to Baseline



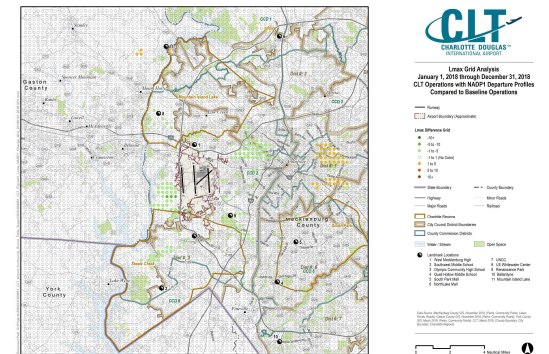
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Lmax Noise Analysis: 2018 Operations with NADP1 Compared to Baseline

Lmax Difference Interval (dB)	Count of Grid Points	Count of Population
Less than -10	0	0
-5 to -10	3	20
-1 to -5	128	15,747
-1 to 1	6,122	707,103
1 to 5	48	13,915
5 to 10	0	0
Greater than 10	0	0
Total	6,301	736,785

- 131 Grid points/15,767 people would experience reduced noise levels with NADP1
- 48 Grid points/13,915 people would experience increased noise levels with NADP1

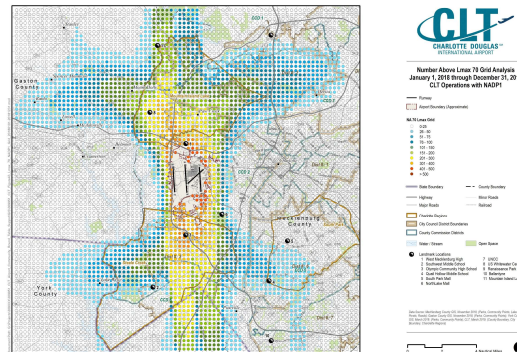


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Number of Events Above Analysis (N70): 2018 Operations with NADP1

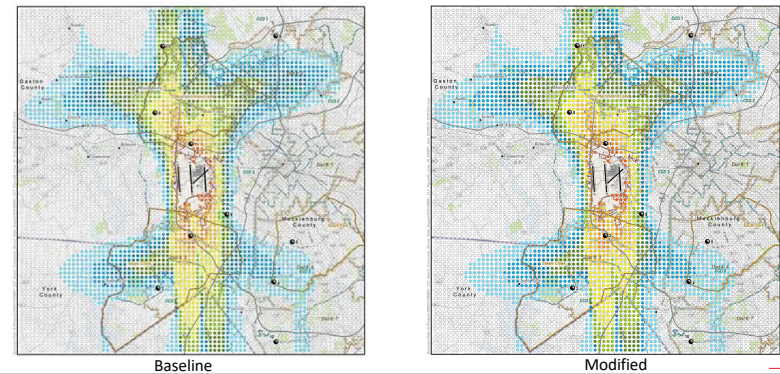
N70 Interval (Events)	Count of Grid Points	Count of Population
25 or Less	3,456	431,917
26-50	976	107,513
51-75	467	60,789
76-100	323	33,060
101-150	330	35,524
151-200	282	24,761
201-300	227	24,330
301-400	145	13,678
401-500	75	4,901
Greater than 500	20	312
Total	6,301	736,785



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Number of Events Above Analysis (N70): 2018 Operations with NADP1 Compared to Baseline



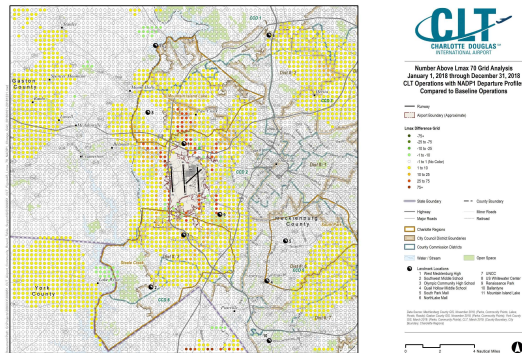
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Number of Events Above Analysis (N70): 2018 Operations with NADP1 Compared to Baseline

