



AWS Data Center (Tanner Way)
Impacts on Great Oak

DCOAG Meeting – Presented to JMT

10 April 2024

Great Oak Subdivision
Dale Browne

Building #1
92 Exhaust Fans
22 Backup Diesels

Building #2
124 Exhaust Fans
22 Backup Diesels

Building #3
124 Exhaust Fans
26 Backup Diesels

Building #4
84 Exhaust Fans
18 Backup Diesels

Substation
192 Mega Watt

CloudHQ MDC1-3, 3-story, 100',
252 MW, 2 substations

Brickyard Way - 4 Buildings, 2-story, 1,759,136 Gross Floor Area

Project Gold - 2-story, 183,420 Gross Floor Area

Tanner Way - 4 Buildings, 1-story, 795,191 sq ft

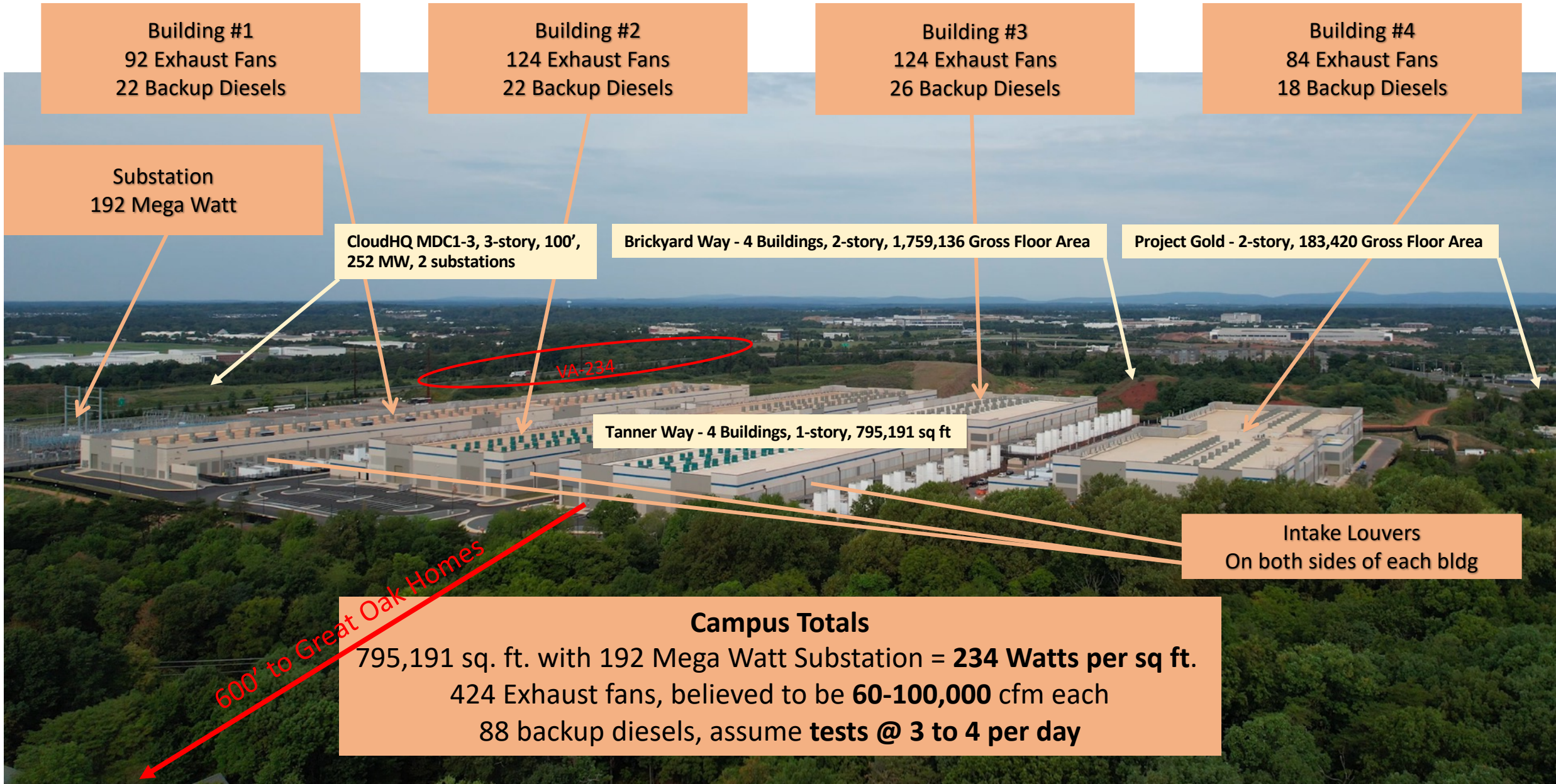
Intake Louvers
On both sides of each bldg

