Update 2024 Nov 20 Criterion Development

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Goals

- Mitigate annoyance or residents
- Avoid false positives
  - Note a wide variation in pre-existing background levels
- Minimize enforcement “judgement calls”
- Avoid procedural “dead ends”
- Provide for protecting areas quieter than Ordinance levels
- Provide for protecting areas already louder than Ordinance levels

Factors to Consider

- A-weighted Sound Levels / L_{DN}
  - $L_{DN} \geq L_{pA,eq}$
    - L_{eq} is an average level
    - Includes short-term events
    - 10 dB “penalty” at night
    - 5-point L_{DN} increase can lead to widespread complaints
  - Compatible ranges tabulated in national standards
- Low-frequency noise
  - C-weighted level limits ($L_{pC,eq}$), and
  - Octave-band *median* level limits ($L_{p,50}$) to control continuous noise
  - Based on guidelines and research

Typical Levels vs. Population Density, Measurements

- DNL is same as L_{dn}
  - Day-Night Average
  - +10 dB at Night

Manassas Park (6800/sq mi)

Manassas (4300/sq mi)

County (1600/sq mi)

Name	Area (km^2)	Population 2000 Census	Population 2010 Census	Population 2020 Census
Manassas (city)	25.59	35,135	37,821	42,772
Manassas Park (city)	6.55	10,290	14,273	17,219
Prince William County	871.27	280,813	402,002	482,204
Totals	903.41	326,238	454,096	542,195

Table C.1 — A-weighted day, night, and day-night average sound levels in decibels and corresponding approximate population densities as indicated

Residential land use category	DNL range (dB)	Typical DNL (dB)	Day level (dB)	Night level (dB)	People per square mile	People per square km
1. Very noisy urban residential	>65	67	66	58	63,840	24,650
2. Noisy urban residential	60 to 65	62	61	54	20,000	7,722
3. Urban and noisy suburban residential	55 to 60	57	55	49	6,384	2,465
4. Quiet urban and normal suburban residential	50 to 55	52	50	44	2,000	772
5. Quiet suburban residential	45 to 50	47	45	39	638	247
6. Very quiet suburban and rural residential	<45	42	40	34	200	77

Many PWC Residential Areas

wikipedia

Compatible Noise levels (L_{DN})

- Context: e.g., Suburban $L_{NDN} \approx L_{DN} + 5$

Receptor	Compatible L_{DN}	Marginal L_{DN}
Residential	50	55
Mixed Use	60	65

- Criteria

Receptor	$L_{pA,eq}$	$L_{pC,eq}$	$L_{p,50}$
Residential	✓	✓	✓
Mixed Use	✓	✓	---
Commercial	✓	✓	---
Industrial	✓	✓	---

Data – Residential

						Lp,50 OBSPL										
Date	Time	Class	Location	LpA'eq	LpC,eq	31.5	63	125	250	500	1000	2000	4000	8000	LpA'50	LpC'50
10/9/24	Day	Residential	Kingsbrooke	52	65	66	54	50	44	41	38	33	27	19	43	63
11/5/24	Day	Residential	Montclair Subdivision	44	57	49	49	45	39	33	36	34	32	28	38	52
11/5/24	Day	Residential	Cloverdale	39	54	51	50	47	40	32	35	35	32	31	38	53
11/5/24	Day	Residential	Rollingwood	47	62	55	57	55	47	37	36	32	31	26	43	60
10/9/24	Day	Education	Yung Elementary	46	63	61	56	54	46	42	40	33	26	23	45	61
11/5/24	Day	Education	Piney Branch (Const)	45	63	59	60	52	45	38	33	30	24	17	42	62
11/5/24	Day	Education	Beville MS	48	64	57	55	47	38	30	35	34	26	16	38	58
11/5/24	Day	Education	Montclairy Library	43	59	56	55	49	45	39	36	33	24	17	42	58
10/9/24	Day	Park	Rollins Ford	47	62	56	56	56	49	39	38	31	23	14	45	60
11/5/24	Day	Park	Locust Shade	52	63	60	58	54	49	49	48	42	36	30	51	62
						Lp,50 OBSPL										
Date	Time	Class	Location	LpA'eq	LpC,eq	31.5	63	125	250	500	1000	2000	4000	8000	LpA'50	LpC'50
10/23/24	Night	Residential	Kingsbrooke	35	49	47	46	41	36	34	29	28	32	23	35	49
11/12/24	Night	Residential	Kingsbrooke	45	58	45	43	41	39	35	38	42	44	38	40	48
10/23/24	Night	Education	Yung Elementary	40	55	51	50	47	39	39	34	29	28	17	39	53
10/23/24	Night	Park	Rollins Ford	39	60	58	54	49	43	36	31	27	25	18	39	58