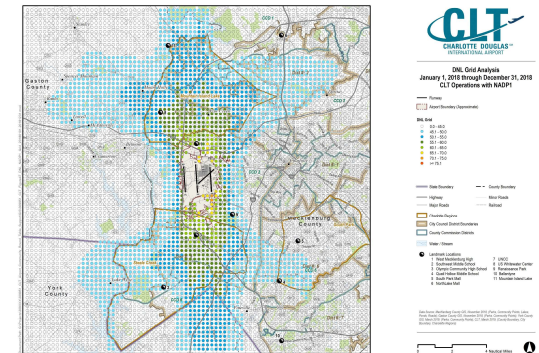
N70 Difference Interval (Events)	Count of Grid Points	Count of Population
Less than -75	0	0
-75 to -25	0	0
-25 to -10	1	76
-10 to -1	56	3,025
-1 to 1	4,026	478,268
1 to 10	2,002	232,898
10 to 25	155	18,124
25 to 75	56	4,361
Greater than 75	5	33
Total	6,301	736,785

- 57 Grid points/3,101 people would experience fewer events above 70 dB Lmax with NADP1
- 2,218 Grid points/255,416 people would experience more events above 70 dB Lmax with NADP1

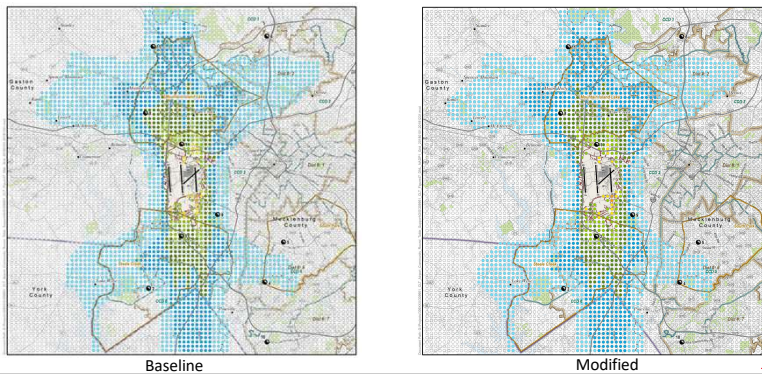


DNL (DNL 45 dB and greater) Noise Analysis: 2018 Operations with NADP1

DNL Interval (dB)	Count of Grid Points	Count of Population
Less than 45	3,816	482,709
45.1-50.0	1,444	152,013
50.1-55.0	643	66,144
55.1-60.0	281	28,275
60.1-65.0	99	7,364
65.1-70.0	16	274
70.1-75.0	2	6
Greater than 75	0	0
Total	6,301	736,785



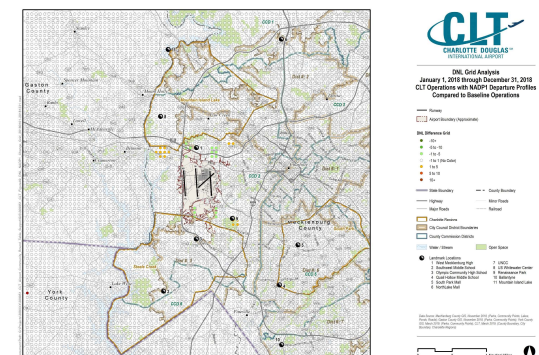
DNL (DNL 45 dB and greater) Noise Analysis: 2018 Operations with NADP1 Compared to Baseline



DNL (DNL 45 dB and greater) Noise Analysis: 2018 Operations with NADP1 Compared to Baseline