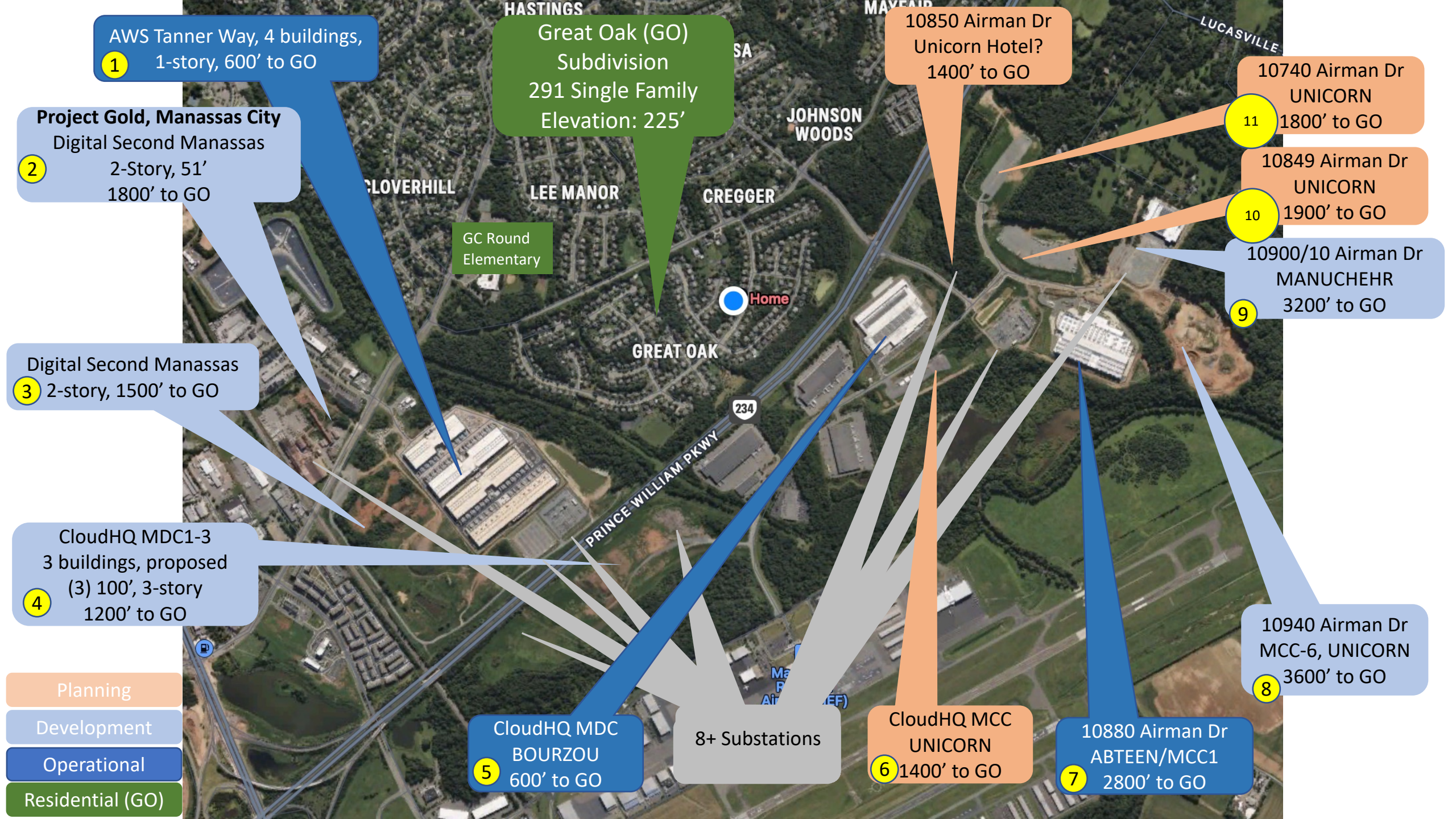
Campus Totals

795,191 sq. ft. with 192 Mega Watt Substation = **234 Watts per sq ft.**
424 Exhaust fans, believed to be **60-100,000 cfm** each
88 backup diesels, assume **tests @ 3 to 4 per day**

600' to Great Oak Homes

VA-234





1 AWS Tanner Way, 4 buildings,
1-story, 600' to GO

2 Project Gold, Manassas City
Digital Second Manassas
2-Story, 51'
1800' to GO

3 Digital Second Manassas
2-story, 1500' to GO

4 CloudHQ MDC1-3
3 buildings, proposed
(3) 100', 3-story
1200' to GO

Great Oak (GO)
Subdivision
291 Single Family
Elevation: 225'