Median All Sensitive Locations + 5 dB

					Lp,50 OBSPL										
Time	Class	MEDIAN	LpA'eq	LpC,eq	31.5	63	125	250	500	1000	2000	4000	8000	LpA'50	LpC'50
Day	Residential		45	59	53	52	49	42	35	36	33	31	27	42	55
Day	All Sensitive		45	62	57	55	49	44	38	36	33	27	21	42	58
Day	All		46	62	57	55	51	45	39	36	33	27	21	43	58
		Target = All Sensitive + 5	50	65	62	60	54	49	43	41	38	32	26	47	63
		Smoothed Criterion	**52**	**65**	**65**	**60**	**55**	**50**	**45**	**41**	**38**	**36**	**35**	**48**	**65**

					Lp,50 OBSPL										
Time	Class	MEDIAN	LpA'eq	LpC,eq	31.5	63	125	250	500	1000	2000	4000	8000	LpA'50	LpC'50
Night	Residential		40	53	46	45	41	37	35	34	35	38	31	42	49
Night	All Sensitive		40	55	47	46	41	39	35	34	29	32	23	39	49
Night	All		40	56	49	48	44	39	36	32	28	30	21	39	51
		Target = All Sensitive + 5	**45**	**58**	**52**	**51**	**46**	**44**	**40**	**39**	**34**	**37**	**28**	**44**	**54**
		Smoothed Criterion	**47**	**60**	**60**	**55**	**50**	**45**	**40**	**36**	**33**	**31**	**30**	**43**	**60**

False Positives (shaded) Day

						Lp,50 OBSPL									
Date	Time	Class	Location	LpA'eq	LpC,eq	31.5	63	125	250	500	1000	2000	4000	8000	
10/9/24	Day	Residential	Kingsbrooke	52	65	66	54	50	44	41	38	33	27	19	Bus
11/5/24	Day	Residential	Montclair Subdivision	44	57	49	49	45	39	33	36	34	32	28	
11/5/24	Day	Residential	Cloverdale	39	54	51	50	47	40	32	35	35	32	31	
11/5/24	Day	Residential	Rollingwood	47	62	55	57	55	47	37	36	32	31	26	
10/9/24	Day	Education	Yung Elementary	46	63	61	56	54	46	42	40	33	26	23	
11/5/24	Day	Education	Piney Branch (Const)	45	63	59	60	52	45	38	33	30	24	17	Construction
11/5/24	Day	Education	Beville MS	48	64	57	55	47	38	30	35	34	26	16	
11/5/24	Day	Education	Montclairy Library	43	59	56	55	49	45	39	36	33	24	17	
10/9/24	Day	Park	Rollins Ford	47	62	56	56	56	49	39	38	31	23	14	Mowers
11/5/24	Day	Park	Locust Shade	52	63	60	58	54	49	49	48	42	36	30	Roadway
			Proposed Criterion	**52**	**65**	**65**	**60**	**55**	**50**	**45**	**41**	**38**	**36**	**35**	

False Positives (shaded) Night

						Lp,50 OBSPL									
Date	Time	Class	Location	LpA'eq	LpC,eq	31.5	63	125	250	500	1000	2000	4000	8000	
10/23/24	Night	Residential	Kingsbrooke	35	49	47	46	41	36	34	29	28	32	23	Crickets
11/12/24	Night	Residential	Kingsbrooke	45	58	45	43	41	39	35	38	42	44	38	Leaves
10/23/24	Night	Education	Yung Elementary	40	55	51	50	47	39	39	34	29	28	17	
10/23/24	Night	Park	Rollins Ford	39	60	58	54	49	43	36	31	27	25	18	
			Proposed Criterion	**47**	**60**	**60**	**55**	**50**	**45**	**40**	**36**	**33**	**31**	**30**	

1 – Continuous Sound, L50s, + 5 dB

- Median + 5
- Windspeed ≤ 6 mph
- Option to overlook if critters active

Residential

Band	Day L_{p50}	Night L_{p50}
31.5	65	60
63	60	55
125	55	50
250	50	45
500	45	40
1000	41	36
2000	38	33
4000	36	31
8000	35	30