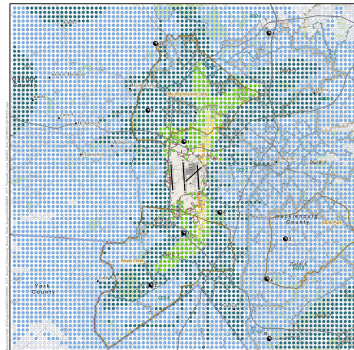
DNL Difference Interval (dB)	Count of Grid Points	Count of Population
Less than -10	0	0
-5 to -10	0	0
-1 to -5	16	589
-1 to 1	6,270	734,936
1 to 5	14	1,245
5 to 10	0	0
Greater than 10	1	15
Total	6,301	736,785

- 16 Grid points/589 people would experience reduced noise levels with NADP1
- 15 Grid points/1,260 people would experience increased noise levels with NADP1



Lmax Noise Analysis: 2018 Operations with NADP2

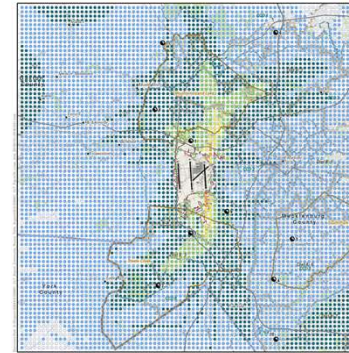
Lmax Interval (dB)	Count of Grid Points	Count of Population
Less Than 60.0	0	0
60.1-70.0	200	23,090
70.1 – 80.0	4,185	512,286
80.1 – 90.0	1,623	170,676
90.1 – 100.0	248	26,990
100.1 – 110.0	37	3,593
110.1 – 120.0	7	150
120.1 – 130.0	1	0
130.1 – 140.0	0	0
140.1 – 150.0	0	0
Total	6,301	736,785



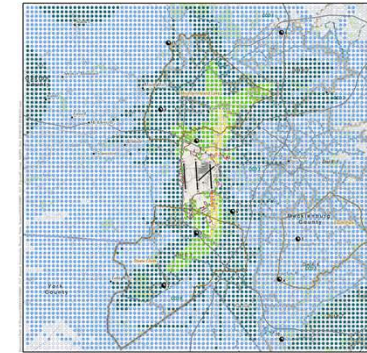
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Lmax Noise Analysis: 2018 Operations with NADP2 Compared to Baseline



Baseline



Modified

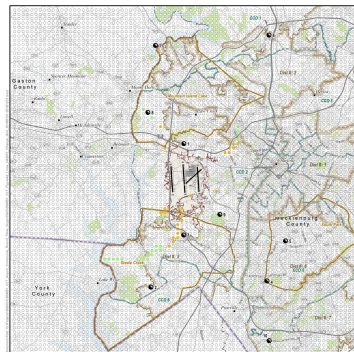
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Lmax Noise Analysis: 2018 Operations with NADP2 Compared to Baseline

Lmax Difference Interval (dB)	Count of Grid Points	Count of Population
Less than -10	0	0
-5 to -10	0	0
-1 to -5	23	2,623
-1 to 1	6,248	732,049
1 to 5	30	2,113
5 to 10	0	0
Greater than 10	0	0
Total	6,301	736,785

- 23 Grid points/2,623 people would experience reduced noise levels with NADP2
- 30 Grid points/2,113 people would experience increased noise levels with NADP2

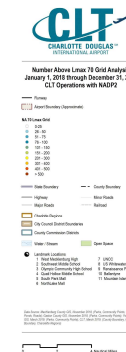
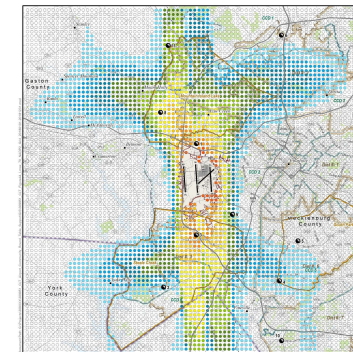