GC Round
Elementary

10850 Airman Dr
Unicorn Hotel?
1400' to GO

11 10740 Airman Dr
UNICORN
1800' to GO

10 10849 Airman Dr
UNICORN
1900' to GO

9 10900/10 Airman Dr
MANUCHEHR
3200' to GO

5 CloudHQ MDC
BOURZOU
600' to GO

8+ Substations

6 CloudHQ MCC
UNICORN
1400' to GO

7 10880 Airman Dr
ABTEEN/MCC1
2800' to GO

8 10940 Airman Dr
MCC-6, UNICORN
3600' to GO

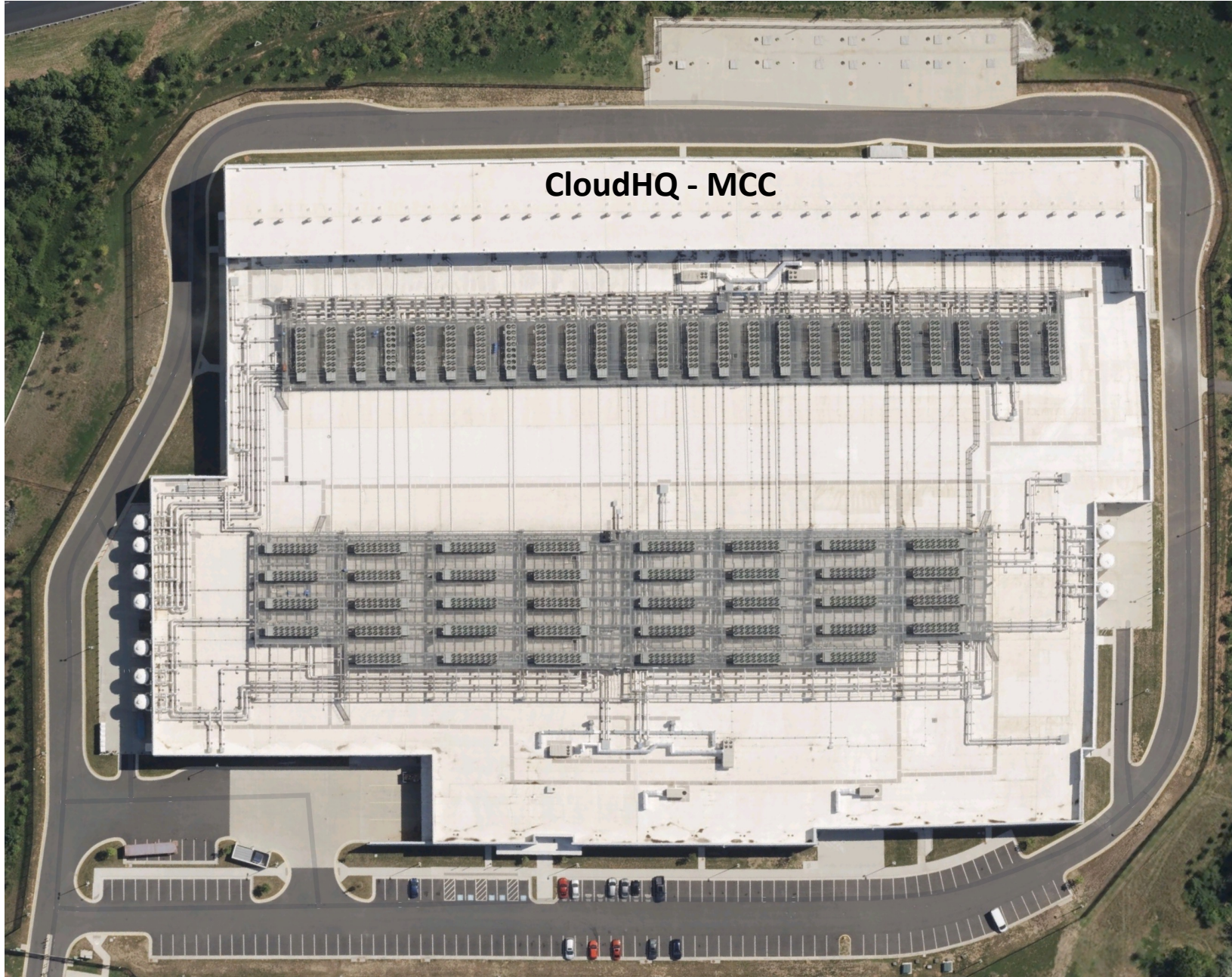
Planning

Development

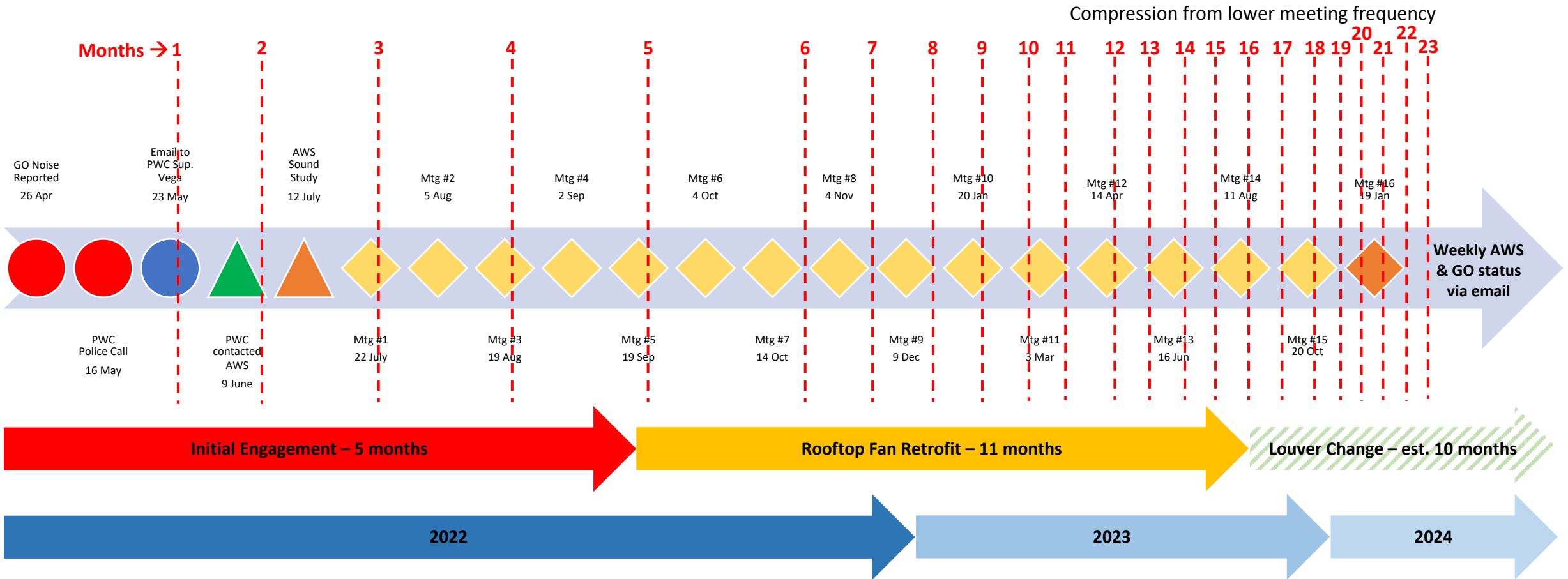
Operational

Residential (GO)

CloudHQ - MCC



AWS, PWC and Great Oak Interactions



Nearly 2-years since first report, AWS data center impacts on Great Oak are better but not fully resolved

Initial Engagement

26 Apr – 19 Sep 2022
(5 months)

- Complaints, police reports and initial dialog
- Great Oak reported noise and blasting damage issues to AWS & PWC
- AWS response during this time lacked detail due to “proprietary concerns”
- AWS acknowledged rooftop AC noise source and began deploying shrouds
- Shrouds were doubled and of little benefit (~1 dBA)



Fan Retrofit

19 Sep 22 – 18 Aug
2023 (11 months)

- AWS VP Operations for North America engaged
- Initiated fan blade and motor change, added wind bands, modified control software
- Noise reduced by about 10 dBA (58-65 dBA to 48-55 dBA range)
- AWS briefed 2024 louver change



Louver Change

18 Aug 23 – Est. Jun
2024 (10 months)

- Add dampening material behind the louvers inside 3 buildings
 - Building #1 excluded, furthest from Great Oak
- Ducts behind each louver varies resulting in design and material variations
- Planned – January – March 2024
- Updated completion June 2024
- No dBA reduction committed, will change “nature” of the noise, expect it to eliminate the “screech”