Extra protection for continuous noise
The equivalent steady state levels, if all bands maxed out:

Weighting	Day	Night
$L_{pA,50}$	48	43
$L_{pC,50}$	65	60

2 – Simplify Transient Sound

- Residential baseline + 5
- Mixed Use
  - A- and C- only
  - L_{NDN} 65 is the HUD Limit
    - Standard construction OK
    - No additional noise reduction
- Commercial and Industrial
  - Addressed by previous Ordinance

Receptor	*Day L_{pA}*	*Night L_{pA}*	*Day L_{pC}*	*Night L_{pC}*
Residential	50	45	65	60
Mixed-Use	62	57	70	65
Commercial	Previous ordinance		Previous ordinance	
Industrial	Previous ordinance		Previous ordinance	

Higher windspeeds are tolerable for measurements on Mixed-Use, Commercial and Industrial properties

Data Centers @ Criteria

						Lp,50 OBSPL								
Date	Time	Class	Location	LpA'eq	LpC,eq	31.5	63	125	250	500	1000	2000	4000	8000
10/9/24	Day	Data Center	Tanner Way	54	66	64	61	56	51	51	51	42	31	24
10/9/24	Day	Data Center	Wellington Glen	59	73	64	65	59	53	51	53	49	41	30
10/9/24	Day	Data Center	Hornbaker 1	60	71	69	64	63	59	59	57	51	44	29
10/9/24	Day	Data Center	Hornbaker 2	62	75	66	64	64	56	56	54	50	43	29
				52	**65**	**65**	**60**	**55**	**50**	**45**	**41**	**38**	**36**	**35**

						Lp,50 OBSPL								
Date	Time	Class	Location	LpA'eq	LpC,eq	31.5	63	125	250	500	1000	2000	4000	8000
10/23/24	Night	Data Center	Tanner Way	47	61	58	57	54	49	45	40	37	41	19
10/23/24	Night	Data Center	Wellington Glen	56	66	60	61	53	49	50	49	44	35	26
11/12/24	Night	Data Center	Wellington Glen	54	70	59	60	55	49	42	44	43	34	22
10/23/24	Night	Data Center	Hornbaker 1	55	70	66	64	63	56	54	51	48	44	40
10/23/24	Night	Data Center	Hornbaker 2	52	67	65	63	61	54	50	48	46	43	38
				47	**60**	**60**	**55**	**50**	**45**	**40**	**36**	**33**	**31**	**30**

Commercial – all ≤ 60 dBA, 70 dBC

Date	Time	Class	Location	A'EQ	C'EQ
10/9/24	Day	Commercial	Uncle Julios	50	66
10/9/24	Day	Commercial	Sam's Junkyard	51	65
10/9/24	Day	Commercial	PW Hospital	55	68
11/5/24	Day	Commercial	Great American Steakhouse	52	67
11/5/24	Day	Commercial	Potomac Mills	54	67
11/5/24	Day	Commercial	Featherstone Plaza	59	70
10/23/24	Night	Commercial	Uncle Julios	49	66
10/23/24	Night	Commercial	Sam's Junkyard	51	62
10/23/24	Night	Commercial	PW Hospital	50	64

Industrial – all ≤ 65 dBA, 75 dBC

Date	Time	Class	Location	A'EQ	C'EQ
10/9/24	Day	Industrial	Office Building	56	68
10/9/24	Day	Industrial	LF Jennings	60	70
11/5/24	Day	Industrial	Featherstone Industrial Par	60	75
10/23/24	Night	Industrial	Office Building	50	60
10/23/24	Night	Industrial	LF Jennings	61	70

Comparison of Criteria

Day

Band	Proposed	Warrenton	Oregon
31.5	65	---	68
63	60	64	65
125	55	60	61
250	50	54	55
500	45	48	52
1000	41	42	49
2000	38	38	46
4000	36	34	43
8000	35	30	40
A_{max}	48	51	55
C_{max}	65	67	69
Avg'g	L_{50}	L_{max}	L_{50}

Night

Band	Proposed	Warrenton	Oregon
31.5	60	---	65
63	55	59	62
125	50	55	56
250	45	49	50
500	40	43	46
1000	36	37	43
2000	34	33	40
4000	32	29	37
8000	30	25	34
A_{max}	43	46	49
C_{max}	60	64	65
Avg'g	L_{50}	L_{max}	L_{50}