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Number of Events Above Analysis (N70): 2018 Operations with NADP2

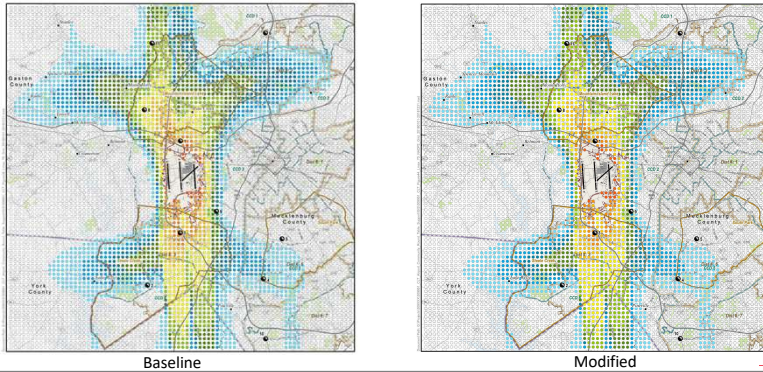
N70 Interval (Events)	Count of Grid Points	Count of Population
25 or Less	3,585	443,966
26-50	907	104,519
51-75	440	57,430
76-100	305	28,922
101-150	336	37,550
151-200	276	23,674
201-300	223	22,710
301-400	143	13,474
401-500	68	4,232
Greater than 500	18	308
Total	6,301	736,785



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Number of Events Above Analysis (N70):
2018 Operations with NADP2 Compared to Baseline



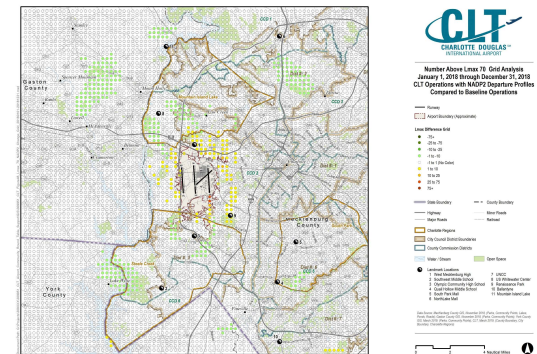
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Number of Events Above Analysis (N70):
2018 Operations with NADP2 Compared to Baseline

N70 Difference Interval (Events)	Count of Grid Points	Count of Population
Less than -75	0	0
-75 to -25	0	0
-25 to -10	0	0
-10 to -1	325	24,765
-1 to 1	5,859	702,721
1 to 10	110	9,282
10 to 25	5	11
25 to 75	2	6
Greater than 75	0	0
Total	6,301	736,785

- 325 Grid points/24,765 people would experience fewer events above 70 dB Lmax with NADP2
- 117 Grid points/9,299 people would experience more events above 70 dB Lmax with NADP2

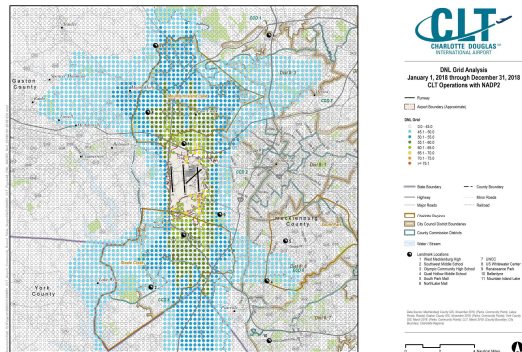


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DNL (DNL 45 dB and greater) Noise Analysis:
2018 Operations with NADP2