- **March 2024 – VP of Operations left AWS with no replacement committed**



Air Intake Louvers

**Diesel Generator
1 of 88**



Blasting damage

(example from 1 of several homes)

- Impact to foundations, patios, interior walls, and windows function
- Exterior dust required professional cleaning on many homes
- Met with EE Reed (site developer) and PWC Fire Marshall
- Homeowners instructed to file insurance claims and let both insurers work it out
- Could not prove when damage occurred, so I believe all were dismissed

Community Wellbeing

Replacing windows in one home did not help (\$20K)

- Health Issues from the noise
 - Disturbed sleep
 - Increased stress and anxiety
 - Exacerbated migraines
 - Aggravated autoimmune disorder due to stress
 - Diesel impact on air quality
- Enjoying our homes and community
 - Deck/Patio/Backyard use is intolerable
 - Impacts to pets, reports of backyard avoidance
- Nearby worries
 - Tot lot 800', Tennis/Pickleball court 900'
 - Latter Day Saints Church parcel 500 ft
 - Round Elementary (playground) at 1400 ft



Great Oak Expectations

Proposed requirement for sustained noise, **combined** from **all nearby data center and substation sources**, as measured at the impacted property boundary

Noise Level	Human Impact
<40 dB(A)	Quiet neighborhood, transient noises may exist w/o irritation
40-45 dB(A)	Barely audible outside
45-50 dB(A)	Audible outside, mildly intrusive to some people
50-55 dB(A)	Moderately intrusive outside, may be audible inside (rooms facing noise source)
55-60 dB(A)	Disturbing outside, audible in most rooms of the house (moderately intrusive)
60-65 dB(A)	Uncomfortable outside, inside noise levels impact sleep, concentration, conversations (disturbing)
65-70 dB(A)	Unbearable outside, home is untenable

Required Level {

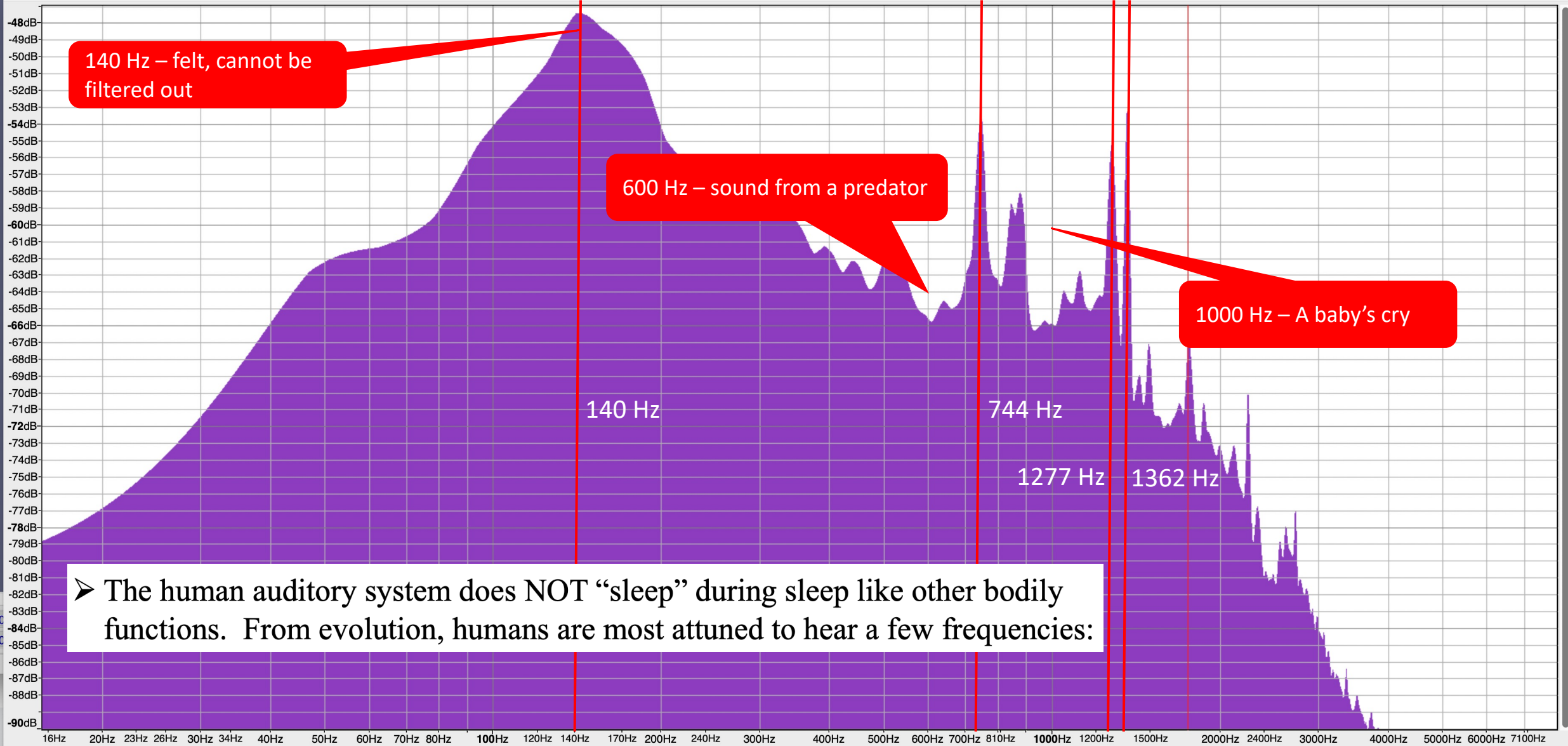
PWC NO Night

PWC NO Day

Current Levels
~54 dBA with
45-69 range



Audio recorded on 17 Nov 23 after Fan retrofit completion



140 Hz – felt, cannot be filtered out

600 Hz – sound from a predator

1000 Hz – A baby's cry

➤ The human auditory system does NOT “sleep” during sleep like other bodily functions. From evolution, humans are most attuned to hear a few frequencies:

Cursor: 1786 Hz (A6) = -69 dB

Peak: 1754 Hz (A6) = -66.7 dB

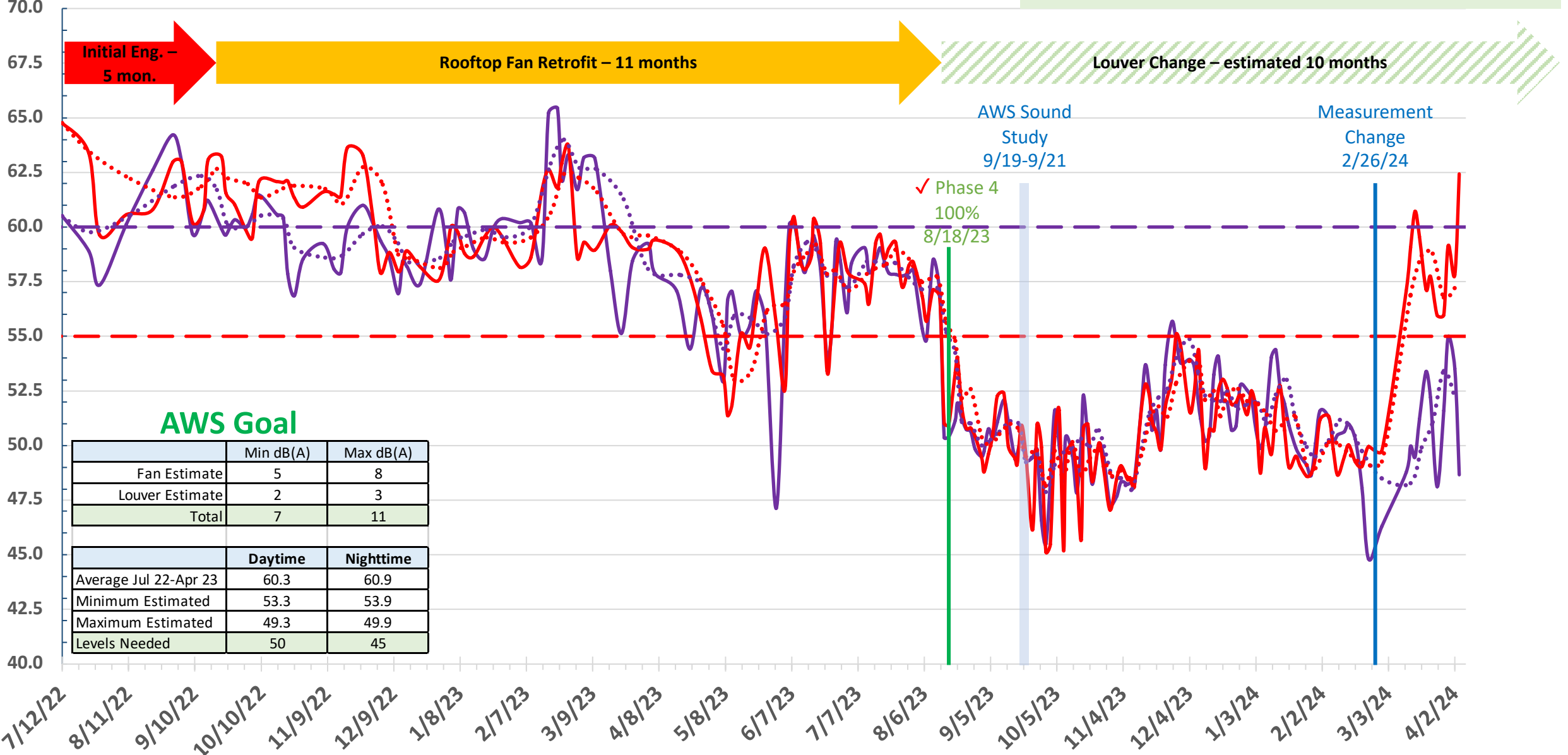
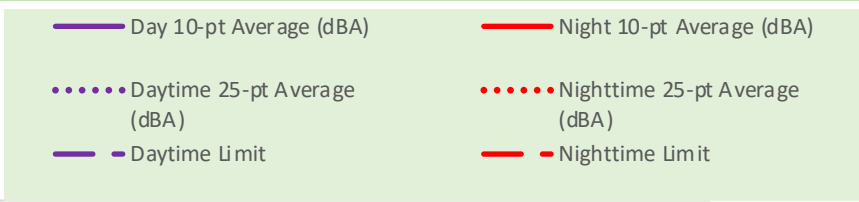
Algorithm: Spectrum Size: 1024 Export...
Function: Hann window Axis: Log frequency Replot...