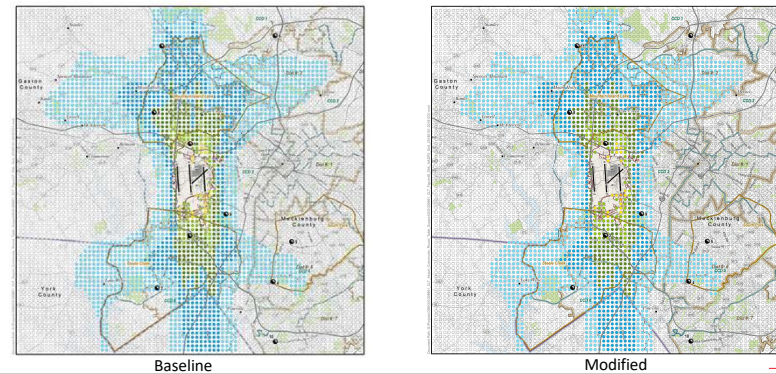
DNL Interval (dB)	Count of Grid Points	Count of Population
Less than 45	3,893	492,020
45.1-50.0	1,422	149,871
50.1-55.0	611	60,674
55.1-60.0	263	27,170
60.1-65.0	91	6,586
65.1-70.0	19	458
70.1-75.0	2	6
Greater than 75	0	0
Total	6,301	736,785



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DNL (DNL 45 dB and greater) Noise Analysis:
2018 Operations with NADP2 Compared to Baseline



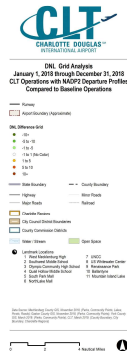
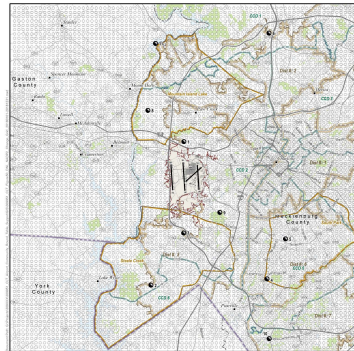
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DNL (DNL 45 dB and greater) Noise Analysis: 2018 Operations with NADP2 Compared to Baseline

DNL Difference Interval (dB)	Count of Grid Points	Count of Population
Less than -10	0	0
-5 to -10	0	0
-1 to -5	0	0
-1 to 1	6,301	736,785
1 to 5	0	0
5 to 10	0	0
Greater than 10	0	0
Total	6,301	736,785

• No grid points or people exposed to increased or decreased noise levels with NADP2 and DNL metric



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ACR Slate Recommendation Analysis – NADP Analysis Results

- Results are consistent with prior ACR analysis of NADPs
- NADP1
 - Maximum sound levels decreased on initial departure close to the airport compared to standard departure profiles
 - Maximum sound levels increased as aircraft navigated away from the airport and reached higher altitudes compared to standard departure profiles
- NADP2
 - Maximum sound levels increased on initial departure close to the airport compared to standard departure profiles
 - Maximum sound levels decreased as aircraft navigated away from the airport and reached higher altitudes compared to standard departure profiles



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ACR Slate Recommendation Analysis – NADP Analysis Observations

- NADP1 compared to 2018 baseline
 - A greater number of grid points and higher population experienced a decrease in Maximum Sound Level (Lmax) than experienced an increase
 - A greater number of grid points and higher population experienced an increase in Number of Events Above (N70) than experienced a decrease
 - Approximately the same number of grid points, and higher population experienced an increase in DNL (45 dB and greater) than experienced a decrease
- NADP2 compared to 2018 baseline
 - Approximately equal numbers of grid points and population would experience an increase or decrease in Maximum Sound Level (Lmax)
 - A greater number of grid points and higher population experienced a decrease in Number of Events Above (N70) than experienced an increase
 - No appreciable change in DNL (45 dB and greater)



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ACR Slate Recommendation Analysis – NADP Analysis Considerations for the ACR

- Do the reported changes from the 2018 baseline to NADP1 or NADP2 meet the goals of the ACR?
- Does the ACR want to recommend implementation of an NADP? If so, which NADP will the ACR recommend?



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Discussion

CLT Technical Consultant to the ACR



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