AWS Tanner Way Noise Signature

Great Oak Noise 10 & 25-Point Averages

AWS Tanner Way

12 July 2022 - 7 Apr 2024

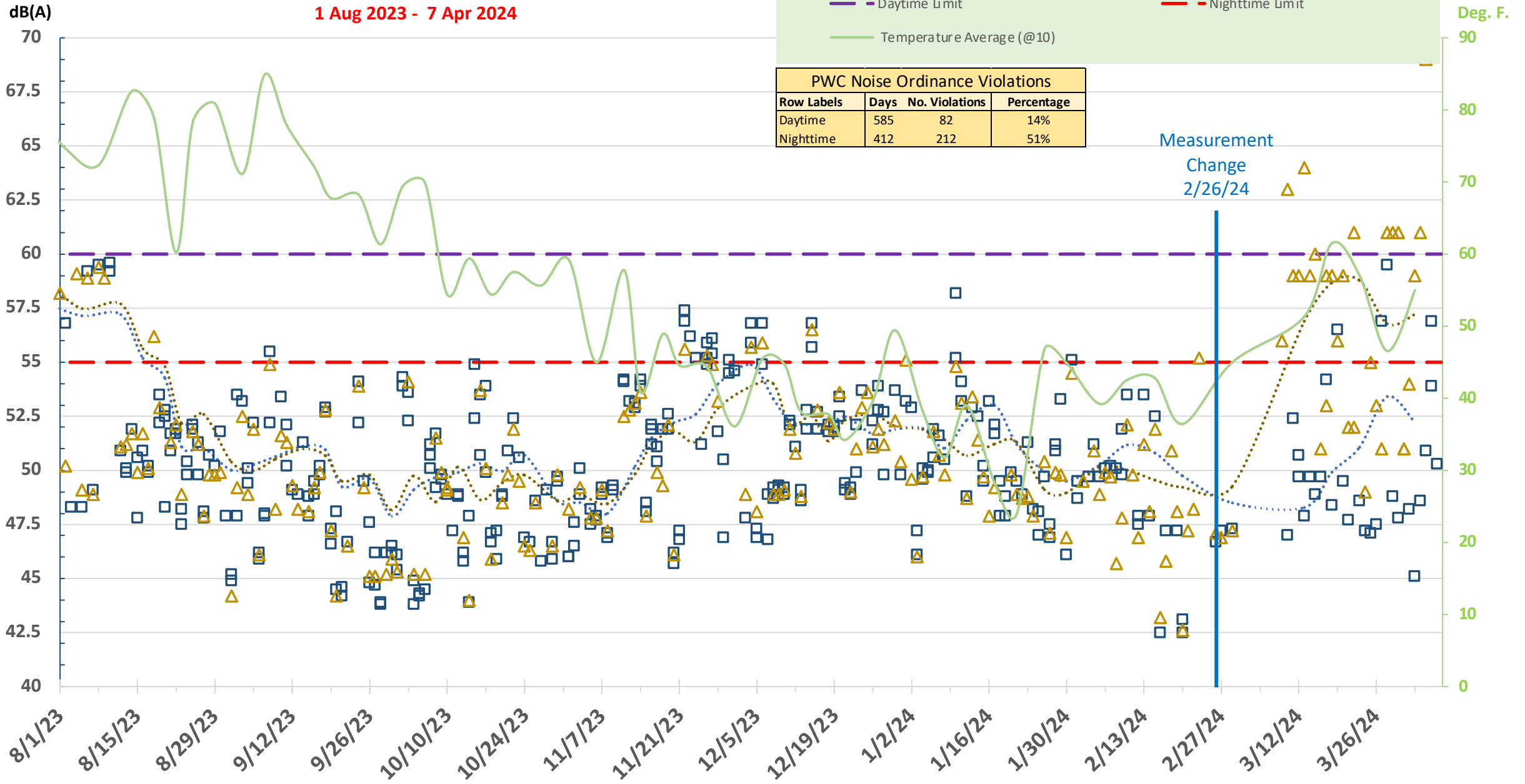


AWS Goal

	Min dB(A)	Max dB(A)
Fan Estimate	5	8
Louver Estimate	2	3
Total	7	11
	Daytime	Nighttime
Average Jul 22-Apr 23	60.3	60.9
Minimum Estimated	53.3	53.9
Maximum Estimated	49.3	49.9
Levels Needed	50	45

Great Oak Noise Scatter & 25-Point AVG After Fan Retrofit - AWS Tanner Way

1 Aug 2023 - 7 Apr 2024



Media Commentary

SOURCE: Prince William Times, Peter Cary, Feb 27, 2023, *Some cities suffering from data center noise turn to tough limits*

"Data center noise is unique in that it is not so much its loudness that is an irritant as its constancy."

Les Blomberg, director of the Noise Pollution Clearinghouse *"Blomberg noted that typical noise limits are focused on transient noise and not on the 24/7 drone that invades your house."* People say noise of 55 to 65 decibels (the range of Prince William's noise ordinance limit) is no louder than human conversation, he said, *"but it's like having a conversation with someone you don't want to have, all the time. That's the thing; there's no escaping it."*

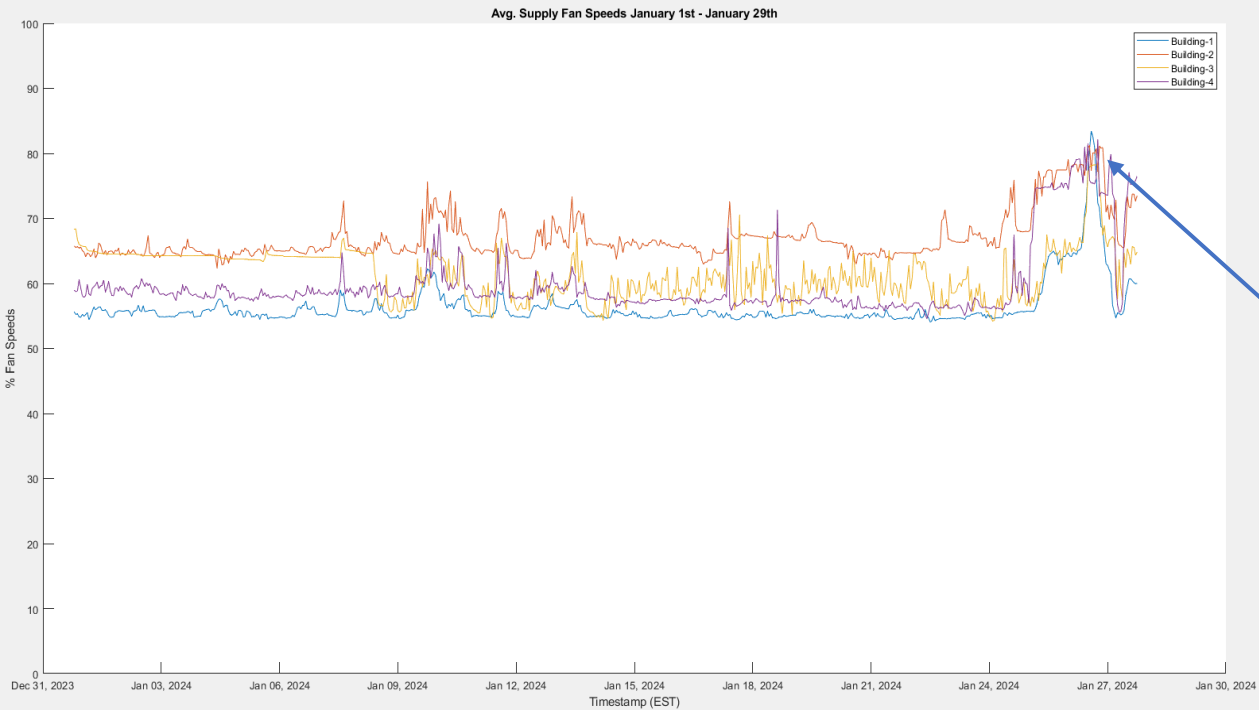
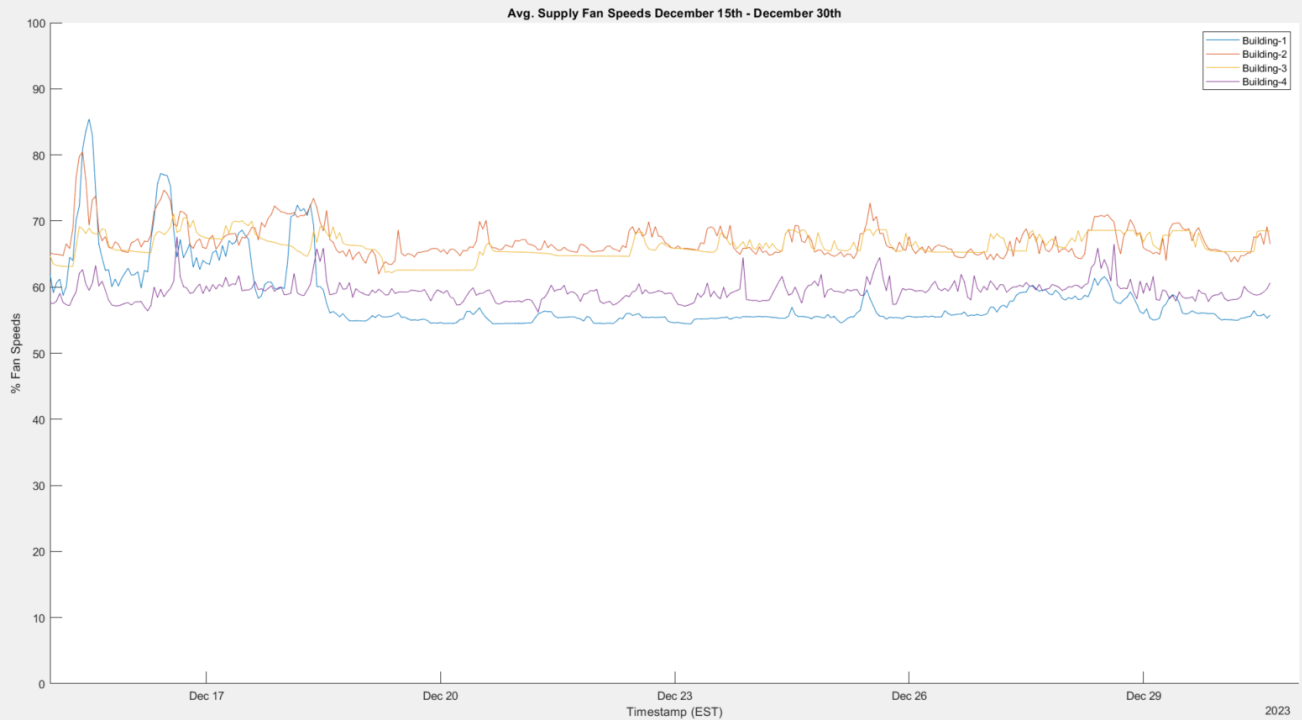
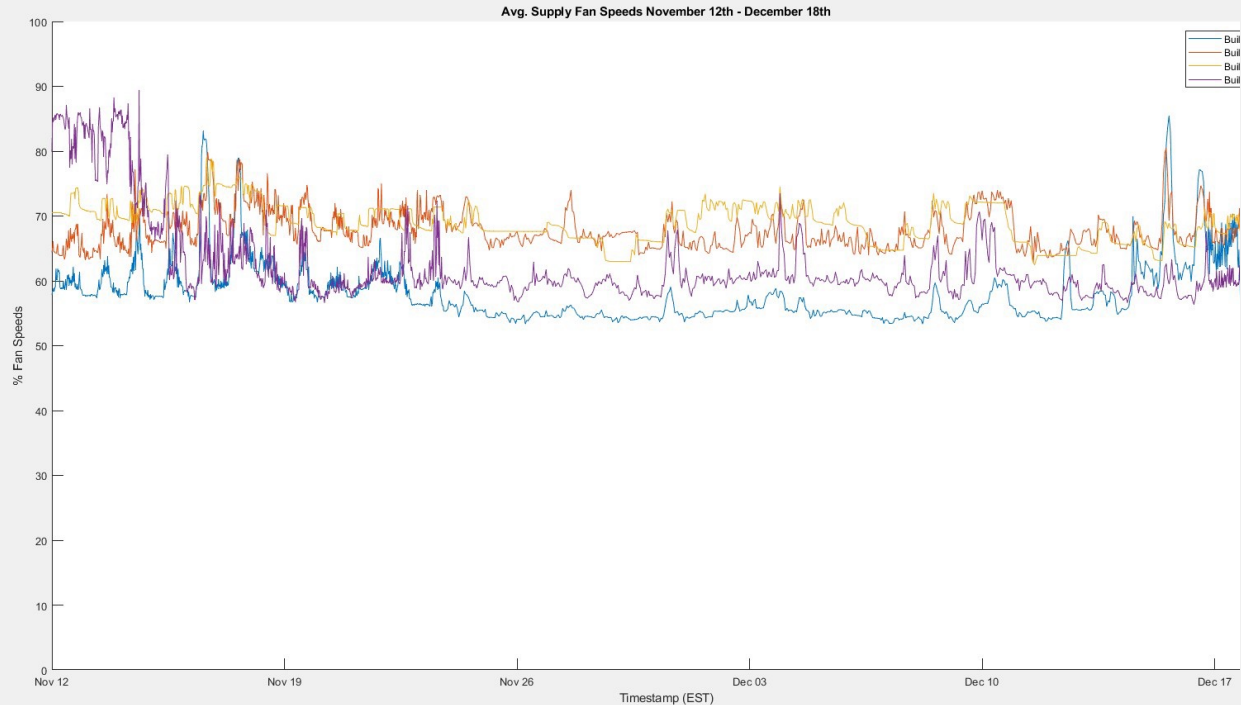
"One solution could be to write an ordinance that penalizes the duration of noise. Alameda, California, regulates noise based not only on decibel level, but also its time length. The longer the noise continues, the quieter it must be. But Blomberg said such an ordinance requires a police officer to stay in place as long as an hour to measure noise duration. It makes sense, but it's not enforceable" he said."

The better solution, he [Blomberg] said – as in Chandler and Niagara Falls – is to require emitters of nonstop noise to be especially quiet. "It's not unreasonable to choose a night level of 45 decibels," Blomberg said, "and a daytime limit of 50".

"Writing ordinances to deal with data center noise is relatively new", said Blomberg. But he and Eric Zwerling, who runs the Rutgers University Noise Technical Assistance Center, said "it can be done".

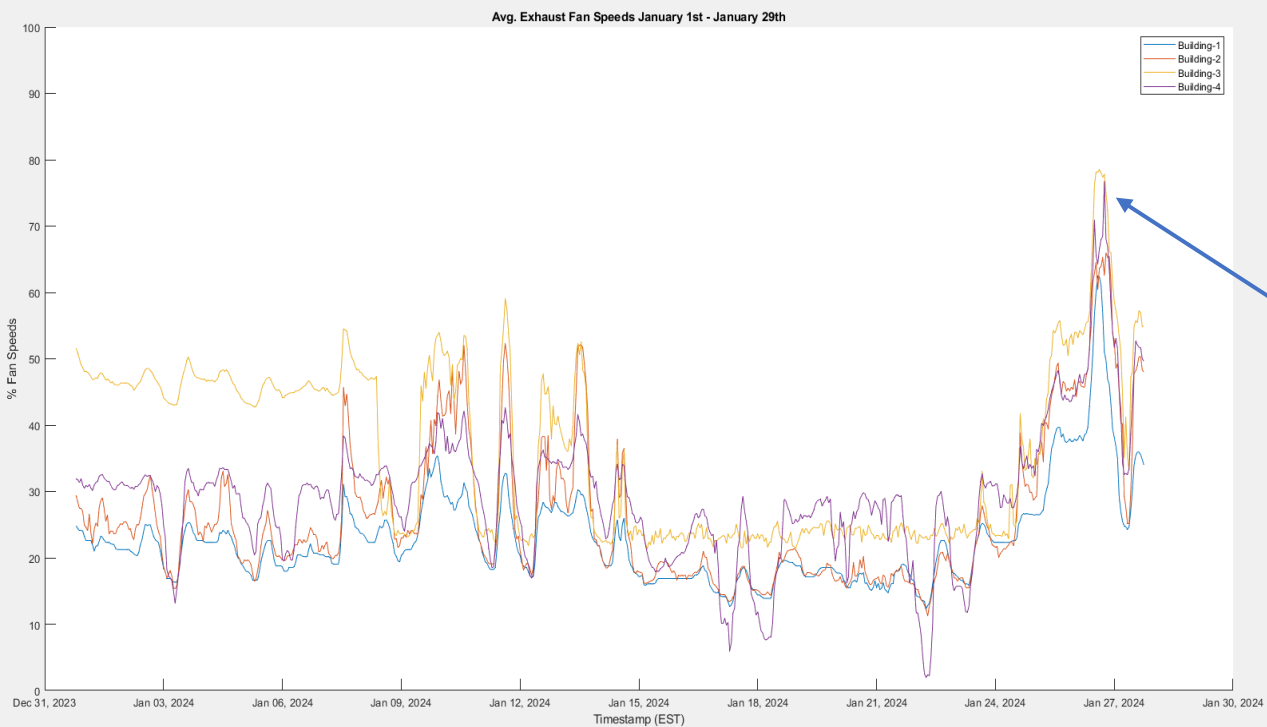
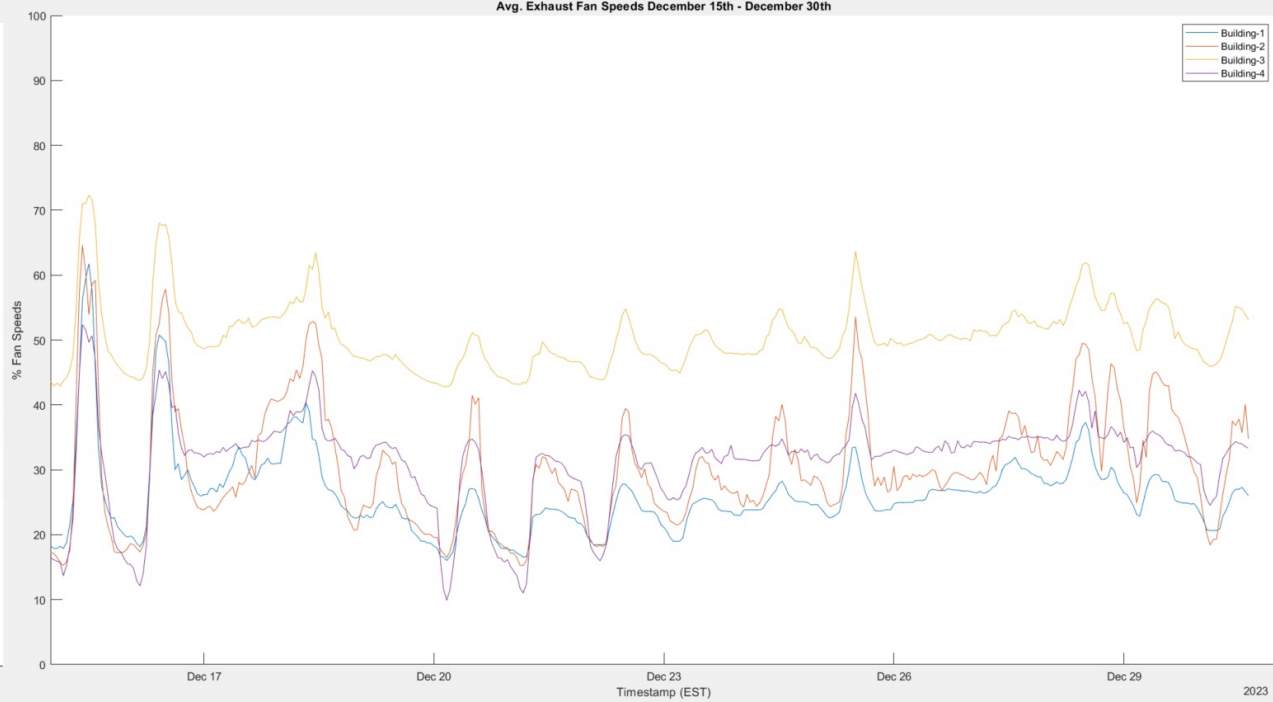
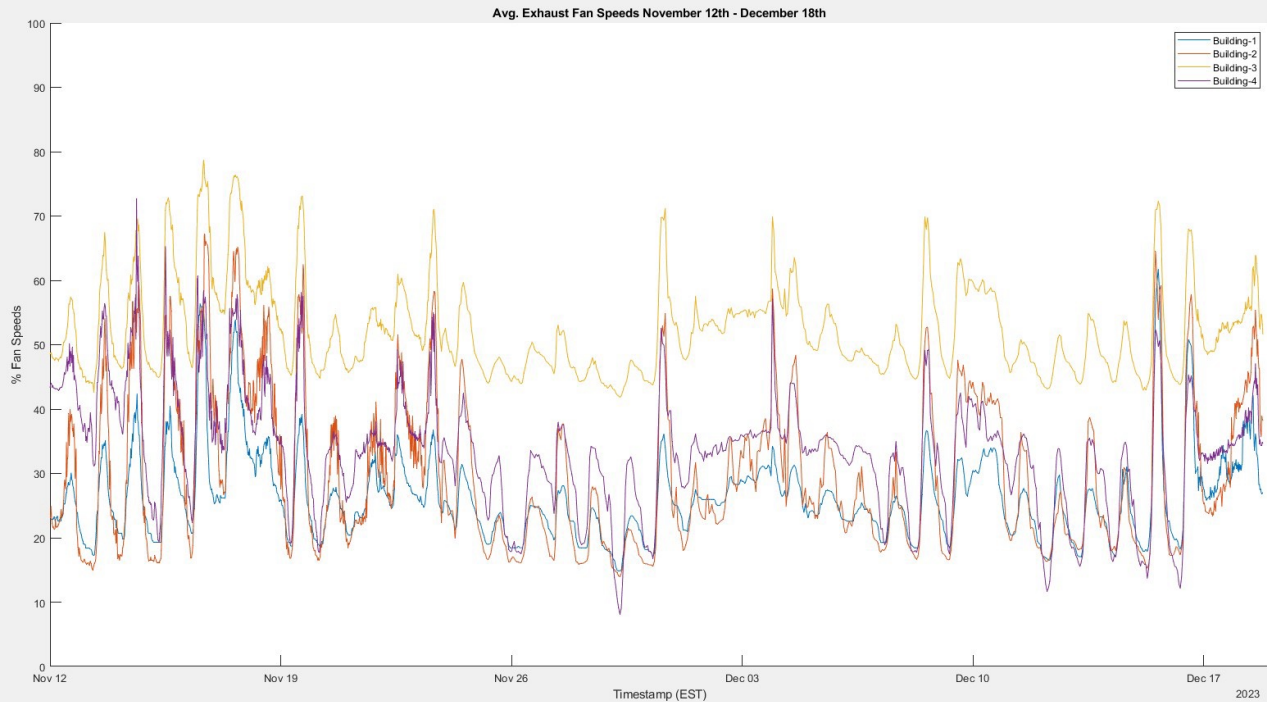
*Thank
you*





Supply Fan Speed

- All fan speeds are “generally” consistent for each building
- Outside temperature was in the 50’s in late Jan
- Building #3 (closest to Great Oak) supply fan speed lower than #2 as of 8 Jan 2024 (reversed)
- This implies workload move away from Great Oak



Exhaust Fan Speed

- Higher fan speed variability
- Outside temperature was in the 50's in late Jan
- Jan 15 – 24 was during cold weather, variability may be related to outside temperature
- Building #3 (closest to Great Oak) exhaust fan speed consistently above the other buildings